

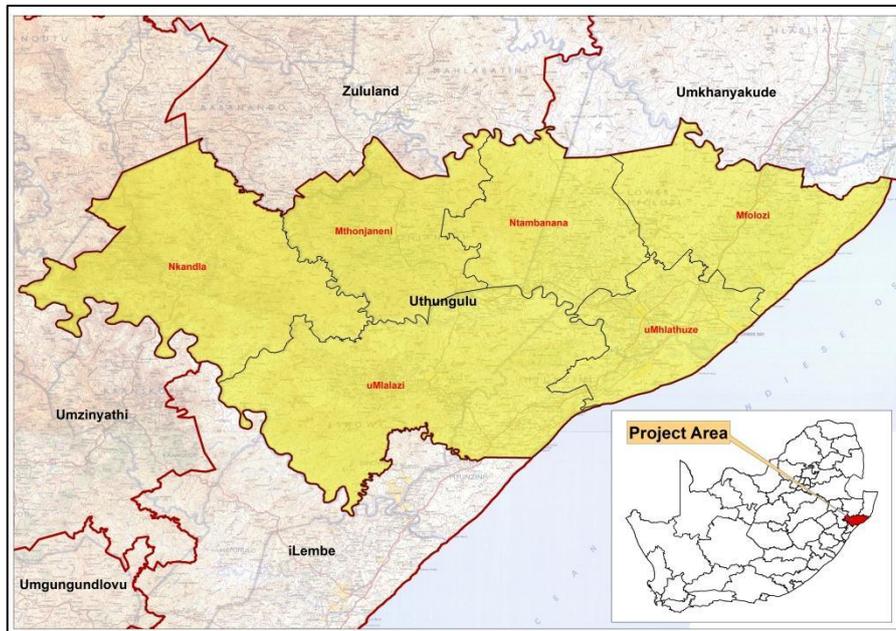
Umgeni Water



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

REPORT
UTHUNGULU DISTRICT MUNICIPALITY

CONTRACT NO. 2015/178



JUNE 2016

STATUS: FINAL REPORT

Prepared for:
Umgeni Water
310 Burger Street, PMB
PO Box 9, PMB, 3200
Tel: (033) 341 1111
Fax: (033) 341 1084
Attention: Mr Vernon Perumal

Compiled by:
Hatch Goba
25 Richefond Circle, Ridgeside Office Park,
Umhlanga, Durban, South Africa, 4321
Tel: +27(0) 31 536 9400
Fax: +27(0) 31 536 9500
e-mail: GMorgan@hatch.co.za
Enquiries: Mr G. Morgan
In Association with JTN Consulting (Pty) Ltd

REPORT CONTROL PAGE

Report control

Client:	Umgeni Water
Project Name:	Universal Access Plan (For Water Services) Phase 2: Progressive Development Of A Regional Concept Plan
Project Stage:	Phase 2: Project Report
Report title:	Project Report
Report status:	Final Report
Project reference no:	2663-00-00
Report date:	20 June 2016

Quality control

Written by:	Shivesh Dinanath- JTN Consulting
Reviewed by:	Busiswa Maome – JTN Consulting
Approved by:	Pragin Maharaj Pr Tech Eng – JTN Consulting
Date:	20 June 2016

Document control

Version History:			
Version	Date changed	Changed by	Comments
0	31 March 2016	PM	Issued for Use
1	16 May 2016	PM	Second Draft for Comment
2	20 June 2016	PM	Final
3	24 June 2016	PM	Final

Contents

REPORT CONTROL	I
QUALITY CONTROL	I
DOCUMENT CONTROL	I
LIST OF FIGURES	IV
LIST OF TABLES.....	V
LIST OF ABBREVIATIONS	VI
EXECUTIVE SUMMARY	VIII
1. OBJECTIVES AND METHODOLOGY.....	1
1.1. BACKGROUND	1
1.2. PURPOSE AND OBJECTIVES	1
1.3. SPECIFIC TARGETS OF THE INTERVENTION	2
1.4. STUDY PROCESS	2
1.5. DATA SOURCES.....	3
2. STUDY AREA.....	4
2.1. CONTEXT.....	4
2.2. BOUNDARIES OF THE STUDY AREA.....	4
2.3. PHYSICAL CHARACTERISTICS OF STUDY AREA	5
2.4. CLIMATE.....	5
2.5. TOPOGRAPHY, GEOLOGY AND SOILS.....	5
2.6. ENVIRONMENTAL	6
3. DEMOGRAPHICS	6
3.1. EXISTING POPULATION AND DISTRIBUTION.....	6
3.1.1. POPULATION SOURCES	6
3.2. SOCIAL AND ECONOMIC INDICATORS	10
3.3. COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DEVELOPMENT	10
3.4. POPULATION GROWTH SCENARIOS	11
4. WATER DEMANDS.....	12
4.1. LEVEL OF SERVICE	12
4.2. WATER DEMAND CALCULATION	16
5. EXISTING WATER SUPPLY INFRASTRUCTURE	17
5.1. WATER RESOURCES AND AVAILABILITY.....	17
5.1.1. JAMESON'S DRIFT WATER SUPPLY SCHEME (UAP PHS ZONE 1).....	17
5.1.2. ESHOWE WATER SUPPLY SCHEME	17
5.1.3. GINGINDLOVU WATER SUPPLY SCHEME	18
5.1.4. KWAHLOKOHLOKO REGIONAL WATER SUPPLY SCHEME	18
5.1.5. MIDDLEDRIFT REGIONAL WATER SUPPLY SCHEME.....	19
5.1.6. MTUNZINI WATER SUPPLY SCHEME	19
5.1.7. MTHONJANENI REGIONAL WATER SUPPLY SCHEME	20
5.1.8. NKANDLA WATER SUPPLY SCHEME.....	20
5.1.9. VUTSHINI REGIONAL WATER SUPPLY SCHEME.....	21
5.1.10. MBONAMBI REGIONAL WATER SUPPLY SCHEME.....	21
5.2. EXISTING WATER SUPPLY SCHEMES AND AREAS.....	22
6. BULK WATER SUPPLY INTERVENTIONS CURRENTLY IN PLANNING	31
6.1. GOEDERTROUW REGIONAL SUPPLY SCHEME	33
6.2. MIDDLEDRIFT REGIONAL SUPPLY SCHEME.....	34

6.3. VUTSHINI-NKANDLA REGIONAL SUPPLY SCHEME	35
6.4. UPPER NSELENI-MHLANA REGIONAL SUPPLY SCHEME.....	36
6.5. MBONAMBI REGIONAL SUPPLY SCHEME	37
7. BULK WATER SUPPLY INTERVENTIONS CONSIDERED IN THIS STUDY	38
7.1. OPTION 1: LOWER TUGELA BULK WATER SUPPLY TO THE GOEDERTROUW REGIONAL SCHEME	45
7.2. OPTION 2: ADDITIONAL RAW WATER SUPPLY FROM THUKELA RIVER TO GOEDERTROUW DAM AT MIDDLEDRIFT.	50
7.3. OPTION 3: BULK WATER SUPPLY TO MFOLOZI LM AND RICHARDS BAY FROM THE LOWER THUKELA SCHEME	53
7.4. OPTION 4: POSSIBLE SUPPLY TO VUTSHINI-NKANDLA FROM DUNDEE BULK	57
7.5. OPTION 5: DAM ON THE MFULE RIVER FOR THE MTHONJANENI AND NSELENI-MHLANA SCHEME	61
7.6. OPTION 6: DAM ON THE NSUZE RIVER FOR THE NKANDLA-VUTSHINI SCHEME.....	67
8. RECOMMENDATIONS.....	71
REFERENCES	72
APPROVAL	73
APPENDICES	74

LIST OF FIGURES

Figure 1: Key Map	xiv
Figure 2: Locality of UThungulu District Municipality	4
Figure 3: Scheme Map.....	32
Figure 4: Supply Zones and Demands.....	39
Figure 5: Layout of Lower Tugela to Eshowe Reservoir	46
Figure 5a: Long Section of Lower Tugela to Eshowe Reservoir	47
Figure 5b: Long Section of Eshowe Reservoir to Mthonjaneni Reservoir	47
Figure 6: Layout of Raw Water Supply from Thukela River to Goedertrouw Dam	51
Figure 6a: Long Section of Raw Water Supply from Thukela River to Goedertrouw Dam	52
Figure 7: Layout of Lower Tugela to Mfolozi and Richards Bay.....	54
Figure 7a: Long Section of Lower Tugela to Mfolozi and Richards Bay.....	55
Figure 8: Layout of Dundee Bulk to Vutshini Nkandla	58
Figure 8a: Long Section of Dundee Bulk to Vutshini Nkandla	59
Figure 9: Layout of Dam on the Mfule River.....	62
Figure 9a: Long Section Raw Water Pipeline from Mfule Dam.....	63
Figure 10: Layout of Mfule Reservoir to Nseleni	65
Figure 10a: Long Section Mfule Reservoir to Nseleni	66
Figure 11: Layout of Dam on the Nsuze River	68
Figure 11a: Long Section of Raw Water Pipeline from Nsuze Dam	69

LIST OF TABLES

Table A: Water Balance	x
Table 1: Source Documents	3
Table 2: Census Population and Households (2011)	7
Table 3: DWS Reconciliation strategy Population growth scenarios (2011)	8
Table 4: Population Projections (2015 – 2045)	11
Table 5: Unit Demands	13
Table 6: Water Service levels (piped water) per Local Municipality	14
Table 7: Water Demand Scenarios	15
Table 8: Demand Calculation.....	16
Table 9: Summary of Existing Infrastructure per Water Supply Scheme	22
Table 10: Project Demands per Zone	41
Table 11: Water Balance	44
Table 12: Capital Costs – Lower Tugela to Eshowe Reservoir.....	48
Table 12a: Capital Costs – Eshowe Reservoir to Mthonjaneni Reservoir.....	49
Table 13: Capital Costs – Raw Water Supply from Thukela River to Goedertrouw Dam.....	53
Table 14: Capital Costs – Lower Tugela to Mfolozi and Richardsbay	56
Table 15: Capital Costs – Dundee Bulk to Vutshini Nkandla	60
Table 16: Capital Costs – Raw Water Pipeline from Mfule Dam.....	64
Table 17: Capital Costs – Mfule Reservoir to Nseleni	67
Table 18: Capital Costs – Raw Water Pipeline from Nsuze Dam	70

LIST OF ABBREVIATIONS

Ave.	Average
CoGTA	Department of Cooperative Governance and Traditional Affairs
DM	District Municipality
DWS	Department of Water and Sanitation
GDP	Gross Domestic Product
GGP	Gross Geographic Product
GIS	Geographical Information System
GRIP	Groundwater Research Information Project
HGDM	Harry Gwala District Municipality
HFY	Historical Firm Yield
IDP	Integrated Development Plan
UTDM	uThungulu 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
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 uThungulu District Municipality (UTDM).

UTDM is located in the North-Eastern region of the KwaZulu-Natal Province on the Eastern seaboard of South Africa. It consists of six Local Municipalities which are Umhlathuze, Umlalazi, Nkandla, Mbonambi, Ntambanana and Mthonjaneni.

The uMhlathuze LM is not included in this study as it is supplied by uMhlathuze Water and covered in another UAP Phase 2 report.

UTDM has the third highest population in the Province after the eThekweni Metro (Durban and surrounds) and the uMgungundlovu District (Pietermaritzburg and surrounds). It covers an area of approximately 8213 square kilometres, from the agricultural town of Gingingdlovu in the south, to the Umfolozi River in the north and inland to the mountainous beauty of rural Nkandla.

UTDM has developed detailed Regional Scheme Masterplans for its area of jurisdiction. The latest masterplans were updated in 2015 and are in draft format. These Masterplans provide detailed options for bulk water supply schemes to the entire municipal area (except farmlands) through the following regional bulk schemes:

- Goedertrouw Regional Scheme
- Middeldrift Regional Scheme
- Upper Nseleni-Mhlana Regional Scheme
- Vutshini-Nkandla Regional Scheme
- Mbonambi Regional Scheme

Each of the Regional Schemes is broken down into Sub-supply areas. Water supply to some of these sub-supply areas have already been implemented and the masterplan outlines the requirements for extension of the bulk water distribution to address water supply in future phases to cover all Sub supply areas and hence the entire Regional Scheme footprint.

The Regional Scheme supply and sub-areas is shown in the overall scheme map in **Appendix B**.

The Water Masterplans focus mainly on treatment and distribution options. Water resource availability is not adequately covered. Therefore, for the purposes of this UAP Phase 2 study, a water demand versus water resource availability was carried out and augmentation options that would address long term water resource availability to meet the projected demands have been assessed.

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

TABLE A: WATER BALANCE

	2015 Masterplan Regional Scheme	Previous Regional Scheme Areas	Masterplan Sub Supply Areas	UAP Phase 2 Supply Zone	Water Resource	Yield (Mℓ/day)	Yield after all allocations	UAP Phase 2 : 30 Year Demand GAADD (Mℓ/day)	Resource Assessment		UAP Phase 2 Augmentation Option	Augmentation Resource Yield after All Allocations (Mℓ/day)
									Water Surplus (Mℓ/day)	Water Deficit (Mℓ/day)		
Existing	Vutshini - Nkandla Regional Scheme	Jamesons Drift	1	1	Tugela River	1	-	1.548	-	0.548	Ntshingwayo Dam via Dundee Bulk or Nsuze Dam	25.5
		Nkandla	8	1	Mhlatuze River	1.34	-	7.74	-	6.4		
		Vutshini	8	1	Vove Dam	0.33	-	7.912	-	7.582		
	Middledrift Regional Scheme	Middledrift	8	0	Tugela River	260	15.8	15.8	-	-	-	-
	Upper Nseleni-Mhlana Regional Scheme	Nseleni/Mhlana	17	5	Nkolokoto & Nseleni River	1.23	-	24.4	-	23.17	Mfule Dam	48.7
	Goedertrouw Regional Scheme	Eshowe	7	2	Goedertrouw Dam	293	(167.55) ¹	24.055	-	227.55	Lower Tugela Bulk Water Supply Scheme	60
		Kwahlokhloko	7	3				11.6				
		Mthonjaneni	8	4				18.9				
		Gingindlovu	-	2	Matigulu River	25.14	-	1.415	23.725	-	-	-
	Mtunzini	-	2	Ntuze River	4.7	-	2.83	1.87	-	-	-	-
Mbonambi Regional Scheme	Mbonambi	-	6	Goedertrouw Dam, Lake Mzingazi & Lake Nsezi	354.7	(227.55) ¹	11.6	-	223.35	Lower Tugela Bulk Water Supply Scheme	50	
In Planning / Implementation	Vutshini - Nkandla Regional Scheme	Jamesons Drift	1	1	Tugela River	1	-	1.548	-	0.548	Ntshingwayo Dam via Dundee Bulk or Nsuze Dam	25.5
		Nkandla	8	1	Mhlatuze River	1.34	-	7.74	-	6.4		
		Vutshini	8	1	Vove Dam	0.33	-	7.912	-	7.582		
	Middledrift Regional Scheme	Middledrift	8	0	Tugela River	260	15.8	15.8	-	-	-	-
	Upper Nseleni-Mhlana Regional Scheme	Nseleni/Mhlana	17	5	Nkolokoto & Nseleni River	1.23	-	24.4	-	23.17	Mfule Dam	48.7
	Goedertrouw Regional Scheme	Eshowe	7	2	Goedertrouw Dam	293	(167.55) ¹	24.055	-	227.55	Lower Tugela Bulk Water Supply Scheme	60
		Kwahlokhloko	7	3				11.6				
		Mthonjaneni	8	4				18.9				
		Gingindlovu	-	2	Matigulu River	25.14	-	1.415	23.725	-	-	-
	Mtunzini	-	2	Ntuze River	4.7	-	2.83	1.87	-	-	-	-
Mbonambi Regional Scheme	Mbonambi	-	6	Goedertrouw Dam, Lake Mzingazi & Lake Nsezi	354.7	(227.55) ¹	11.6	-	239.15	Lower Tugela Bulk Water Supply Scheme	50	

All information gathered from the All Town Recon Strategies and the 2015 Draft Masterplans of the respective Regional Schemes

Groundwater is excluded from this water balance

1) Kwahlokhloko All Town Recon Strategy (pg. 15)

Goedertrouw Regional Scheme

Yield	Goedertrouw Dam	293	Mℓ/day
	Rutledge and Eshlazi Dams	3.20	Mℓ/day
	Thukela transfer scheme	244.2	Mℓ/day
Total Yield		540.4	Mℓ/day
Usage	Water usage by Mhlatuze Water	296	Mℓ/day
	Irrigation, industry and Forestry	411.95	Mℓ/day
Total Usage		707.95	Mℓ/day
Yield after all allocations		(167.55)	Mℓ/day
Goedertrouw Regional Scheme Demand (UAP Ph 2)		60	Mℓ/day
Deficit		227.55	Mℓ/day

From Table A, it can be seen that, based on the current water usage, there is a resource deficit within the Goedertrouw Regional Scheme.

Possible interventions for reducing and ultimately eliminating this deficit include:

- Water trading with holders of existing water use entitlements such as irrigators (*pg. 28 Kwahlokhloko All Town Recon Strategy*)
- The Lower Tugela Bulk Water Supply Scheme

Vutshini-Nkandla Regional Scheme

From Table A, it can be seen that, based on the current water usage, there is a resource deficit within the Nkandla-Vutshini Regional Scheme.

Possible interventions for reducing and ultimately eliminating this deficit include:

- Extension of the pipeline from Nquthu to the upper reaches of the Nkandla LM. (see section 7.4)
- A dam on the Nsuze River (see section 7.6)

Upper Nseleni-Mhlana Regional Scheme

From Table A, it can be seen that, based on the current water usage, there is a resource deficit within the Upper Nseleni-Mhlana Regional Scheme.

A possible intervention for eliminating this deficit is to implement the option of Mfule Dam (see section 7.5).

Middledrift Regional Scheme

There is a significant surplus of water in this scheme. No further interventions are required.

Mbonambi Regional Scheme

Yield	Goedertrouw Dam	293	Mℓ/day
	Rutledge and Eshlazi Dams	3.20	Mℓ/day
	Thukela transfer scheme	244.2	Mℓ/day
	Lake Mzingazi	36.7	Mℓ/day
	Lake Nsezi	25	Mℓ/day
Total Yield		602.1	Mℓ/day
Usage	Water usage by Mhlatuze Water (incl. Lakes Mzingazi & Nsezi)	357.7	Mℓ/day
	Goedertrouw Regional Scheme	60	Mℓ/day
	Irrigation, industry and Forestry	411.95	Mℓ/day
Total Usage		829.65	Mℓ/day
Yield after all allocations		(227.55)	Mℓ/day
Mbonambi Regional Scheme Demand (UAP Ph 2)		11.6	Mℓ/day
Deficit		239.15	Mℓ/day

From Table A, it can be seen that, based on the current water usage, there is a resource deficit within the Mbonambi Regional Scheme.

Possible interventions for reducing and ultimately eliminating this deficit include:

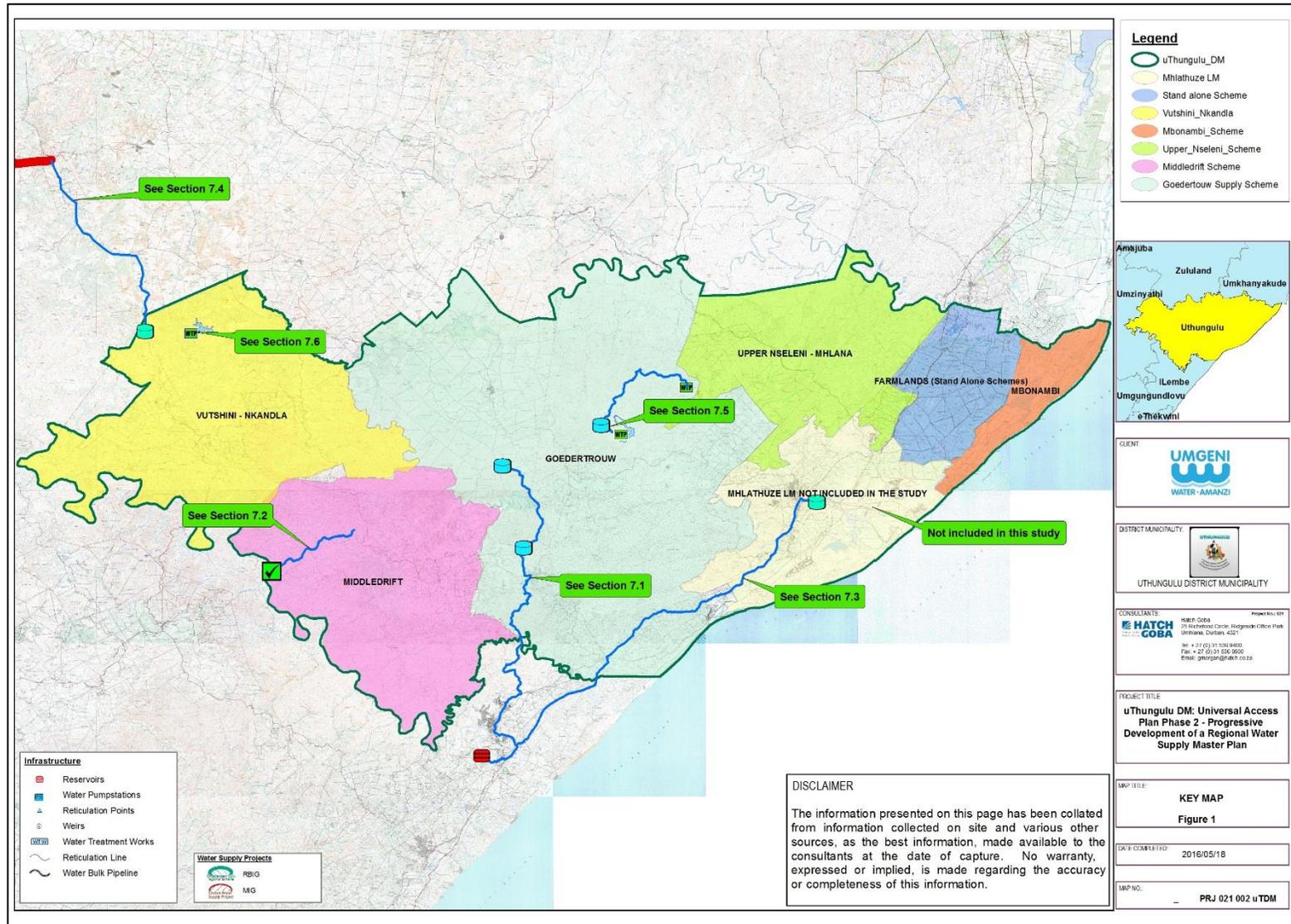
- Water trading with holders of existing water use entitlements such as irrigators (*pg. 28 Kwahlokhloko All Town Recon Strategy*)
- The Lower Tugela Bulk Water Supply Scheme

As the Masterplan addresses bulk water supply schemes for UTDM in detail, further distribution investigation was deemed unnecessary. In this study therefore, the options of augmenting water resources to the 5 Regional Schemes to address long term water resources deficiencies was investigated.

The options that were investigated are as follows:-

- Option 1: Lower Tugela Bulk Potable Water Supply to the Goedertrouw Supply Scheme
- Option 2: Additional Raw Water Transfer from the Thukela River to Goedertrouw Dam
- Option 3: Bulk Potable Water Supply to Richards Bay and Mbonambi from the Lower Thukela Bulk Water Supply Scheme
- Option 4: Possible Supply to Vutshini Nkandla Bulk Water Supply Scheme from Dundee Bulk Scheme
- Option 5: Dam on the Mfule River to Augment Water to Supply Zone 5 & 6
- Option 6: Dam on the Nsuze River to Augment Water to Supply Zone 1

The above options are shown in the Overall Map in Appendix C 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 investigation be undertaken to supply water from the Lower Thukela Scheme to Eshowe and Richards Bay (for City of uMhlatuze and Mbonambi).
- The feasibility of extending the Dundee Bulk Scheme past Nquthu to the upper reaches of the Nkandla-Vutshini Scheme, be investigated.
- The feasibility of additional raw-water transfer (increase of allocation on existing water use licence) from the Thukela River to the Goedertrouw Dam catchment at Middeldrift need to be investigated as this will provide additional raw water to support the Goedertrouw Regional Scheme.
- Pre-feasibility studies on the Mfule and Nsuzi Dams to augment water supply to the Nseleni and Vutshini-Nkandla Regional Schemes
- The possibility of additional raw-water abstraction at Middeldrift for the Thukela-Mhlatuze transfer scheme be investigated.

1. OBJECTIVES AND METHODOLOGY

1.1. BACKGROUND

The Department of Cooperative 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 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 uThungulu 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 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.

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 uThungulu 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
The Development of Universal Access Plan for Water & Sanitation in uThungulu District Municipality	<ul style="list-style-type: none"> LDM SMEC South Africa 	Umgeni Water Cogta Department of Water Affairs	September 2014
First Stage Reconciliation Strategy for Ilembe District Municipality	<ul style="list-style-type: none"> Water for Africa (Pty) Ltd Aurecon (Pty) Ltd Water Geosciences and Charles Sellick and Associates 	Department of Water Affairs	June 2011
UThungulu District Municipality Integrated Development Plan (IDP) 2007/08 – 2011/12	<ul style="list-style-type: none"> uThungulu DM 	uThungulu District Municipality	4 May 2011
Masterplan Goedertrouw Regional Scheme, 2015 Revision. (Draft)	<ul style="list-style-type: none"> Aecom SA (Pty) Ltd 	uThungulu District Municipality	October 2015
Masterplan Mbonambi Regional Scheme, 2015 Revision. (Draft)	<ul style="list-style-type: none"> Aecom SA (Pty) Ltd 	uThungulu District Municipality	October 2015
Masterplan Middeldrift Regional Scheme, 2015 Revision. (Draft)	<ul style="list-style-type: none"> Aecom SA (Pty) Ltd 	uThungulu District Municipality	October 2015
Masterplan Nseleni Mhlana Regional Scheme, 2015 Revision. (Draft)	<ul style="list-style-type: none"> Aecom SA (Pty) Ltd 	uThungulu District Municipality	October 2015
Masterplan Vutshini Nkandla Regional Scheme, 2015 Revision. (Draft)	<ul style="list-style-type: none"> Aecom SA (Pty) Ltd 	uThungulu District Municipality	October 2015

2. STUDY AREA

2.1. CONTEXT

The uThungulu District Municipality is located in the North-Eastern region of the KwaZulu-Natal Province on the Eastern seaboard of South Africa.

2.2. BOUNDARIES OF THE STUDY AREA

UThungulu District Municipality is surrounded by the Umkhanyakude DM to the North East; and Zululand DM to the North West. The Umzinyathi and iLembe DM's are situated to the West and South West respectively. UThungulu consists of six Local Municipalities which are Umhlathuze, Umlalazi, Nkandla, Mthonjaneni, Ntambanana and Mfolozi.

Figure 2 illustrates the locality of UTDM and neighbours as described above.

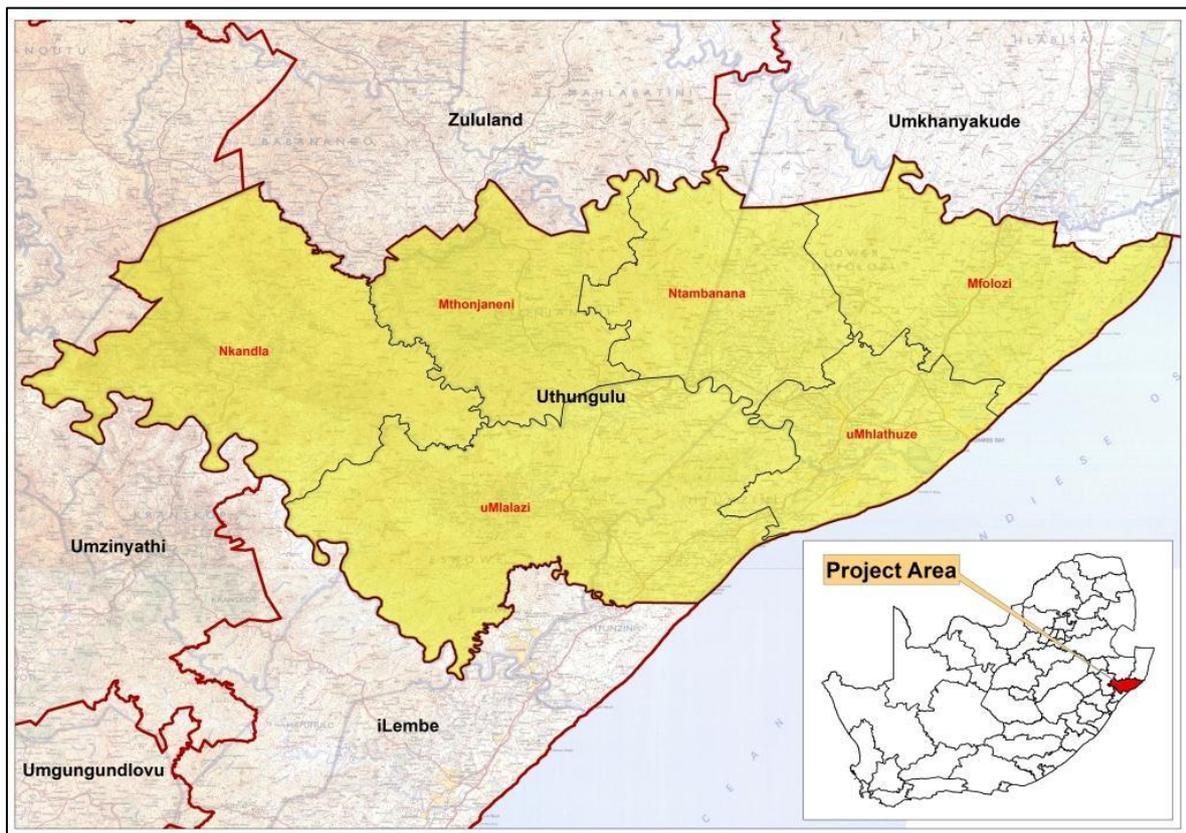


Figure 2: Locality of uThungulu District Municipality

2.3. PHYSICAL CHARACTERISTICS OF STUDY AREA

The uThungulu District Municipality comprises the best and worst of the two economies of South Africa. It is home to several of the largest industrial giants in the world, the retail sector in the urban areas are burgeoning with economic activity, the agricultural and tourism potential is boundless and opportunities exist for local economic development. However, in recent times, the district has also experienced a number of difficulties in light of the world-wide economic recession. This coupled with crippling droughts and deep rural communities living in utter poverty are also strong characteristics of uThungulu district, with a backlog of water and sanitation service delivery topping our list of priorities. (IDP, 2014/2015)

2.4. CLIMATE

The climatic conditions of the district are very diverse due to the topography, which plays a major role in modifying rainfall and temperature. Mean annual rainfall decreases from an average 1200 - 1400mm along the coastal region to an average of 650mm inland. Similarly mean annual temperatures decrease varies from 21 degrees Celsius along the coast to 16 degrees Celsius inland. The western portion of the study area lies within the Thukela catchments. The steepness and highly dissected nature of the topography result in small fast flowing watercourses, many of which are seasonal. The remainder of the study area lies within a large primary catchment with major rivers that run through it. The area also has a number of wetlands, the most notable being Lake Cubhu and the Greater Mhlathuze Wetland System to the south of Richards Bay at Esikhaleni. The Phobane Dam on the Mhlathuze River is the only major dam in the area. This dam is used to regulate the flow in the lower reaches of the Mhlathuze River in order to ensure adequate flow to supply agricultural irrigation needs (sugarcane, citrus and cotton are the major crops in the area), industrial requirements (Richards Bay, Empangeni and the recently commenced Ticor Heavy Mineral mining operations at Hillendale) as well as for domestic needs. (All Towns, 2011)

2.5. TOPOGRAPHY, GEOLOGY AND SOILS

The topographic features of uThungulu are multi-faceted. The flat coastal region comprises of the Natal Coastal Belt and Zululand Coastal Plain with altitudes ranging from sea level to 450 metres. Inland adjacent to the coastal belt, the Low veld of Zululand to the north east and the Eshowe Block to the west are characterized by hilly topography with altitudes increasing to 900 metres. The terrain becomes more extreme towards the North West. In places, the area characterized by steeply incised valleys with altitudes between 900 and 1 400 metres. The Valley of the Tugela River bounds the district on the west. The coastal belt areas include sand

stone, shale and mudstones, whose soils have a high agricultural potential. Low potential soils occur along the Tugela River as well as along portions of the Mhlatuze River. (IDP, 2014/2015)

2.6. ENVIRONMENTAL

The uThungulu District generally has a good climate and is well endowed with natural resources whose comparative advantages are:

- A good climate that opens up avenues for productive agricultural and tourism development;
- Agriculture with irrigation infrastructure in place;
- a scenic environment and the coastal terrain thus creating more opportunities for tourism development;
- And the district's location within KwaZulu-Natal that is reputable for its African Experience.

3. DEMOGRAPHICS

3.1. EXISTING POPULATION AND DISTRIBUTION

During the Professional Service Provider (PSP) inception meeting with Umgeni Water, it was proposed that the Census 2011 small areas layer will be used as base data for the demographics. 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 UTDM 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
Nkandla	114 417	22 464	5,1
Mfolozi	122 889	25 584	4,8
Ntambanana	74 337	12 825	5,8
Umlalazi	213 600	45 063	4,7
Mthonjaneni	47 820	10 431	4,6
Total	573 063	116 367	4,5

Source: Census 2011

Population	573 063
Age Structure	
Population under 15	34.80%
Population 15 to 64	60.70%
Population over 65	4.50%
Dependency Ratio	
Per 100 (15-64)	64.70
Sex Ratio	
Males per 100 females	89.00
Population Growth	
Per annum	0.24%
Labour Market	
Unemployment rate (official)	34.70%
Youth unemployment rate (official) 15-34	44.40%
Education (aged 20 +)	
No schooling	16.00%
Higher education	8.50%
Matric	30.10%

Household Dynamics	
Households	202 976
Average household size	4.20
Female headed households	48.90%
Formal dwellings	70.00%
Housing owned	51.80%
Household Services	
Flush toilet connected to sewerage	27.20%
Weekly refuse removal	29.60%
Piped water inside dwelling	30.50%
Electricity for lighting	75.80%

Source: 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)

Jameson's Drift Water Supply Scheme (Nkandla LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	1.65	1.94	2.26	2.63
	Median growth (Mℓ/day)	1.60	1.80	1.97	2.15
	Low growth (Mℓ/day)	1.55	1.66	1.72	1.77
Eshowe Water Supply Scheme (Umlalazi LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	10.24	12.56	15.15	18.01
	Median growth (Mℓ/day)	9.84	11.34	12.90	14.51
	Low growth (Mℓ/day)	9.44	10.24	10.99	11.73
Gingindlovu Water Supply Scheme (Umlamazi LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	1.07	1.29	1.54	1.81
	Median growth (Mℓ/day)	1.03	1.19	1.34	1.49
	Low growth (Mℓ/day)	1.00	1.09	1.17	1.23
Kwahlokholoko Water Supply Scheme (Umlalazi LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	9.88	12.00	14.32	16.84
	Median growth (Mℓ/day)	9.49	10.83	12.19	13.57
	Low growth (Mℓ/day)	9.11	9.78	10.39	10.97

Middelrift Water Supply Scheme (Umlalazi LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	9.19	10.66	12.32	14.13
	Median growth (Mℓ/day)	8.91	9.94	11.00	12.09
	Low growth (Mℓ/day)	8.64	9.27	9.85	10.39
Mtunzini Water Supply Scheme (Umlamazi LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	2.11	2.74	3.48	4.33
	Median growth (Mℓ/day)	2.02	2.43	2.87	3.32
	Low growth (Mℓ/day)	1.93	2.16	2.36	2.55
Mthonjaneni Water Supply Scheme (Mthonjaneni LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	9.29	11.28	13.46	15.82
	Median growth (Mℓ/day)	8.92	10.18	11.46	12.75
	Low growth (Mℓ/day)	8.56	9.20	9.77	10.30
Nkandla Water Supply Scheme (Nkandla LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	5.53	6.42	7.42	8.52
	Median growth (Mℓ/day)	5.36	5.99	6.63	7.29
	Low growth (Mℓ/day)	5.20	5.58	5.93	6.26
Vutshini Water Supply Scheme (Nkandla LM)		2010	2015	2020	2025
Future requirements without WC/WDM	High growth (Mℓ/day)	4.31	5.96	6.89	7.91
	Median growth (Mℓ/day)	4.18	5.59	6.19	6.80
	Low growth (Mℓ/day)	4.05	5.25	5.58	5.88

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 UTDM.

3.2. SOCIAL AND ECONOMIC INDICATORS

According to the 2010 Global Insight Statistics, it is noted that the vast majority of economic performance (41.8%) in the district is vested in uMhlathuze Local Municipality with its primary urban centres being Richards Bay and Empangeni.

This area is the third most important in the province of KwaZulu-Natal in terms of economic production and contributes 9.1% of the total Gross Geographic Product (GGP) and 8.5% of the total employment (formal and informal) in 2010. Between 1996 and 2009 the Gross Domestic Product (GDP) average annual growth rate for the uThungulu region was 2.8% - lower than the province at 3.2% and the national rate of 3.2% per annum. In 1997, the GDP average annual growth rate was approximately 7%.

The manufacturing sector is the largest sectorial contributor to the economy of the district albeit that its proportionate contribution has decreased slightly since 1996. Interestingly, only those contributions from the mining and finance sectors have shown an increase during the same period. The increase in the mining sector has been significant in that this sector is the second largest economic contributor above community services. From 1996 to 2010, the economy of the uThungulu District grew at a slightly slower pace than the national economy at an average annual growth rate of 3.2% per annum compared to 3.29% for the national economy. This resulted in the uThungulu economy decreasing its share in national output from 1.45 % in 1996 to 1.44% in 2010.

3.3. COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL DEVELOPMENT

The City of Mhlathuze plays an important role in the national, provincial and district economies due to the bulk-handling harbour at Richards Bay. The harbour is the largest deepwater port in Africa, and handles a large proportion of South Africa's exports. The port originally provided the impetus for large scale industrial development in the area. The City of Mhlathuze, a WSA on its own is the uThungulu DM's largest contributor to its GGP. The most important industries are BHP Billiton Aluminium, Mondi, SAPPI, RBCT, Tata Steel and Bell Equipment (IDP 2015/16).

The economy of City of Mhlathuze is dominated by the Richards Bay – Empangeni complex. The sectors that contribute the most are (SA Cities Network, 2014):

- metal products, machinery and household appliances (11.02%)
- land and water transport (10.83%)
- food, beverages & tobacco (7.37%)

- wood and wood products (7.21%)
- mining of metal ores (6.42%)
- education (5.66%)
- real estate (5.57%)
- finance and insurance (4.4%)

These eight sectors contributed 58.5% of the Gross Value Added in 2011. Metal products and machinery; wood and wood products; and mining of metal ores are the primary drivers, with education, real estate, finance and insurance as secondary. The strong Gross Value Added component in manufacturing and processing is dependent on the success of a handful of large industries (SA Cities Network, 2014).

The economy of the City of Mhlathuze grew significantly in the period 1996-2001, outpacing the growth rates of KZN and the country. However, from 2001-2011, the growth slowed significantly due to the strong link of the local economy to the international economy, which saw a slump in 2007/08. If the local economy continues to decline, this will have a significant impact on the residents in this area. The city will need to look beyond the mining phase and ensure other strong economic drivers if the city is to regain and sustain a strong local economy (SA Cities Network, 2014).

3.4. POPULATION GROWTH SCENARIOS

The future population is envisaged to increase at a growth rate of 1% to 2% per annum according to Statistics SA. The Table below sets out the growth assumptions for UTDM.

Table 4: Population Projections (2015 – 2045)

Year	Umlalazi	Nkandla	Mfolozi	Ntambanana	Mthonjaneni
2015	229 731	84 766	57 000	120 000	93 000
2020	245 746	91 317	61 405	129 274	100 187
2025	262 911	98 374	66 151	139 265	107 930
2030	281 308	105 977	71 263	150 028	116 272
2035	301 030	114 168	76 771	161 623	125 258
2040	322 172	122 991	82 704	174 113	134 938
2045	344 841	132 496	89 096	187 570	145 366

Source: Census 2011

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.

2015 Draft Masterplan

- The UTDM 2015 draft Masterplan is based on a consumption of 82.6 l/c/d for rural areas and 200 l/c/d for urban areas.
- Growth factors varied from 1% to 2% in each Regional Scheme Area
- Planning horizon = 20 years.

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
Nkandla	3 753	7 452	2 412	882	369	189	7 404	22 464
Mfolozi	2 679	11 505	4 965	1 227	417	486	4 308	25 584
Ntambanana	609	2 250	3 264	1 377	867	330	4 131	12 825
Umlalazi	8 844	9 945	8 892	2 484	1 338	2 025	11 535	45 063
Mthonjaneni	2 541	2 415	1 533	522	252	213	2 955	10 431
TOTAL	18 426	33 567	21 066	6 492	3 243	3 243	30 333	116 367

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, Scenario 3 which utilises the latest population and figures from the updated uThungulu Masterplan but with an allowance of 100ℓ/c/day with an allowance for 30% losses was deemed to be the most probable scenario in uThungulu District Municipality assuming that all households will eventually have a house connection. This equates to a category 5 level of service as indicated in **Table 6**. The 30 year water demand for each Local Municipality is presented in **Table 8**.

Table 8: Demand Calculation

Local Municipality	30 YEAR Households	30 YEAR Population	30 YEAR DEMAND Mℓ/day (GAADD)
UTHUNGULU DISTRICT MUNICIPALITY			
NKANDLA	33 612	201 674	17.22
MTHONJANENI & NTAMBANANA	32 127	192 764	18.90
EMLALAZI	92 480	554 877	55.71
MFOLOZI	74 837	449 024	35.97
Total	233 056	1 398 339	127.80

For the purposes of water supply infrastructure sizing, the projected 30 year water demands per supply area was used. Water demands per supply area are discussed further in Section 8.

5. EXISTING WATER SUPPLY INFRASTRUCTURE

5.1. WATER RESOURCES AND AVAILABILITY

Information on the status of the water sources was obtained from the UTDM IDP, All Towns Reconciliation Strategy and UTDM Masterplan.

For areas not yet covered by the proposed regional scheme, local schemes utilise boreholes or river abstractions as an existing water source. The local water sources together with levels of service are indicated in the relevant tables under each scheme area in section 5.2.

5.1.1. JAMESON'S DRIFT WATER SUPPLY SCHEME (UAP PHS ZONE 1)

The Jameson's Drift Water Supply Scheme is supplied with potable water from a water treatment works (WTW) which gets its raw water from the Tugela River system in quaternary catchment V40B.

The total raw water that was abstracted in the Jameson's Drift water supply scheme area (i.e. from the Tugela River) in 2008 was estimated as 0.5 million m³/a (1.5 Ml/day). Based on the estimated raw water requirements, the treated water production with 12% losses was estimated to be 0.5 million m³/a (1.4 Ml/day)

The 3-month maximum abstraction during low flow periods at Jameson's Drift abstraction point was determined to be approximately 15.17 million m³ (165.8 Ml/day) which is more than adequate to meet the low flow requirements for all the water users in the Jamesons Drift Scheme.

The Jamesons Drift Scheme is included as Sub Supply Area 5 of the Vutshini Nkandla Scheme area in the 2015 Draft Masterplan. This scheme forms Zone 1 of this UAP Phase 2 study. The existing and proposed infrastructure in Sub Supply Area 5 is shown in the Overall Map in **Appendix C**.

5.1.2. ESHOWE WATER SUPPLY SCHEME

The Eshowe Water Supply Scheme area is supplied by the Eshowe WTW situated in the town of Eshowe. Raw water to the works is supplied from Rutledge and Eshlazi Dams situated in the Mlalazi River, a tributary of the Mhlatuze River. The Rutledge Dam is very small and is supplemented by raw water supplies from Goedertrouw Dam in the Mhlatuze River.

The total raw water abstraction in the Eshowe Regional Water Supply Scheme area in 2008 was estimated in the Uthungulu WSDP (2007) as 3.28 million m³/a (8.98 Mℓ/day) with the treated water production estimated to be 2.88 million m³/a (7.90 Mℓ/day). The losses are approximately 12% of the total raw water abstraction.

Apart from Eshowe Water Supply Scheme, two other water supply schemes are supplied by Goedertrouw Dam namely; Mthonjaneni and Kwahloko Water Supply Schemes.

Rutledge Dam and Eshlazi Dam have a combined firm yield of 3.2 Mℓ/day. Therefore augmentation from Goedertrouw Dam, which has a firm yield of 293 Mℓ/day, will have to continue to supply for the Eshowe Water Supply Scheme in order to maintain sufficient water supply.

The 2015 revision of the uThungulu Masterplan shows that the Eshowe, Mthonjaneni and Kwahloko Regional Schemes have been consolidated and named the Goedertrouw Regional Scheme.

5.1.3. GINGINDLOVU WATER SUPPLY SCHEME

The Gingindlovu Water Supply Scheme comprises raw water abstraction in the Matigulu River, a water treatment works in the town and bulk service storage infrastructure and distribution networks.

The total raw water that was expected to be abstracted in the Gingindlovu Water Supply Scheme area (i.e. from the Matigulu River) in 2008 was estimated as 0.34 million m³/a (0.93 Mℓ/day). Based on the estimated raw water requirements, the treated water production with 12% losses was estimated to be 0.29 million m³/a (0.8 Mℓ/day)

The 3-month maximum abstraction during low flow periods at the Gingindlovu abstraction point was determined to be approximately 2.3 million m³ (25.14 Mℓ/day) which is more than adequate to meet the low flow requirements for all the water users downstream of the dams and dependent on run-of-river abstraction.

5.1.4. KWAHLOKOHLOKO REGIONAL WATER SUPPLY SCHEME

The Kwahloko Regional Water Supply Scheme area is supplied by a water treatment works (WTW) at Goedertrouw and Mpungose which gets raw water from Goedertrouw Dam

situated in the Mhlatuze River. The scheme has a number of smaller schemes abstracting from run-of-river abstractions or from boreholes.

The total water abstraction for treatment at the Kwahlokhloko WTW in 2008 was estimated as 3.06 million m³/a (8.37 Mℓ/day) with the treated water production estimated to be 2.96 million m³/a (7.37 Mℓ/day) which is 88% of the total raw water abstraction.

5.1.5. MIDDLEDRIFT REGIONAL WATER SUPPLY SCHEME

The Middledrift Regional Water Supply Scheme area is supplied using the Thukela Transfer scheme abstraction works from where water is pumped to a water treatment works (WTW) which supplies the various villages in the Middledrift supply area. There are several small water supply schemes still supplying some of the areas of the supply area either from groundwater or small streams.

The required total water abstraction for treatment at the Madungela WTW as well as for the small schemes in the Middledrift Regional Water Supply Scheme area in 2008 was estimated as 3.0 million m³/a (8.2 Mℓ/day) with the required treated water production estimated to be 2.6 million m³/a (7.12 Mℓ/day) which is 87% of the total raw water abstraction.

5.1.6. MTUNZINI WATER SUPPLY SCHEME

The Mtunzini Water Supply Scheme is supplied by a water treatment works (WTW), which gets its raw water from a weir in the Ntuzi River, 700m upstream of the confluence with Mlalazi River. Furthermore, the scheme is supplemented by eight boreholes and recently a treated water bulk supply main from Mhlatuze Local Municipality.

The total raw water abstracted for treatment at the Mtunzini WTW in 2008, was estimated as 0.66 million m³/a (1.81 Mℓ/day) based on the estimated treated water production with 12% losses. The treated water production was provided as measured to be 0.58 million m³/a (1.59 Mℓ/day).

The 3-month maximum abstraction during low flow periods at the Mtunzini abstraction point was determined to be approximately 0.43 million m³ (4.7 Mℓ/day) which is insufficient to meet the low flow requirements for all the water users in the future however the UTDM has a Service

Level Agreement with uMhlathuze Local Municipality to supply the Mtunzini Water Supply Scheme with treated bulk water.

5.1.7. MTHONJANENI REGIONAL WATER SUPPLY SCHEME

The Mthonjaneni Regional Water Supply Scheme area is supplied by two main water treatment works (WTW) at Goedertrouw Dam and Mthonjaneni (Nompojwana), which gets raw water from Hlambanyathi River, a tributary of the Mhlathuze River. The scheme has a number of smaller schemes either from run-of-river abstractions such as St Mary's Hospital WTW as well as from borehole schemes supplying the rural villages.

The total water abstracted for treatment in the Mthonjaneni Water Supply scheme area in 2008 was estimated as 2.92 million m³/a (8.01 Mℓ/day) with the treated water production estimated to be 2.57 million m³/a (7.05 Mℓ/day) which is 88% of the total raw water abstraction.

The high yield of the Goedertrouw Dam on the Mhlathuze System (section 6.1) is sufficient to meet the current and future demands of the scheme.

5.1.8. NKANDLA WATER SUPPLY SCHEME

The Nkandla Water Supply Scheme area is supplied mainly from run-of-river abstraction from the Mhlathuze River and a water treatment works (WTW) near the river. There are also several small water supply schemes still supplying some of the areas in the Water Supply Scheme area, either from groundwater or small streams.

The total water abstraction for treatment at the Mhlathuze WTW as well as for the small schemes in the Nkandla Regional Water Supply Scheme area in 2008 was estimated as 1.8 million m³/a (4.93 Mℓ/day) with the treated water production estimated to be 1.58 million m³/a (4.3 Mℓ/day) which is 88% of the total raw water abstraction.

The 1-month maximum abstraction during low flow periods at the Nkandla abstraction point was determined to be approximately 0.041 million m³ (1.3 Mℓ/day) which is insufficient to meet the low flow requirements for all the water users in the future. The future source for the Nkandla Supply Scheme is the Nsuze River which will augment the scheme's supply and cater for future demands. (See section 7.6)

5.1.9. VUTSHINI REGIONAL WATER SUPPLY SCHEME

The Vutshini Regional Water Supply Scheme area is supplied mainly from run-of-river abstraction from the Vutshini River and the Vove Dam on the Vove River. There are several small water supply schemes still supplying some of the areas of the supply area either from groundwater or small streams.

The required total water abstraction for treatment at the Vutshini WTW as well as for the small schemes in the Vutshini Regional Water Supply Scheme area in 2008 was estimated as 1.4 million m³/a (3.91 Mℓ/day) with the required treated water production estimated to be 1.3 million m³/a (3.44 Mℓ/day) which is 87% of the total raw water abstraction.

The 3-month maximum abstraction during low flow periods at the Vutshini abstraction point was determined to be approximately 0.03 million m³ (0.3 Mℓ/day) which is insufficient to meet the low flow requirements for all the water users in the future.

The Vove Dam has firm yield of 0.2 million m³/a (0.55 Mℓ/day). The dam will thus be insufficient to cater for the requirements of the Vutshini Scheme.

5.1.10. MBONAMBI REGIONAL WATER SUPPLY SCHEME

The Mbonambi Regional Scheme is supplied by means of boreholes, water tankers and from Mhlathuze Water. From discussions with UTDM, the total water for this scheme is in excess of 4 Mℓ/day but this can currently not be supplied by Mhlathuze water and an augmentation scheme is necessary.

5.2. EXISTING WATER SUPPLY SCHEMES AND AREAS

The existing schemes of uThungulu 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.

Table 9: Summary of Existing Infrastructure per Water Supply Scheme

Scheme Area	Source	WTW
Jameson's Drift	Tugela River	Jameson's Drift WTW - 1.0 Ml/day conventional plant
Richards Bay	Lake Mzingazi	Lake Mzingazi WTW - 65 Ml/day, Conventional plant
Eshowe	Rutledge and Eshlazi Dams	Eshowe WTW - 6.91 Ml/day, Conventional plant
Gingindlovu	Matigulu Rive	Gingindlovu WTW - 1.50 Ml/day, Conventional plant
Kwahlokoheko	Goedertrouw Dam	Kwahlokoheko WTW - 10 Ml/day, Conventional plant
Middledrift	Mhlatuze River	Madungela WTW - 3.45 Ml/day, Conventional plant
Mtunzini	Ntuze River	Mtunzini WTW - 1.50 Ml/day, Conventional plant
Mthonjaneni	Hlambanyathi River	Mthonjaneni WTW - 1.50 Ml/day, Conventional plant
Nkandla	Mhlatuze River	Nkandla WTW - 3.60 Ml/day, Conventional Plant
Vutshini	Vutshini River– a tributary of the Nsuze River and the Vove Dam	Vutshini WTW - 0.26 Ml/day, Conventional Plant
Mbonambi	Mhlatuze Water, Boreholes	Lake Mzingazi WTW - 65 Ml/day, Conventional plant

The Existing small schemes within the supply areas in the uThungulu District Municipality are presented in the tables below:

Nseleni Supply Area

Scheme Name	No. of Households Supplied	Level of Service	Source
Dondatha	68	Standpipe	Borehole
Mambuka	300	Standpipe	Upper Nseleni
Emzini/ Malongweni	24	Metered Standpipe	Spring
Buchanan Town	423	Yard and Standpipe	Upper Nseleni bulk, Crocodile dam
Isihuzu	76	Standpipe	Borehole
Phase 1 – KwaHlaza Ngqutshini, obizo, Ndondwane, Mquzankunzi	800	Standpipe	Upper Nseleni Bulk
Mabuyeni/ Makehleni	29	Standpipe	Upper Nseleni Bulk
Mpemvu	25	Standpipe	Borehole
Mgazini	40	Standpipe	Borehole
Enhlabosini	101	Standpipe	Borehole
Zizizeni	127	Standpipe	Borehole
Sabhuza	50	Standpipe	Borehole

Source: Water Services Master Plan 2015 Draft Report

Greater Mthonjaneni supply area

Scheme Name	No. of Households Supplied	Level of Service	Source
Debe	111	Standpipes	Borehole
Hlabathini	272	Standpipes	Borehole
Kwa Magwaza	92	Standpipes	Kwa Magwaza Farm Dam
Melmoth	1946	Full	Melmoth Dam
Mfanefile	85	Standpipes	River
Mfule	107	Standpipes	Borehole
Nomponjwana	1122	Standpipes	Hlambanyiti River
Ndundulu Shange	131	Standpipes	Borehole
Nqaba	133	Standpipes	Spring
Ntembeni / Makhasaneni	31	Standpipes	Borehole
Ntembeni / Mfanefile	375	Standpipes	Borehole
Obuka / Kwamawanda	66	Standpipes	Borehole
Ogelwini & Makhwandini	334	Standpipes	Borehole
Ompensheni	75	Standpipes	Borehole
Phezukwehlanza	126	Standpipes	Borehole
St. Marys Hospital	Hospital	Full	Stream
Zimela	163	Standpipes	Borehole

Source: Water Services Master Plan 2015 Draft Report

Kwahloko Supply area

Scheme Name	No. of Households Supplied	Level of Service	Source
Bhekeshowe	40	Standpipe	Boreholes
Ekuphumaleni	Hospital	Full	Mhlatuze River
Eyetheni	80	Standpipe	Boreholes
Feliswane	64	Standpipe	Boreholes
Isiphezi	107	Standpipe	Mpungose Bulk
Kwasebe 1 + 2	2 100	Standpipe & un-metered yard connection	Boreholes
Lubisana	62	Standpipe	Borehole
Mbizo	126	Standpipe	Mpungose Bulk
Mpungose	1052	Standpipe	Goedertrouw Dam
Mzimela / Makolokolo	299	Standpipe	Mhlatuze River
Nteneshane Phase 1	374	Standpipe	Mzimela scheme
Ohhahheni	99	Standpipe	Spring
Ufasimba	261	Standpipe	Mhlatuze River

Source: Water Services Master Plan 2015 Draft Report

Eshowe supply area

Scheme Name	No. of Households Supplied	Level of Service	Source
Amahubha	225	Standpipe	Borehole
Catherine Booth Hospital	34	Full	Amatikulu River
Eshowe Town incl. King Dinizulu	3228	Metered House	Ruthledge Park Dam
Ezingeni	415	Standpipe	Boreholes
Gingindlovu	620	Metered House	Umsinduzi River
Hemfane	244	Standpipe/ metered house	River
Ibhade	18	Metered Yard	Boreholes
Isidibha	144	Standpipe	Boreholes
Khoza	346	Standpipe	Boreholes
Mabhokweni	152	Water dispenser units	Boreholes
Madala	71	Standpipe	Boreholes
Maqhulu	196	Water dispenser units	Boreholes
Mathibelana	381	Standpipe	Boreholes
Mona Phansi	83	Un-metered yard	Boreholes
Mpondweni	50	Standpipe	Boreholes
Mpungose Ph 2	809	Standpipe	Eshowe
Mtunzini	764	Metered house	Ntuze River
Ngudwini	127	Standpipe	Khoza bulk
Ntenjane	51	Standpipe	Boreholes
Nyonibizumuntu	133	Standpipe	Boreholes
Obanjeni 1 & 2	89	Standpipe	Umlalazi River
Ogaya	250	Metered yard	Boreholes
Kwa Mfana	51	Standpipe	Boreholes

Source: Water Services Master Plan 2015 Draft Report

Mbonambi supply area

Scheme Name	No. of Households Supplied	Level of Service	Source
Holinyoka	234	Standpipes	Borehole
Malaleni / Sokhulu	250	Standpipes	Borehole
Ndlabeyilandula	1700	Standpipes	Borehole
Mbonambi Bulk Supply3	26146 Reticulated & 50589 Bulk Supply	Metered House Connections	uMhlatuze Water
Hlanzeni / Thukweni	2360	Standpipes	Borehole

Source: Water Services Master Plan 2015 Draft Report

Middledrift Supply Area

Scheme Name	Level of Service	Source
Hlwehlwe 1	Metered yard	River
Hlwehlwe 2	Standpipe	River
Umkhalazi	Metered yard	Spring
Magwaza	Metered yard	Nsuze river
Middeldrift	Metered Standpipe	Thukela River Transfer Scheme
Mphundumane	Standpipe	Spring
Nyawashane	Metered yard	Borehole
Zimbidla	Metered yard	Nsuze River
Bangindoda	Standpipe	Borehole
Donsindaba	Standpipe	Spring
Vuma (Itshempevu) Standpipe Borehole None 220	Vuma (Itshempevu) Standpipe Borehole None 220	Vuma (Itshempevu) Standpipe Borehole None 220
Vuma (Shange)		
Kholweni	Standpipe	Borehole
Hayinyama	Standpipe	Borehole & Nembe river
Mombeni	Standpipe	Borehole
Mvuzane	Standpipe	River Weir
Bongela	Standpipe	River
Ntuli 1	Standpipe	Borehole
Ntuli 2	Standpipe	Borehole
Oyaya	Standpipe	Boreholes
Samungu	Standpipe	Bangindoda
Zamimpilo	Standpipe	Spring
Izindlozi	Metered standpipe	Thukela River Transfer Scheme
Mphaphala	Standpipe	Borehole
Mbongolwana Hospital	Standpipe	Weir
Mngwenya	Standpipe	Borehole
Sogedle	Standpipe	Matigulu river, well
Ngedlesi (Ukukhanyakwesizwe)	Standpipe	Borehole

Source: Water Services Master Plan 2015 Draft Report

Nkandla Supply Area

Scheme Name	Scheme Capacity (m ³ /d)	Level of Service
Amaphutu	182	Metered Yard
Bokwe	54	Metered Yard
Madiyane	16	Metered Yard
Mandaba 1	7	Standpipe
Mandaba 2	10	Standpipe
Mbizwe	21	Standpipe
Mdlalenga	82	Standpipe
Mshisandlu	53	Standpipe
Niselelo	60	Standpipe
Nkandla Bulk Phase 1 & 2	-	N/A
Nkandla Town	272	Metered house
Nontshiza	65	Standpipe
Sidumuke	12	Standpipe
Thalaleni	333	Metered Yard
Thaleni	19	Standpipe
Vimbimbobo	37	Standpipe
Zondi	105	Standpipe
Ethalaneni	101	Standpipe
Hlasimpilo	2	Standpipe
Kwabadala Old Age Home	65	N/A
Mahlayizeni	133	Standpipe
Vumangoma	121	Standpipe

Source: Water Services Master Plan 2015 Draft Report

Vutshini Supply Area

Scheme Name	Scheme Capacity (m ³ /d)	Level of Service
Dlomo	37	Metered Standpipes
Fort Louis	256	Standpipes
Mchunu	9	Standpipes
Mona Mission	9	Standpipes
Qhudeni Town	112 1	Metered Yard Taps
Ntshiza	10	Metered Yard
Vutshini	261	Standpipes
Dolwane	38	Metered Yard
Esihosheni	53	Metered Yard
Samunge	21	Metered Standpipes
Nhlosane	4	Standpipes
Jameson's Drift	20	Standpipes
Machumwini	3	Standpipes
Thotswana	81	Standpipes
Ezijebeeni	19	Standpipes
Pholela	44	Metered Yard
Mhlosana	18	Standpipes

Source: Water Services Master Plan 2015 Draft Report

6. BULK WATER SUPPLY INTERVENTIONS CURRENTLY IN PLANNING

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

The information below was obtained from 2015 Draft Masterplan undertaken by AECOM (2015) as well as information that was obtained from service providers working in UTDM.

From a bulk water supply perspective and in order to align the resources with the overall planning of UTDM with respect to the 5 overall regional schemes, the water resources status and availability is presented for each Regional Scheme Masterplan.

Refer to the Project Scheme Map (**Figure 3**), in conjunction with the information below, where existing and planned supply is depicted within their respective regional schemes.

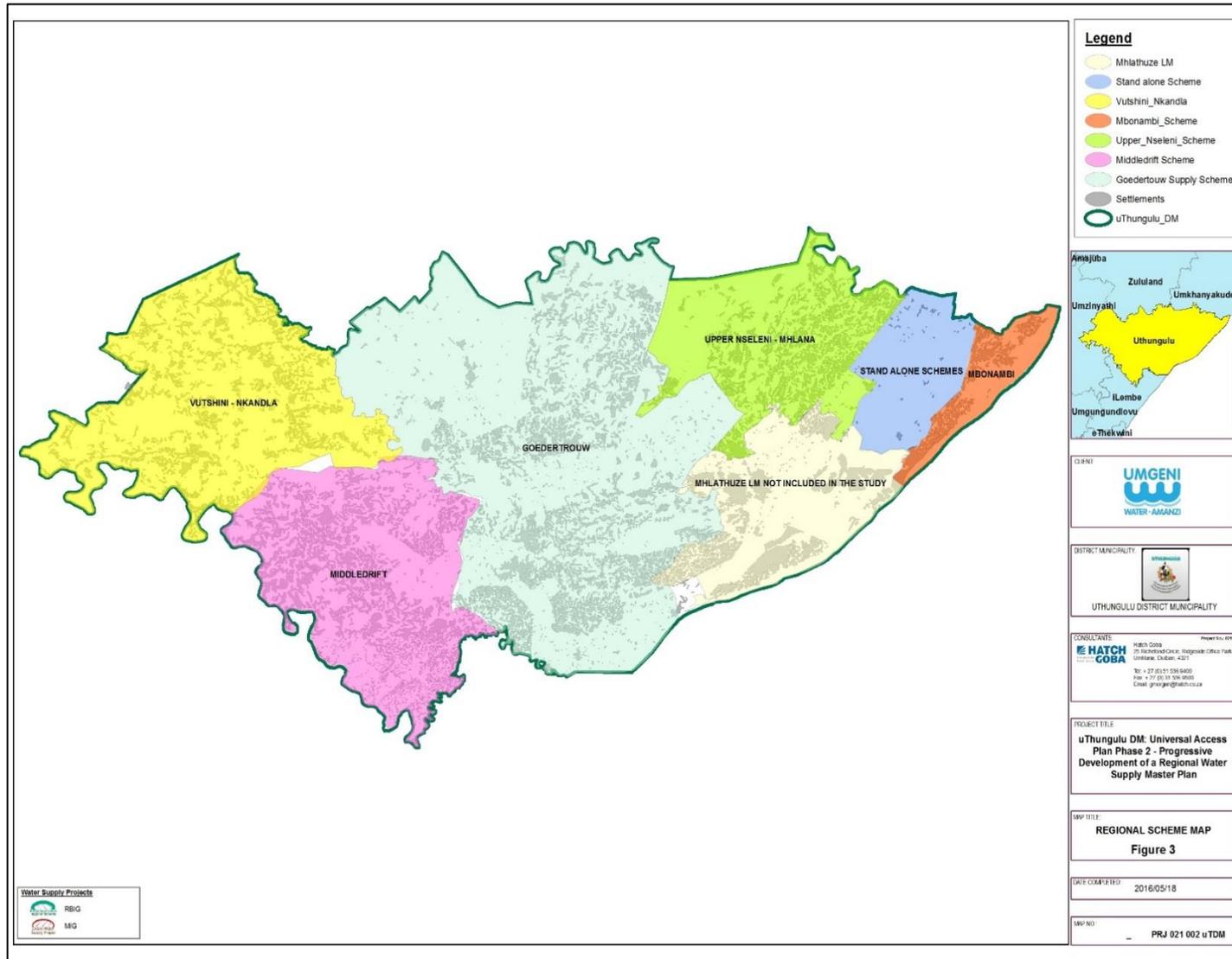
A water balance is presented in Table 11 highlighting either the adequacy or need for augmentation of the water resources for each regional scheme.

Figure 3 below shows the five regional scheme areas within the district as per the 2015 Draft Masterplan.

The five regional scheme areas:

- Goedertrouw Regional Scheme (incorporating Mthonjaneni, Kwahloko and Eshowe Regional Schemes)
- Middledrift Regional Scheme
- Upper Nseleni-Mhlana Regional Scheme
- Vutshini-Nkandla Regional Scheme
- Mbonambi Regional Scheme

Areas which were not covered by the five regional schemes were labelled as “Stand-alone schemes” (shaded in blue below). It is recommended that these, predominantly farmland, stand-alone areas be supplied by localised schemes (boreholes etc.) due to the sparse population and the proximity of the area in relation to the other regional schemes, it would not be feasible to extend bulk regional schemes to supply this area.



6.1. GOEDERTROUW REGIONAL SUPPLY SCHEME

Goedertrouw Regional Scheme

30 Year Water demand :	58.8 Mℓ/day
Water Source :	Goedertrouw Dam
Source Yield :	293 Mℓ/day (Over-allocated)
Augmentation Required :	Yes
Augmentation Option	Thukela-Mhlathuze Transfer Scheme

The intention of the Goedertrouw Regional Scheme, as shown on the Project Scheme Map in Figure 3, is to consolidate three previous regional schemes, viz,

- Mthonjaneni Regional Scheme,
- Kwahloko Regional Scheme and
- Eshowe Regional Scheme

The Goedertrouw Regional Scheme will eventually be supplied from the Goedertrouw Dam. Currently however, apart from Goedertrouw Dam water resources for the three schemes are as follows:

Scheme	Water Source	Yield (Mℓ/day)
Mthonjaneni Regional Scheme	Goedertrouw Dam	293 (before all allocations)
Kwahloko Regional Scheme	Goedertrouw Dam	293 (before all allocations)
Eshowe Regional Scheme	Rutledge & Ehlazi, augmented from Goedertrouw	3.2 combined

The Rutledge and Ehlazi dams have a combined yield of 3.2 Mℓ/day and supply the town of Eshowe as well as the Eshowe Regional Scheme. The Rutledge and Ehlazi Dams are augmented with raw water from the Goedertrouw Dam which has a yield of 293 Mℓ/day. An additional 93 Mℓ/day is made available from the Thukela – Mhlathuze raw water transfer at Middeldrift on the Mhlathuze River.

For the Goedertrouw Regional Scheme the following Sub-Supply Areas are existing and/or planned:

	Sub-Supply Areas
Existing	1 to 9 (Partial coverage)
Planned	1 to 9 (Coverage of remainder of areas)

6.2. MIDDLEDRIFT REGIONAL SUPPLY SCHEME

Middledrift Regional Scheme

30 Year Water demand :	15.8 Ml/day
Water Source :	Thukela Transfer
Source Yield :	260 Ml/day
Augmentation Required :	No
Augmentation Option	-

The Middledrift Regional Scheme water resource is as follows:

Scheme	Water Source	Yield (Ml/day)
Middledrift Regional Scheme	Thukela Transfer Scheme	110

The Thukela Transfer Scheme pipeline is 1.5m in diameter and has a design capacity of 1 m³/s (86.4 Ml/day). Water is pumped from the Thukela River via two high lift pump stations to a tributary of the Mhlatuze River, above Goedertrouw Dam. Bulk raw water is supplied to the Middledrift WTW via the aforementioned scheme. The Thukela River is able to provide sufficient water to meet projected demand in the long term and is thus a sustainable bulk source.

For the Middledrift Regional Scheme the following Sub-Supply Areas are existing and/or planned:

	Sub-Supply Areas
Existing	1 to 8
Planned	1 to 8(Coverage of remainder of areas)

6.3. VUTSHINI-NKANDLA REGIONAL SUPPLY SCHEME

Vutshini-Nkandla Regional Scheme

30 Year Water demand :	17.2 Ml/day
Water Source :	Mhlatuze River Vove Dam Vutshini Stream Tugela River
Source Yield :	2.67 Ml/day
Augmentation Required :	Yes
Augmentation Option	Ntshingwayo Dam via Dundee Bulk Nsuze River Dam

The intention of the Vutshini-Nkandla Regional Scheme, as shown on the Project Scheme Map, is to consolidate three previous regional schemes, viz,

- Vutshini Regional Scheme,
- Nkandla Regional Scheme and
- Jamesons Drift Regional Scheme

The Vutshini-Nkandla Regional Scheme will eventually be supplied from the Ntshingwayo Dam. Currently however water resources for the three schemes are as follows:

Scheme	Water Source	Yield (Ml/day)
Vutshini Regional Scheme	Vove Dam & Vutshini Stream	0.33
Nkandla Regional Scheme	Mhlatuze River	1.34
Jamesons Drift Regional Scheme	Tugela River	1.00

For the Vutshini-Nkandla Regional Scheme the following Sub-Supply Areas are existing and/or planned:

	Sub-Supply Areas
Existing	1 to 10
Planned	1 to 9 Coverage of remainder of areas)

6.4. UPPER NSELENI-MHLANA REGIONAL SUPPLY SCHEME

Upper Nseleni-Mhlana Regional Scheme

30 Year Water demand :	24.4 Mℓ/day
Water Source :	Nseleni River NkolokotoRiver
Source Yield :	1.64 Mℓ/day
Augmentation Required :	Yes
Augmentation Option	Mfule Dam

The Upper Nseleni-Mhlana Regional Scheme will eventually be supplied from the Mfule Dam.

Water resource for the scheme is as follows:

Scheme	Water Source	Yield (Mℓ/day)
Upper Nseleni-Mhlana	Mfule Dam	48.7

For the Upper Nseleni-Mhlana Regional Scheme the following Sub-Supply Areas are existing and/or planned:

	Sub-Supply Areas
Existing	1 to 17
Planned	1 to 8, 10, 12 and 14

6.5. MBONAMBI REGIONAL SUPPLY SCHEME

Mbonambi Regional Scheme

30 Year Water demand :	11.6 Mℓ/day
Water Source :	Lake Mzingazi Lake Nsese
Source Yield :	2 Mℓ/day (After all other allocations)
Augmentation Required :	Yes
Augmentation Option	Lower Thukela Scheme

The Mbonambi Regional Scheme will continue to be supplied from the City of uMhlatuze.

Water resource for the scheme is as follows:

Scheme	Water Source	Yield (Mℓ/day)
Mbonambi	Lake Mzingazi, Lake Nsese (uMhlatuze City)	36.7

For the Mbonambi Regional Scheme the following Sub-Supply Areas are existing and/or planned:

	Sub-Supply Areas
Existing	1 to 17
Planned	1 to 8, 10, 12 and 14

7. BULK WATER SUPPLY INTERVENTIONS CONSIDERED IN THIS STUDY

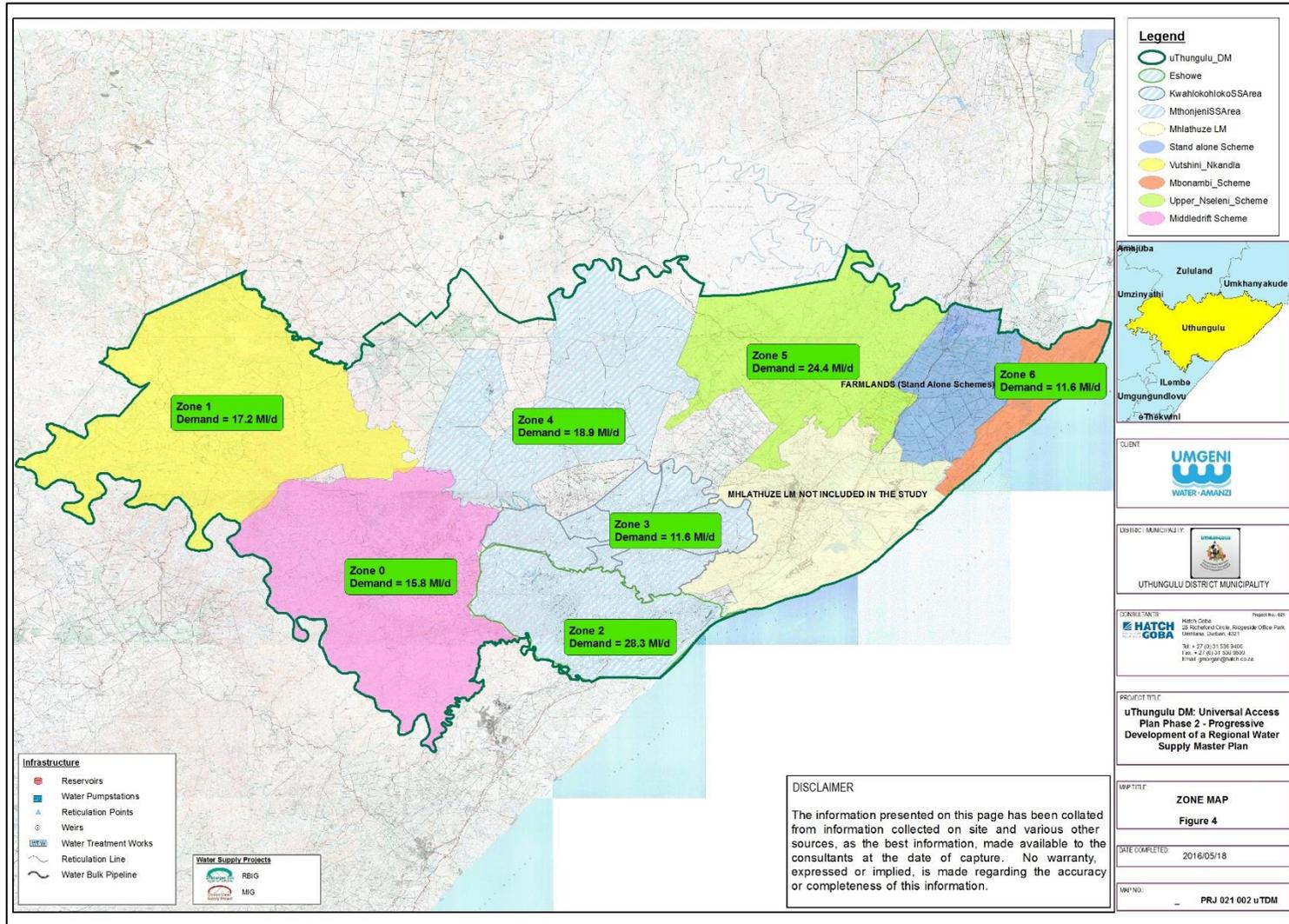
Using available information, the following regional schemes have been investigated as options to supply the bulk water in uThungulu District Municipality.

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. The viability and possible further investigation of each option is discussed after the option is presented.

Using the methodology presented in Section 1.4 as well as the existing scheme footprints, the UThungulu District Municipality was divided into 6 Bulk Supply Zones. These zones together with the demand for each zone, as determined in this UAP Phase 2 investigation, are shown in **Figure 4** and summarised in **Table 10**.



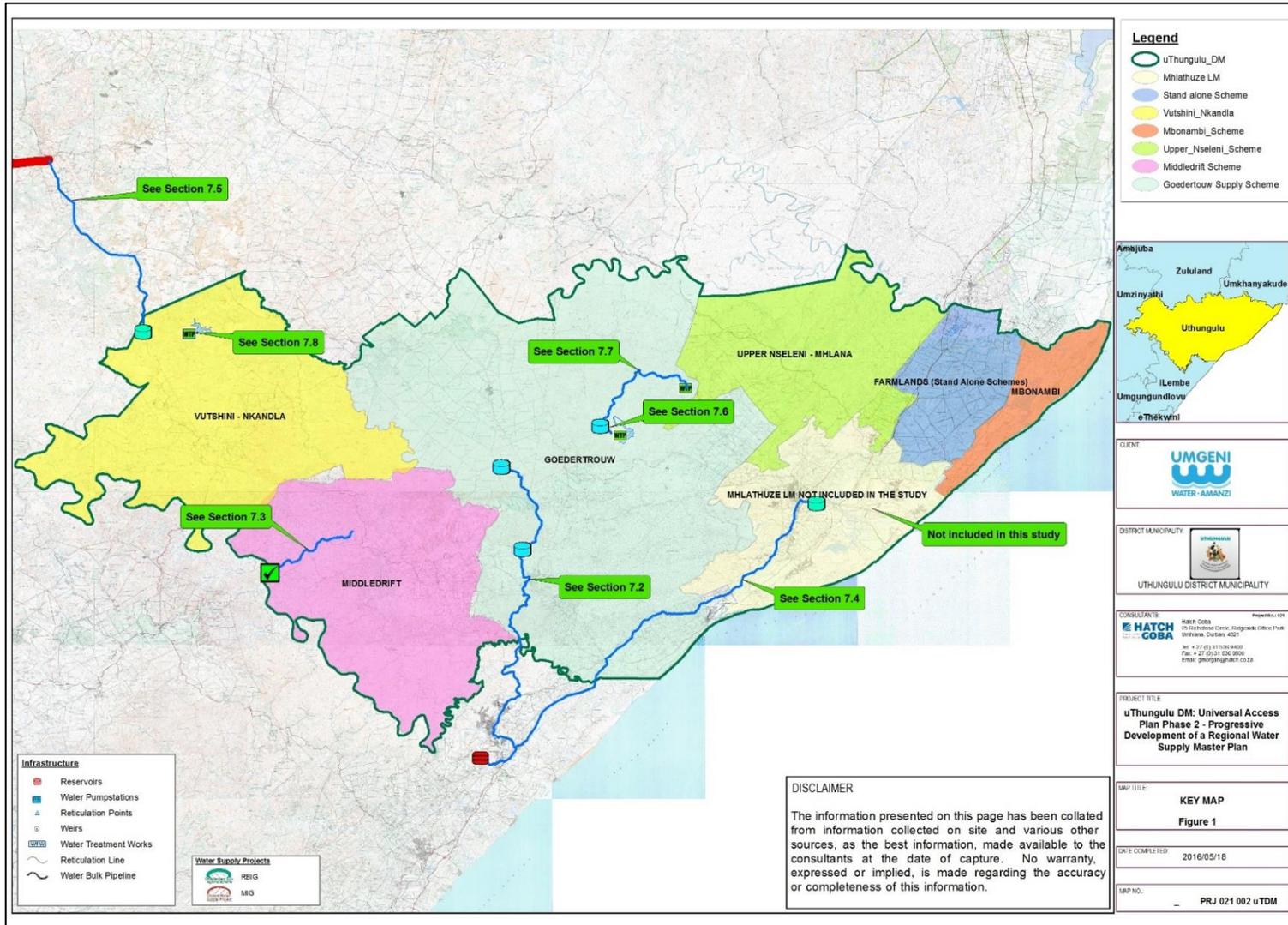


Table 10: Project Demands per Zone

Zone	Population 2015	Population 2045	2015 GAADD (Mℓ/day)	2045 GAADD (Mℓ/day)	Local Municipality
0	70 535	110 252	10.09	15.8	Umlalazi
1	84 766	132 496	11.02	17.2	Nkandla
2	93 000	145 366	18.14	28.3	Umlalazi
3	66 196	89 222	8.61	11.6	Umlalazi
4	93 000	145 366	12.09	18.9	Mthonjaneni
5	120 000	187 570	15.60	24.4	Ntambanana
6	57 000	89 096	7.41	11.6	Mfolozi
TOTALS	584 497	899 368	82.95	127.8	

As mentioned in Section 6, UTDM has prepared an Infrastructure Masterplan that outlines the requirements for eventual bulk water supply to the majority of its area of jurisdiction via regional bulk water schemes. As the pipeline layouts and scheme configuration has already been addressed including existing and proposed infrastructure, the focus of this UAP Phase 2 study was to determine the water requirements for each scheme and investigate augmentation options where there is a water deficit in the long term (2045).

In order to determine the adequacy of the water resources supplying each of these zones, a water balance exercise was carried out where the yields of the existing water resources was compared to the demands listed in **Table 10**. Where a deficit existed for a particular Supply Zone, an augmentation option was investigated and these options are presented in this section. The results of the water balance assessment are presented in **Table 11**.

VUTSHINI NKANDLA REGIONAL SCHEME

The Vutshini Nkandla Regional Scheme falls within Zone 1 of the UAP Phase 2 supply. This Zone incorporates the Vutshini, Nkandla, and Jamesons Drift Schemes. The projected long term water demand for this scheme is 17.2 Mℓ/day. The current yield of the water resources supplying this scheme as is 2.67 Mℓ/day. Augmentation options for this Zone include a possible extension of the Dundee Bulk Scheme or a dam on the Nsuzo River. Preliminary hydrological investigations indicate that a dam impounding 30.66 Mcm will yield 19 Mℓ/day that will be sufficient for this scheme.

The options discussed above are presented in Section 7.4 and Section 7.6.

MIDDLEDRIFT REGIONAL SCHEME

The Middledrift Regional Scheme falls within Zone 0 of the UAP Phase 2 study. The Middledrift Regional Scheme is supplied with water from the Thukela River via the Thukela-Mhlatusze raw water Transfer to Goedertrouw Dam. Water is then treated at the Middledrift Water Treatment Works and distributed to consumers in the scheme.

The current water use licence for the Thukela-Mhlatusze Transfer Scheme is 260 Mℓ/day for Middledrift and other downstream users. The projected long term demand on Goedertrouw Dam, including the Thukela Transfer Scheme, is 553 Mℓ/day. This reduces to 537.2 Mℓ/day after the allocation of the long term demand of 15.8 Mℓ/day for the Middledrift Regional Scheme.

The projected water use on the Goedertrouw Dam is 707.95 Mℓ/day. This includes a projected long term demand for the Goedertrouw Regional Scheme (discussed below) and current demand on other downstream users including uMhlatusze Water. The Goedertrouw Dam is thus in deficit of 170.55 Mℓ/day (707.95 Mℓ/day minus 537.2 Mℓ/day) after the long term allocation of 15.8 Mℓ/day for the Middledrift Regional Scheme. In order to ensure the allocation of 15.8 Mℓ/day for the Middledrift Regional Scheme, the option of either an increased water use application on the Thukela-Mhlatusze Raw Water Transfer Scheme needs to be investigated. Another alternative is to investigate water trading with downstream water users on Goedertrouw Dam including irrigators and forestry that currently have a water use licence of 411.95 Mℓ/day. Therefore, no further augmentation options were investigated for the Middledrift Regional Scheme as the assumption that the long term demand of 15.8 Mℓ/day will be supplied from the Thukela River.

GOEDERTROUW REGIONAL SCHEME

The Goedertrouw Regional Scheme falls within Zones 2, 3 & 4 of this UAP Phase 2 study. According to the latest draft UTDM Water Masterplan, this scheme incorporates three previous regional schemes viz.

- Eshowe Regional Scheme
- Kwahlokohloko Regional Scheme
- Mthonjaneni Regional Scheme

The intention is that all of these schemes be ultimately supplied by Goedertrouw Dam and the Goedertrouw Water Treatment Works. The long term water demand for the Goedertrouw Regional Scheme is 58.8 Mℓ/day. The Goedertrouw Dam has a deficit of 170.55 Mℓ/day (707.95 Mℓ/day minus 537.2 Mℓ/day) as described above under the *Middledrift Scheme*.

The one option of augmenting water supply to the Goedertrouw Scheme is via the Lower Thukela Bulk Water Supply Scheme (LTBWSS) that is currently being commissioned by Umgeni Water. It is understood that the abstraction licence on the Thukela River for the LTBWSS is 110 Ml/day. The water works is currently being designed to treat 55 Ml/day and will be upgraded in the future when the demand increases. The intention is to supply the Ilembe District Municipality, south of the Thukela River from the LTBWSS. According to Umgeni Water's latest Infrastructure Masterplan, the option of supply to consumers north of the Thukela River from the LTBWSS is envisaged after the construction of a dam on the lower Umvoti River (Wolverdient or Isithundu) that will supply the consumers that the LTBWSS is currently allocated to. With this long term view in mind, the option of extending the LTBWSS footprint north of the Thukela more especially to supply the Goedertrouw Regional Scheme was investigated. This option is presented in Section 7.1.

Another option was investigated and presented in Section 7.2. This option entails additional raw water from the Thukela River to supply Middeldrift.

UPPER NSELENI MHLANA REGIONAL SCHEME

The Upper Nseleni-Mhlana Regional Scheme falls within Zone 5 of this UAP Phase 2 Study. The projected long term water demand for this scheme is 24.4 Ml/day. The current yield of the water resources supplying these schemes, viz, Nseleni and Nkolokoto Rivers is insufficient for the long term demand. The option of a dam on the Mfule River together with a water works and bulk infrastructure to link to the current infrastructure in the Upper Nseleni-Mhlana Regional Scheme was investigated. Preliminary hydrological investigations indicate that a dam impounding 131.58 mcm will yield 48.7 Ml/day that will be sufficient for this scheme.

This option is presented in Section 7.5.

MBONAMBI REGIONAL SCHEME

The Mbonambi Regional Scheme falls within Zone 6 of this UAP Phase 2 Study. The projected long term demand for this scheme is 11.6 Ml/day. A section of Mbonambi is supplied by uMhlatuze Water although supply is intermittent. The one option of augmenting water supply to the Richards Bay area and consequently Mbonambi, is a pipeline from the LTBWSS discussed above under the Goedertrouw Regional Scheme. This option is presented in Section 7.3.

Table 11: WATER BALANCE

	2015 Masterplan Regional Scheme	Previous Regional Scheme Areas	Masterplan Sub Supply Areas	UAP Phase 2 Supply Zone	Water Resource	Yield (Mℓ/day)	Yield after all allocations	Resource Assessment		UAP Phase 2 Augmentation Option	Augmentation Resource Yield after All Allocations (Mℓ/day)	
								UAP Phase 2 : 30 Year Demand GAADD (Mℓ/day)	Water Surplus (Mℓ/day)			Water Deficit (Mℓ/day)
Existing	Vutshini - Nkandla Regional Scheme	Jamesons Drift	1	1	Tugela River	1	-	1.548	-	0.548	Ntshingwayo Dam via Dundee Bulk or Nsuze Dam	25.5
		Nkandla	8	1	Mhlatuze River	1.34	-	7.74	-	6.4		
		Vutshini	8	1	Vove Dam	0.33	-	7.912	-	7.582		
	Middledrift Regional Scheme	Middledrift	8	0	Tugela River	260	15.8	15.8	-	-	-	-
	Upper Nseleni- Mhlana Regional Scheme	Nseleni/Mhlana	17	5	Nkolokoto & Nseleni River	1.23	-	24.4	-	23.17	Mfule Dam	48.7
	Goedertrouw Regional Scheme	Eshowe	7	2	Goedertrouw Dam	293	(167.55) ¹	24.055	-	227.55	Lower Tugela Bulk Water Supply Scheme	60
		Kwahlokohe	7	3				11.6				
		Mthonjaneni	8	4				18.9				
		Gingindlovu	-	2	Matigulu River	25.14	-	1.415	23.725	-	-	-
	Mtunzini	-	2	Ntuze River	4.7	-	2.83	1.87	-	-	-	-
Mbonambi Regional Scheme	Mbonambi	-	6	Goedertrouw Dam, Lake Mzingazi & Lake Nsezi	354.7	(227.55) ¹	11.6	-	223.35	Lower Tugela Bulk Water Supply Scheme	50	
In Planning / Implementation	Vutshini - Nkandla Regional Scheme	Jamesons Drift	1	1	Tugela River	1	-	1.548	-	0.548	Ntshingwayo Dam via Dundee Bulk or Nsuze Dam	25.5
		Nkandla	8	1	Mhlatuze River	1.34	-	7.74	-	6.4		
		Vutshini	8	1	Vove Dam	0.33	-	7.912	-	7.582		
	Middledrift Regional Scheme	Middledrift	8	0	Tugela River	260	15.8	15.8	-	-	-	-
	Upper Nseleni- Mhlana Regional Scheme	Nseleni/Mhlana	17	5	Nkolokoto & Nseleni River	1.23	-	24.4	-	23.17	Mfule Dam	48.7
	Goedertrouw Regional Scheme	Eshowe	7	2	Goedertrouw Dam	293	(167.55) ¹	24.055	-	227.55	Lower Tugela Bulk Water Supply Scheme	60
		Kwahlokohe	7	3				11.6				
		Mthonjaneni	8	4				18.9				
		Gingindlovu	-	2	Matigulu River	25.14	-	1.415	23.725	-	-	-
	Mtunzini	-	2	Ntuze River	4.7	-	2.83	1.87	-	-	-	-
Mbonambi Regional Scheme	Mbonambi	-	6	Goedertrouw Dam, Lake Mzingazi & Lake Nsezi	354.7	(227.55) ¹	11.6	-	239.15	Lower Tugela Bulk Water Supply Scheme	50	

All information gathered from the All Town Recon Strategies and the 2015 Draft Masterplans of the respective Regional Schemes
Groundwater is excluded from this water balance

1) Kwahlokohe All Town Recon Strategy (pg. 15)

7.1. OPTION 1: LOWER TUGELA BULK WATER SUPPLY TO THE GOEDERTROUW REGIONAL SCHEME

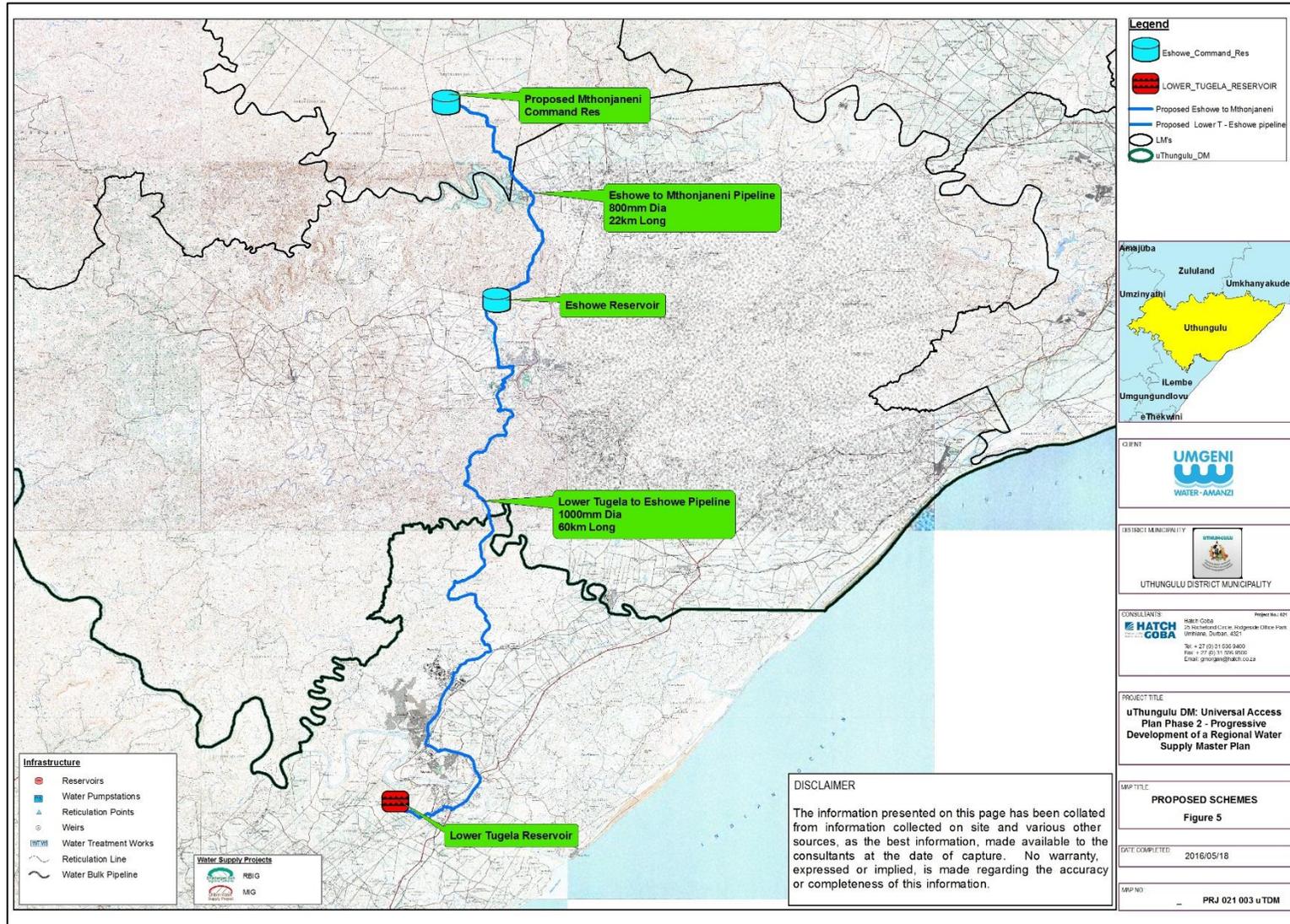
An option of extending the Lower Thukela Bulk Water Supply Scheme north to supply the Uthungulu DM was investigated. A 60km long 1000mm diameter bulk pipeline will transfer 60 Ml/day for Zones 2 to 4, from the Lower Thukela Command reservoir along the R102 and then along the R66 to a command position at elevation 560m at Eshowe to allow the Eshowe and Kwaholkohloko Schemes in the Goedertrouw Regional Scheme to be supplied.

In order to keep the maximum static head to 150m, as required by Umgeni Water, it will be necessary to pump twice to a reservoir at elevation 450m, at an approximate chainage of 27 km. Thereafter, water can be gravitated for 23 km whereafter two more pumpstations will be required to deliver water to the Eshowe Reservoir.

A 22 km long 800mm diameter pipeline from Eshowe Command to a command position at elevation 760m just past Goedertrouw Dam will allow for supply to the Mthonjaneni Scheme.

An alternative configuration would be to link into the new water works at Goedertrouw Dam from where water is supplied to the Mthonjaneni Scheme via a series of existing pump stations.

A layout of this option is shown in **Figure 5** and a longitudinal section of the pipelines is shown in **Figures 5a** and **5b**. The capital cost of this option is presented in **Table 12** and **12a**.



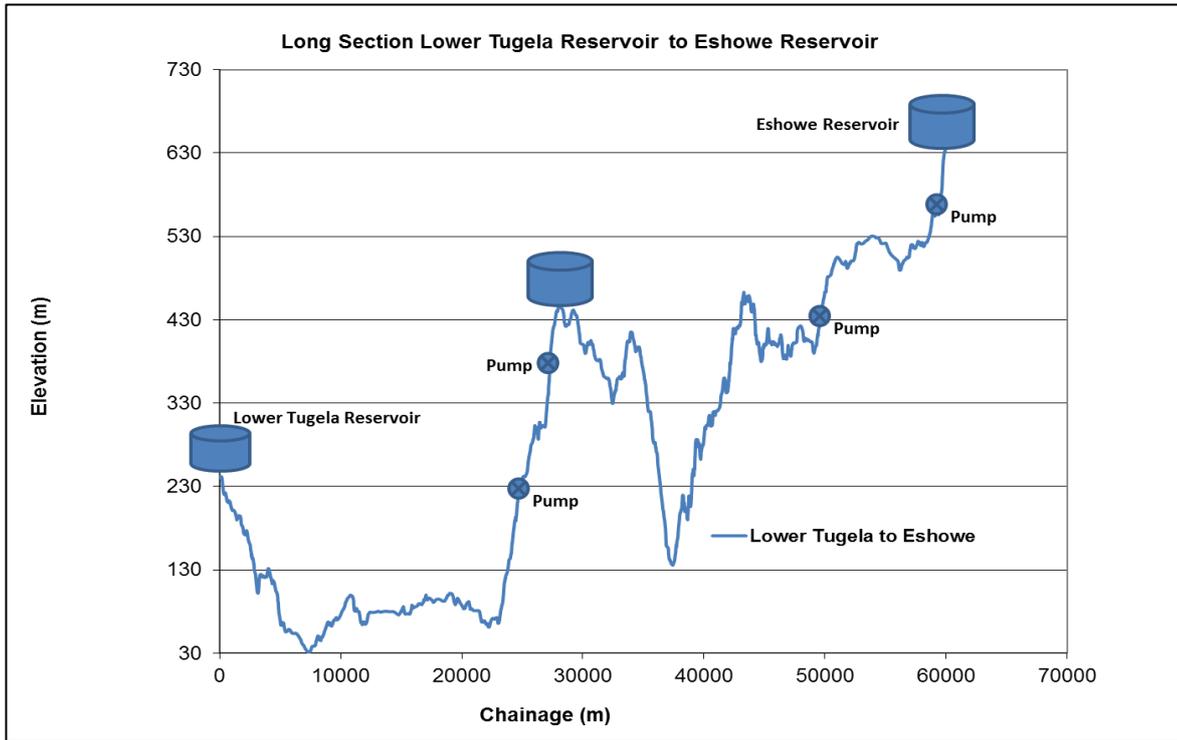


Figure 5a: Long Section of Lower Tugela Reservoir to Eshowe Reservoir

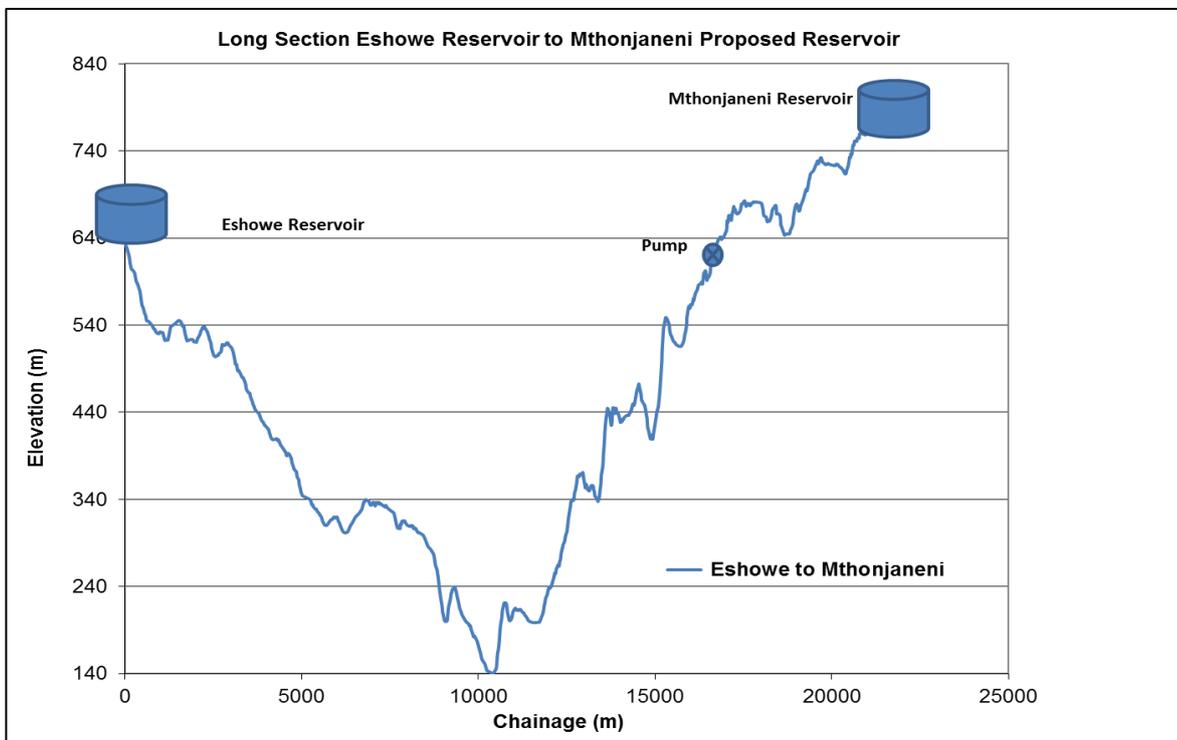


Figure 5b: Long Section of Eshowe Reservoir to Mthonjaneni Reservoir

Table 12: Capital Costs: Lower Tugela Reservoir to Eshowe Reservoir

Consultants	
Design and Tender Documentation	99 471 668
Geotech Survey	3 000 000
Land Survey	481 140
Cathodic Protection	5 000 000
Construction Monitoring	11 226 600
Construction	
Pipe Supply	268 636 500
Pipeline Construction	478 720 397
Pipe Bridge/Jack	32 000 000
Pumpstation	220 522 500
Water Works	0
Reservoir	105 361 361
Dam	0
Abstraction	0
Land Acquisition - 7.5%	82 893 057
Environmental, Community Liaison	8 000 000
Health & Safety, Quality Assurance	11 052 408
Project Office	38 683 427
Contingencies	679 524 528
Sub total	2 038 573 585
VAT (14%)	285 400 302
Grand total	2 331 973 887

Electricity Capital costs excluded

Table 12a: Capital Costs: Eshowe Reservoir to Mthonjaneni Reservoir

Consultants	
Design and Tender Documentation	36 310 430
Geotech Survey	3 000 000
Land Survey	176 418
Cathodic Protection	5 000 000
Construction Monitoring	4 116 420
Construction	
Pipe Supply	98 500 050
Pipeline Construction	175 530 812
Pipe Bridge/Jack	10 000 000
Pumpstation	24 057 000
Water Works	0
Reservoir	105 361 361
Dam	0
Abstraction	0
Land Acquisition - 7.5%	30 258 692
Environmental, Community Liaison	5 000 000
Health & Safety, Quality Assurance	4 034 492
Project Office	14 120 723
Contingencies	251 233 199
Sub total	753 699 597
VAT (14%)	105 517 944
Grand total	872 217 540

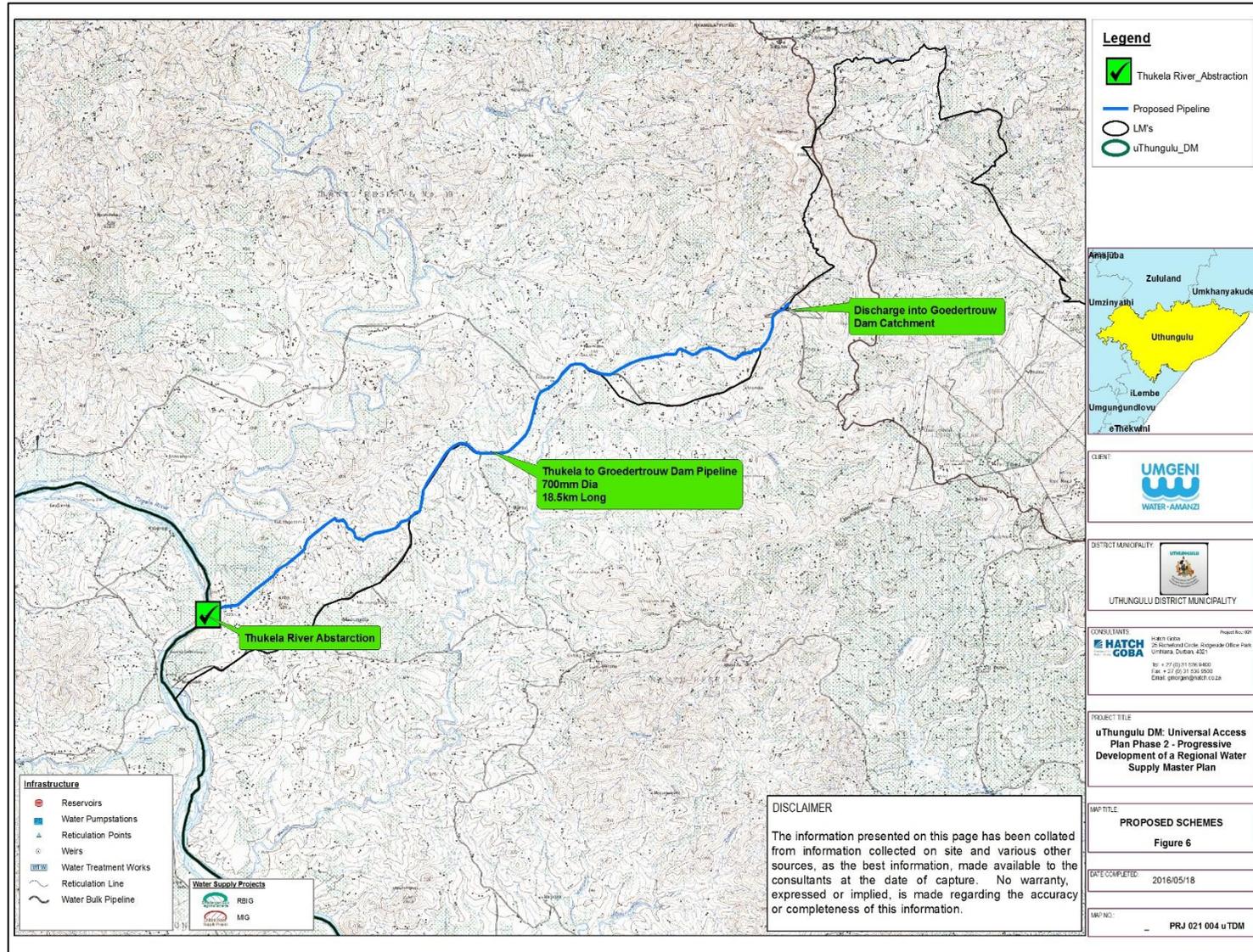
Electricity Capital costs excluded

7.2. OPTION 2: ADDITIONAL RAW WATER SUPPLY FROM THUKELA RIVER TO GOEDERTROUW DAM AT MIDDLEDRIFT

Raw water is currently transferred from the Tugela River to the Middledrift Water supply scheme and further to the watershed into the Goedertrouw Dam via the Madungela high lift pump station.

The current allocation for this transfer is 95 Mℓ/day. In order to supply the long term demands of Zones 2 to 4 and due to other water use allocations, 60 Mℓ/day will be required. Water can be treated at the Goedertrouw Water Works at the Dam for distribution to the three zones that make up the Goedertrouw Regional Scheme. In order to supply the 60 Mℓ/day, an 850mm diameter pipeline together with three pump stations will be required.

The option of utilising the existing system with bigger pumps is also worth investigating. This option is shown in **Figure 6**, the long section in **Figure 6a** and a capital cost is presented in **Table 13**. This option is only worth considering should an additional water use licence be approved.



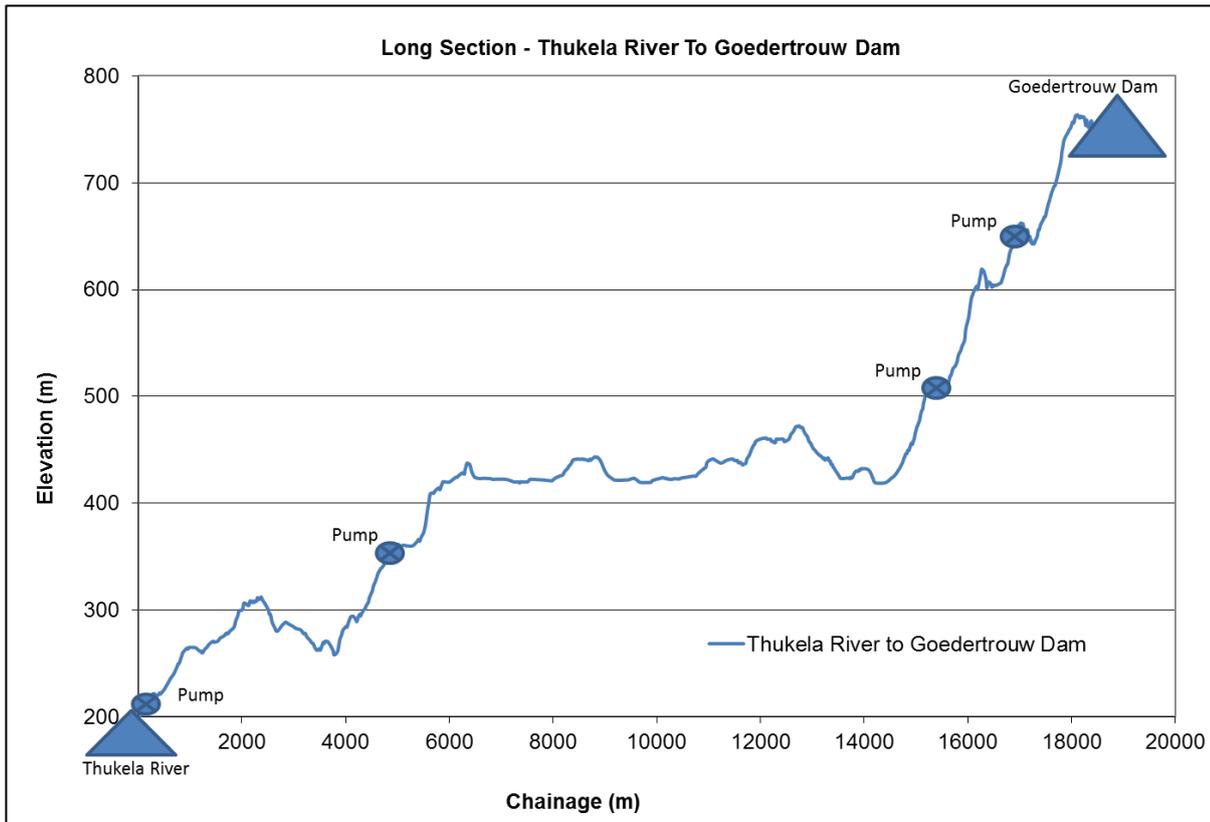


Figure 6a: Long Section of Thukela River to Goedertrouw Dam

Table 13: Capital Costs: Thukela River to Goedertrouw Dam at Middledrift

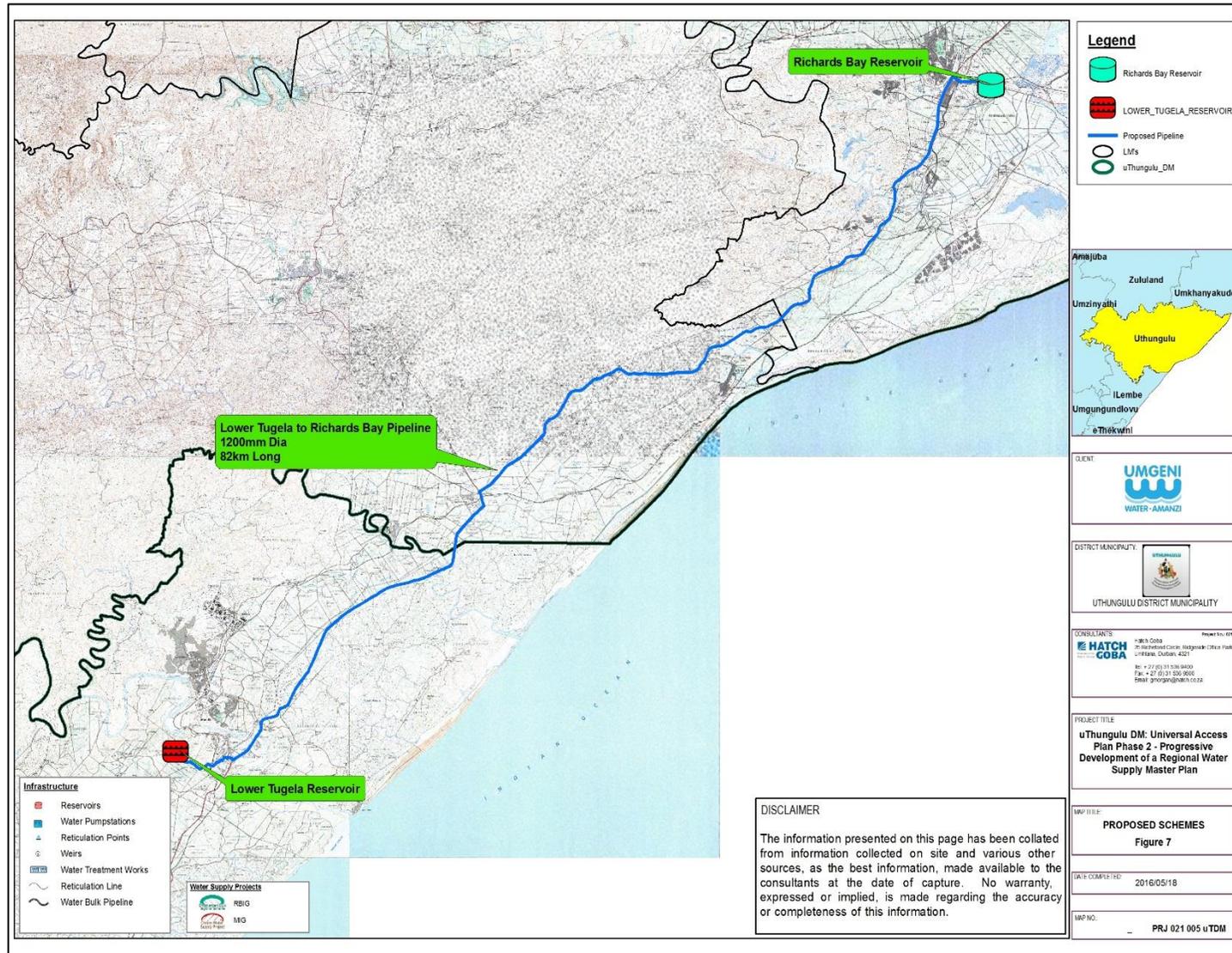
Consultants	
Design and Tender Documentation	32 767 654
Geotech Survey	3 000 000
Land Survey	148 352
Cathodic Protection	5 000 000
Construction Monitoring	3 461 535
Construction	
Pipe Supply	82 829 588
Pipeline Construction	147 605 456
Pipe Bridge/Jack	0
Pumpstation	133 650 000
Water Works	0
Reservoir	0
Dam	0
Abstraction	0
Land Acquisition - 7.5%	27 306 378
Environmental, Community Liaison	5 000 000
Health & Safety, Quality Assurance	3 640 850
Project Office	12 742 977
Contingencies	227 076 394
Sub total	681 229 183
VAT (14%)	95 372 086
Grand total	779 601 269

Electricity Capital costs excluded

7.3. OPTION 3: BULK WATER SUPPLY TO MFOLOZI LM AND RICHARDS BAY FROM THE LOWER THUKELA SCHEME

The possibility of bulk water supply to Richards Bay to augment supply to the town as well as to allow supply to Zone 6, Mbonambi, was investigated. An 82km long, 1200mm diameter pipeline that has been sized to transfer the full 110 Mℓ/day available from the Lower Thukela Scheme under gravity in the long term, after other possible resource developments, will be implemented to supply water to the Ilembe DM thus freeing up the 110 Mℓ/day available on the Lower Thukela Scheme. The pipeline will follow the R102 and N3 to a terminal point alongside the N3 from where Mbonambi can be supplied.

This option is presented in **Figure 7** and the Longitudinal Section is shown in **Figure 7a**. The capital cost for this option is shown in **Table 14**.



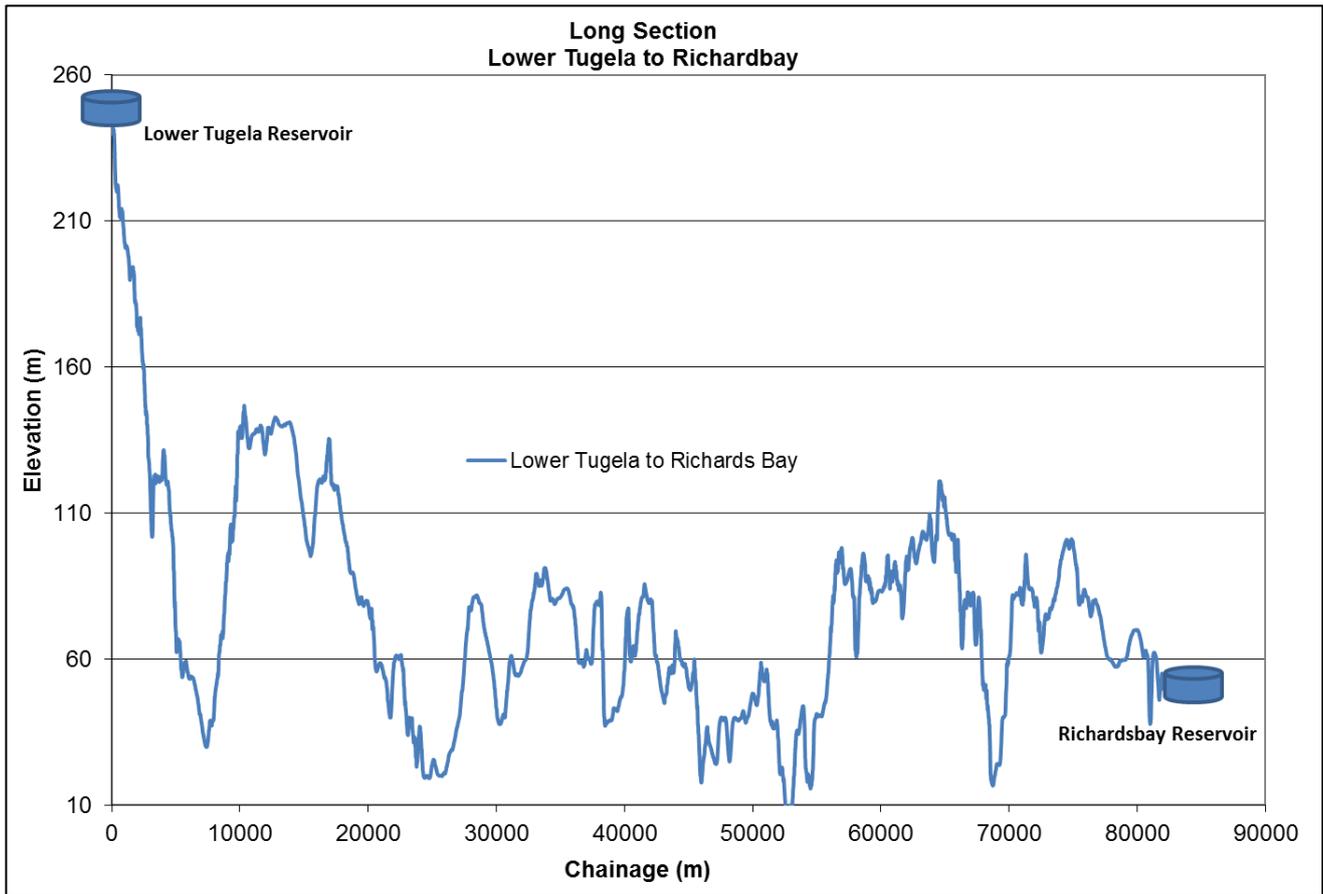


Figure 7a: Long Section of Lower Tugela Bulk to Mfolozi and Richards Bay

Table 14: Capital Costs: Lower Tugela Bulk to Mfolozi LM and Richards Bay

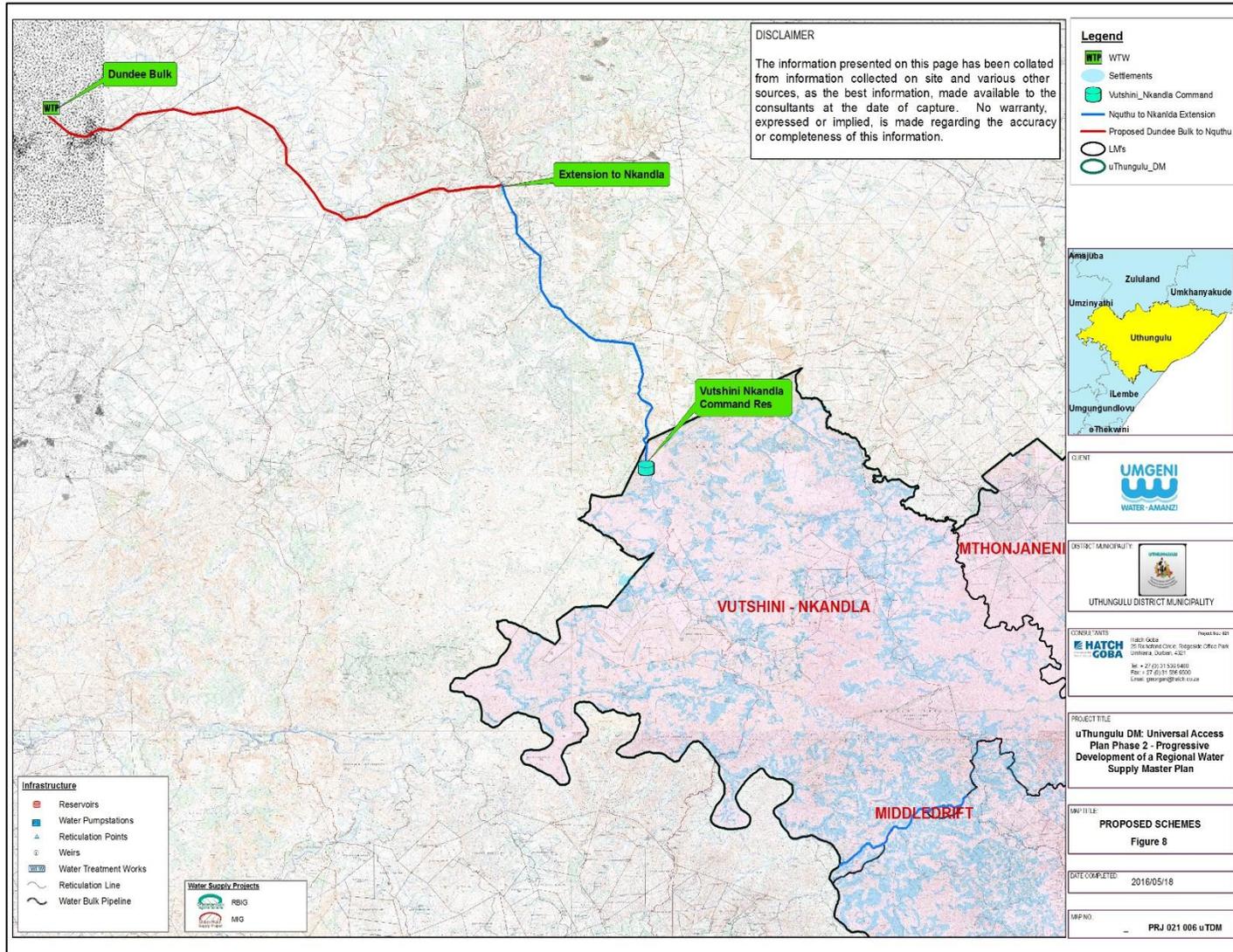
Consultants	
Design and Tender Documentation	99 471 668
Geotech Survey	3 000 000
Land Survey	481 140
Cathodic Protection	5 000 000
Construction Monitoring	11 226 600
Construction	
Pipe Supply	268 636 500
Pipeline Construction	478 720 397
Pipe Bridge/Jack	32 000 000
Pumpstation	220 522 500
Water Works	0
Reservoir	105 361 361
Dam	0
Abstraction	0
Land Acquisition - 7.5%	82 893 057
Environmental, Community Liaison	10 000 000
Health & Safety, Quality Assurance	11 052 408
Project Office	38 683 427
Contingencies	679 524 528
Sub total	2 038 573 585
VAT (14%)	285 400 302
Grand total	2 331 973 887

Electricity Capital costs excluded

7.4. OPTION 4: POSSIBLE SUPPLY TO VUTSHINI-NKANDLA FROM DUNDEE BULK

The option of supply to the Nkandla-Vutshini area, Zone 1, from the proposed Dundee bulk was investigated. The proposed Dundee Bulk Scheme intends supplying the Edumeni and Nquthu Local Municipalities in the Umzinyathi District Municipality with bulk water from the Ntshingwayo Dam. After all allocations, 25.5 Mℓ/day will be available as surplus for other possible users.

This option will require a 40km long, 450mm diameter pipeline from the terminal point of the Dundee Bulk Scheme at Nquthu to supply 17 Mℓ/day to a terminal point at elevation 1585m from where it will be possible to supply the Nkandla area. It will be possible to gravitate water from the terminal point at Nquthu for approximately 56 km where after two stage pumping will be required to an intermediate reservoir at an approximate chainage of 62 km and at an elevation of 1450m. Water can then be further gravitated for 25 km whereafter another two stage pumping set up will be required to a terminal reservoir at elevation 1585m ASL in the upper reaches of the Nkandla LM from where water supply can then be connected to existing or planned infrastructure. This option is shown in **Figure 8**, the longitudinal section is shown in **Figure 8a** and capital costs presented in **Table 15**.



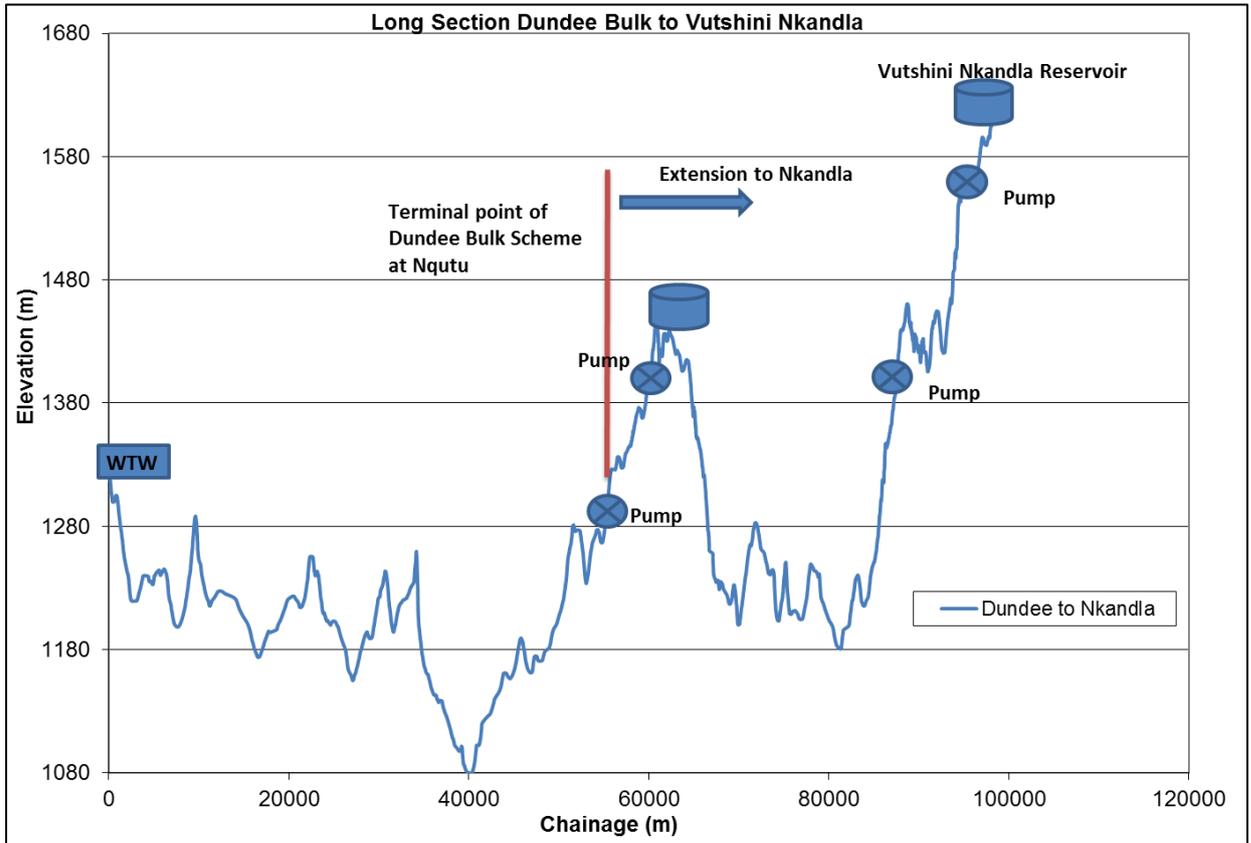


Figure 8a: Long Section of Dundee Bulk to Vutshini-Nkandla

Table 15: Capital Costs: Dundee Bulk to Vutshini-Nkandla

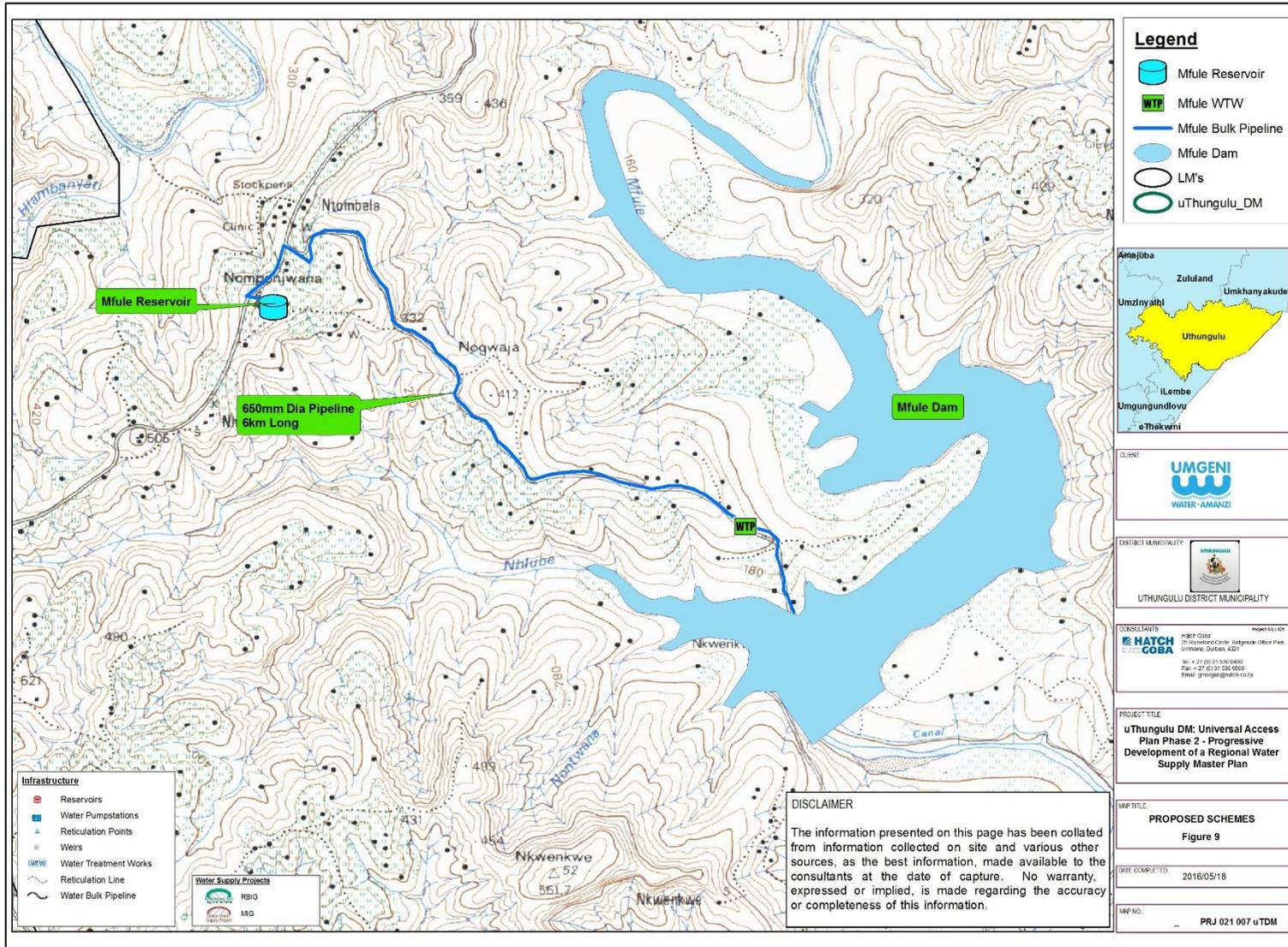
Consultants	
Design and Tender Documentation	35 182 370
Geotech Survey	3 000 000
Land Survey	320 760
Cathodic Protection	5 000 000
Construction Monitoring	7 484 400
Construction	
Pipe Supply	69 498 000
Pipeline Construction	123 848 063
Pipe Bridge/Jack	90 000 000
Pumpstation	72 171 000
Water Works	0
Reservoir	35 398 164
Dam	0
Abstraction	0
Land Acquisition - 7.5%	29 318 642
Environmental, Community Liaison	5 000 000
Health & Safety, Quality Assurance	3 909 152
Project Office	13 682 033
Contingencies	245 406 292
Sub total	736 218 877
VAT (14%)	103 070 643
Grand total	842 289 520

Electricity Capital costs excluded

7.5. OPTION 5: DAM ON THE MFULE RIVER FOR THE MTHONJANENI AND NSELENI-MHLANA SCHEME

A possible dam, impounding 131.58 Mcm with a yield of 48.7 Mℓ/day, together with a waterworks at co-ordinates -28.671S; 31.6185 E on the Mfule River, will allow for storage to supply to Zones 4 & 5. This dam will also allow storage for other water users such as irrigators and forestry downstream of Goedertrouw Dam, thereby freeing up the water resource availability in Goedertrouw Dam for domestic water supply.

The dam is shown in **Figure 9**. A 6km long, 600mm diameter pipeline, will supply 43 Mℓ/day from the waterworks at the dam to a command position in Zone 4 as shown in **Figure 9**. The longitudinal section of the pipeline is shown in **Figure 9a**. Capital costs of the pipeline are shown in **Table 16**.



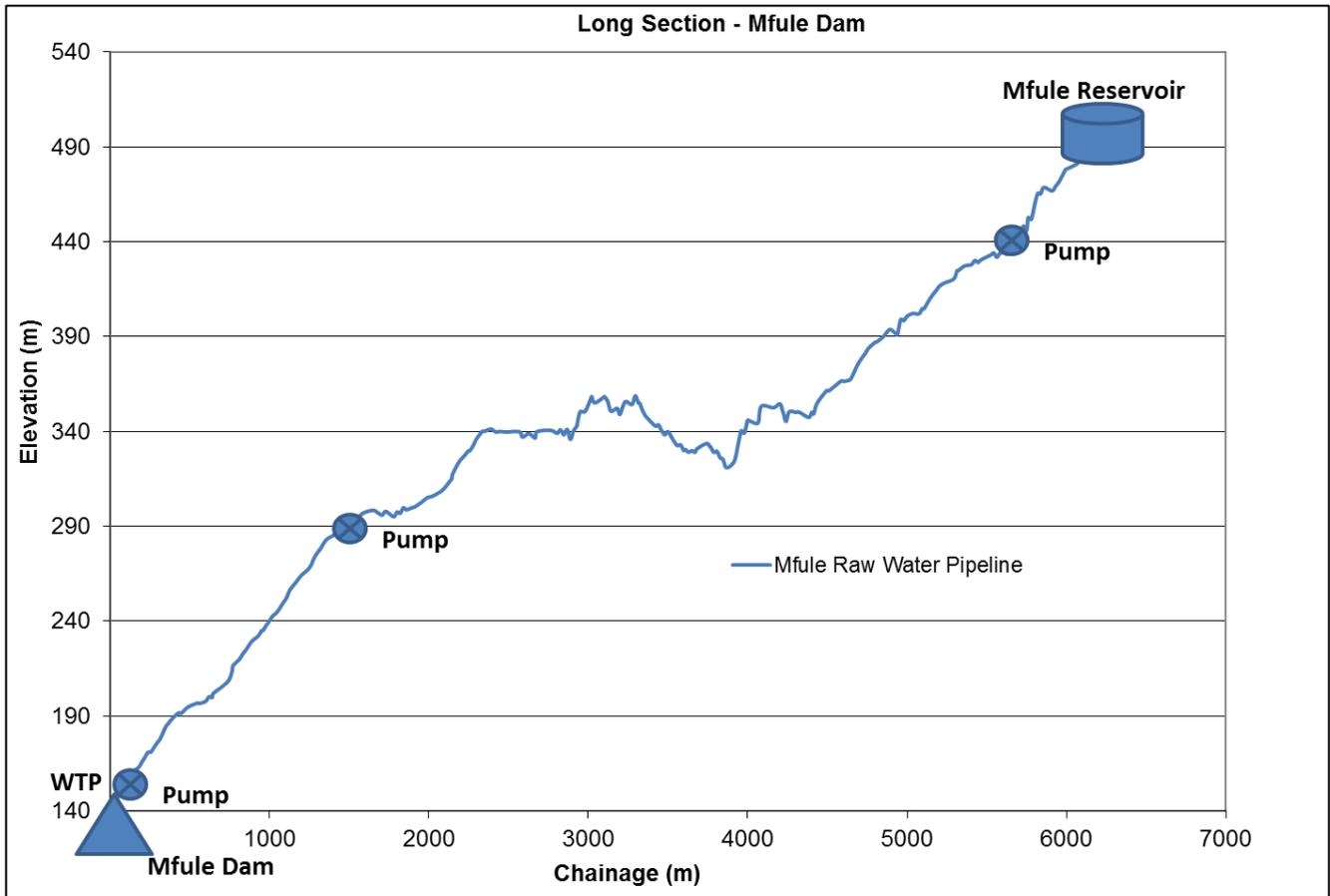


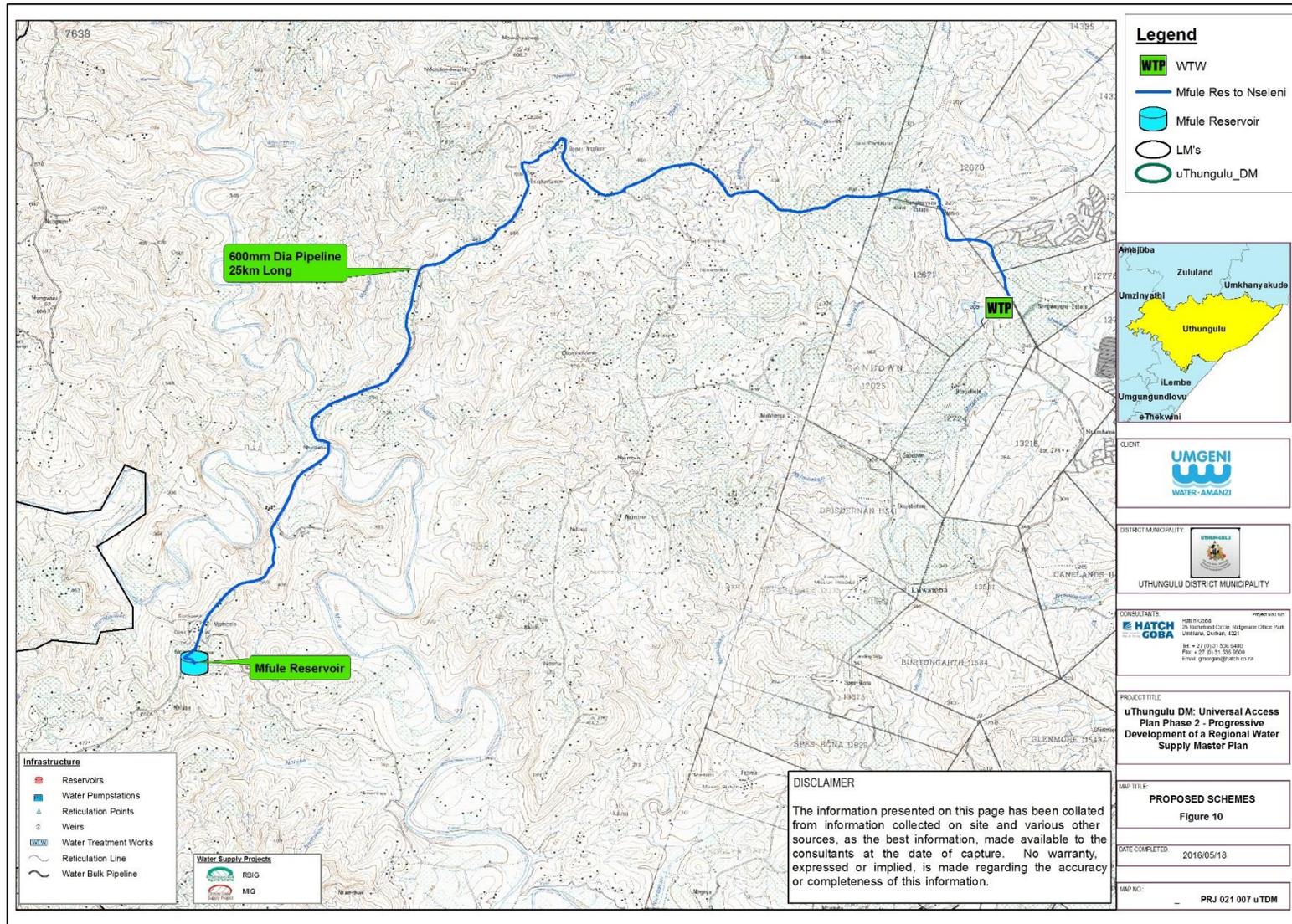
Figure 9a: Long Section of the Raw Water Pipeline from Mfule Dam

Table 16: Capital Costs: Raw Water Pipeline from Mfule Dam

Consultants	
Design and Tender Documentation	403 797 776
Geotech Survey	3 000 000
Land Survey	48 114
Cathodic Protection	5 000 000
Construction Monitoring	1 122 660
Construction	
Pipe Supply	20 047 500
Pipeline Construction	35 725 403
Pipe Bridge/Jack	0
Pumpstation	176 418 000
Water Works	2 405 700
Reservoir	3 512 045 352
Dam	700 000 000
Abstraction	40 000 000
Land Acquisition - 7.5%	336 498 147
Environmental, Community Liaison	7 000 000
Health & Safety, Quality Assurance	44 866 420
Project Office	157 032 468
Contingencies	2 720 003 770
Sub total	8 160 011 309
VAT (14%)	1 142 401 583
Grand total	9 307 412 892

Electricity Capital costs excluded

In order to supply to the Nseleni area in Zone 5 from the Mfule Reservoir, a pipeline from this reservoir to the Crocodile Water Treatment Works was investigated. This option will require a 25km long, 600mm diameter pipeline from the command reservoir position in zone 4, to supply 24.4 Ml/day to the Crocodile WTW from where it will be possible to supply the Nseleni area. Single stage pumping will be required for this option. This option is shown in **Figure 10**, the longitudinal section is shown in **Figure 10a** and capital costs presented in **Table 17**.



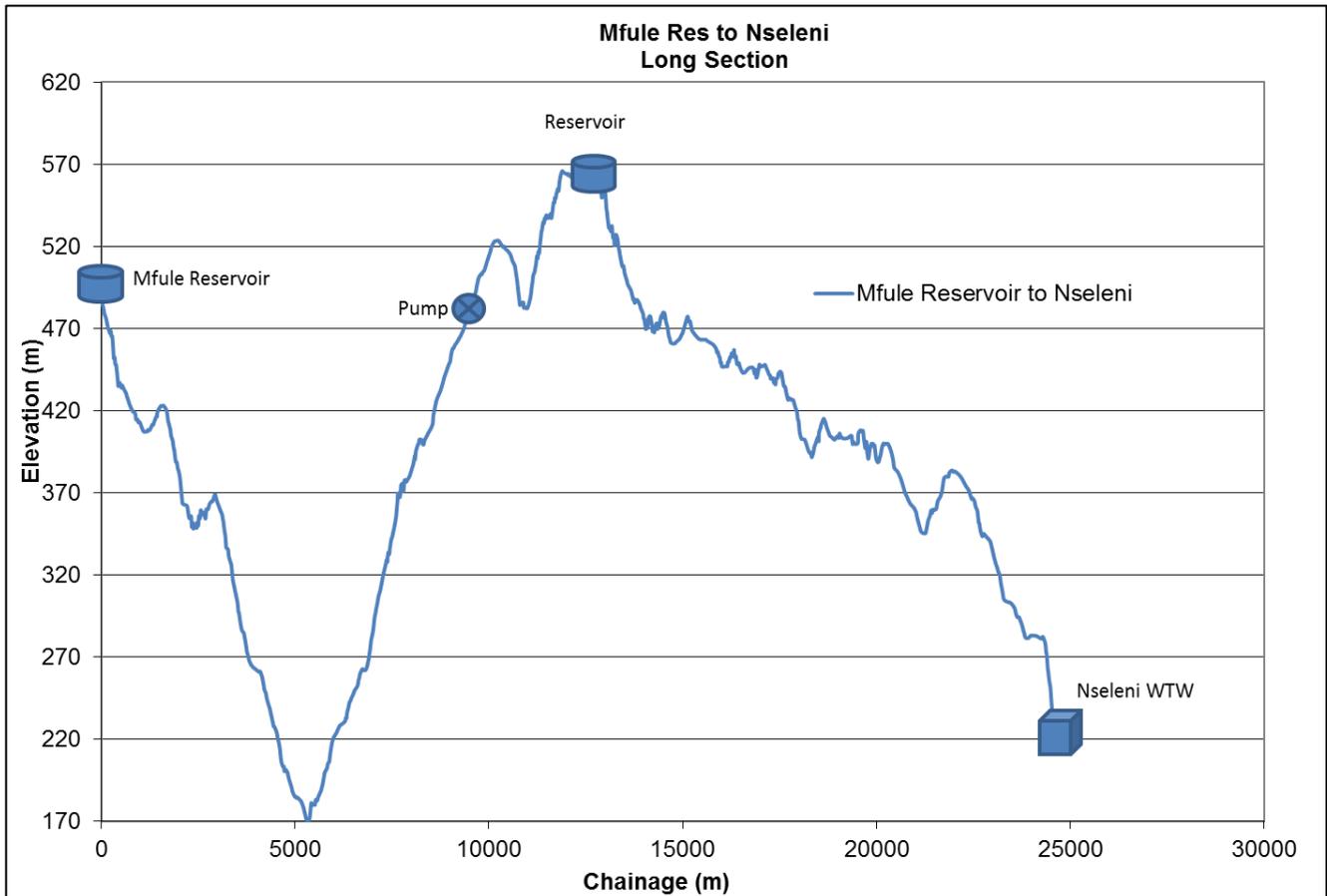


Figure 10a: Long Section of Mfule Reservoir to Nseleni

Table 17: Capital Costs: Mfule Reservoir to Nseleni

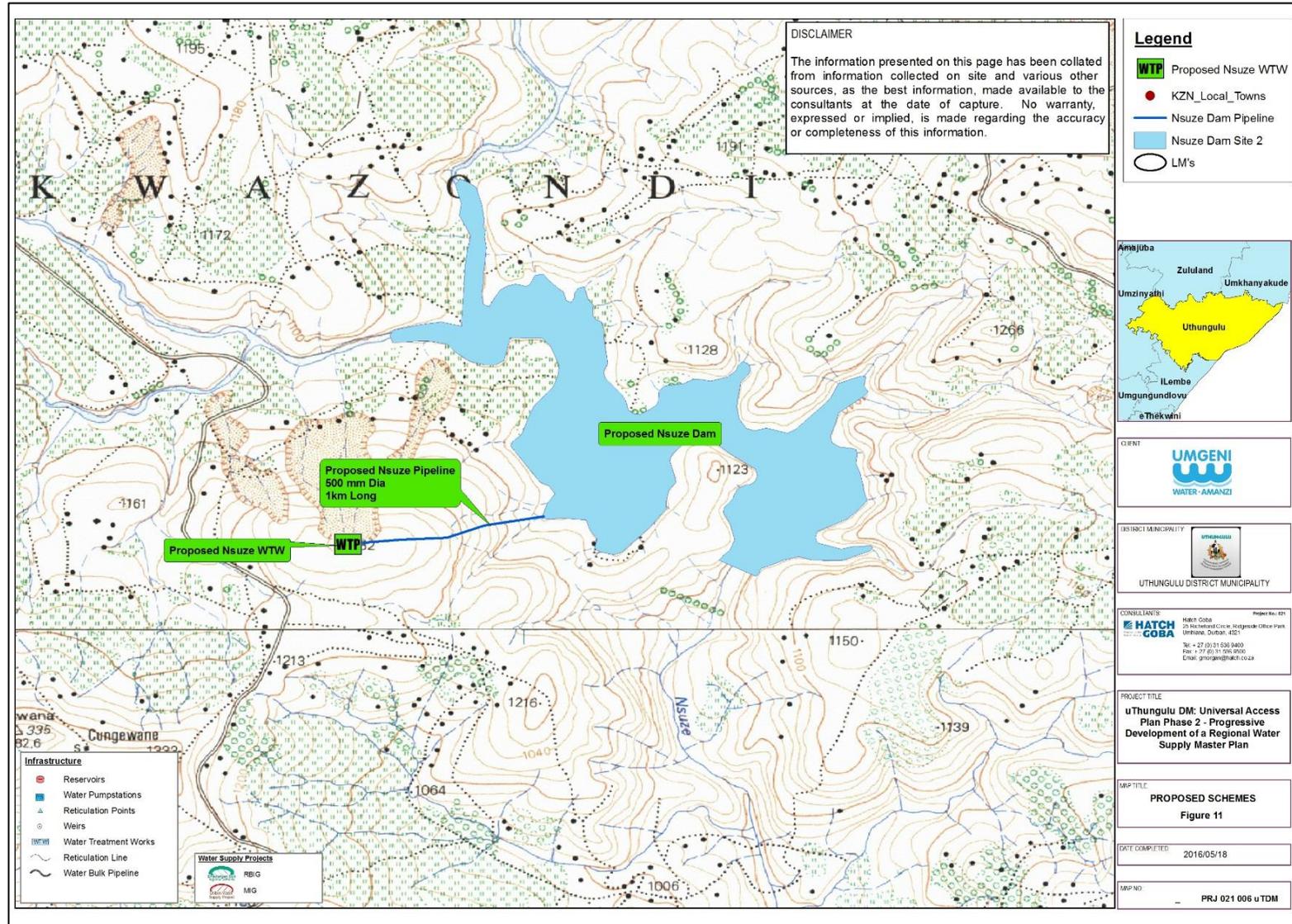
Consultants	
Design and Tender Documentation	26 386 255
Geotech Survey	3 000 000
Land Survey	200 475
Cathodic Protection	5 000 000
Construction Monitoring	4 677 750
Construction	
Pipe Supply	66 156 750
Pipeline Construction	117 893 829
Pipe Bridge/Jack	30 000 000
Pumpstation	33 412 500
Water Works	0
Reservoir	45 717 530
Dam	0
Abstraction	0
Land Acquisition - 7.5%	21 988 546
Environmental, Community Liaison	7 000 000
Health & Safety, Quality Assurance	2 931 806
Project Office	10 261 321
Contingencies	184 813 381
Sub total	554 440 142
VAT (14%)	77 621 620
Grand total	637 061 762

Electricity Capital costs excluded

7.6. OPTION 6: DAM ON THE NSUZE RIVER FOR THE NKANDLA-VUTSHINI SCHEME

A possible dam, impounding 30.66 Mcm with a yield of 19 Ml/day, together with a waterworks at co-ordinates 28°29'46.72"S; 30°55'55.35"E on the Nsuz River, will allow for storage to supply to Zone 1. The dam is shown in **Figure 11**.

A 1km long, 500mm diameter pipeline, will supply 17.2 Ml/day from the dam to a WTW which will then be linked to existing and proposed pipelines. The longitudinal section of the pipeline is shown in **Figure 11a**. Capital costs of the pipeline are shown in **Table 18**.



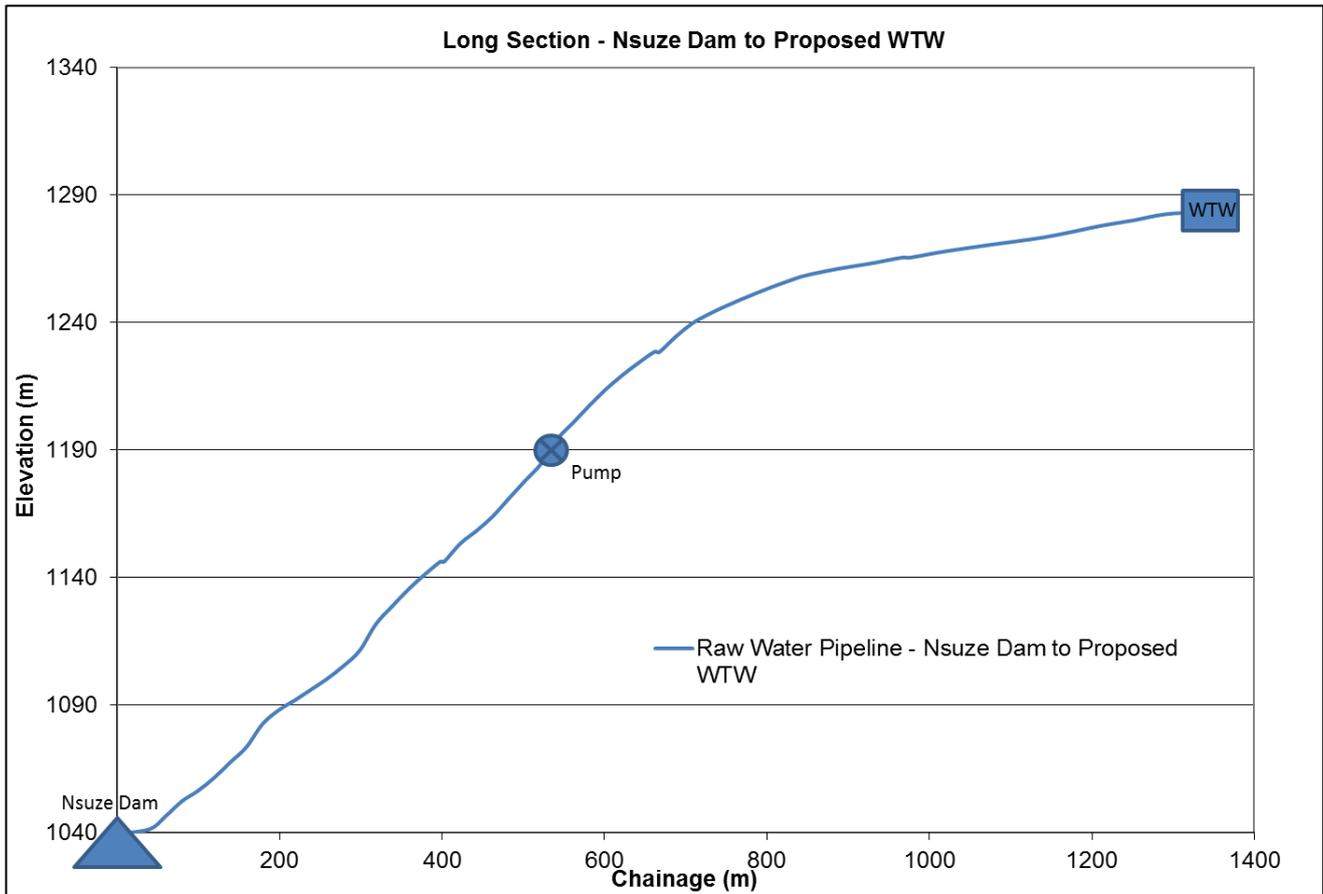


Figure 11a: Long Section of Raw Water Pipeline from Nsuze Dam

Table 18: Capital Costs: Raw Water Pipeline from Nsuze Dam

Consultants	
Design and Tender Documentation	78 194 315
Geotech Survey	3 000 000
Land Survey	8 019
Cathodic Protection	5 000 000
Construction Monitoring	187 110
Construction	
Pipe Supply	2 205 225
Pipeline Construction	3 929 794
Pipe Bridge/Jack	0
Pumpstation	120 285 000
Water Works	2 405 700
Reservoir	0
Dam	700 000 000
Abstraction	40 000 000
Land Acquisition - 7.5%	65 161 929
Environmental, Community Liaison	10 000 000
Health & Safety, Quality Assurance	8 688 257
Project Office	30 408 900
Contingencies	530 737 125
Sub total	1 592 211 374
VAT (14%)	222 909 592
Grand total	1 823 120 966

Electricity Capital costs excluded

8. RECOMMENDATIONS

It is recommended that:

- A detailed feasibility investigation be undertaken to supply water from the Lower Thukela Scheme to Eshowe and Richards Bay (for City of uMhlatuze and Mbonambi).
- The feasibility of extending the Dundee Bulk Scheme past Nquthu to the upper reaches of the Nkandla-Vutshini Scheme, be investigated.
- The feasibility of additional raw-water transfer (increase of allocation on existing water use licence) from the Thukela River to the Goedertrouw Dam catchment at Middledrift need to be investigated as this will provide additional raw water to support the Goedertrouw Regional Scheme.
- Pre-feasibility studies on the Mfule and Nsuzi Dams to augment water supply to the Nseleni and Vutshini-Nkandla Regional Schemes
- The possibility of additional raw-water abstraction at Middledrift for the Thukela-Mhlatuze transfer scheme be investigated.

REFERENCES

- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mhlana Somopho Water Supply Scheme Area - Mbonambi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Eshowe Water Supply Scheme Area - uMlalazi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Gingindlovu Water Supply Scheme Area - uMlalazi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Kwahlokhloko Water Supply Scheme Area - uMlalazi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Middledrift Water Supply Scheme Area - uMlalazi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Mthunzini Water Supply Scheme Area - uMlalazi Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Graeter Mthonjaneni Water Supply Scheme Area - Mthonjaneni Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Nkandla Water Supply Scheme Area - Nkandla Local Municipality.*
- Department of Water Affairs. (2011). *First Stage Reconciliation Strategy for Vutshini Water Supply Scheme Area - Nkandla Local Municipality.*
- UThungulu District Municipality. (2015). *Master Plan - Goedertrouw Regional Scheme.*
- UThungulu District Municipality. (2015). *Master Plan - Mbonambi Regional Scheme.*
- UThungulu District Municipality. (2015). *Master Plan - Middledrift Regional Scheme.*
- UThungulu District Municipality. (2015). *Master Plan - Upper Nseleni_Mhlana Regional Scheme.*
- UThungulu District Municipality. (2015). *Master Plan - Vutshini_Nkandla Regional Scheme.*
- Statistics South Africa Census. (2011). *Household Services_Small Areas.*
- UThungulu District Municipality. (2014/2015). *Integrated Development Plan Review.*

APPROVAL

Approval of report:

PS MATHAKA
JTN representative


Signature

24/06/2016
Date

G. Morgan
Hatch Goba representative


Signature

24/06/2016
Date

Umgeni Water representative

Signature

Date

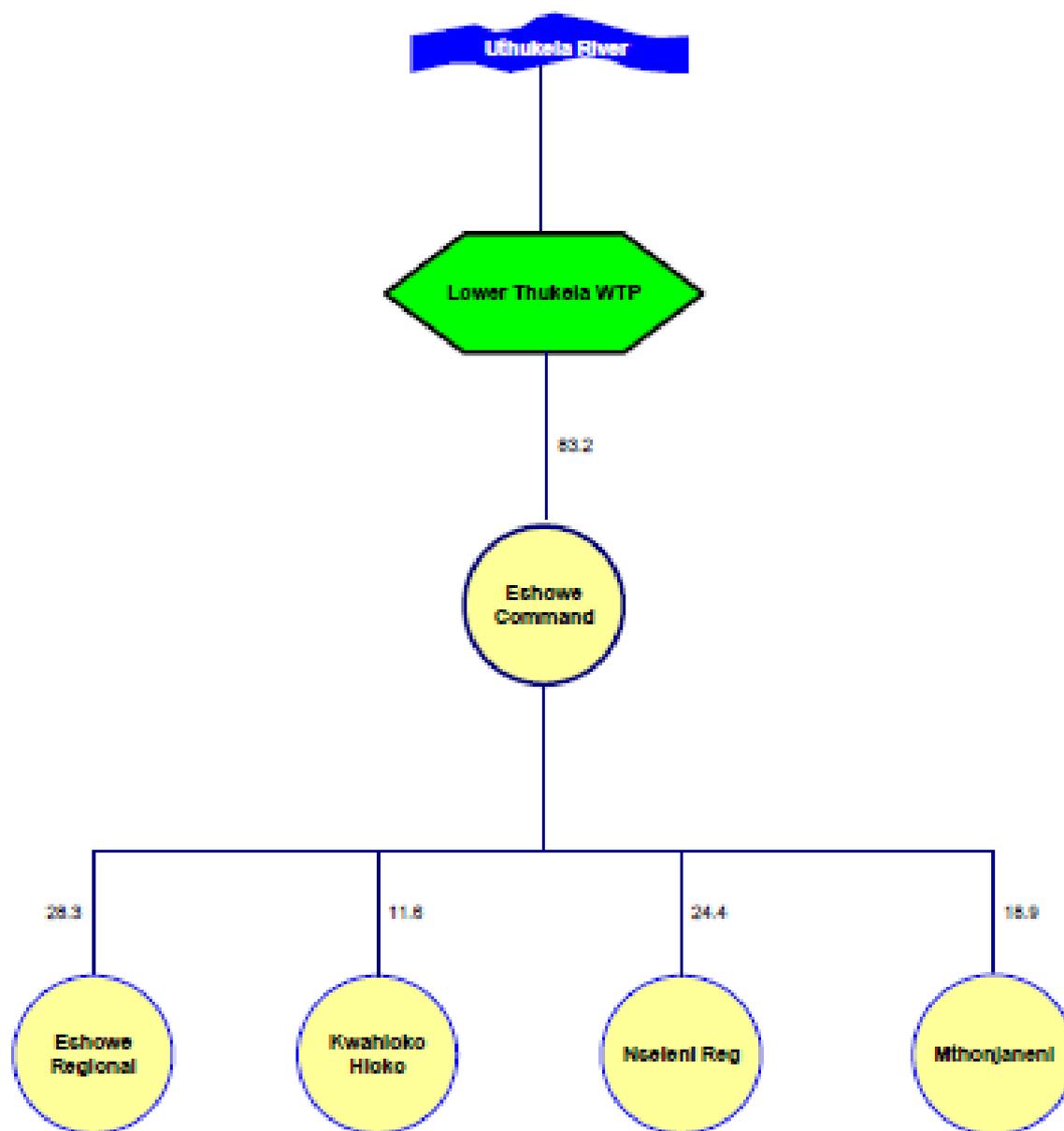


APPENDICES

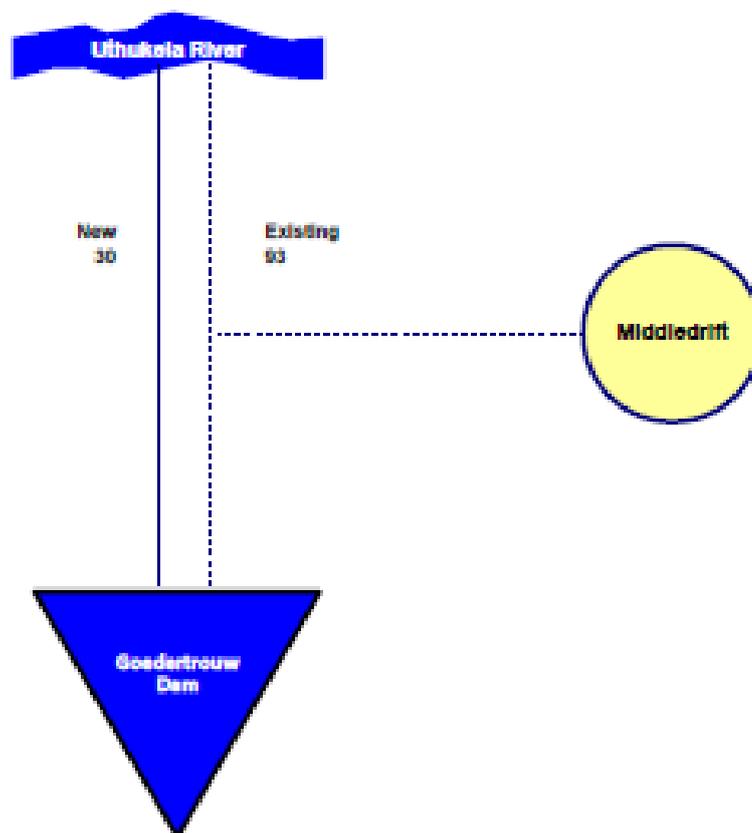


APPENDIX A: Options Schematics

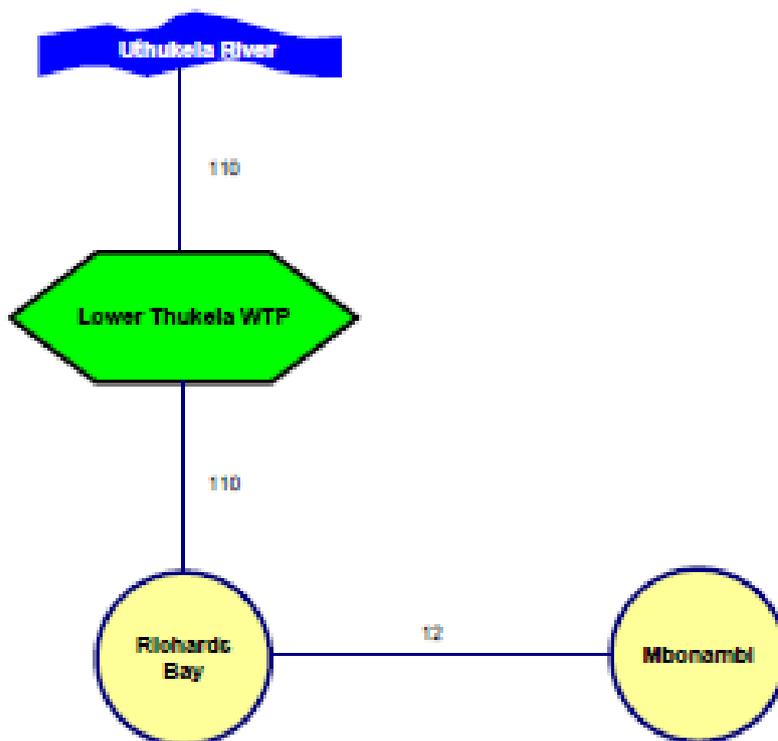
UTHUNGULU: OPTION 1



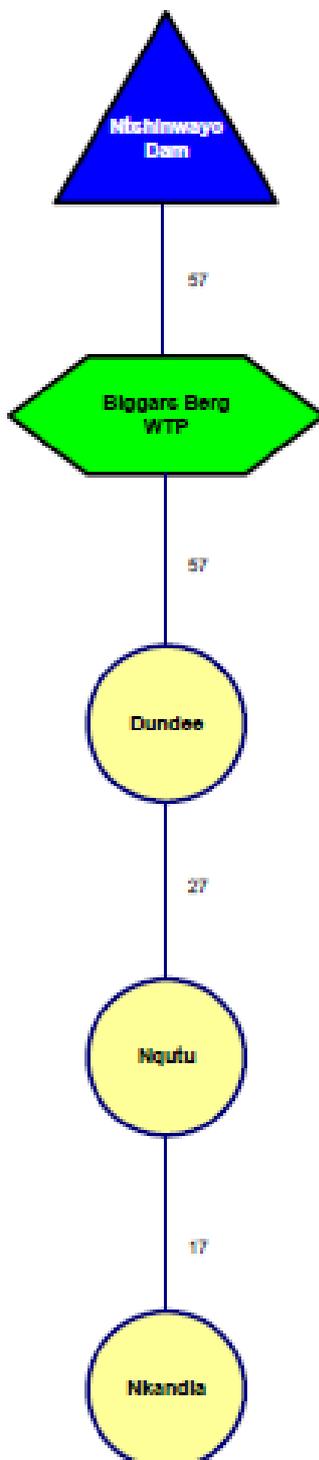
UTHUNGULU: OPTION 2



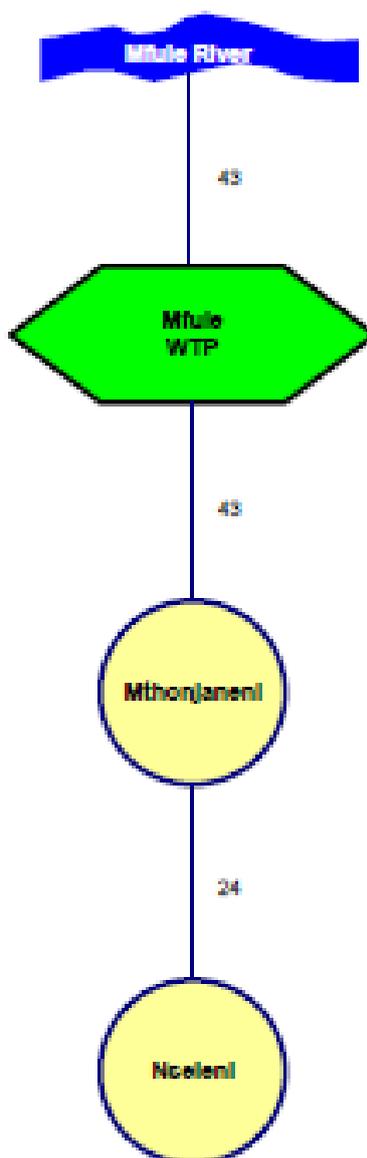
UTHUNGULU: OPTION 3



UTHUNGULU: OPTION 4

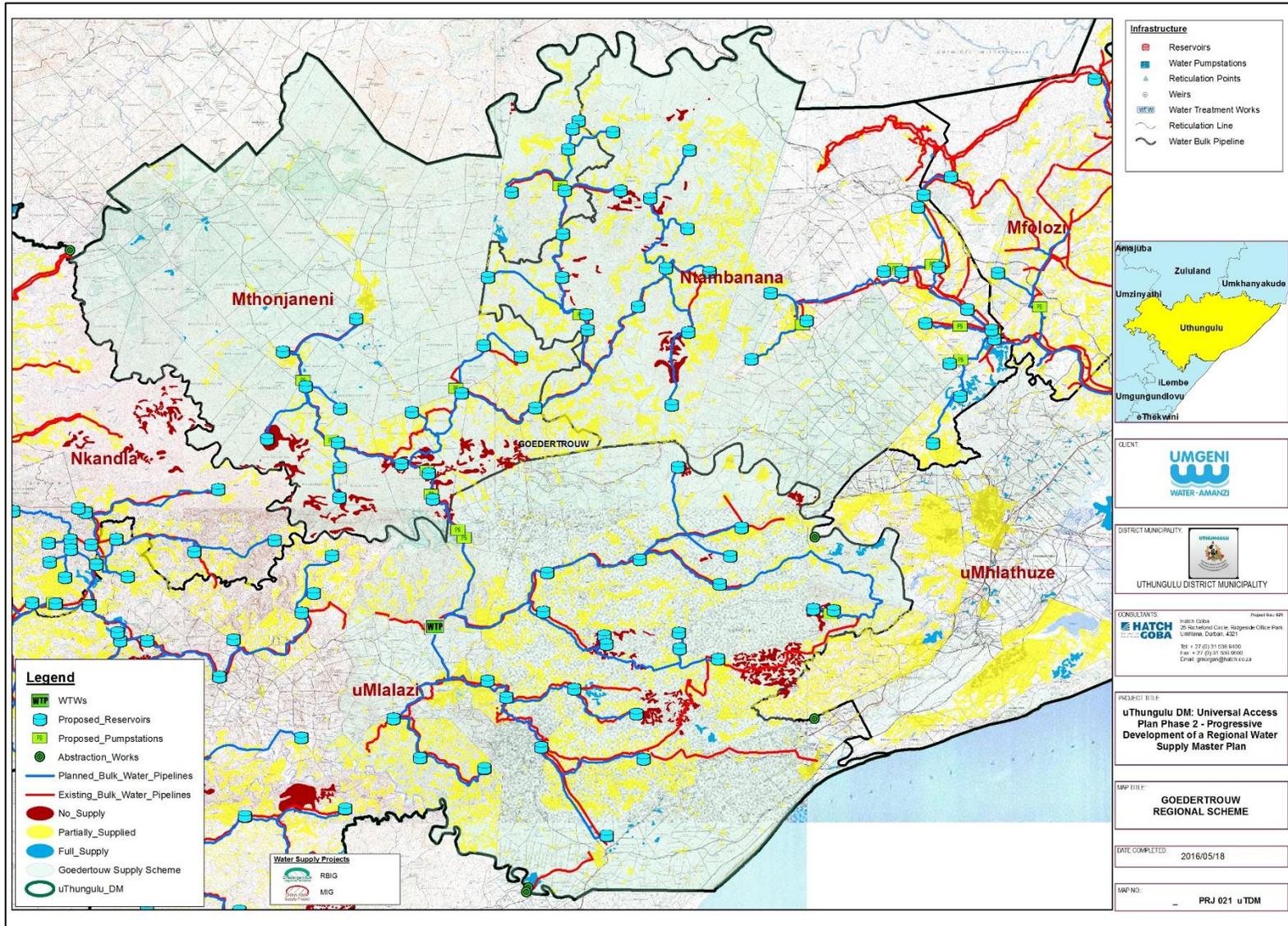


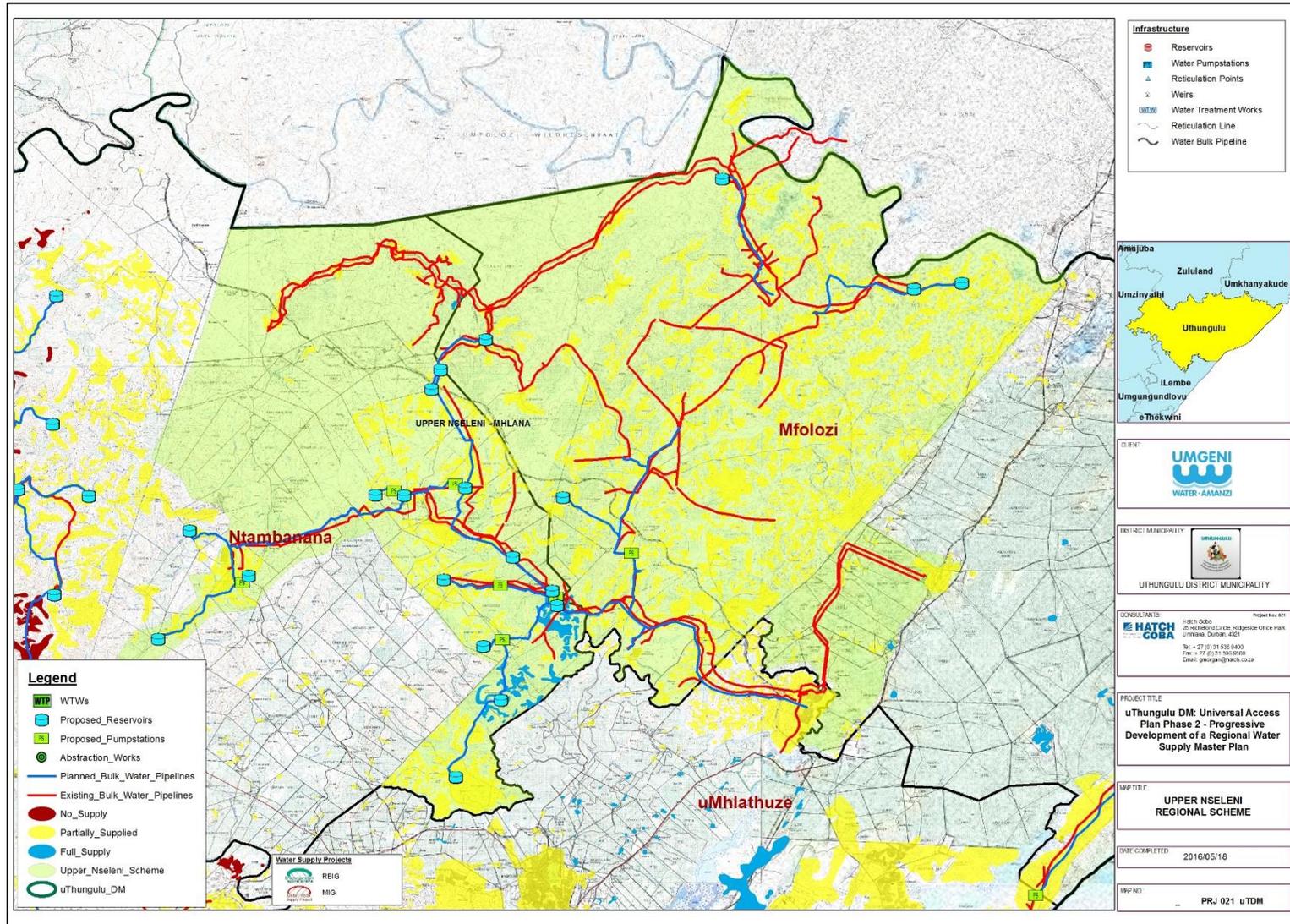
UTHUNGULU: OPTION 5

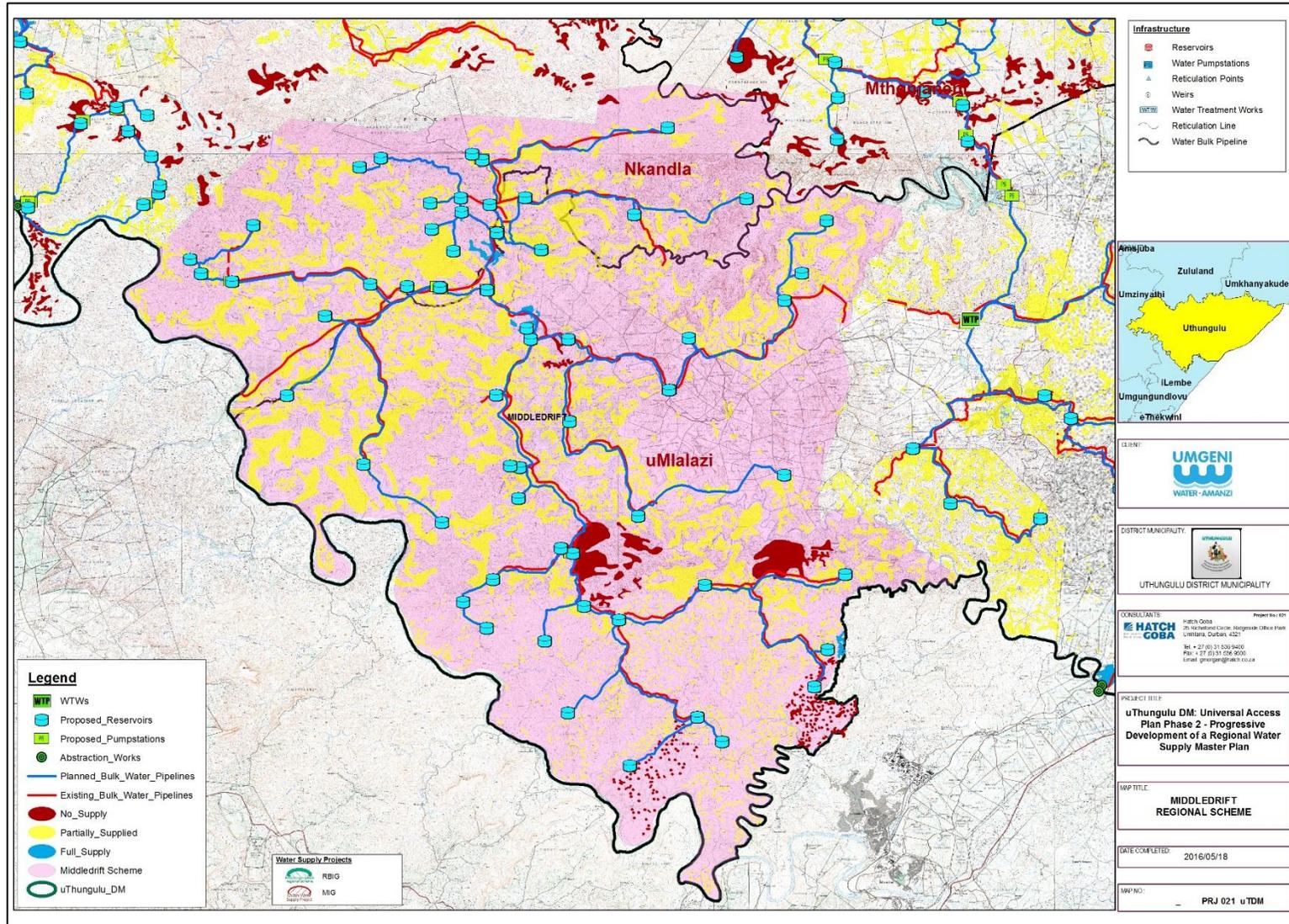


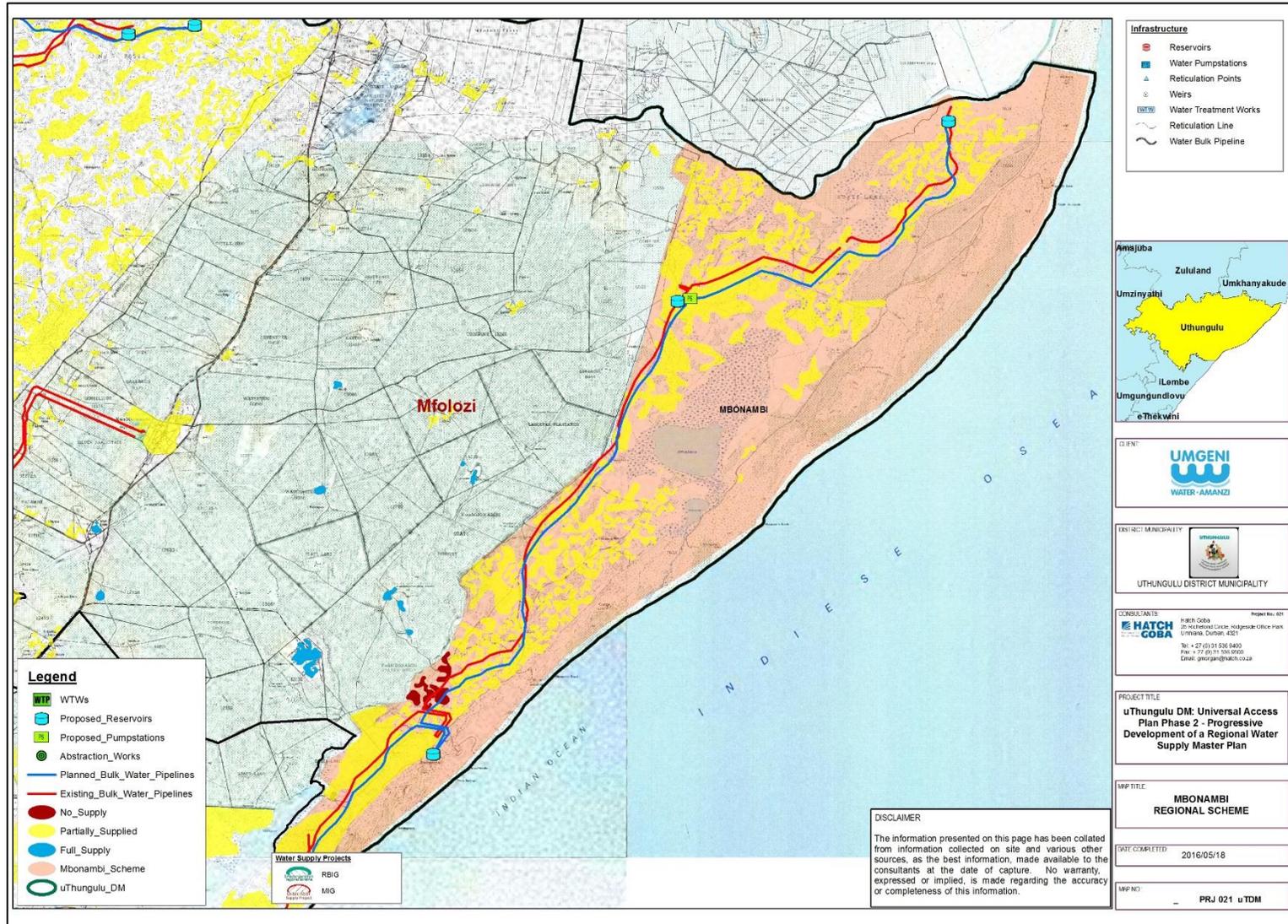


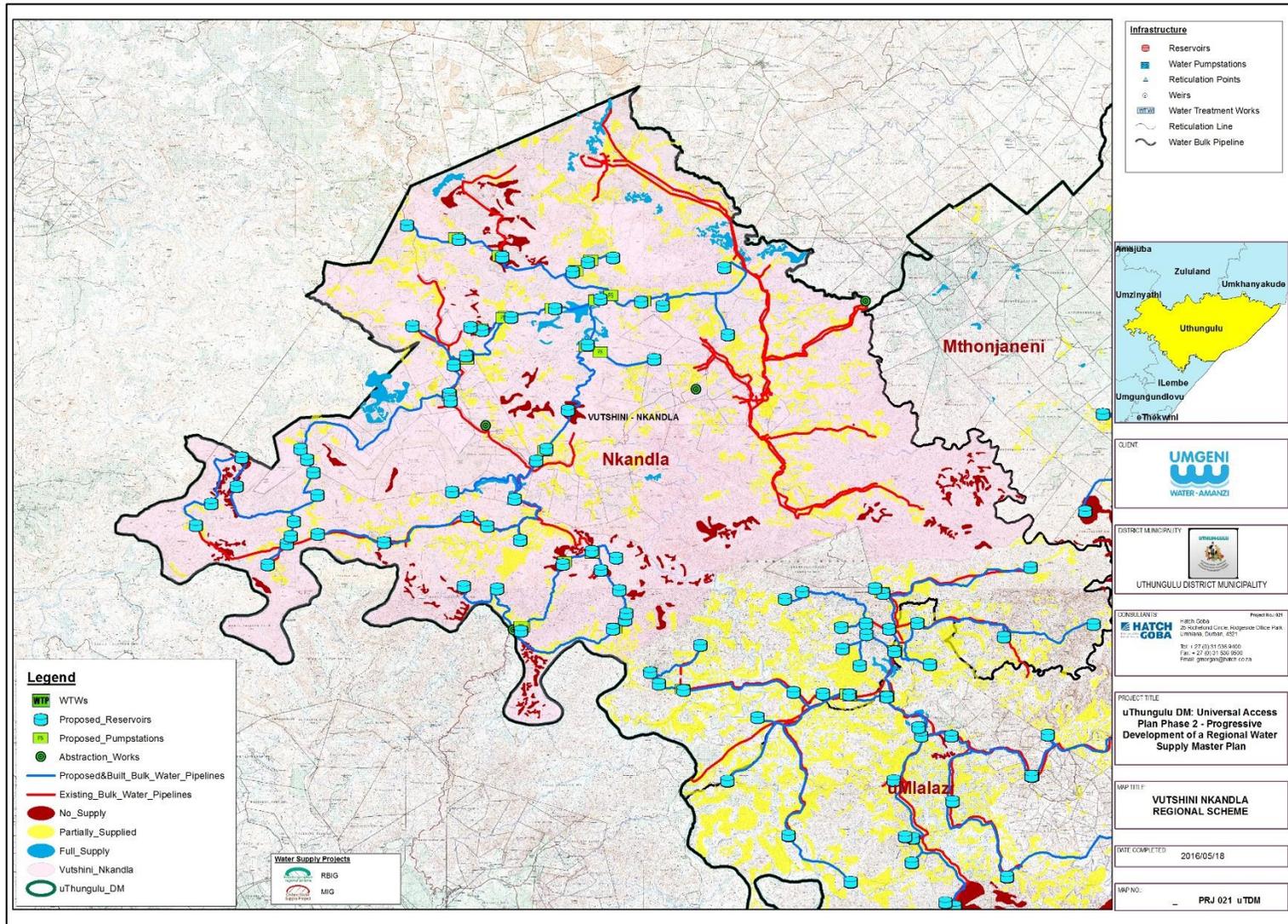
APPENDIX B: Existing and Planned Regional Schemes













APPENDIX C: Overall Layout Plan of Options

