UNIVERSAL ACCESS PLAN (FOR WATER SERVICES) PHASE 2

PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT PLAN – UGU DISTRICT MUNICIPALITY

CONTRACT NO. 2015/178

RECONNAISSANCE STUDY

FINAL

JUNE 2016

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REPORT CONTROL PAGE

Client:	Umgeni Water
Project Name:	Universal Access Plan (For Water Services) Phase 2: Progressive Development of a Regional Concept Plan
Project Stage:	Reconnaissance Study
Report title:	Progressive Development of a Regional Concept Plan – UGU: Reconnaissance Study
Report status:	Final
Project reference no:	2663-00-00
Report date:	June 2016

Quality Control

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Date:	June 2016

Document Control

Version History:			
Version	Date changed	Changed by	Comments

LIST OF ABBREVIATIONS

Amsl	Above mean sea level
Ave.	Average
CoGTA	Department of Cooperative Governance and Traditional Affairs
UDM	Ugu District Municipality
DM	District Municipality
DWS	Department of Water and Sanitation
GIS	Geographical Information System
GRIP	Groundwater Research Information Project
HFY	Historical Firm Yield
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
l/c/d	Litres per capita per day
LM	Local Municipality
LMBWSS	Lower Mkhomazi Bulk Water Supply Scheme
LoS	Level of Service
m^3	Cubic meters
Ml/d	Megalitres per day
PSP	Professional Service Provider
RDP	Reconstruction and Development Plan
RF	Reference Framework
SCP	Southern Coast Pipeline
SPF	Summer Peak Factor
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
WTP	Water Treatment Plant

EXECUTIVE SUMMARY

This report is the Reconnaissance Study for the Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for Ugu District Municipality. The study commences with the analysis of the status of levels of service and service coverage followed by the projection of water demands over a 30 year horizon from 2015 to 2045. Current projects under planning and implementation by different sectors are reviewed, culminating in proposals for concept plans. Proposals for concept plans are based on the water requirement projections for 2035.

This Executive Summary (of the findings of the study) is presented to summarise, the following:

- Study Area
- Projected Population
- 2011 Levels of Service
- Existing Water Supply Schemes
- Projects in Planning
- Projected Demands
- Planned/Proposed Interventions
- Estimated Costs of Interventions
- Conclusions

A STUDY AREA

The Ugu District Municipality comprises six local municipalities Vulamehlo Local Municipality, uMdoni Local Municipality, Umzumbe Local Municipality, Ezinqoleni Local Municipality, Hibiscus Coast Local Municipality and uMuziwabantu Local Municipality.

B PROJECTED POPULATION

The projected population of the District, per Local Municipality for the period 2011 to 2045 is as follows.

Table B: Population Projections

Local Municipality	2011 (Census)	Population				Overall % Growth 2015 to 2045	Equivalent Annual Growth (%)
		2015	2025	2035	2045		
Ezingoleni	52 543	55 146	62 463	68 810	77 104	39.8	0.97
Hibiscus Coast	256 118	267 075	306 134	341 613	382 923	43,3	0.97
Umdoni	78 871	81 927	93 289	103 854	116 820	42.6	0.97
UMuziwabantu	96 551	101 585	114 727	125 932	141 392	39.1	0.97
Umzumbe	160 967	168 588	191 379	211 485	241 248	43.1	0.97
Vulamehlo	77 392	81 090	91 991	101 757	115 271	42.1	0.97
Ugu	**722 442**	**755 410-**	**859 984**	**953 451**	**1 074 759**	**42.3**	**0.97**

The population of the district is, thus, expected to increase by about 42.3% over the 30 year period from 2015 to 2045 or at an average 1.0% per annum.

C 2011 LEVELS OF SERVICE

According to the Census 2011 Statistics, the levels of service in the district per local municipality is as indicated in the following table.

Table C: 2011 Levels of Service

Local Municipality	Total No. of Households	Below RDP	No Access	Total Backlogs	%age Backlogs	Backlog as % of DM Backlog
Ezinqoleni	11 473	3 401	1 663	5 064	44%	8.4%
Hibiscus Coast	72 176	9 825	2 723	12 548	17%	20.5%
uMdoni	22 869	3 037	479	3 516	15%	5.7%
uMuziwabantu	21 620	5 394	3 323	8 717	40%	14.2%
Umzumbe	35 171	6 122	16 121	22 243	63%	36.3%
Vulamehlo	16 135	3 607	5 518	9 123	57%	14.9%
Ugu	**179 444**	**31 386**	**29 827**	**61 213**	**34%**	**100.0%**

As can be seen from the table above, as at 2011, the backlogs in the Ugu DM was 34%. The greatest backlogs by number of households, is attributed to the Umzumbe Local Municipality constituting about 36.3% of the Ugu District Municipality's backlog, followed by Hibiscus Coast constituting 20.5% of the district backlog.

D EXISTING WATER SUPPLY SCHEMES

The Ugu DM falls within the Mvoti to Mzimkhulu Water Management Area (WMA), which drains towards the east coast of South Africa. The Mvoti Mzimkhulu WMA overlaps over the KwaZulu-Natal and the Eastern Cape Provinces. The most prominent surface resources in this WMA include the Lovu, Mdloti, Mngeni, Mkhomazi, Mlazi, Mtamvuna, Mtwalume, Mvoti, Mzimkhulu and Nonoti catchments.

The DM is currently served through 16 No. Water Supply Schemes. The major water supply schemes (WSS) are uMzimkhulu WSS, uMtamvuna WSS, Harding Weza WSS, uMzinto WSS, uMtwalume WSS, Vulamehlo WSS and Mhlabatshane WSS.

E PROJECTS IN PLANNING

A number of projects in planning/implementation were reviewed, including, the following water resources projects, which are detailed in Table E: The impacts of these planned projects is also detailed.

Table E: Bulk Water Resources Projects in Planning

Water Supply Scheme	Intervention	Cost Details	Impacts
uMzimkhulu	Ncwabeni Dam	Estimated at R900M (2017)	Increase of supply to meet 2045 SDD
Harding Weza	Weza Dam	Estimated at R120M (2010)	Increase of supply to meet 2025 SDD
Vulamehlo Cross Border	Vulamehlo Dam on Mtwalume River	Estimated at R170M (2014)	Increase of supply to meet 2045 SDD
Umgeni, uMzinto and uMtwalume WSS's	South Coast Pipeline and Lower uMkhomazi BWSS	R2.6B (2015)	Provision of at least 37.5 Ml/day to these systems
Mhlabatshane WSS	Raw water Augmentation Pipeline	R500M (2015)	Provision of a further 4Ml/day to WSS

Other projects exist, however, these are for infrastructure upgrades and service coverage extensions. In addition, planning reports were reviewed to identify potential water resources, in particular for the Harding Weza WSS.

F PROJECTED WATER DEMANDS

The study developed a demand model that was used to estimate projected demands per Local Municipality Area and per Water Supply Scheme. The projected daily demands per Local Municipality were determined to be as follows:

Table F1: Projected Daily Demands per LM

Local Municipality	2011 Census Statistics		Projected Daily Demands (Ml/d)					Overall % Increase 2015 to 2045	Overall Quantity Increase 2015 to 2045
	Total No. Households	Back logs (HH)	2011	2015	2025	2035	2045		
Ezingoleni	11 473	5 064	3.25	3.40	6.12	7.86	8.67	255	5.27
Hibiscus Coast	72 176	12 548	41.88	43.42	53.12	62.85	69.34	59.7	25.92
uMdoni	22 869	3 516	13.55	13.98	16.75	19.54	21.58	54.4	7.6
uMuziwabantu	21 620	8 717	7.02	7.36	12.48	15.75	17.40	236	10.04
Umzumbe	35 171	22 243	7.79	8.15	18.74	24.12	27.03	332	18.88
Vulamehlo	16 135	9 123	4.13	4.32	9.00	11.55	12.87	298	8.55
Ugu	**179 444**	**61 213**	**77.6**	**80.6**	**116.2**	**141.7**	**156.9**	**94.6**	**76.3**

As can be seen from the above table, the daily demand of the DM is expected to grow by an overall of 94.6% for the period 2015 to 2045. This will see an increase in water requirements of 76.3Ml/day.

The Gross Average Daily Demands (Ml/day) per WSS, were determined and are detailed in the following table. These were used to determine the adequacy of water resources per WSS.

Table F2: Projected GAADD per WSS

	Water Supply Scheme	LM(s) to which WSS is allocated	GAADD (Ml/day)				
			2011	2015	2025	2035	2045
1	Umgeni Water	uMdoni LM	4.424	4.626	7.950	9.891	10.985
2	uMzinto		10.245	10.538	12.171	14.056	15.520
3	uMtwalume		5.470	5.710	8.508	10.457	11.635
	Sub-Total Umgeni, uMzinto, uMtwalume		20.139	20.874	28.629	34.405	38.140
4	uMzimkhulu	Hibiscus Coast LM	34.598	35.845	41.865	48.602	53.602
5	uMtamvuna		8.807	9.172	14.007	17.694	19.544
6	Harding/Weza	uMuziwabantu LM	6.579	6.894	11.846	14.944	16.499
7	kwaMbotho		0.818	0.858	1.429	1.851	2.051
8	kwaFodo		0.415	0.437	0.737	0.968	1.071
9	kwaNyuswa		0.400	0.421	0.961	1.260	1.391
	Sub-Total Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa		8.213	8.610	14.973	19.023	21.012
10	Phungashe/Mhlabatshane	Umzumbe LM	2.333	2.437	6.458	8.451	9.484
11	KwaNdelu		0376	0.392	1.276	1.685	1.889
12	kwaHlongwa		0.186	0.195	0.578	0.768	
13	Vulamehlo	Vulamehlo LM	0.098	0.103	0.605	0.804	0.907
14	Vulamehlo Farming		0.708	0.738	1.980	2.557	2.864
15	Vulamehlo Cross Border		1.585	1.662	4.433	5.807	6.518
16	KwaLembe		0.577	0.604	1.412	1.866	2.072
	TOTAL		**77.621**	**80 633**	**116 217**	**141.661**	**156.894**

The Summer Daily Demands (SDD) were used to determine the adequacy of existing water resources and primary bulk infrastructure. The projected SDD's per WSS are summarised in the following table, together with capacities of existing infrastructure and available and utilised water resources. The SDD's highlighted indicated potential supply constraints.

Comment [S1]:

Table F3: Projected SDD per WSS

Water Supply Scheme	2011	SDD (Ml/day)				Equiv Daily Yield of Source (Ml/d)	WTP Capacity (Ml/d)
		2015	2025	2035	2045		
Umgeni Water	5.134	5.368	9.379	12.050	13.427	SCP-37.5	37.5
uMzinto	15.824	16.255	18.818	21.914	24.204	8.7	12.0
uMtwalume	7.797	8.131	12.059	15.474	17.286	3.3	7.5
Sub-Total Umgeni, uMzinto and uMtwalume	28.755	29.754	35.256	45.438	54.917	49.5	57.0
uMzimkhulu	56.201	58.133	66.977	78.059	86.085	50.1 85*	54 81
uMtamvuna	11.857	12.311	18.554	23.943	26.502	33	20
Harding/Weza	7.713	8.079	14.105	18.351	20.305	3.8 13.3+	3.7 11.8
kwaMbotho	0.898	0.941	1.645	2.224	2.472		
kwaFodo	0.453	0.477	0.845	1.161	1.289		
kwaNyuswa	0.440	0.462	1.106	1.515	1.678		
Sub-Total Harding/Weza, kwaFodo, kwaMbotho and kwaNyuswa	9.504	9.959	17.701	23.251	25.744	3.8 13.3+	3.7 11.8
Phungashe/Mhlabatshane	2.621	2.739	7.464	10.189	11.471	4.4 8.0++	4.0 8.0
KwaNdelu	0.412	0.430	1.465	2.023	2.275	4.4	1.4
kwaHlongwa	0.203	0.212	0.663	0.922	1.040		
Vulamehlo	0.112	0.117	0.695	0.966	1.095		
Vulamehlo Farming	0.824	0.858	2.308	3.098	3.482		
Vulamehlo Cross Border	1.751	1.836	5.103	6.982	7.863	1.6 10.2**	4.5
KwaLembe	0.630	0.660	1.621	2.241	2.495	46	1.4
Total	**112.870**	**117.009**	**162.806**	**201.111**	**222.966**		

Notes
+ Water availability following construction of planned Weza Dam
++ Water Availability following augmentation of raw water by planned raw water pipeline on the uMzimkhulu River
** Water Availability following construction of Dam on the Mtwalume River
* Water Availability after Ncwabeni Dam

It is noted that in tables for WSS, the subtotals have been calculated individually and combined for the following schemes, because plans exist to supply the systems from common sources;

- Umgeni, uMzinto and uMtwalume as these could be served from the proposed Umgeni Water South Coast Pipeline and the Lower Mkhomazi Bulk Water Supply Scheme,
- Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa, as these may in future, be served from the Weza Dam and Weza WTP.

G PROPOSED INTERVENTIONS

Based on the capacities of existing infrastructure, projection of demands to year 2035 and a review of projects in planning and/or currently under implementation, the study proposed the implementation of the following projects:

- All water resources projects in planning, as in Table E above, with the addition of the following:
  - A raw water pipeline from uMtamvuna River to Harding Weza WTW to augment raw water resources to the WSS,
  - A 2Ml/d WTP situated at the proposed Ncwabeni Dam to augment supplies to the Mhlabatshane WSS
- Infrastructure upgrades to the remainder of infrastructure to meet growing demands.

These projects are summarised per LM area as follows:

Table G: Proposed Interventions per LM

Type of Intervention	Local Municipality						Total No.
	Ezinqoleni	Hibiscus Coast	Umdoni	uMuziwabantu	Umzumbe	Vulamehlo	
Dams	Nil	1 No. – Ncwabeni Dam	1 No. Ngwadini Dam	1 No. – Weza Dam	Nil	1 No. – Vulamehlo Dam on uMtwalume River	4 No. dams
Raw/Treated Water Augmentation	Nil	Nil	Umgeni Water SCP	Raw Water Abstraction from uMtamvuna River	Raw water abstraction from uMzimkhulu River	Nil	3 No. Projects
New WTP	Nil	Nil	1 No. 100Ml/d WTP - LMBWSS	Nil	1 No. 2Ml WTP at Ncwabeni Dam		2 No. new WTP
WTP Upgrades	Nil	1 No. - Mtamvuna WTP	Nil	1 No. – Harding Weza WTP	3 No.; Mhlabatshane WTP, kwaNdelu WTP & kwaHlongwa WTP	2 No.; Vulamehlo WTP & kwaLembe WTP	7 No.
Primary Bulk Pipelines (km)	14.5	50.4	13.6	25.5	15.7	12.1	103.7
Additional Reservoir Capacity (Ml)	Nil	20	15	20	10	6	71

H ESTIMATED COSTS OF INTERVENTIONS

The 2016 Estimated Costs for the proposed interventions were as follows:

Table H: Costs of Interventions R (millions)

Type of Intervention	Local Municipality						Total No.
	Ezinqoleni LM	Hibiscus Coast	Umdoni	uMuziwabantu	Umzumbe	Vulamehlo	
Water Resources	0	900.00	1 241.20	160.39	535.00	513.63	3 350.23
UAP Proposed Projects	64.72	191.89	104.33	405.75	217.23	173.34	1 157.24
Total R(Millions)	**64.72**	**1 091.89**	**1 345.53**	**586.14**	**752.23**	**686.97**	**4 507.47**
No. of Households (2035)	17 032	84 558	25 706	31 1712	52 348	25 187	236 002
Cost per Household (R)	3 800	12 913	52 343	18 162	14 370	27 275	19 099

J CONCLUSIONS

Based on impacts of interventions to backlog alleviation and other factors, the study then recommends a proposal for phasing of projects, starting with the highest priority, as follows:

- Projects in Umzumbe LM,
- Projects in Hibiscus Coast LM
- Projects in uMuziwabantu LM
- Projects for Umdoni LM
- Projects for Vulamehlo LM and
- Projects for Ezinqoleni LM

It is noted that the proposals in the report are based on high level assessment and review of available documents. On implementation, all proposals require to be taken through detailed feasibility studies and design processes.

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ANNEXURES

1. OBJECTIVES AND METHODOLOGY

This report is the Reconnaissance Study for the Universal Access Plan: Phase 2 – Progressive Development of a Regional Concept Plan for Ugu District Municipality.

1.1. Background to Study

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 ten WSA's in the KwaZulu-Natal Province and constituted Phase 1 of the project. The outcome of this Phase 1 plan provided good base information in some of the WSA's with regards to water supply in KwaZulu-Natal. There are however areas for improvement in the plan as per the following observations:

- The project focused on small localised schemes for universal access in the near future, however these proposed schemes are not necessarily sustainable.
- The proposed schemes were largely designed in isolation and took little cognisance of other water planning studies and recommendations.
- Many of the WSDP's and /or Water Master Plans were being updated during the course of the project, and need to be incorporated into UAP planning.
- The project did not go as far as Umgeni Water's extended area into the Eastern Cape.
- The footprints did not take cognisance of town planning type information that would give an indication of future demands.

These gaps have resulted in Umgeni Water (UW) initiating a second stage of this UAP project with the main objective being the progressive development of a Regional Bulk Water Supply Concept Plan for the Municipality that would address bulk water supply backlog.

Umgeni Water has appointed Bigen Africa Services (Pty) Ltd, in association with ZIYANDA Consulting cc, to review the Phase 1 of the UAP project in the form of developing UAP – Phase 2, for Ugu District Municipality (UDM), uMgungundlovu District Municipality (UMDM), uMkhanyakude District Municipality (UKDM), Zululand District Municipality (ZDM) and City of uMhlathuze (CoU) all located in the KwaZulu-Natal province.

The development of the plan resulted in the following two (2) deliverables:

Deliverable 1: Status Quo Report
Deliverable 2: Reconnaissance Study Report and GIS data, namely an updated DWS Reference Framework Geodatabase for the study area; and maps to be published as part of an interactive mapping series.

This report serves as part of Deliverable 2, being the Reconnaissance Study Report.

1.2. Purpose of Report

A reconnaissance study refers to a preliminary feasibility study designed to ascertain whether a feasiblity study is warranted. This report provides a concept plan for regional bulk water supply infrastructure that will address water backlogs in terms of regional bulk water supply.

In the context of this report, regional bulk is defined as per the RBIG Policy (2007) of "infrastructure travelling over vast distances and supplying to various institutions" or as any infrastructure providing a supply of more than 2Mℓ/day (abstractions works, WTP, reservoirs).

1.3. Specific Targets of the Study

The main outcomes as per agreement between the Client, Umgeni Water and all professional service providers engaged in this study are as follows:

1. Supply areas are defined and prioritised based on agreed criteria including footprints (from UAP Ph1), needs, proximity to existing bulk schemes, financial viability, footprint density, DHS and land claim areas, proximity to development nodes, sustainable demands, etc.
2. Existing supply schemes (NB regional) are verified, quantified, documented and mapped.
3. Options of already proposed regional schemes are assessed and documented.
4. Perform high level assessment of demand/supply capability.
5. Required new or existing water resource sources are determined and mapped.
6. Extensions to existing schemes and/or new regional schemes are documented in GIS and Visio.
7. Key stakeholders are informed (UW, DWS, COGTA, SALGA).
8. DWS Geodatabase is updated, data sent to CoGTA.

1.4. Study Process

Figure 1 summarises the process followed for this reconnaissance study.

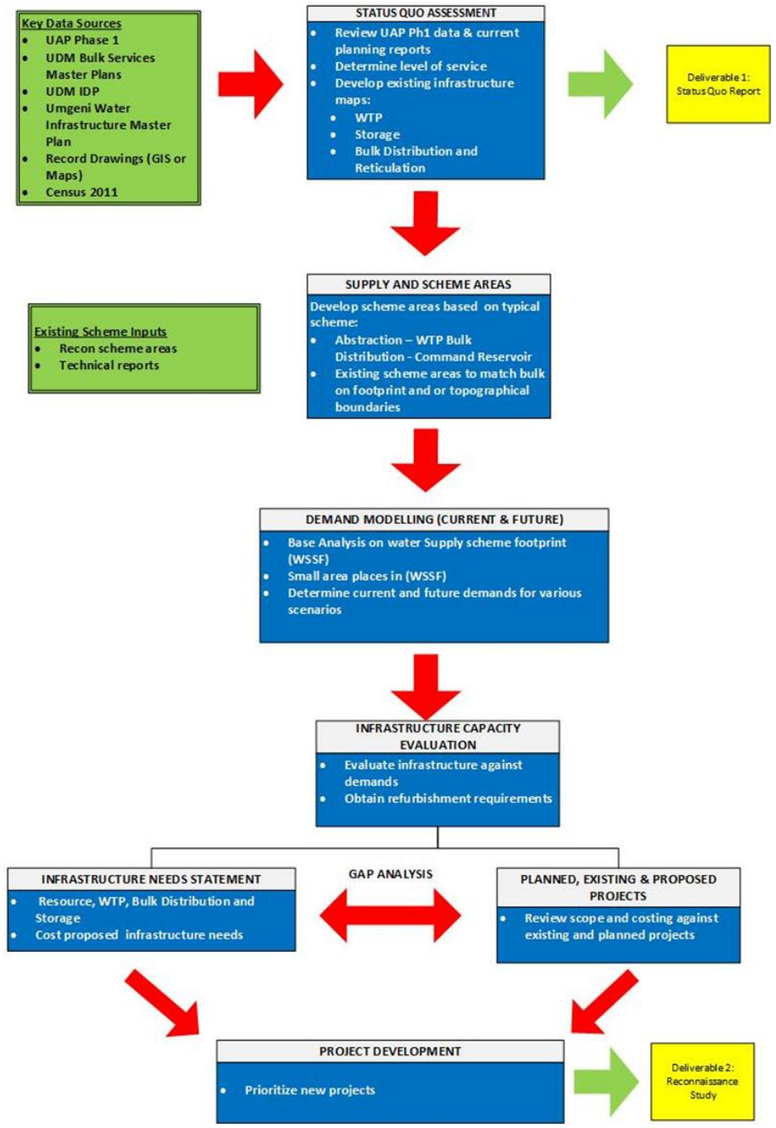

Figure 1: Study Process

1.5. Data Sources

Table 1: Data Sources

Document	Compiler(s)	Document Owner (Client)	Date
First Stage Reconciliation Strategy for Eastern Region; Ugu District Municipality: • Weza Harding Water Supply Scheme Area • uMtamvuna Water Supply Scheme Area • Lower uMzimkhulu Water Supply Scheme Area • Mtwalume Water Supply Scheme Area • Vulamehlo Water Supply Scheme Area • Ndelu Water Supply Scheme Area • Phungashe Water Supply Scheme Area • uMzinto Water Supply Scheme Area	• Water For Africa Environmental Engineering & Management Consultants (Pty) Ltd • Water Geosciences Consulting • Charles Sellick and Associates Aurecon	Department of Water & Sanitation	June 2011
The Development of Universal Access Plan for Water Services in Ugu District Municipality	• Focus • Mott McDonald PDNA • MHO Geospace • Sivuno Consulting	CoGTA	October 2014
Bulk Water Services Master Plan: Hibiscus Coast, Ezinqoleni and uMuziwabantu Municipalities, March 2006	Stewart Scott International	Ugu DM	March 2006
Bulk Water Services Master Plan: Mhlabatshane River Sub-Regional Water Scheme for Portions of the Umzumbe and Hibiscus Coast Local Municipalities	SBA Consulting	Ugu DM	May 2006
Ugu DM Water Services Development Plan	Ugu DM	Ugu DM	February 2012
Water Master Plan: Northern Areas, Umdoni & Part of Umzumbe, Draft Report,	CBI Arup Consulting	Ugu DM	April 2006
Kwa-Zulu Natal Regional Bulk Water Supply: Reconnaissance Study: Southern Regional Schemes	Iliso Consulting	Umgeni Water	March 2006
The Ugu District Municipality Integrated Development Plan (2012/13 to 2016/17) 2014/15 Annual Review	Ugu DM	Ugu DM	Not dated
Harding Weza Regional Bulk Water Supply: Planning Report for Weza Dam, Final	SSI Engineers & Environmental Consultants (Pty) Ltd and KaMawewe Development Consultants	Ugu DM	25 June 2010
Utility Mapping and Pipe Replacement Programme for Harding– Report, WaterGems and GIS files	ZIYANDA Consulting	Ugu DM	July 2013

Document	Compiler(s)	Document Owner (Client)	Date
Utility Mapping and Pipe Replacement Programme for Area North– Report, WaterGems and GIS files	ZIYANDA Consulting	Ugu DM	July 2013
Utility Mapping for Ugu South – WaterGems and GIS files	Stewart Scott International	Ugu DM	July 2013
Utility Mapping for Ugu North – WaterGems and GIS files	Stewart Scott International	Ugu DM	July 2013
Consolidated SDF Report, Draft	RCR Collaborative Team	Ugu DM	March 2011
Ugu Environmental Management Framework. Status Quo Report - Final Draft	Mott MacDonald	Ugu DM and DAEA	Sept 2013
Air quality management plan for the Ugu District municipality (2013)	uMoya-NILU Consulting (Pty) Ltd	Ugu DM	May 2013
Vulamehlo Cross Border Scheme: Proposed Dam on the Mtwalume River: Prefeasibility Study Report	ZIYANDA Consulting in association with Bosch Stemele Consulting Engineers	Ugu DM	June 2014
Infrastructure Master Plan 2016: 2016/17 – 2046/2047; Volumes 1 and 2	Umgeni Water	Umgeni Water	2016

2. STUDY AREA

2.1. Context

The Ugu District Municipality is on the south coast of KwaZulu-Natal, and it stretches from the vicinity of Scottburgh, south to Port Edward. The main business centre of the Ugu DM is Port Shepstone. The Ugu DM extends for approximately 100 km westwards and inland and includes the town of Harding.

2.2. Boundaries of Study Area

The Ugu District Municipality (UDM) shares the border with OR Tambo District Municipality in the Eastern Cape Province to the South, the Harry Gwala District Municipality to the North West, uMgungundlovu District Municipality to the North, and eThekwini Metropolitan Municipality to the North East. The DM covers an area of approximately 5 063km² as shown in **Figure 2**.

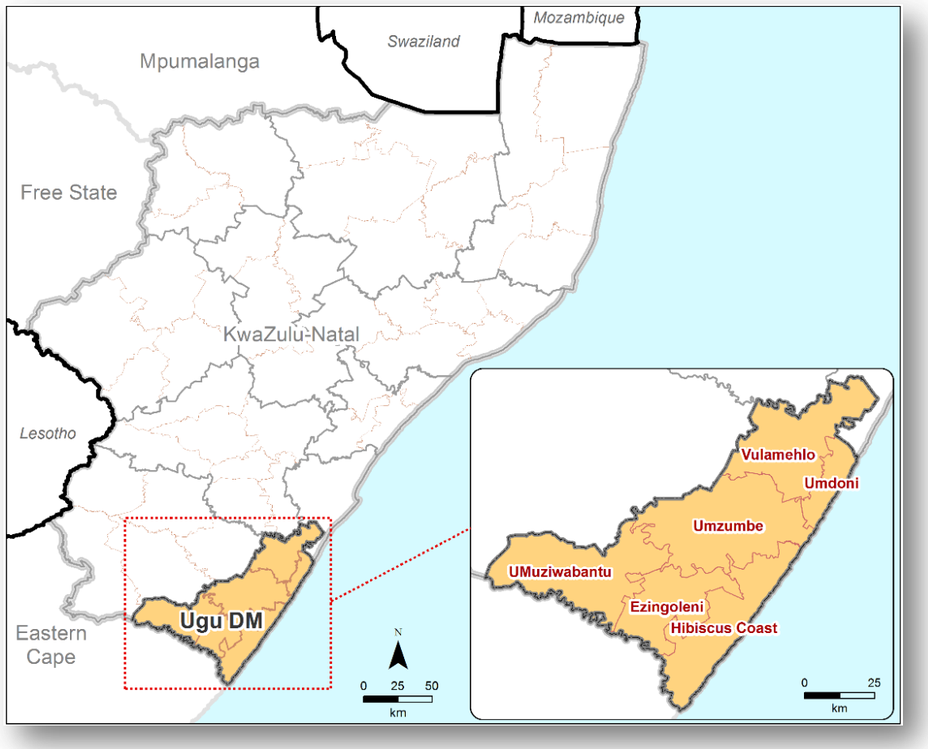

Figure 2: Provincial Perspective

The District Municipality comprise six (6) local municipalities, namely: Vulamehlo Local Municipality, Umdoni Local Municipality, Umzumbe Local Municipality, Ezinqoleni Local Municipality, Hibiscus Coast Local Municipality and Umuziwabantu Local Municipality, as shown in **Figure 3**.

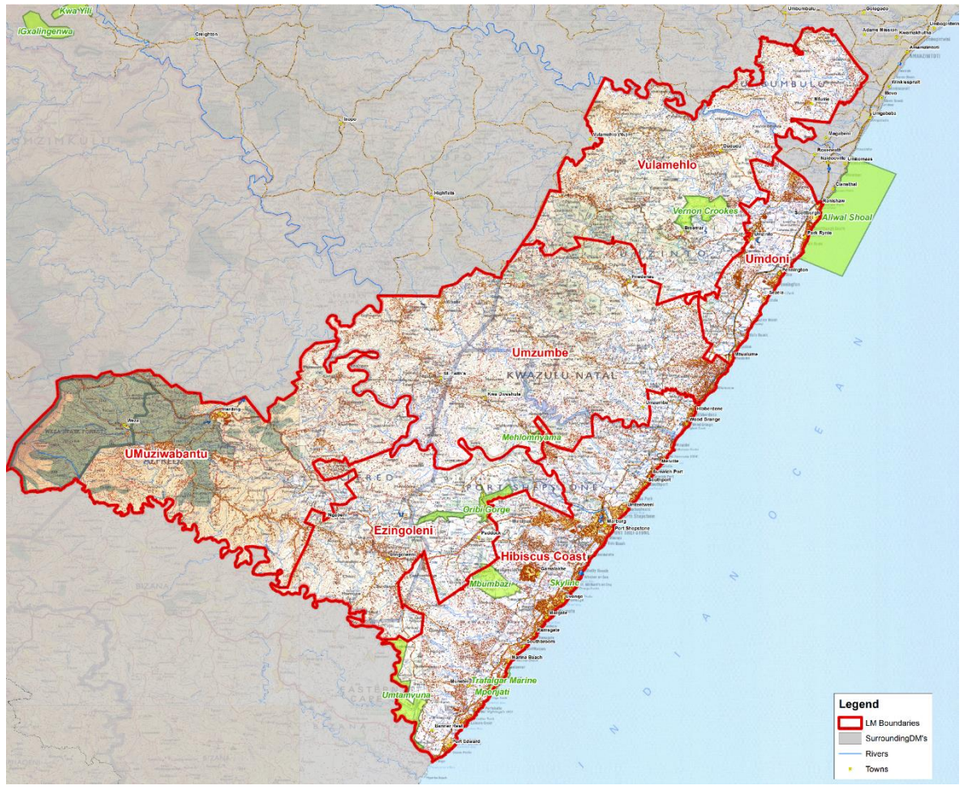

Figure 3: Local Municipality Perspective

2.3. Physical Characteristics of Study Area

The coastal plains are generally flat along the coast, however, immediately rising and becoming undulating westwards (inland). The area has a number of major rivers flowing through and discharging into the Indian Ocean. Some of the significant rivers include, Umzimkhulu, Mtwalume, uMtamvuna and Mkomaas. The Ugu DM has large areas under commercial agriculture.

The N2 traverses the DM in a north-east to south-west direction and parallel to the coast from the northern boundary of the DM southwards until Port Shepstone, where it turns westward (inland) towards and past Harding town. Another major road, the R65 traverses from Port Shepstone

southwards to Port Edward. Both the R65 and N2 (north-south direction) demarcates the district into the coastal strip (towards the coast) and the inland portions. The major business centres and suburban settlements are situated within the coastal strip. Inland of the N2 (south-north) and the R65 is a mix of settlements including, high density housing, farms and rural settlements. The land use within the DM is shown in **Figure 4**, together with the general water schemes (as defined in previous studies) within the municipality. ***It is noted that the water schemes areas may be amended in this project.***

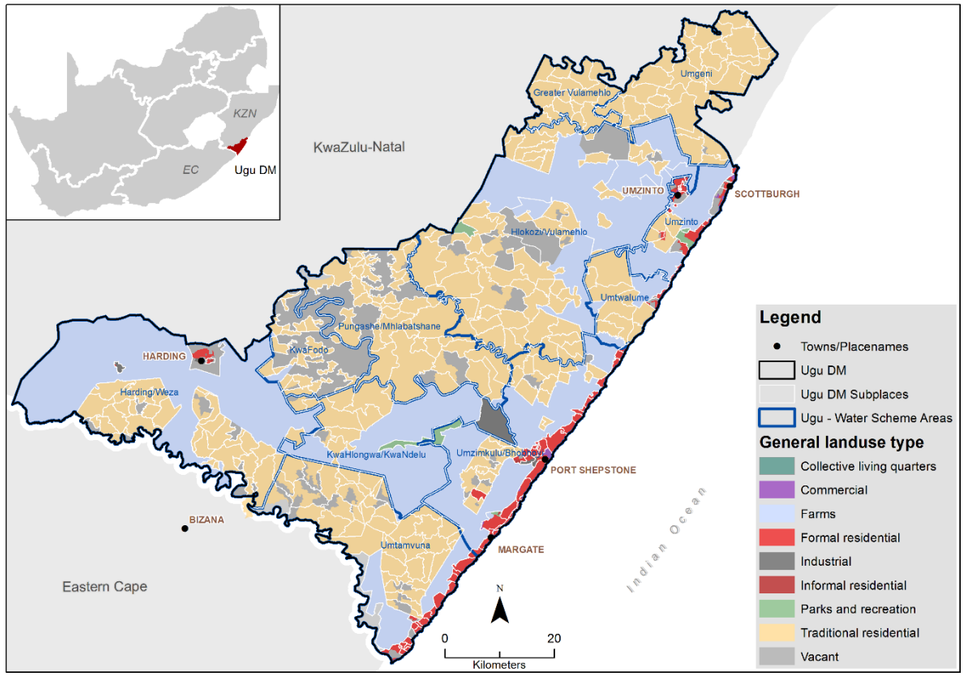

Figure 4: Land Occupation Types Map

2.4. Climate

The UDM falls within the sub-tropical coastal region and the climate is warm to hot and humid sub-tropical. The mean daily temperature at Port Shepstone, which is deemed representative of the district, is 20.3 °C, ranging from an average minimum of 16.9 °C to an average maximum of 23.7 °C with an average annual rainfall of 1140mm, as per the South African Weather Services. Further details on other climatic variables are described in the Air Quality Management Plan for The Ugu District Municipality dated May 2013.

2.5. Topography, Geology and Soils

The topography, geology and soils in the area are summarised from the UDM's IDP (2012/13 - 2016/17). The landscape is generally described as low-relief bounded by coastline in the east; and high-relief in the west. The area is generally underlain by the Dwyka Series occurring south of the Mkomazi River, inland from the Mtwalume River to the Ifafa River, south of the Umzimkhulu River. Alluvial deposits are found generally along estuaries and river flood plains.

Sands overlaying the bluff beds are Berea red sands found North of Sezela, south of Mpambanyoni and south of the Mkomaas River. Dolorites are found along the uMzumbe coast and in the vicinity of the Damba River. Extensive deposits of Gneiss can be found along the entire coast with cretaceous marine sediment deposits.

2.6. Environmental

An Environmental Management Framework (EMF) Status Quo Report dated September 2013, referenced within the Ugu DM IDP 2013/14 to 2016/17, identifies environmental issues and offers strategic recommendations on further development of the EMF.

The district has some areas of environmental significance, however only 2% of the land surface area is formally protected and development restricted. Such protected areas include steep land which is difficult to service or is prone to erosion and river flood lines, where development cannot encroach and riverine and estuary systems.

Ecologically determined land parcels set up to protect fragile, unique and rare eco-systems are identified by Ezemvelo. These constitute core environmental areas (those areas that must be protected absolutely); intermediate environmental areas (which require detailed assessment and trade-off for development purposes); and nature reserves (areas under public management and protection).

3. DEMOGRAPHICS

3.1. Existing Population and Distribution

The population of Ugu as at Census 2011 was 722 484 with slightly more females (53.1%) than males (46.9%) within the municipality. The Hibiscus Coast Local Municipality contributes the highest population of 35%, followed by Umzumbe LM at 22% then Umuziwabantu LM at 13% while both Umdoni and Vulamehlo contribute 11% each with Ezingoleni with the least population contribution of 7%.

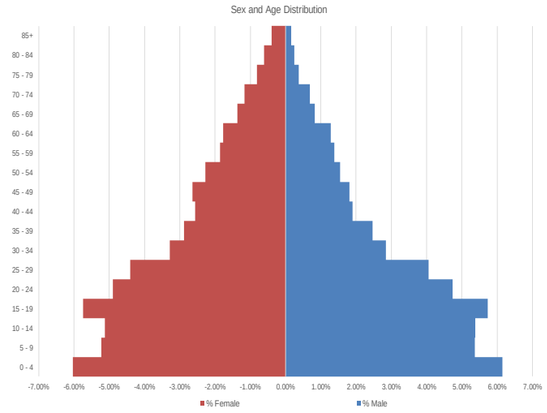

Figure 5: Ugu Age Profile (Census 2011)

The age profile of the municipality is relatively young with 62.8% of the population being under 25 years of age (**Figure 5**). The economically active age group of 15-64 years is currently 60.1% of the population and has been increasing from 54% in 1996 and 56.7% in 2011. As such, the dependency ratio has also been on the decline.

The types of main dwelling consist 64.9% in formal areas (urban areas and farm land), 29.6% in traditional areas (Tribal Areas), and 7.2% in informal areas. There has been a rapid increase of formal areas from 45.1% in 1996 and 53.9% in 2011.

3.2. Social and Economic Indicators

The key demographic statistics of the district are summarised in **Table 2**. Unemployment rate in Ugu is 35.2%, with wide variation between LM's from Hibiscus Coast with a rate of 28% to Vulamehlo LM with a rate of 52.6%. Similarly, the youth unemployment ranges from 37.3% in Hibiscus Coast LM to 62.8% in Vulamehlo LM.

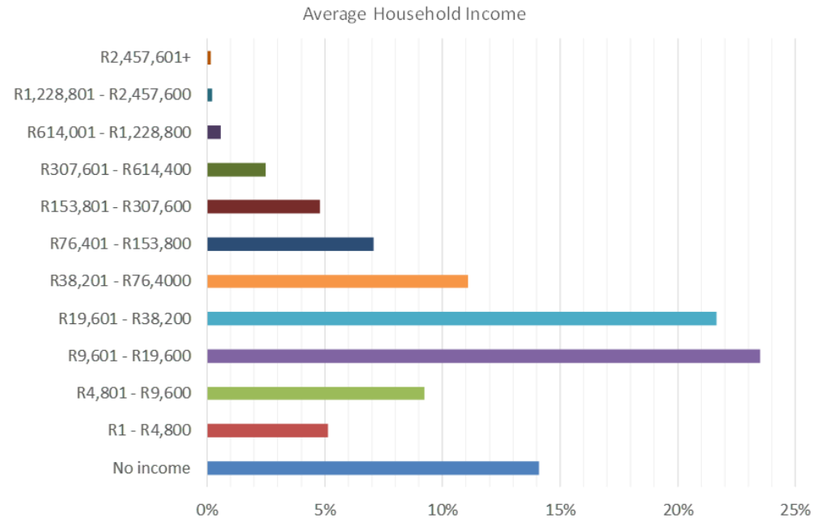

Figure 6: Employment and Household Income within Ugu DM

Figure 6 summarises the employment and household income within the DM. Only about 27% of the economic active population is gainfully employed while over 50% are inactive economically. This could be telling on the likely affordability and payment levels to be expected for essential services such as water.

Table 2: Key Demographic Statistics (Census 2011)

Population	722 484
% traditional areas population	29.6%
% formal areas population	64.9%
Age Structure	
Population under 15	33.3%
Population 15 to 64	60.1%
Population over 65	6.6%
Dependency Ratio	
Per 100 (15-64)	66.4
Sex Ratio	
Males per 100 females	88.3
Population Growth	
Per annum	0.3%
Labour Market	
Unemployment rate (official)	35.2%
Youth Unemployment rate (official)	45.10
Education (aged 20 +)	
No schooling	12.8%
Higher education	7.3%
Matric	24.1%
Household Dynamics	
Households	179 440
Average household size	3.9
Female headed households	50.5%
Formal dwellings	64.9%
Housing owned	56.0%
Household Services	
Flush toilet connected to sewerage	34.0%
Weekly refuse removal	25.9%
Piped water inside dwelling	34.4%
Electricity for lighting	71.9%

The average household annual income in Ugu in 2011 was R 61,337, more than double that declared in 2001. However, about 14% of households have no income, while over 59.5% of households have an annual income of up to R 38,200 per annum (R 3,000 or less per month). The largest proportion of the economically active population earns <R 1,633 per month.

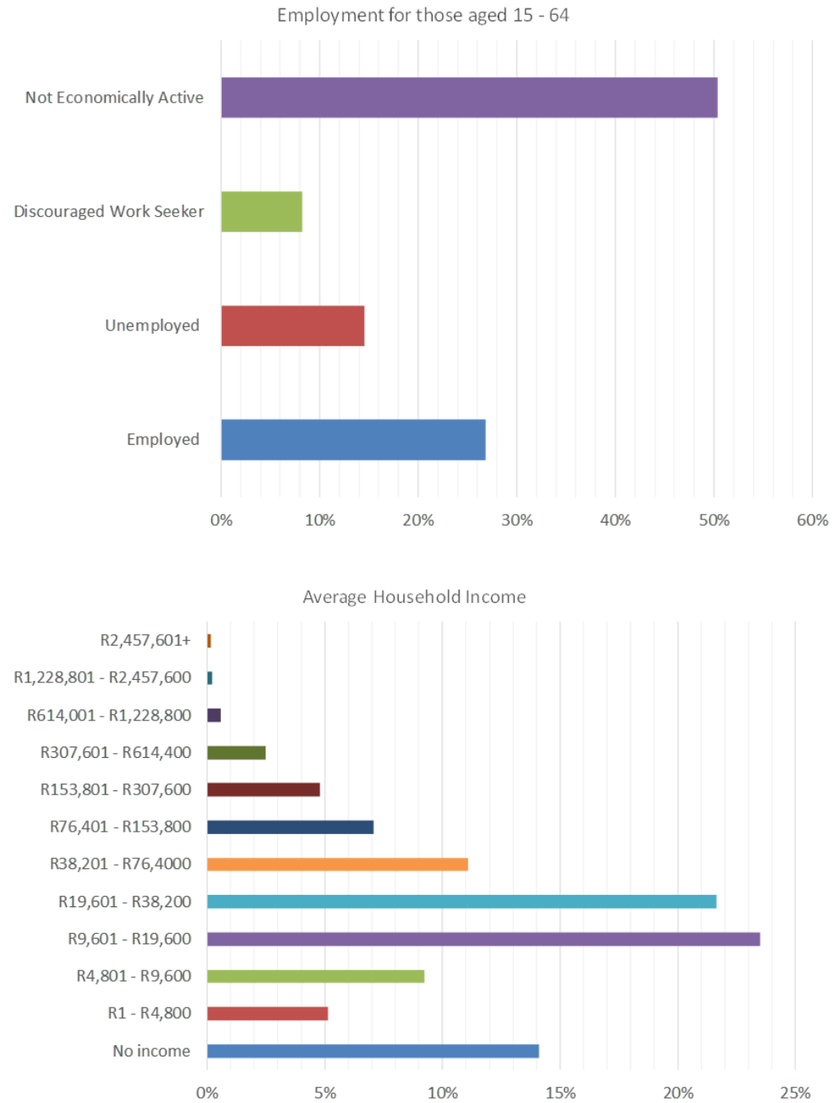

Figure 7: Employment and household income per annum (Census 2011)

3.3. Commercial, Industrial and Institutional Development

The main commercial activities are generated from agricultural farming, tourism and institutional activities. A vast area of farmlands are involved in sugar cane farming, followed by banana plantations.

3.4. Population Growth

The UDM population grew from 704 030 in 2001 to 722 484 in 2011 (Census figures) at an annual growth rate of 0.3% (2001 – 2011) which was much lower than the annual growth rate of 1.9% recorded over the period 1996 - 2001. While the population growth rate for UDM is 0.3%, there are variations within the LM's with rates of -0.7%, 2.3%, -1.9%, 0.4%, -0.4% and 1.6% for Vulamehlo, Umdoni, Umzumbe, Umuziwabantu, Ezinqoleni and Hibiscus Coast LM's respectively. The recorded growth rate were all much lower than those previously recorded with the exception of Umdoni LM which had a slight change from 2.8%. The district annual growth rate for Ugu is half that of the KZN Province, which is at 0.7%.

3.5. Population Prediction Scenarios

The Strategic Development Framework and the IDP adopted growth rates of 0.3% per year for rural municipalities and 0.5% for urban municipalities. While the rational for these figures is understandable it is important to note that the growth rates of the predominantly urban local municipalities of the Hibiscus Coast and Umdoni recorded annual growth rates of 2.3% and 1.6%, the quoted 0.5% needs to be used with caution.

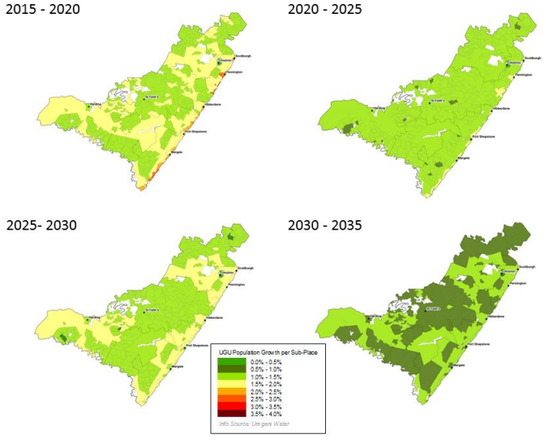

Figure 8: Population Growth Rates

Umgeni Water obtained information from Stats SA and under their guidance, estimated growth rates for each sub-place in KZN for each five (5) year period from 2011 to 2035. These growth rates have been adopted in the modelling process as the probable population growth rates per sub-place and take into account births, deaths and population migration. These predictions remain an estimate and have an associated level of accuracy, which accuracy deteriorates the longer into the future the prediction is made.

For this reason, the model adopts an inaccuracy of 5% initially, growing to 15% by 2035 for the growth rates provided. These extremes are used for the determination of the low and high modelled estimates.

4. EXISTING WATER SUPPLY INFRASTRUCTURE

This Chapter describes the existing infrastructure commencing with the description of supply in the UDM, followed by a review of known and potential water resources and ending with a review of the existing infrastructure.

4.1. Description of Supply to Study Area

Based on the DWS Reference Framework, there are a total of eleven (11) major water supply areas within Ugu DM, which are depicted in **Figure 9** below. The DM operates the majority of these systems with the exception of Umgeni, uMzinto, uMtwalume and Mhlabatshane where Umgeni Water is the bulk water services provider.

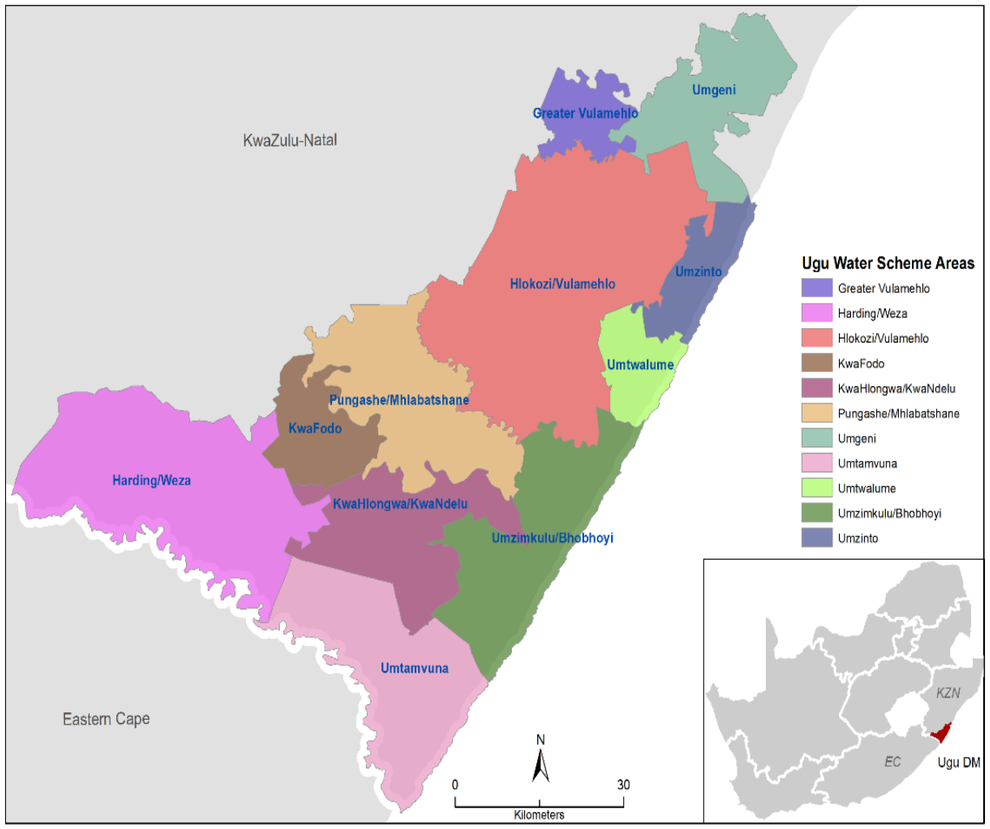

Figure 9: Ugu Bulk Water Supply Areas as per DWS

For purposes of this Reconnaissance Study, the Ugu DM has been conveniently re-demarcated into 16 supply areas, which are illustrated in **Figure 10**.

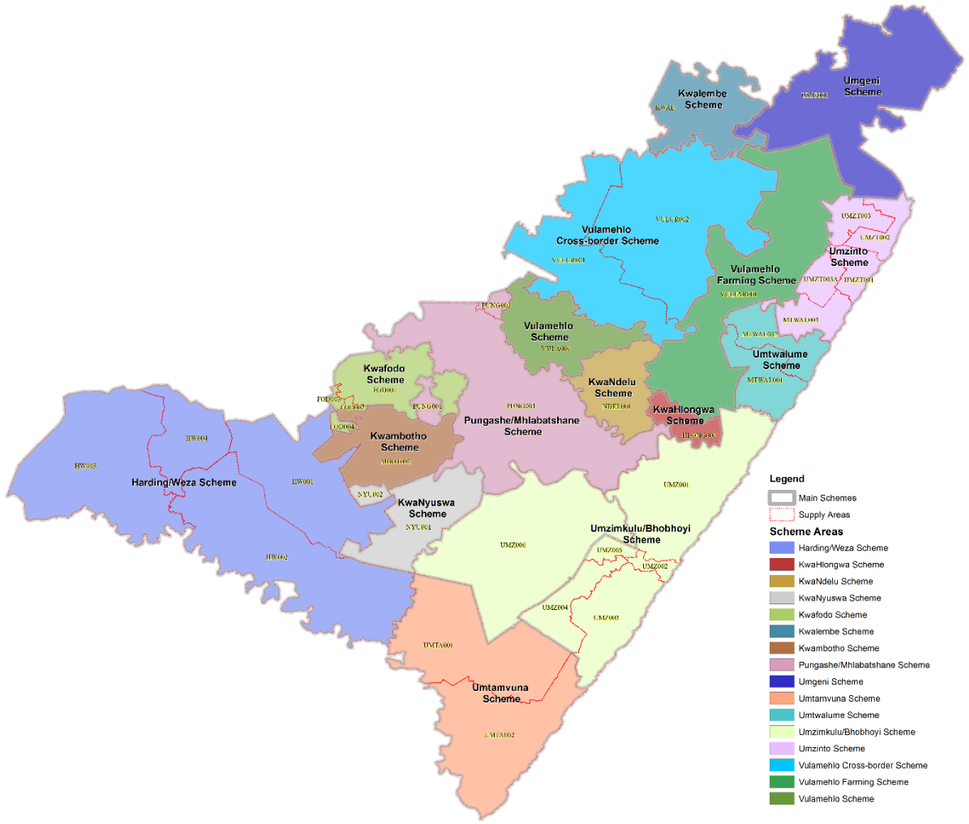

Figure 10: Ugu Bulk Water Supply Areas as per This Study

4.2. Water Resources and Availability

The Ugu DM falls within the Mvoti to Mzimkhulu Water Management Area (WMA), which drains towards the East coast of South Africa. The Mvoti Mzimkhulu WMA overlaps over the KwaZulu-Natal and the Eastern Cape Provinces. The WMA extends to Greytown in the North, Port Edward in the south, the Drakensberg Mountains in the west and the Indian Ocean in the east. The most prominent surface water resources in this WMA include the Lovu, Mdloi, Mngeni, Mkhomazi, Mlazi, Mtamvuna, Mtwalume, Mvoti, Mzimkhulu and Nonoti catchments, as illustrated in **Figure 11**, for those falling within Ugu DM. Other less prominent surface water resources include the Weza River and Phungashe/Mhlabatshane River.

The Ugu District Municipality's WSDP of 2012 also indicates a total of 687 boreholes exist but no details or yields for these boreholes are provided.

At least five (5) WSS have water distribution in excess of 5Mℓ/day and these account for approximately 93.6% of the water supply. These schemes include uMzimkhulu, uMtamvuna, Harding/Weza, uMtwalume and uMzinto. The remaining four (4) WSS's are smaller with water distributed generally not exceeding 2.5 Mℓ/day per WSS.

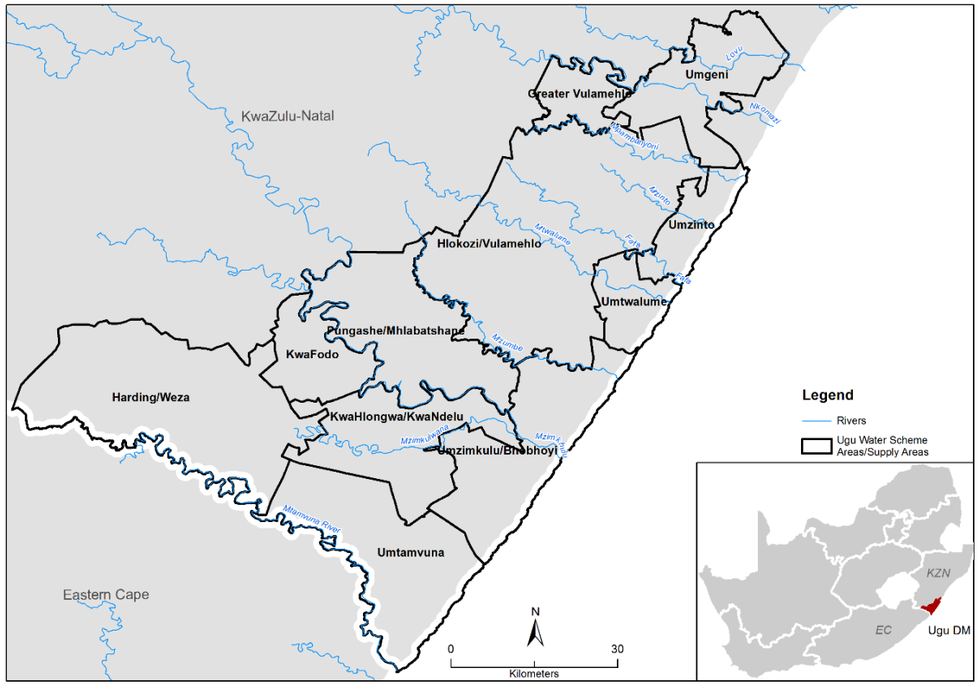

Figure 11: Major Water Resources within Ugu DM

Resources currently utilised and other potential resources are discussed below.

4.2.1. Resources Currently Utilised

Table 3 shows the yields and registration details of the existing and prominent water sources as recorded in the various documents including the Reconciliation Studies for the Eastern Districts.

Table 3: Water Resources Availability

WSS	WTP	Source	Yield *	WARMS	Flow
Umgeni	Amazimtoti/ Wiggins	South Coast Pipeline	17.93Mm^3/ annum or 49Ml/day	N/A	12.5Ml/day
uMzinto	uMzinto	Esperanza Weir E J Smith Dam	3.2Mm^3/annum or 8.7Ml/day	4.38 Mm^3/annum	7Ml/day
uMtwalume	uMtwalume	uMtwalume River	1.2Mm^3/annum or 4.4Ml/day	3.1 Mm^3/annum	7.5Ml/day
uMzimkhulu	uMzimkhulu	uMzimkhulu River	18.3Mm^3/annum or 50.1Ml/day	11.5 Mm^3/annum	54Ml/day
uMtamvuna	uMtamvuna	uMtamvuna River	12Mm^3/annum or 33Ml/day	3.5 Mm^3/annum	20 Ml/day
Harding Weza	Harding/Weza	Weza River	1.39Mm^3/annum or 3.8Ml/day		3.6 Ml/day
	Harding	Harding Dam	0.6Mm^3/annum or 1.6Ml/day		1.2Ml/day
Phungashe/ Mhlabatshane	Mhlabatshane	Mhlabatshane Dam	1.6Mm^3/annum or 4.4Ml/day	N/A	6.5Ml/day
kwaNdelu	Ndelu	uMzumbe River	1.6Mm^3/annum or 4.4Ml/day	N/A	1.4Ml/day
kwaLembe	kwaLembe	Mkomaas River	16.85Mm^3/annum or 46Ml/day	N/A	1.4Ml/day
Vulamehlo Cross Border	Vulamehlo	Upper uMtwalume River	0.6Mm^3/annum or 1.6Ml/day	N/A	4.5Ml/day
Total			73.67Mm^3/ annum, or 201.3Ml/day	22.48M m^3/annum	119.6 Ml/day

Is noted that the figure of 49Mℓ/day quoted as the yield of the South Coast Pipeline is the pipeline capacity at the Quarry reservoir. The Ugu DM demand of this pipeline is reported as being in the order of 10.5Mℓ/day to 12.5Mℓ/day, during the period January 2015 to May 2016.

The raw water supply (water availability) to the South Coast system indicates that:

- The Upper and Middle South sub-regions show a failure in the hydrological water balance.
- Raw water supply to the various WTP's needs to be augmented to enable the full treatment capacity to be utilised.

The surface water resources (currently being utilised) for the Ugu DM region indicate the availability of raw water resource of at least 73.67mm³/annum (equivalent to 201.3Mℓ/day). Demand projections indicate a 2045 GAADD of 156.9Mℓ/day and a 2045 SDD of 223.0Mℓ/day. The projected 2035 SDD is 201.1Mℓ/day.

For the Ugu DM region, it can be deducted that there could be sufficient raw water available in the rivers, however, opportunities for additional yields from these rivers require new infrastructure before the additional yields may be utilised.

4.2.2. Other Potential Resources or Resources in Planning

Iliso Consulting concluded a study for Umgeni Water in 2006, documented in the report, "Reconnaissance Study: Southern regional Schemes" dated March 2006. The study identified a total of 21 potential dam sites that could be exploited to augment raw water supply to a number of neighbouring areas, including Ugu DM. The river systems that were studied, included the Mzimtlava, Mzimkhulwana, Mtamvuna, Ngwangwane Gungununu Mzimkhulu and Bisi. The dam sites identified on the Mtamvuna and Bisi Rivers are considered relevant for the Ugu DM and as water demands increase, these sites may require further investigation and development as appropriate.

The following dams are in advanced planning/implementation stages of development and could provide augmentation to the Ugu DM region's raw water resources:

- Weza Dam, on Weza River
- Vulamehlo Dam on the Upper uMtwalume River
- Ngwadini Dam OCS off the Mkomaas River
- Ncwabeni OCS Dam off the uMzimkhulu River

4.3. Bulk Water Supply Schemes and Constraints

This section summarises the existing bulk water schemes within Ugu DM and the corresponding key infrastructure details. The rest of the infrastructure details are summarised in the following sub-sections.

4.3.1. Umgeni Water Supply (UMG 001)

The Umgeni Water South Coast Pipeline (SCP) is the main source of supply and currently provides about 2 Mℓ/day to this Scheme area. This scheme serves the area in the north of Ugu DM and covers the areas on the northern side of Vulamehlo LM and includes the rural areas of kwaMaphumulo, Nkwali, Mfume and Vulindlela. The treated water from Umgeni Water is received via metered connections and thereafter the service is owned and operated by the UDM.

In the Water Demand Model utilised in this project, the scheme area is denoted UMG 001.

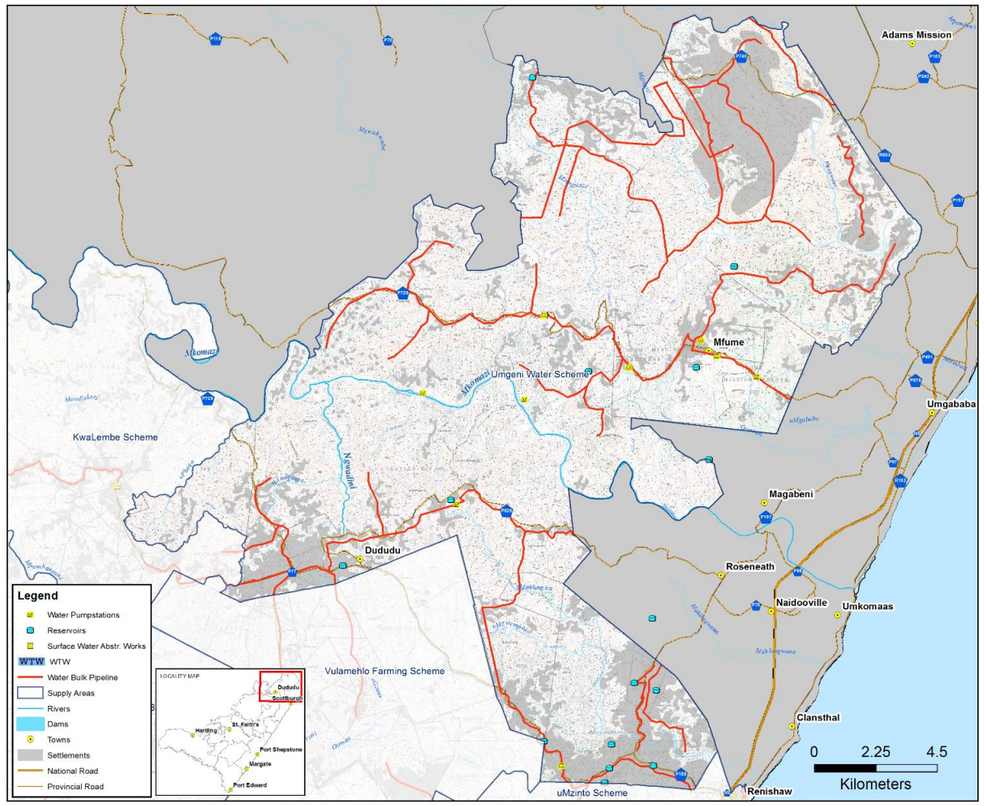

Figure 12: Umgeni Water Supply Scheme (UMG 001) Layout

Figure 12 illustration, is also included (showing settlements) as part of **Annexure C** to this report. No details are available to provide a schematic representation of the infrastructure serving this scheme.

4.3.2. uMzinto Water Supply (UMZT 001, UMZT 002 and UMZT 003) Scheme

The uMzinto Supply Scheme abstracts and treats water for the areas referred to as the Upper South Coast, including Renishaw, Scottburgh, Park Rynie, Sezela, Umzinto and Ifafa. The scheme has also been extended to supply further inland areas including kwaCele, Amandawe and farming areas with a pipeline also supplying Dududu. The scheme areas supplied by the uMzinto Water Supply Scheme have been denoted by UMZT 001, UMZT 002, UMZT 003 and UMZT 003A) in the Water Demand Model used on this project.

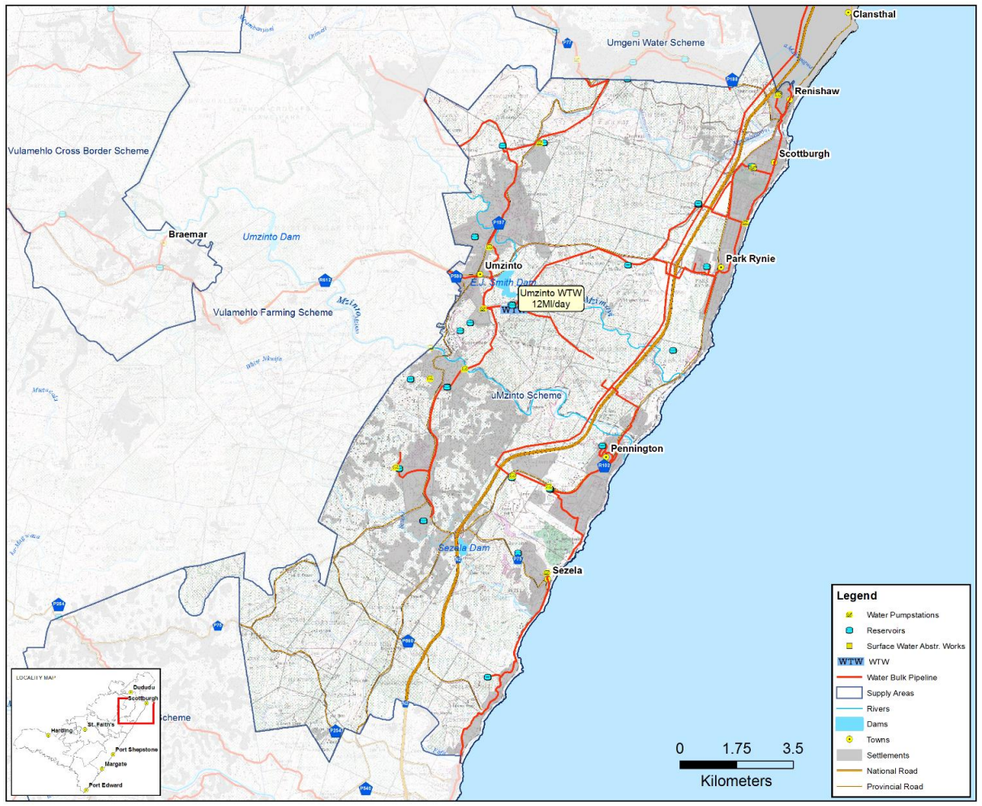

Figure 13: uMzinto Water Supply Scheme Layout

4.3.2.1. Water Resource Consideration

The uMzinto Scheme is owned by Ugu DM and jointly operated by Umgeni Water and Ugu DM, with the former operating the treatment facility and some bulk infrastructure, while Ugu DM operates the remainder of the infrastructure. The uMzinto WTP, with a capacity of 13.6Mℓ/day, but operating on average at 12Mℓ/day, gets its water from EJ Smith Dam and Esperanza Weir on uMzinto River. The Water Use Authorisation and Registration Management System (WARMS) database indicates a registered water volume use of 4.4 million m^3/year (12.0 Mℓ/day) against an abstraction of 3.6 million m^3/year (7.0 Mℓ/day), which is well within the limits.

The estimated yield of the two sources is 2.5 million m^3/year (6.9Mℓ/day). In addition, the Umgeni Water South Coast Pipeline (SCP), once completed, can provide an additional 37.5 Mℓ/day (2.6 million m^3/year) to this, uMtwalume WSS and Umgeni WSS systems.

It is reported that the SCP is providing about 10.5Ml/day to this system.

There are a total of over seventeen (17) potable water reservoirs within the uMzinto system.

4.3.2.2. Water Supply Infrastructure

The bulk water infrastructure is summarised in **Table 4** below.

Table 4: Bulk Water Supply Infrastructure

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
EJ Smith Dam	4.4Mm³/annum	6.9Ml/day
uMzinto Dam		
WTP	**Existing Capacity (Mℓ/day)**	
uMzinto	13.6	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
uMzinto WTP to Cabana Res	250 200 100	3 882 2 089 7 583
Between WTP & Cabana T off to Kelso	125 100	821 377
uMzinto WTP to T off to uMzinto heights	225 150 75	2 848 5 060 721
Reservoir	**Storage (Mℓ)**	
Hazelwood	0.68	
Nkonka	5	
Umzinto Height	5	
Freeland Park	2.3	
Scottburgh South	5.25	
Scottburgh central	2.71	
Ellingham	2	
Park Rynie	0.9	
Esperanza	0.3	
2*Ifafa	1	
2*Malangeni	Not available	
Cabana	1	
Kelso	0.5	
Pennington	3	
Umdoni	1	
Hilton	2	
Bazley	1	

The infrastructure for the uMzinto Water Supply Scheme is further illustrated in schematic diagram in **Annexure B** as **Figure B2**.

4.3.2.3. *Condition of Bulk Infrastructure*

The condition of the infrastructure is unknown. However, most of the underground infrastructure is expected to be over 35 years old, with a significant amount of pipework being of asbestos cement.

4.3.3. Mtwalume Water Supply (MTWAL 001, MTWAL 002 & MTWAL 003) Scheme

The uMtwalume Water Supply Scheme abstracts and treats water for the areas usually referred to as the Middle South Coast, including Bazley, Elysium, Ifafa, parts of Kelso and uMtwalume along the coast and inland areas including the rural areas of Mathulini and kwaQoloqolo. The scheme areas supplied by the uMtwalume Water Supply Scheme have been denoted by MTWAL 001, MTWAL 002 & , MTWAL 003 in the Water Demand Model used on this project. The scheme layout is as shown in **Figure 14** below.

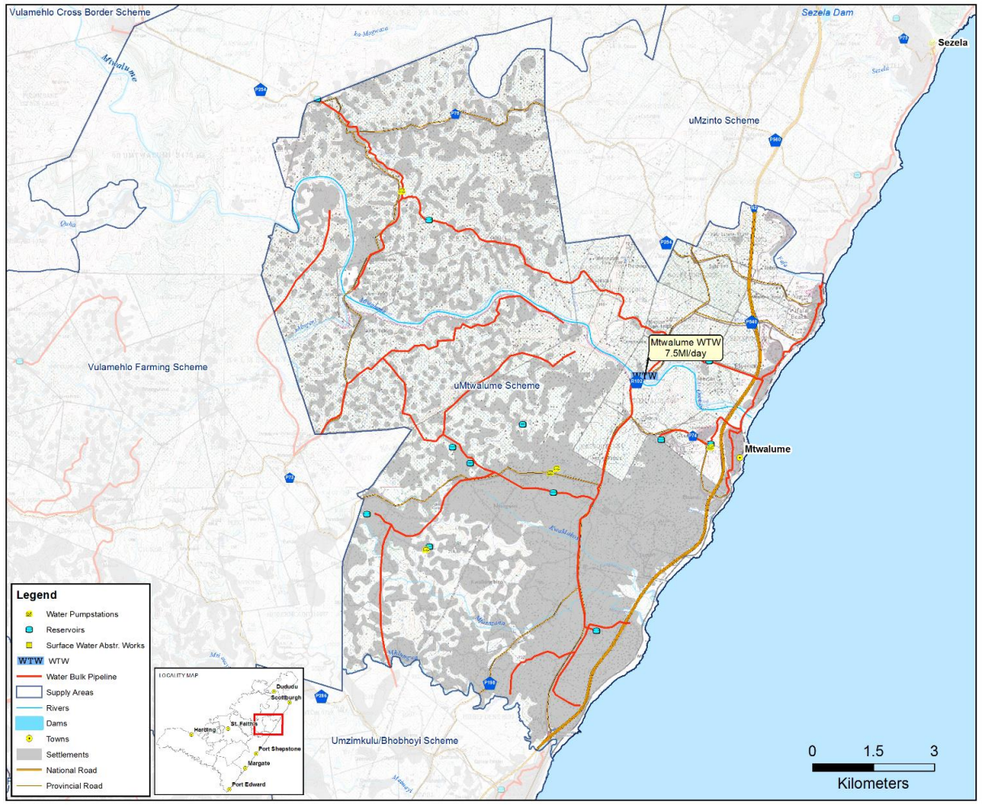

Figure 14: uMtwalume Water Supply Scheme Layout

4.3.3.1. *Water Resource Considerations*

The uMtwalume WTP is also owned by Ugu DM, however, operated by Umgeni Water. It abstracts its water from the uMtwalume River. The capacity of the treatment facility is 7.5Mℓ/day.

The yield of the uMtwalume River at the point of abstraction is reported as 1.2Mm^3/annum (3.3Mℓday). The registered use is however 3.2Mm^3/annum (8.7Mℓ/day).

4.3.3.2. *Water Supply Infrastructure*

The bulk water infrastructure description and capacity is summarised in **Table 5** below.

Table 5: Bulk Water Infrastructure Description and Capacity (Mtwalume)

Raw Water Source	Lawful Availability (Ml/day)	Yield (Mℓ/Day)
uMtwalume River	8.7	3.3
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
uMtwalume	7.5	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
uMtwalume WTP to Ellysium Reservoir	225	2 329
Ellysium Reservoir Mtwalume Res	150	5 469
Mtwalume Res to Koelwaters Res	100	1 468
Mtwalume WTP to Mnafu Reservoir	250	4 553
Mnafu Reservoir to Mathulini Res	350	3 572
Mtwalume WTP to Magwaza Reservoir	100	8 120
Magwaza Reservoir to Inkonxe	100	4 615
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Inkonxe	0.5	No details
Magwaza	0.5	No details
Ellysium	5.5	No details
Mathulini	0.5	No details
Mnafu	3	No details
Koelwaters	1	No details
Mtwalume	0.25	No details

This infrastructure is further illustrated by a schematic diagram, included in **Annexure B** as **Figure B3**.

4.3.3.3. *Bulk Infrastructure Condition*

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement. A number of recent upgrades (or infrastructure replacement) have been made making some of the infrastructure relatively new. A condition assessment was recently completed by

Ugu DM.

4.3.4. uMzimkhulu/Bhobhoyi Supply (UMZ 001, UMZ 002 UMZ 003, UMZ 004, UMZ 005 & UMZ 006) Scheme

The uMzimkhulu/Bhobhoyi Supply Scheme abstracts and treats water from the uMzimkhulu River for the areas covering parts of the Lower South Coast, from Hibberdene in the north to Ramsgate in the south. Inland it extends to supply areas that include Gamalakhe, Murchison, kwaMavundla, Loisiana and kwaMadlala. The scheme areas supplied by the uMzimkhulu/Bhobhoyi Water Supply Scheme have been denoted by UMZ 001, UMZ 002, UMZ 003, UMZ 004, UMZ 005 and UMZ 006) in the Water Demand Model used on this project.

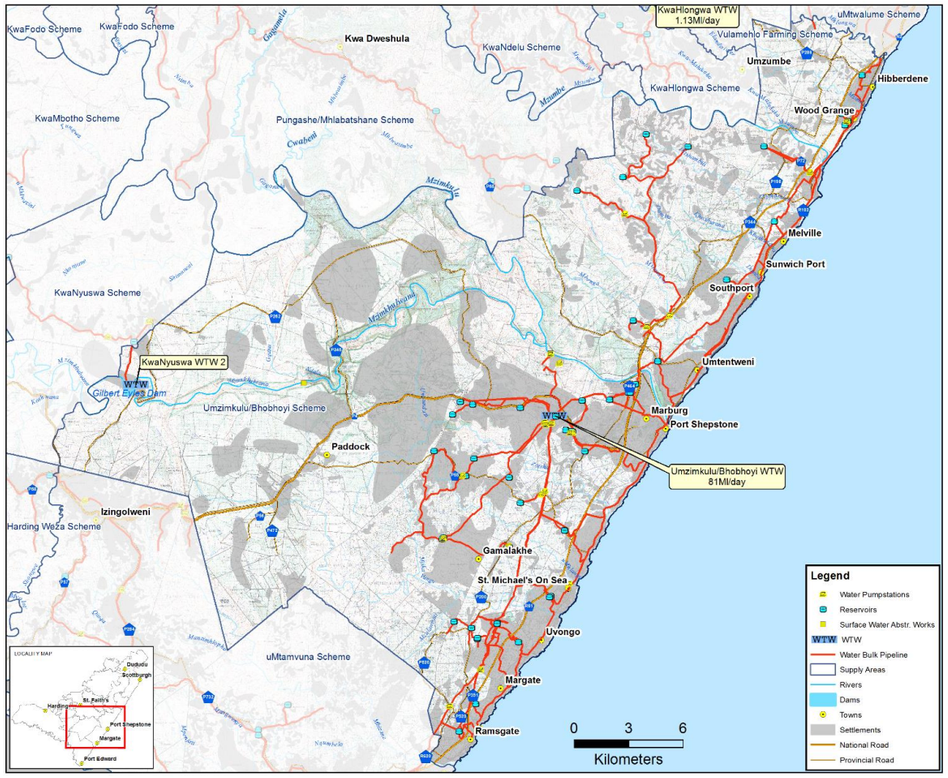

Figure 15: uMzimkhulu Water Supply Scheme Layout

4.3.4.1. Water Resource Considerations

The uMzimkhulu Scheme is also owned and operated by Ugu DM and abstracts its water from the uMzimkhulu River at St Helen's Rock Pump Station. Water is pumped to the Bhobhoyi WTP through 700mm dia and 400mm dia pipelines either directly to the WTP or via an off-channel storage dam. The capacity of the treatment facility is 54Ml/day, with a current average daily treated water of 47Ml/day. The WTP is currently being upgraded to 81Ml/day and the upgrade work is scheduled for completion in mid-2017.

The yield of the source is reported as 18.3Mm^3/annum (Pre-Feasibility Study of Ncwabeni Dam) or 50.1Ml/day. The registered use is 11.5Mm3/annum or 31.4Ml/day.

4.3.4.2. Water Supply Infrastructure

Some of the bulk water infrastructure for the uMzimkhulu/Bhobhoyi Water Supply Scheme is summarised in **Table 6** below.

Table 6: Bulk Water Infrastructure Description and Capacity (uMzinkhulu/Bhoboyi)

Raw Water Source	Lawful Availability (Ml/day)	Yield (Mℓ/Day)
uMzimkhulu River	31.4	50.1Ml/d
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
uMzimkhulu WTP	54 being upgraded to 81Ml/day (2017)	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
uMzimkhulu WTP to Murchison no.2	200	2 493
Murchison no.2 - Murchison no.3	200	3 367
Murchison no.3 - Murchison no.4	200	1 414
Murchison no.2 – Murchison hospital	200	5 876
uMzimkhulu WTP to Bomela North	264	5 348
uMzimkhulu WTP to Betania	315	1 831
Betania to Gamalakhe A	315	8 168
Gamalakhe A to Gamalakhe tower	300	1 393
uMzimkhulu WTP tees off to Izotsha	600	5 684
uMzimkhulu WTP to Sport field BPT	600	8 890
uMzimkhulu WTP tees off Shelly 1 & 2	375 200 100	5 740 759 1 278
uMzimkhulu WTP tees off to uMzimkhulu 36 & 36A	400 300 264	3 415 3 289 3 291
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Nosita	2.5	No details
Kaisers	1	No details
Sea slope A&B	9.54	No details
Ramsgate South	2.5	No details
Ramsgate North	2.5	No details
Margate 2A &2B	9.5	No details
Barrow green	3.4	No details
Res 12A	4.5	No details
UMzimkhulu 36/36A	7.27	No details
Upper Marburg	10	No details
Masinege	2	No details
Esperanza	1	No details
Abersville	10	No details
Uvongo	2.5	No details
Shelly beach 1&2	7.5	No details
Catalina	2.5	No details
Lower Woodgrange	1.14	No details
Woodgrange	4.54	No details
Melville	4.5	No details
Anerley	2.5	No details

This infrastructure is also illustrated by means of a schematic diagram in **Annexure B** as **Figure B4**.

4.3.4.3. Condition of Bulk Supply Infrastructure

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement. A number of recent upgrades (or infrastructure replacement) have been made making some of the infrastructure relatively new. A condition assessment has been completed by Ugu DM recently.

4.3.5. uMtamvuna Supply (UMTA 001 & UMTA 002) Scheme

The uMtamvuna Supply Scheme abstracts and treats water from the uMtamvuna River for the areas that include the inland areas of Ezinqoleni, kwaXolo, MkwaShoba/Mdlazi, and kwaShobeni and coastal strip areas from Ramsgate to Port Edward. The scheme areas supplied by the uMtamvuna Water Supply Scheme have been denoted by UMTA 001 and UMTA 002 in the Water Demand Model used on this project.

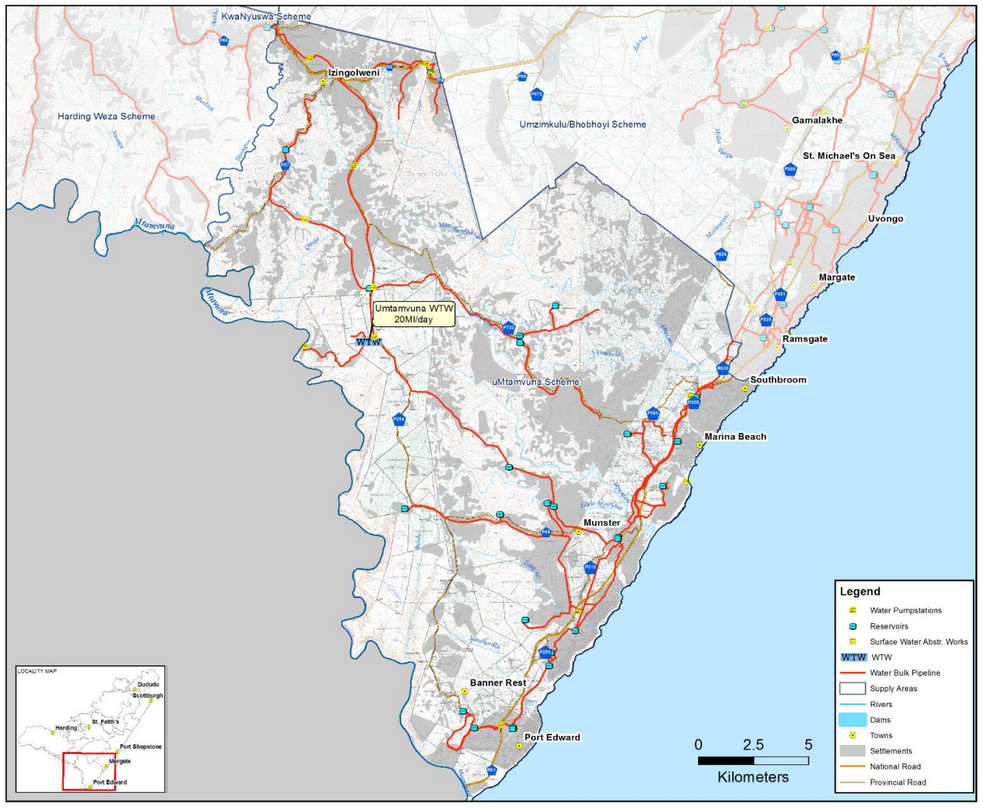

Figure 16: uMtamvuna Water Supply Scheme Layout

4.3.5.1. Water Source Considerations

The uMtamvuna Scheme is owned and operated by Ugu District Municipality and abstracts raw water from the uMtamvuna River and treated at the nearby uMtamvuna WTP.

The water is pumped either directly to the treatment plant or to an off-channel storage dam next to the plant. The capacity of WTP is 20Ml/day with a current daily average flow of 15.3Ml/day. This is however in contrast to a registered use on the WARMS database of 9.6Ml/day – there is therefore need to update the water use registration information with the DWS.

At a 3-month low flow duration, the maximum abstraction at the uMtamvuna abstraction point is estimated at 6.7 million m^3 for 3 months (or summer peak of 73.4Ml/day), assuming no abstractions are taking place upstream. Based on available information, the uMtamvuna Catchment have a surplus water supply of 5 million m^3/annum. Thus the future water requirements for domestic (and other) uses can be supplied from the available water resources without the development of additional water resources.

4.3.5.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 7** below.

Table 7: Bulk Water Supply Infrastructure

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
UMtamvuna River		33Ml/d (Estimated)
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
uMtamvuna WTP	20	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
uMtamvuna WTP to Florida	300	3000
Florida – Shoba	150	10 000
Florida – Izingolweni	200	14 000
uMtamvuna WTP to BP01	397.4	12 406
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Ezinqoleni Reservoirs	4.5	
BP1	5	
BPT	5	
BP 2	5	
Bromsgrove	2	
Leisure bay	2.5	
New banners nest	1	
Upper banners nest 1 &2	0.34	
South broom	2.5	
Sanlameer	2.5	

This infrastructure is further illustrated by a schematic diagram in **Annexure B** as **Figure B5**.

4.3.5.3. *Condition of Bulk Water Infrastructure*

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement. A number of recent upgrades (or infrastructure replacement) have been made making some of the infrastructure relatively new. The pipeline from uMtamvuna to Ezinqoleni was completed in 2009.

4.3.6. Harding/Weza Supply (HW 001, HW 002, HW003 & HW004) Scheme

The Harding/Weza Water Supply Scheme abstracts and treats water from the Weza River and the Harding Dam. The scheme supplies the rural areas of KwaMachi, kwaJali, kwaMthimude and the town of Harding. Progressively, the scheme has also been extended to incorporate the areas of kwaMbotho and kwaFodo. It is the plan that the existing kwaFodo, kwaMbotho and kwaNyuswa WTP's will be decommissioned for supply from the Harding/Weza WTP. The scheme areas supplied by the Harding/Weza Water Supply Scheme have been denoted by HW 001, HW 002, HW 003 and HW 004) in the Water Demand Model used on this project.

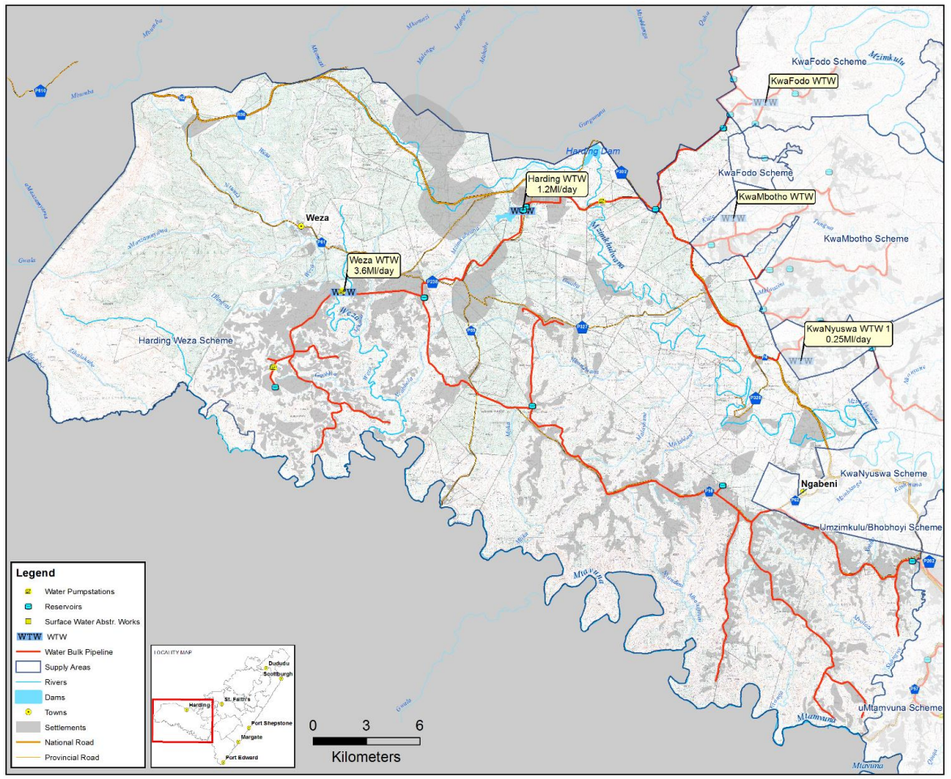

Figure 17: Harding/Weza Water Supply Scheme Layout

4.3.6.1. *Water Resource Considerations*

This WSS is made up of two systems that are interoperable but generally function as independent systems. Both systems are owned and operated by Ugu DM.

The Harding Weza WTP and the Harding WTP, with capacities of 3.6Ml/day and 1.2Ml/day respectively, serve the scheme. The scheme raw water sources are recorded as having a combined yield of 1.99Mm^3/annum (or 5.2 Ml/day). No records of registered use have been found for this scheme.

4.3.6.2. *Water Supply Infrastructure*

The bulk water infrastructure description and capacity is summarised in **Table 8** below.

Table 8: Bulk Water Supply Infrastructure

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
Weza		5.2
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
Weza/New Harding WTP	3.6	
Harding WTP	1.2	11.8 (Planned)
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
Weza/New Harding WTP to Jali	150	6 284
Jali to Bazini	100	1 225
Weza/New Harding WTP to Ikwezi A & B	200	5 242
Ikwezi to Machi	200	1 0901
Machi to Elim	200	15 016
Elim to Mlozane	200	2 622 12 587
Ikwezi to Harding WTP	200	4 421
Harding WTP to kwaFodo	160	8 669
kwaFodo to kwaFodo 1/Mbotho	160	3 990
KwaFodo to kwaFodo north 1	160	12 194
kwaFodo north 1 to kwaFodo north 1	160	850
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Ikwezi	11	No details
Jali	0.5	No details
Machi	1	No details
Bazini	0.1	No details
Elim	5.5	No details
Mlozane	0.5	No details
Kwafoda	0.1	No details
Kwafodo North 1	0.1	No details
Kwafodo North 2	0.05	No details
Kwambotho	0.55	No details

This infrastructure can be further illustrated by means of a schematic diagram in **Annexure B** as **Figure B6**.

4.3.6.3. Condition of Bulk Infrastructure

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement. A number of recent upgrades (or infrastructure replacement) have been made making some of the infrastructure relatively new. A condition assessment has been completed by Ugu DM recently.

4.3.7. KwaMbotho Supply (MBOT 001) Scheme

The kwaMbotho Supply Scheme abstracts and treats water from the Ncekete River for the supply to the rural areas of kwaMbotho. The scheme areas supplied by the kwaMbotho Water Supply Scheme have been denoted by MBOT 001 in the Water Demand Model used on this project.

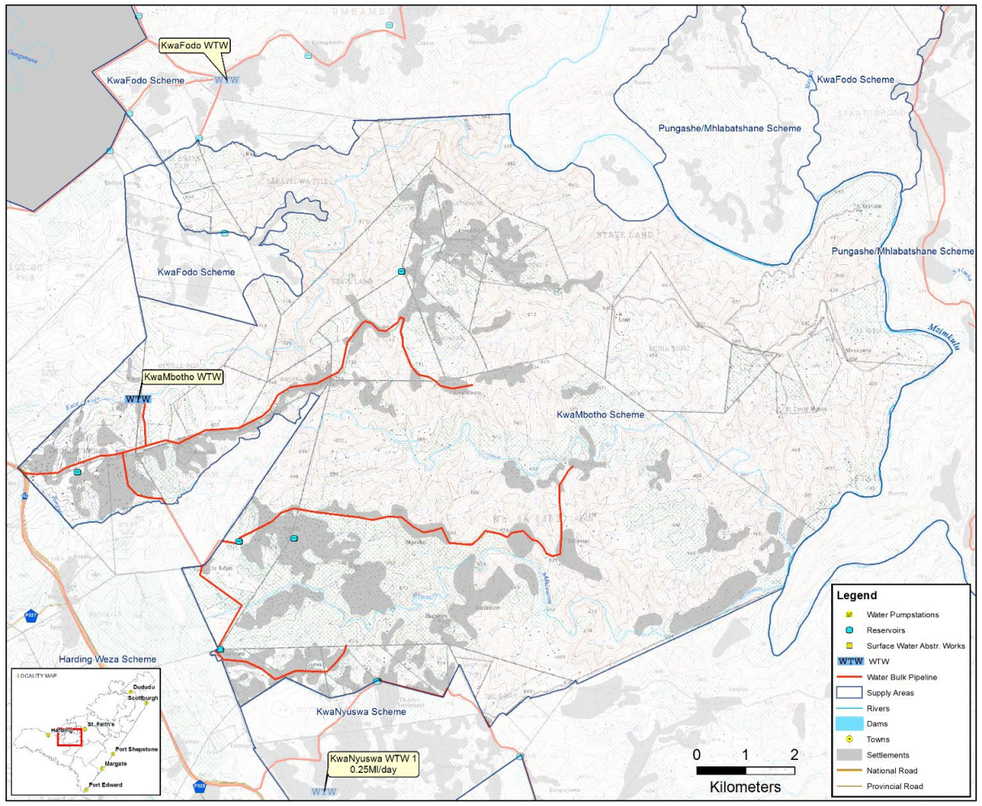

Figure 18: kwaMbotho Water Supply Scheme Layout

4.3.7.1. Water Supply Considerations

The yield of the current source is not known. It is the current plan to decommission the source and WTP of this scheme and incorporate it into the Harding Weza Scheme.

4.3.7.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in the table below.

Table 9: Bulk Water Supply Infrastructure: KwaMbotho WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
KwaMbotho Stream		
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
KwaMbotho WTP		
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
KwaMbotho WTP split to Isitebele 4	160	3 086
Res	110	5 495
KwaMbotho WTP to kwaFodo Res	160	2 430
KwaMbotho WTP to Santomba G Res	160	6 710
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
KwaFodo	0.55	
Isitebele	0.12	
Santomba		
KwaMbotho 2	0.12	
Kwanonkala 3	0.2	
BPT		

This infrastructure can further be illustrated by a schematic diagram in **Annexure B** as **Figure B7**.

4.3.7.3. Condition of Bulk Infrastructure

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement.

The WTP is to be decommissioned and the scheme is to be incorporated into the Harding Weza Scheme.

4.3.8. KwaFodo Supply (FOD 001, FOD 002, FOD 003 & FOD 004) Scheme

The kwaFodo Supply Scheme abstracts and treats water from the Cekeza River for the supply to the rural areas of kwaFodo. The scheme areas supplied by the kwaFodo Water Supply Scheme have been denoted by FOD 001, FOD 002, FOD 003 & FOD 004) in the Water Demand Model used on this project.

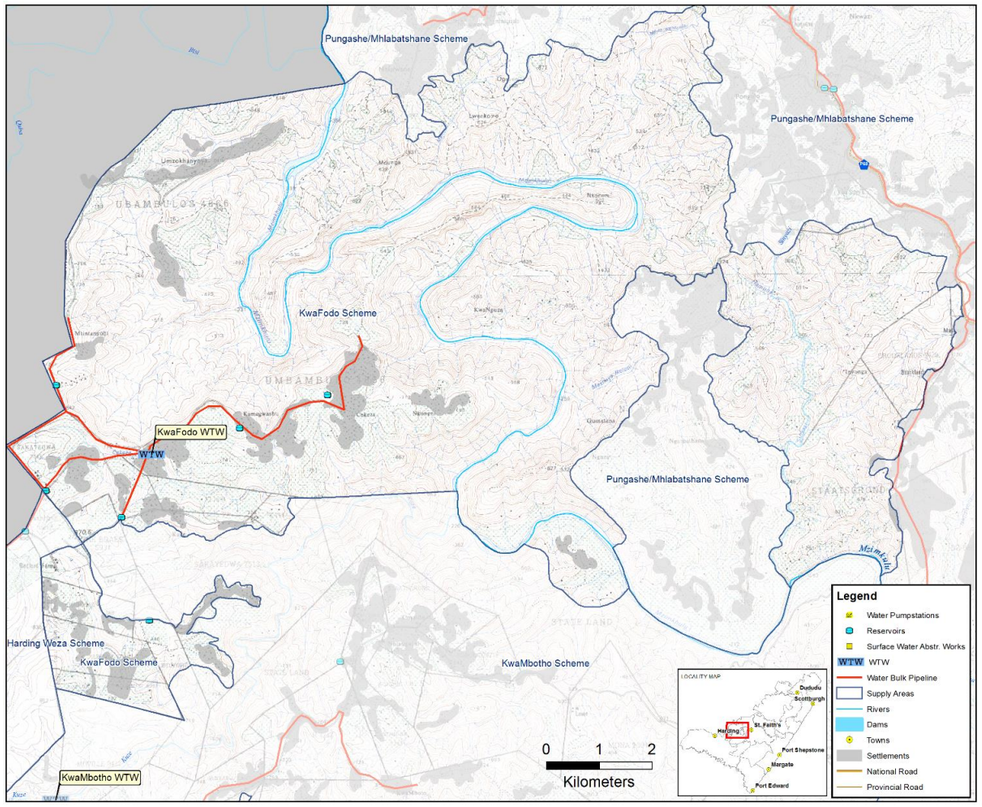

Figure 19: kwaFodo Water Supply Scheme Layout

4.3.8.1. Water Supply Considerations

The yields of the current source are unknown. It is the intention of the Ugu DM to decommission the WTP of this scheme and incorporate the scheme into the Harding Weza Scheme.

4.3.8.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 10**.

Table 10: Bulk Water Supply Infrastructure: kwaFodo WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
Cekeza River	No details	No details
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
kwaFodo WTP		
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
KwaFodo South 2 to Kwafodo WTP	100	2 210
KwaFodo WTP to Santomba A	100	1 330
Santomba A to Res	100	3 380
KwaFodo WTP to BPT1	100	1 803
KwaFodo WTP to BPT2	100	2 110
BPT2 to Res	100	2 170
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
BPT	0.03	No details
kwaFodo South 2	0.05	No details
BPT	0.03	No details
Santomba A	0.1	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B8**.

4.3.8.3. Condition of Bulk Water Infrastructure

The condition of the infrastructure is unknown.

4.3.9. KwaNyuswa Supply (NYU 001 & NYU 002) Scheme

The kwaNyuswa Supply Scheme abstracts and treats water from a local river for the supply to the areas of kwaNyuswa. The scheme areas supplied by the kwaNyuswa Water Supply Scheme have been denoted by NYU 001 and NYU 002) in the Water Demand Model used on this project.

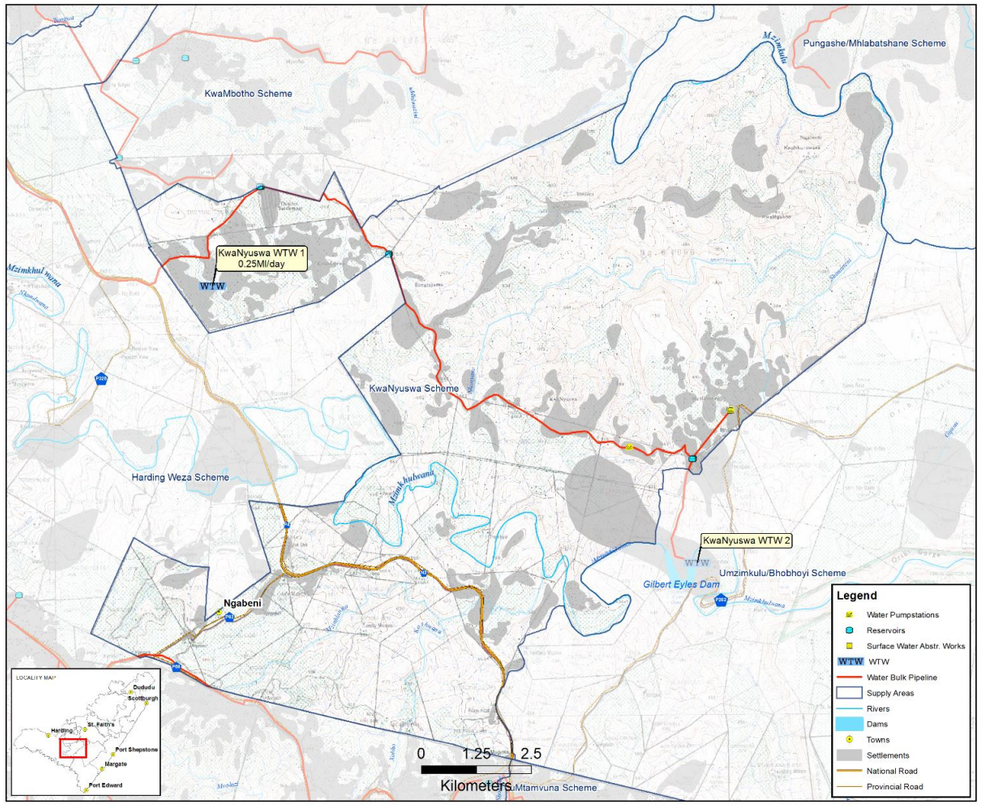

Figure 20: kwaNyuswa Water Supply Scheme Layout

4.3.9.1. Water Supply Considerations

The yields of the scheme source are not known and these need to be confirmed to establish the viability of this scheme.

4.3.9.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 11**.

Table 11: Bulk Water Supply Infrastructure: kwaNyuswa WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
River		No details
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
KwaNyuswa WTP :2		
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
KwaNyuswa WTP2 to kwaNyuswa A Reservoirs	160	2 778
kwaNyuswa A to Res	100	1 391
kwaNyuswa A to 2 x Res	160 110 90 75 63 50	5 063 1 487 384 415 1 139 1 813
2 x Res to kwaNyuswa Res	200	3 820
KwaNyuswa WTP1 to kwaNyuswa Res		2 530
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
2*KwaNyuswa	0.6	No details
2*res	0.4	No details
KwaNyuswa res A	0.4	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B9**.

4.3.9.3. Condition of Bulk Infrastructure

The condition of existing infrastructure is unknown.

4.3.10. Pungashe/Mhlabatshane Supply (PUNG 001 & PUNG 002) Scheme

The Pungashe/Mhlabatshane Supply Scheme abstracts and treats water from the recently constructed Mhlabatshane Dam. The dam and the WTP are owned by Umgeni Water while Ugu DM owns and operates infrastructure downstream of the WTP. The scheme areas supplied by the Pungashe/Mhlabatshane Water Supply Scheme have been denoted by PUNG 001 and PUNG 002 in the Water Demand Model used on this project.

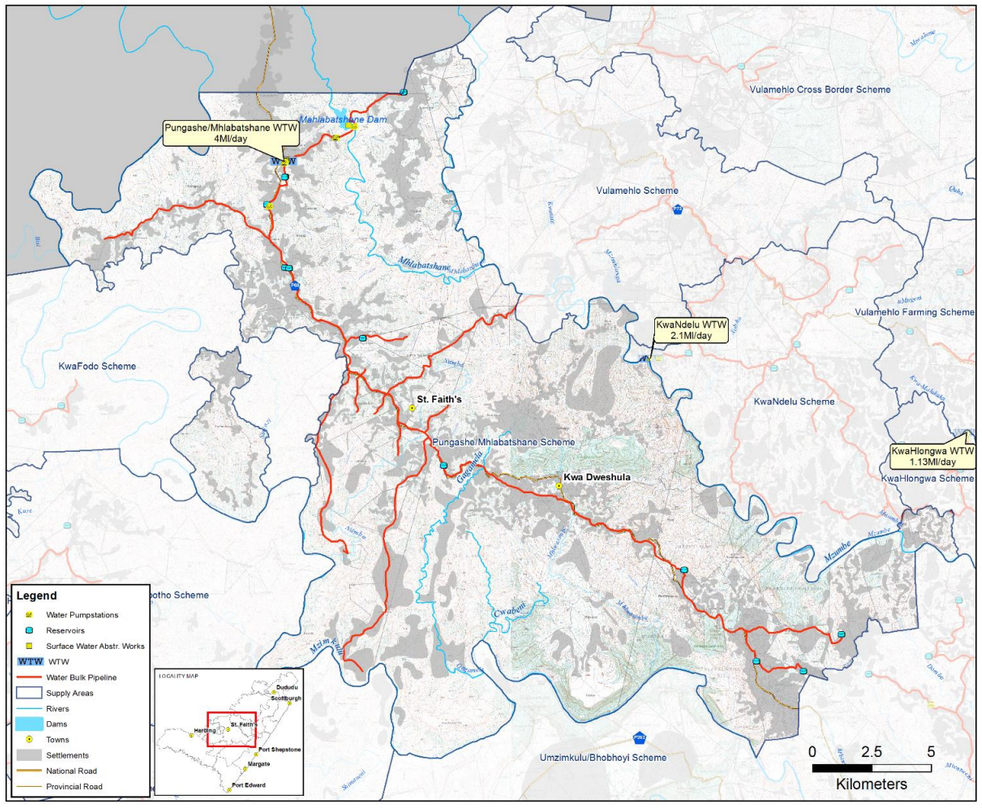

Figure 21: Pungashe/Mhlabatshane Water Supply Scheme Layout

4.3.10.1. Water Supply Considerations

The scheme source of water is the newly constructed Mhlabatshane Dam with a yield of 1.6Mm^3/annum or 4.4Ml/day. The existing Mhlabatshane WTP has a capacity of 4.0Ml/day. The registered use of this source is not known.

Both the dam and the WTP are owned and operated by Umgeni Water. It is noted that Umgeni Water has plans to construct a raw water pipeline to abstract raw water from the uMzimkhulu River and augment supplies to the scheme by an additional 4Ml/day, to meet future projected demands.

4.3.10.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 12** below.

Table 12: Bulk Water Supply Infrastructure: Phungashe/Mhlabatshane WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
Mhlabatshane Dam		4.4
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
Phungashe WTP	4.4	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
Phungashe WTP to Ndwebu	160	3 467
Phungashe WTP to Phungashe WTP balancing tank	160	1 020
Phungashe WTP balancing tank to Pungashe Res	160	3 611
From Pungashe Res T off to Res	160	650
From Res Toff to Pungashe village Res	400	300
Pungashe village to Nomagetje	400	1 660
Nomagetje to kwaPhongolo	400	4 770
From kwaPhongolo T off to kwaNcengesi	450 400 350	987 2 157 2 286
From kwaNcengesi T to St Faith	430	8 000
St Faith to Mehlomnyama	350	12 991
From Mehlomnyama split to Qwabe and	160	11 167
To Enkulu	160	1 270
Enkulu to Frank lands	160	2 533
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Ndwebu	0.6	No details
Pungashe WTP balancing tank		No details
Pungashe res	0.5	No details
Res	2	No details
Pungashe Village	0.6	No details
Nomagetje	0.25	No details
kwaPhongolo*2	1.9	No details
St. Faiths Res	2.5	No details
Mehlomnyama*2	0.75	No details
Qwabe	0.25	No details
Enkulu	0.5	No details
Frankland	1	No details
Kwancengesi	0.2	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B10**.

4.3.10.3. Condition of Bulk Infrastructure

The condition of the infrastructure is varied, however a significant amount of infrastructure is in good condition having been constructed recently.

4.3.11. kwaNdelu Supply (NDEL 001) Scheme

The kwaNdelu Supply Scheme abstracts and treats water from the Mzumbe River for the supply to the rural areas of kwaNdelu. The scheme areas supplied by the kwaNdelu Water Supply Scheme have been denoted by NDEL 001 in the Water Demand Model used on this project.

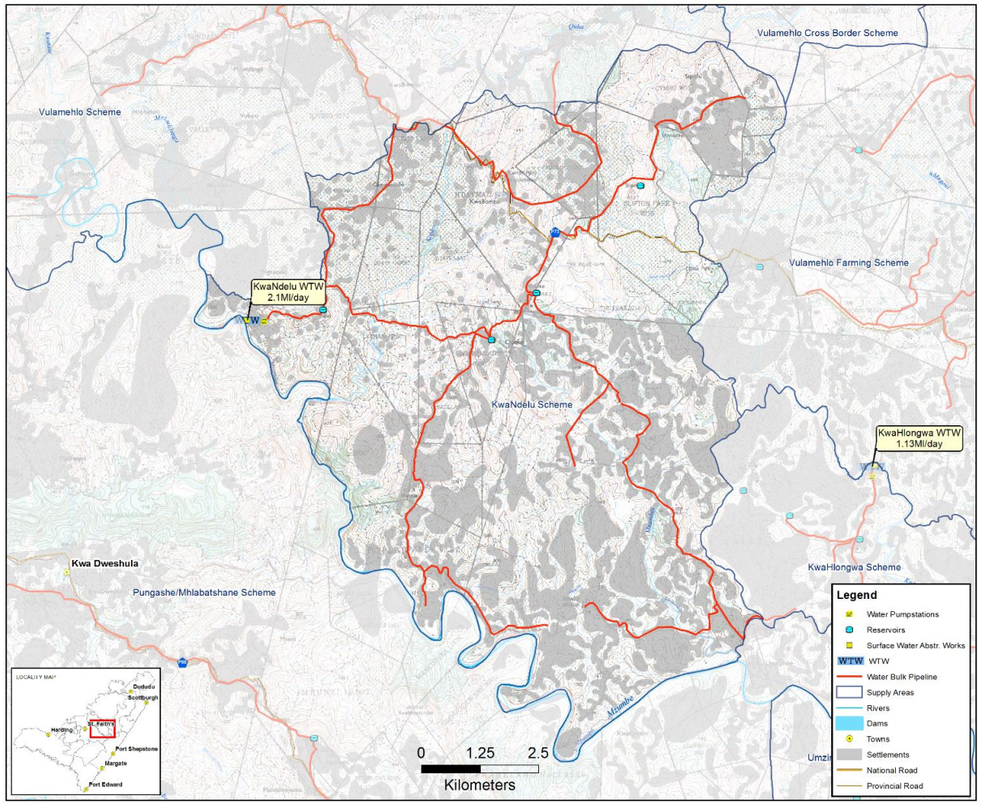

Figure 22: kwaNdelu Water Supply Scheme Layout

4.3.11.1. Water Supply Considerations

The kwaNdelu Scheme abstracts its water from Mzumbe River. The yield of this river is estimated at 1.6Mm^3/annum or 4.4Ml/day.

4.3.11.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 13** below.

Table 13: Bulk Water Supply Infrastructure: kwaNdelu WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
Ndelu River		4.4
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
Ndelu WTP	1.4	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
Ndelu WTP to Stone Hill	200	1 974
Stone Hill to Ixobho	200	5 030
Ixobho to Odeke 1	160	1 458
Odeke 1 to kwaHlaba	110	4 330
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Stone hill	0.1	No details
Ixobho	0.5	No details
Odeke res 1	0.1	No details
Kwahlaba	0.2	No details
Stone hill	0.1	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B11**.

4.3.11.3. Condition of Bulk Infrastructure

The kwaNdelu Scheme was commissioned around 2008. Therefore, the infrastructure is assumed to be in fairly good condition.

4.3.12. Vulamehlo Supply Scheme

The Vulamehlo Scheme distributes water from an extension of the Ndelu Water Scheme for the supply to the rural areas of Vulamehlo. The scheme areas supplied by the Vulamehlo Water Supply Scheme have been denoted by VULA 001 in the Water Demand Model used in this project.

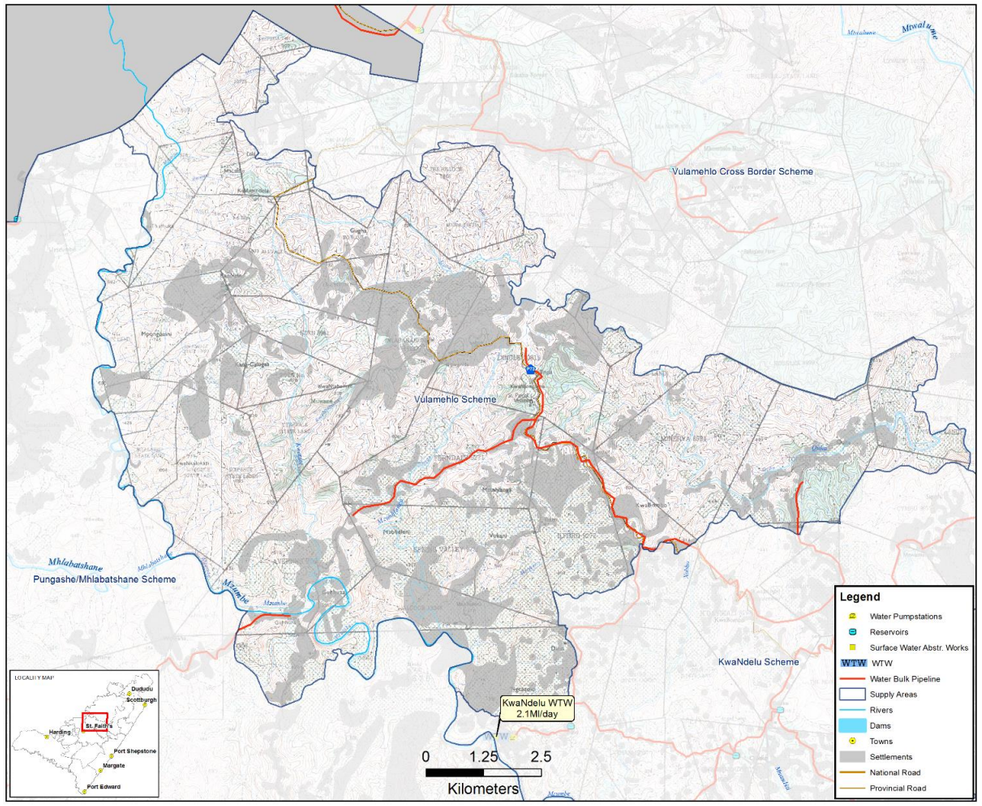

Figure 23: Vulamehlo Water Supply Scheme Layout

4.3.12.1. Water Supply Considerations

This scheme is supplied via the Ndelu WTP.

4.3.12.2. Water Supply Infrastructure

The infrastructure is not considered as bulk and is therefore not detailed.

4.3.12.3. Condition of Bulk Infrastructure

The existing infrastructure for this scheme was commissioned around 2009 and is considered to be fairly new.

4.3.13. kwaHlongwa Supply Scheme

The kwaHlongwa Scheme abstracts, treats and distributes water from an extension of the kwaMalukaka River for the supply to the rural areas of kwaHlongwa. The scheme areas supplied by the kwaHlongwa Water Supply Scheme have been denoted by HLONG 001 in the Water Demand Model used in this project.

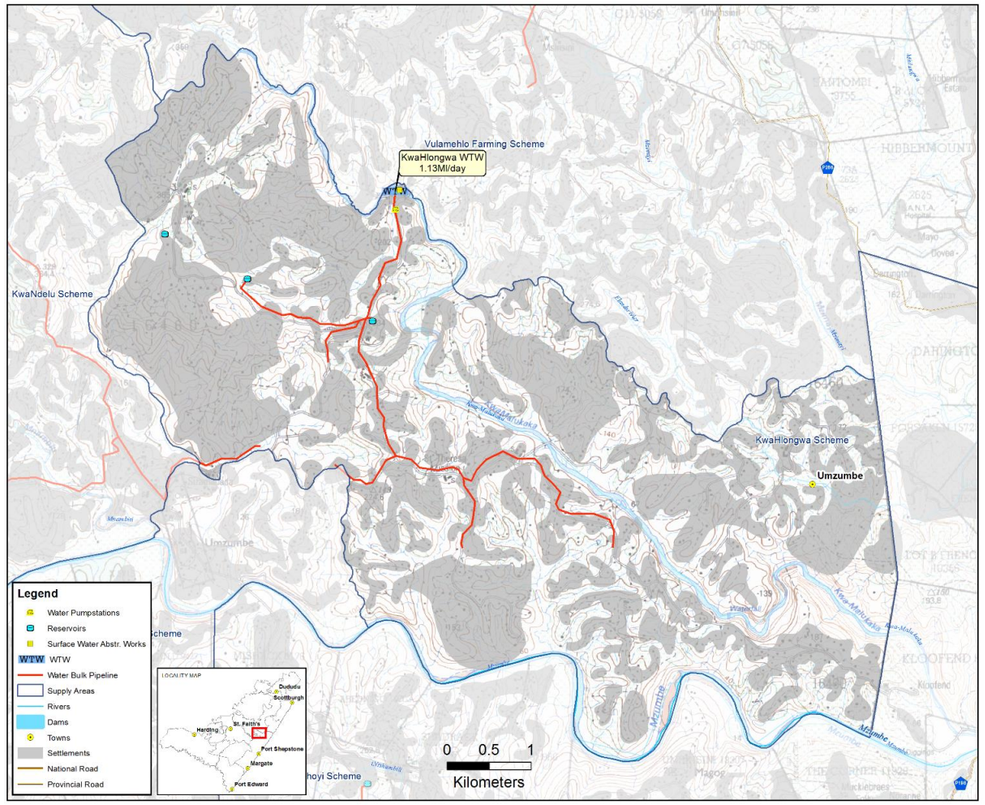

Figure 24: kwaHlongwa Water Supply Scheme Layout

4.3.13.1. *Water Supply Considerations*

The yields of the kwaMalukaka River are not known.

4.3.13.2. *Water Supply Infrastructure*

The bulk water infrastructure description and capacity is summarised in **Table 14** below.

Table 14: Bulk Water Supply Infrastructure: kwaHlongwa WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
kwaMalukaka River		No details
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
KwaHlongwa WTP		
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
KwaHlongwa WTP to Molukhakha	150	1 710
Molukhakha to uMgubo	100	1 790
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Molukhakha	0.5	No details
uMgubo	0.1	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B13**.

4.3.13.3. *Condition of Bulk Infrastructure*

The kwaHlongwa Scheme was commissioned around 2003. The infrastructure is considered to be in good condition.

4.3.14. Vulamehlo Cross Border Supply Scheme

The Vulamehlo Cross Border Scheme abstracts, treats and distributes water from the Upper Mtwalume River for the supply to the areas of Jolivet, Hlokozi, Nyavini and Braemar in the Harry Gwala DM and Ugu DM. The scheme areas supplied by the Vulamehlo Cross Border Water Supply Scheme have been denoted by VULCR 001 and VULCR 002 in the Water Demand Model used on this project.

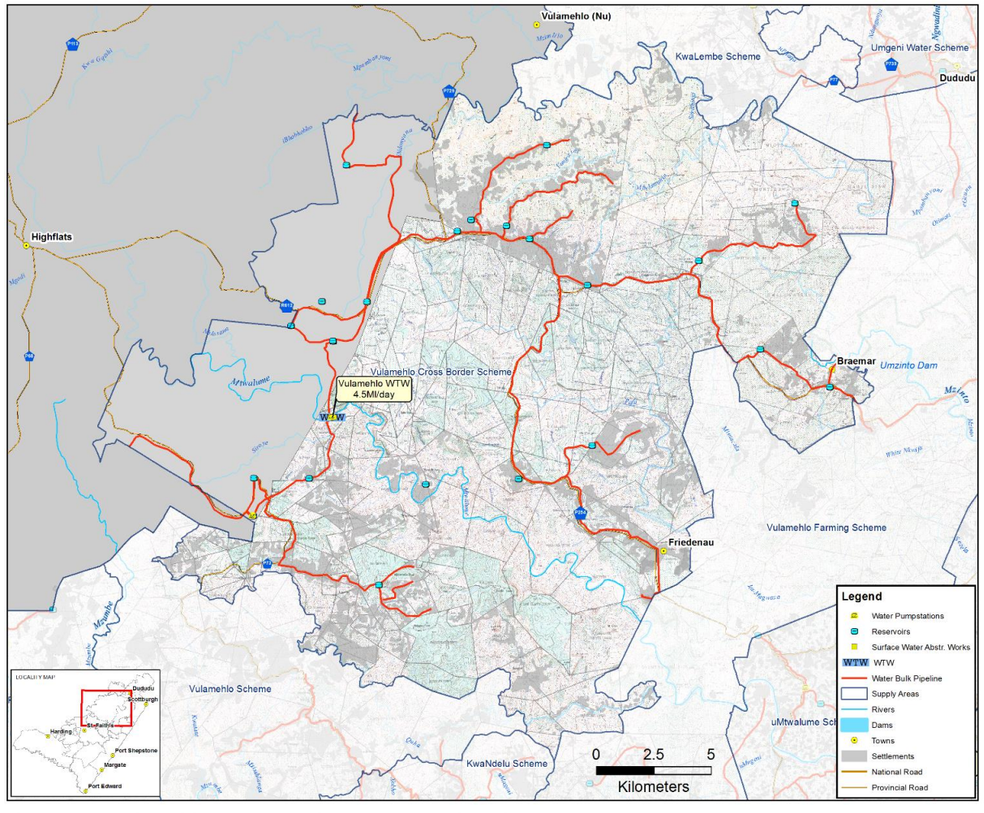

Figure 25: Vulamehlo Cross Border Water Supply Scheme Layout

4.3.14.1. *Water Supply Considerations*

The Vulamehlo WTP abstracts its water from the Upper uMtwalume River. The river, at the point of abstraction, is recorded to have a yield of about 0.6Mm^3/annum or 1.6Ml/day. The Vulamehlo WTP currently abstracts and treats up to about 4.5Ml/day. The water use for this scheme is not registered.

4.3.14.2. *Water Supply Infrastructure*

The bulk water infrastructure description and capacity is summarised in **Table 15** below.

Table 15: Bulk Water Supply Infrastructure: Vulamehlo Cross Border WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
uMtwalume River		1.6
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
Vulamehlo Cross Border	4.5	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
Vulamehlo WTP to Nyavini Reservoir No. 1	150	3 140
Vulamehlo WTP to Hluthankungu Reservoir	150	3 160
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Res A2	0.2	No details
Hluthankungu	2	No details
Res B1	0.25	No details
Jolivet res	0.15	No details
Hluthankungu Res A	2	No details
Res A3	0.2	No details
Res A4	0.2	No details
Res A5	0.2	No details
Res A6	0.2	No details
Res A7	0.2	No details
Res A8	0.2	No details
Res A9	0.2	No details
Res A9	0.05	No details
Res A10	0.2	No details
Res A11	0.25	No details
Breamer	0.25	No details
uMgaye	2.5	No details
Res	NA	No details
BPT	NA	No details
kwaNkosi	0.5	No details
Nyavini	0.5	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B15**.

4.3.14.3. *Condition of Bulk Infrastructure*

The condition of the infrastructure is varied and also comprises old underground pipes including asbestos cement.

4.3.15. Vulamehlo Farming Scheme

The Vulamehlo Farming Supply Scheme covers the farming areas in the Vulamehlo LM. This area currently benefits from privately owned stand-alone schemes and supplies from neighbouring schemes such as uMzinto WSS.

The scheme areas supplied by the Vulamehlo Farming Water Supply Scheme have been denoted by VULFAR 001 in the Water Demand Model used in this project.

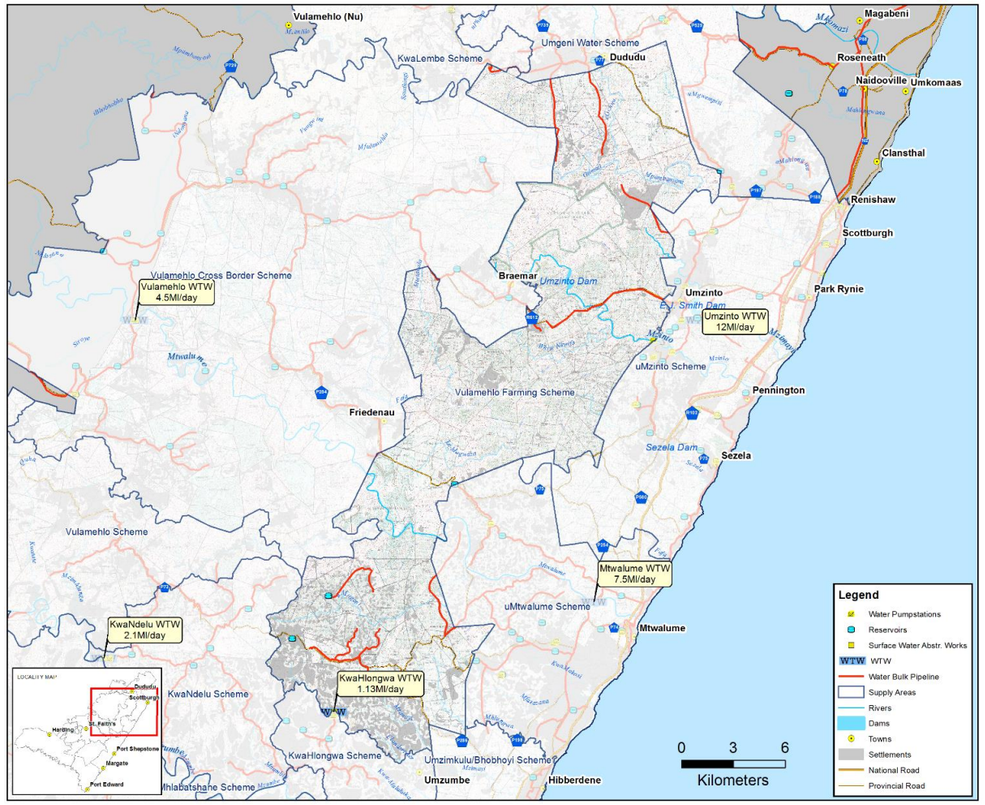

Figure 26: Vulamehlo Farming Water Supply Scheme Layout

4.3.15.1. Water Supply Considerations

The scheme area is vast and sparsely populated. The neighbouring scheme is uMzinto WSS, which has been extended to supply some of the farming areas such as Cedars, via a pipeline *enroute* to Dududu.

4.3.15.2. Water Supply Infrastructure

The infrastructure in the scheme is considered to be of a reticulation nature and has not been detailed in this study.

4.3.16. kwaLembe Water Supply Scheme

The kwaLembe Water Supply Scheme abstracts and treats water from the Mkomaas River for the supply to the rural areas of kwaLembe. The scheme areas supplied by the kwaLembe Water Supply Scheme have been denoted by KWAL 001 in the Water Demand Model used in this project.

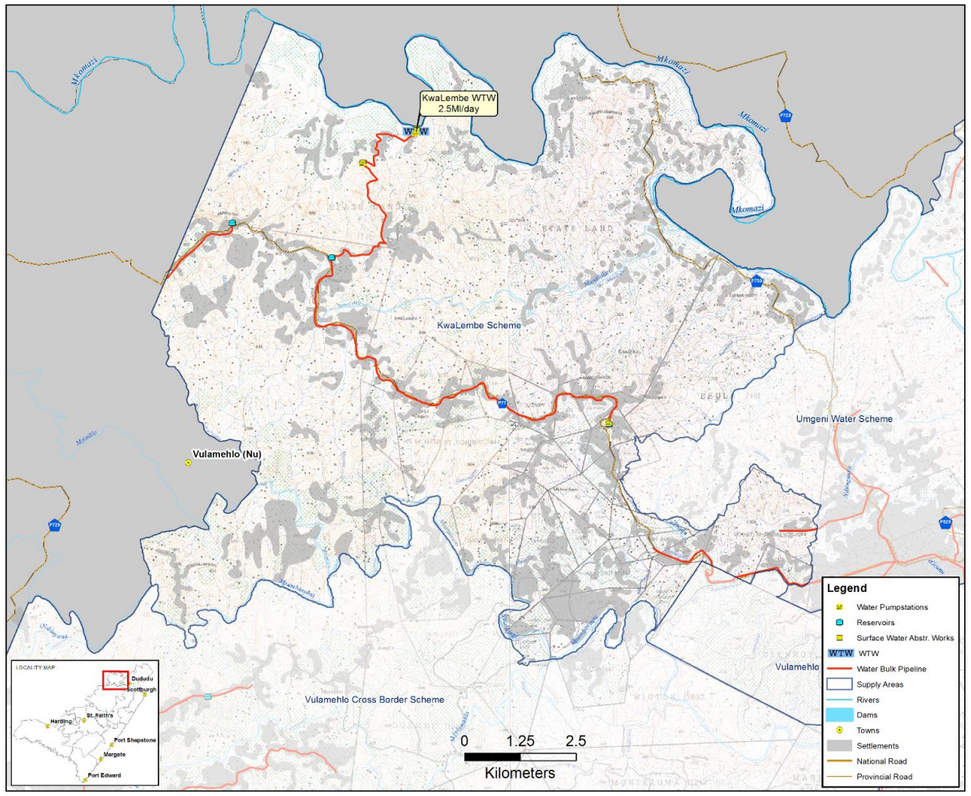

Figure 27: kwaLembe Water Supply Scheme Layout

4.3.16.1. Water Supply Considerations

The kwaLembe WTP abstracts water from the Mkomaas River. At the point of abstraction, the yield of the Mkhomazi River is estimated to be 16.85Mm^3/annum or 46Ml/day. The kwaLembe WTP has a capacity of 1.4Ml/day.

4.3.16.2. Water Supply Infrastructure

The bulk water infrastructure description and capacity is summarised in **Table 16** below.

Table 16: Bulk Water Supply Infrastructure: kwaLembe WSS

Raw Water Source	Lawful Availability	Yield (Mℓ/Day)
Mkomaas River		46
WTP	**Existing Capacity (Mℓ/day)**	**Proposed Capacity (Mℓ/day)**
Kwalembe WTP	1.4	
Bulk Supply Pipeline	**Diameter (mm)**	**Length (m)**
Kwalembe WTP to Res	NA	2 301
Res to Ntabeskopo	NA	3 911
Ntabeskopo to Kwaqiko	NA	11 376
Reservoir	**Storage (Mℓ)**	**Upgrade (Additional Storage Required) Mℓ**
Ntabeskopo	NA	No details
Kwaqiko Res 1	0.2	No details

This infrastructure is further illustrated by in a schematic diagram in **Annexure B** as **Figure B16**.

4.3.16.3. Condition of Bulk Infrastructure

The kwaLembe Scheme was commissioned around 2002. The infrastructure is therefore considered to be in a fairly good condition.

5. BULK WATER SUPPLY INTERVENTIONS CURRENTLY IN PLANNING

This section of the report reviews projects that impact on the service in the district. The interventions are currently initiated at three levels as follows:

- Ugu DM
- Department of Water and Sanitation (DWS)
- Umgeni Water

The project details follows:

5.1. Ugu DM Bulk Water Projects

Bulk water supply planning is primarily undertaken by Ugu DM in this area. A number of projects are related to extension of distribution infrastructure. Some are related to bulk infrastructure which include the development (or augmentation) of raw water sources, abstraction, treatment and distribution thereof. Significant projects have been extracted from DWS databases and will comprise projects funded through the Municipal Infrastructure Grant (MIG), MWIG and RBIG. The significant projects are discussed by water supply scheme.

5.1.1. Umgeni Water Supply Scheme Area

The following projects are registered under MIG for this scheme:

Table 17: Projects Registered under MIG (Umgeni Water Supply Scheme Area)

Project	Description	Impact
Maphumulo Water Supply	Infrastructure to distribute treated water in the unserviced areas of the project footprint	Backlog alleviation
Thoyane Water Supply	Infrastructure to distribute treated water in the unserviced areas of the project footprint	Backlog alleviation

The water supply scheme is supplied via the Umgeni Water South Coast Pipeline (SCP). According to records available from the Ugu DM, this pipeline currently supplies approximately 2Ml/day to this scheme.

5.1.2. uMzinto Water Supply Scheme Area

The following projects are registered under MIG for this scheme.

Table 18: Projects Registered under MIG (uMzinto Water Supply Scheme Area)

Project	Description	Impact
Greater Vulamehlo WSS	The project provides an alternative water supply to Dududu, in the Vulamehlo LM en route. The infrastructure serves the adjoining areas which include the water scheme area, denoted as Vulamehlo Farming	Incorporates the Vulamehlo Farming Area and Dududu in the uMzinto Water Supply Scheme.
KwaCele Water Supply	Reticulation infrastructure for rural areas of kwaCele Tribal Area	Backlog alleviation for rural areas of kwaCele/Amandawe
Mistake Farm Water Supply Scheme	Reticulation infrastructure and clear water reservoirs	Water Source is uMzinto WTP
Farm Isonti Low Cost Housing Infrastructure	Provision of water supply to housing project	Servicing of new housing scheme
Ugu Water Pipe replacement	Replacement of aged infrastructure	Renewal of infrastructure

It is noted that, under the Greater Vulamehlo Water Supply project, the gravity/pumping pipeline to Dududu has already been constructed and commissioned. Reticulation from the main infrastructure is in progress.

It is noted that, when the South Coast Pipeline has been commissioned in its entirety, the uMzinto WTP will continue to supply potable water to communities in the adjacent inland areas of the Ugu DM. Supply will be curtailed to the existing yield of the water resource.

5.1.3. uMtwalume Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 19: Projects Registered under MIG (uMtwalume Water Supply Scheme)

Project	Description	Impact
uMtwalume Water Treatment Works Upgrading and Pipeline to Sezela	A link pipeline between Sezela and Pennington is to be upgraded to 200 mm diameter uPVC, thereby enabling transfer under gravity of an additional 2.0 Ml/day into the Mtwalume system.	Transfer of 2Mll/day to the Mtwalume System from the uMzimkhulu/Bhobhoyi System
Qoloqolo Water Supply	Infrastructure to distribute treated water in the unserviced areas	Backlog alleviation

5.1.4. uMzimkhulu/Bhobhoyi Water Supply Scheme

5.1.4.1. MIG Projects

The following projects are registered under MIG for this scheme:

Table 20: Projects Registered under MIG (uMzimkhulu/Bhobhoyi Water Supply Scheme)

Project	Description	Impact
uMzimkhulu Bulk Water Augmentation Scheme	Upgrade of raw water abstraction (at St Helens Rock), uMzimkhulu/Bhobhoyi WTP, raw water storage and southern mains pipelines	• Increased capacity to abstract, treat and distribute potable water, • As a result, uMzimkhulu WTP will be upgraded from 54Ml/day to 81Ml/day capacity
Msikaba and Surrounds Water Supply	Infrastructure to distribute treated water in the uMzimkhulu/Bhobhoyi System	Backlog alleviation
Gamalakhe Water Supply Scheme	Pipeline to Gamalakhe, enroute coastal strip	Secure the supply to Gamalakhe and increase capacity to supply to areas enroute.
Stick Farm Water Supply	Infrastructure to distribute treated water in the uMzimkhulu/Bhobhoyi System to unserviced areas around Stick Farm	Backlog alleviation

5.1.5. uMtamvuna Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 21: Projects Registered under MIG (uMtamvuna Water Supply Scheme)

Project	Description	Impact
Ezinqoleni Water Supply Scheme	Infrastructure to deliver and reticulate areas in Ezinqoleni	Bulk infrastructure and Backlog alleviation
kwaXolo Water Supply Scheme	Reticulation Infrastructure	Backlog alleviation
uMtamvuna Raw Water Upgrades	Capacity Upgrades of the raw water abstraction from 20Ml/day to 30Ml/day and of the WTP from 20Ml/day to 30Ml/day	Bulk infrastructure upgrade

5.1.6. Harding/Weza Scheme

5.1.6.1. MIG Projects

The following projects are registered under MIG for this scheme:

Table 22: Projects Registered under MIG (Harding/Weza Scheme)

Project	Description	Impact
Harding/Weza Regional Bulk Water Supply	Scope includes: • Weza Dam, of 1.84Mm^3 • Upgrade of Harding/Weza WTP from 3.7Ml/d to 11.8Ml/d	Increase in water resource and hence potential for treated water

5.1.7. kwaMbotho Water Supply Scheme

No projects are registered for this area. However, current planning (Refer to "Harding Weza Regional Water Supply Scheme Pre-Feasibility Study – Water Technical Report" dated September 2013 by RH-DHV) indicates that this scheme will be incorporated into the Harding Weza Scheme. In this case, the kwaMbotho WTP will be decommissioned.

5.1.8. kwaFodo Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 23: Projects Registered under MIG (kwaFodo Water Supply Scheme)

Project	Description	Impact
kwaFodo Water Supply	Distribution infrastructure with source as Harding/Weza Water Supply Scheme	Transfers kwaFodo Water supply demands to Harding/Weza Scheme

Again, current planning (Refer to "Harding Weza Regional Water Supply Scheme Pre-Feasibility Study – Water Technical Report" dated September 2013 by RH-DHV) indicates that this scheme will be incorporated into the Harding Weza Scheme. In this case, the kwaFodo WTP will be decommissioned.

5.1.9. Phungashe/Mhlabatshane Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 24: Projects Registered under MIG (Phungashe/Mhlabatshane Water Supply Scheme)

Project	Description	Impact
kwaDeyi Water Supply	Bulk and reticulation infrastructure to distribute treated water	Backlog alleviation
Mhlabatshane Regional Water Scheme	Bulk and reticulation infrastructure to distribute treated water	Backlog alleviation

5.1.10. Vulamehlo Cross Border Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 25: Projects Registered under MIG (Vulamehlo Cross Border Water Supply Scheme)

Project	Description	Impact
Vulamehlo Cross Border Water Supply Scheme	Proposal for Dam, WTP upgrade, bulk and reticulation infrastructure	Increase capacity of WTP from 1.8Ml/d to 10.2Ml/day following construction of dam on the Upper Mtwalume
uMgayi Water Supply	Infrastructure to distribute treated water in the unserviced areas	Backlog alleviation

The project “Vulamehlo Cross Border Water Supply Scheme” includes for the construction of a dam upstream of the existing abstraction weir. The proposed dam with a capacity of 17.6 Mm^3 will improve the yield of this system to 10.5 Mm^3/annum. The project is to be financed under MIG.

5.1.11. kwaLembe Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 26: Projects Registered under MIG (kwaLembe Water Supply Scheme)

Project	Description	Impact
kwaLembe Water Supply	new 6Ml/d WTP, a weir across the Mkomazi River, upgrades on approximately 23km of existing pipeline, and distribution infrastructure	6Ml/d WTP and Backlog Alleviation

5.1.12. kwaNdelu Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 27: Projects Registered under MIG (kwaNdelu Water Supply Scheme)

Project	Description	Impact
kwaNdelu Water Supply Scheme	Infrastructure to distribute treated water in the unserviced areas	Backlog alleviation
Mabheleni East Water Project	Infrastructure to distribute treated water in the unserviced areas	Backlog alleviation

5.1.13. Vulamehlo Farming Water Supply Scheme

The following projects are registered under MIG for this scheme:

Table 28: Projects Registered under MIG (Vulamehlo Farming Water Supply Scheme)

Project	Description	Impact
Greater Vulamehlo Supply Scheme	Infrastructure emanating from uMzinto WTP and serving the areas of Amandawe, kwaCele and Vulamehlo Farms and alternative supply to Dududu.	Possible Transfer of water from uMzinto Scheme to Vulamehlo Farming (VULFAR) and Vulamehlo (VUL 001)

5.2. DWS Planned Projects

DWS has the following planned projects per WSS.

5.2.1. Umzimkhulu/Bhobhoyi WSS

A feasibility study for “Ncwabeni Off-Channel Storage Dam” exists, Refer to the suite of documents prepared by BKS (Pty) Ltd in July 2012, entitled “Ncwabeni Off-Channel Storage Dam Feasibility Study”. The study proposes the construction of an off channel storage dam on the Lower uMzimkhulu with a capacity of 15.5 Million m^3. This will improve the yield of the catchment to 30 million m^3/annum. The 2011 estimated costs of the project was R660 Million with recommendations that this project be funded either through the Regional Bulk Infrastructure Grant (RBIG) or Umgeni Water, if appointed as the bulk water services provider for the uMzimkhulu WSS.

The 2017 cost estimate of the project was given as R900M.

5.3. Umgeni Water Projects

Umgeni Water has investigated/planned/implemented a number of interventions, impacting on different WSS's in the Ugu DM. These are discussed further.

5.3.1. Middle South Coast WSS's (Umgeni, uMzinto and uMtwalume)

According to the Umgeni Infrastructure Master Plan and following investigations/studies in liaison with Sappi Saiccor, Umgeni Water plans to implement the Lower Mkhomazi Bulk Water Supply Scheme. This will include the construction of Ngwadini OCS Dam impounding raw water from the Mkomaas River and the construction of a 100Ml/day WTP and associated infrastructure resulting in the delivery of treated water to the Quarry Reservoir. This system will be integrated to supply water to the South Coast via the South Coast Pipeline.

The South Coast Pipeline (SCP) has been constructed from the Mgeni System and currently supplies water to the South Coast. The pipeline has been constructed up to the Kelso Reservoir off-take in Scottburgh. It is planned to further extend the South Coast Pipeline from Kelso Reservoir Off-take to the Malangeni Off-take (Umdoni Reservoir) via Phase 2b.

The remainder of the SCP will ultimately be extended from the Malangeni off-take to Hibberdene once the Lower Mkhomazi Bulk Water Supply Scheme (LMBWSS) is in place. The SCP will finally integrate with the uMzimkhulu/ Bhobhoyi WSS in the vicinity of Hibberdene. The integration of the two systems will provide a measure of operational flexibility.

The capacity of the SCP is recorded as 37.5Ml/day. Further phases of the SCP are envisaged, once the Lower Mkhomazi BWSS project is constructed.

The Umgeni Water Infrastructure Master Plan provides an estimated cost of R2.9 billion (2015) for the LMBWSS and R0.21 million (2015) for Phase 2b of the SCP.

5.3.2. Pungashe/Mhlabatshane WSS

Umgeni Water has constructed the Mhlabatshane Dam, capable of supplying 4.4Ml/day to the Mhlabatshane WTP. In addition UW plans to implement the following to meet future demands:

- Construct a raw water abstraction pipeline from the uMzimkhulu River to the Mhlabatshane WTP to augment raw water supply to 8Ml/day,
- Upgrade the Mhlabatshane WTP to a capacity of 8Ml/day.

5.3.3. Southern Regional Schemes (Mhlabatshane, Harding Weza, uMtamvuna, uMzimkhulu)

Umgeni Water commissioned a study, "Reconnaissance Study: Regional Schemes" by Iliso Consulting, March 2006, to undertake a study of potential dam sites for southern regional schemes.

A number of potential dam sites were identified for further investigation and/or development to meet water supply needs. Some of the proposed dam sites arising from the study have been utilised to formulate proposals for interventions in this report.

6. WATER DEMAND MODELLING

This Chapter provides the background for demand modelling, highlighting assumptions made. It culminates with a summary of the outputs of the demand model, as they will be utilised to formulate the reconciliation findings of this study and proposals for concept plans.

6.1. Water Losses and Demand Management

For purposes of this model, because it is required to quantify water demands that need to be satisfied over time, the term "Water Losses" is used to include the following factors:

- Physical losses
- Excessive water use / usage due to:
    - Unmetered connections
    - Inappropriate water tariffs
    - Inefficient invoicing or debt recovery
- Unauthorised water connections

6.2. Water Service Level Migration

In general for WSA's appointed for, three (3) development scenarios are analysed in the modelling process. Each of these scenarios are defined by the change / improvement of the levels of service expected over differing time scales and differentiate between urban and rural areas, defined as per the DWS Infrastructure Reference Database.

The three (3) scenarios can be defined as follows:

Scenario 1: This scenario refers to the targets being aimed for by the Local Water Service Authority (WSA) for each area. In this instance, this was assumed to be the same as Scenario 2

Scenario 2: This is the target scenario as per the KZN Provincial Growth and Development Plan (PGDP). The target as per the KZN PGDP is to provide a minimum of 75ℓ/cap/day to all consumers in KZN by 2030. This has been interpreted as a level of service equivalent to a yard connection. Allowance was made for losses as additional to the

Scenario 3: This is the expected, practical, implementable development scenario as set by Bigen Africa, based on engineering experience and knowledge.

6.3. Water Demand Modelling

Bigen Africa developed a zero-based demand modelling tool that has been used to determine the projected demands over a 20 year period (2015 – 2035) for Ugu District Municipality. The demand model is a Microsoft Excel application in which modelling is performed at Census "Small Area" Level.

The following sub-sections provide an overview of the source data, inputs and structure of the outputs from the model.

6.3.1. Source Data

Boundary Definitions

Census 2011 was used to define the reference numbers, names and associations between small area, sub-places, local municipalities and district municipalities.

Demographics

The Census 2011 data was used as the base data for the following:

- Population
- Households
- Heads per household
- Income level categories
- Existing levels of water supply services

The data provided has some level of accuracy and for purposes of this model it has been assumed that the true figures within a 10% wide band around the data provided in the census. The definition of urban and rural areas used in the model is derived from the classification applied to sub-place areas by DWS National in the DWS Reference Framework Geodatabase.

Growth Rates

Population growth rates were derived by Umgeni Water, utilising algorithms provided by Statistics SA. The data utilised in the model was provided at sub-place level. These growth rates allow for migration into and out of sub-places as well as for births and deaths for the period 2011 to 2045.

The growth rates provided are estimates and a band width of 10% is allowed for the period 2011 – 2015, increasing linearly up to 30% for the period 2030-2035.

6.3.2. Inputs

The key inputs for the UDM demand model included the following:

1) Unit Water Demands
2) Supply Areas
3) Quaternary Catchments
4) Water Loss Targets
5) WTP Losses

6.3.2.1. *Unit Water Demands*

Various categories of unit water demands are used in the model. The basis of these unit demands is as indicated by DWS, Umgeni Water and as set out in UAP Phase 1.

Table 29 indicates the unit domestic demands used in the model.

Table 29: Average Annual Daily Demands

Average Annual Daily Demands								
Category	Description of consumer category	Household Annual Income range		Per capita cons (l/c/d)			Non Seasonal	Seasonal
		From	To	Low	Prob	High	SPF	SPF
1	Very High Income; villas, large detached house, large luxury flats HC	R 1 228 001	R 9 999 999	360	410	460	1.5	2.5
2	Upper middle income: detached houses, large flats HC	R 153 601	R 1 228 000	260	295	330	1.5	2.4
3	Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower HC	R 38 401	R 153 600	200	228	255	1.4	2.3
4	Low middle Income: Small houses or flats with WC, one kitchen, one bathroom HC	R 9 601	R 38 400	140	170	200	1.4	2.2
5	Low income: flatlets, bedsits with kitchen & bathroom, informal household HC	R 1	R 9 600	80	100	120	1.3	2.0
6	No income & informal supplies with Yard connections	R 0	R 0	70	80	90	1.2	1.5
7	Informal with no formal connection RDP LOS	R 0	R 0	40	50	60	1.1	1.1
8	Informal below 25 l/c/d <RDP .	R 0	R 0	5	12	20	1.0	1.0

Further to the description of consumer categories presented in the table above:

- Informal below 25ℓ/c/d = "<RDP" or no formal supply
- Informal with no formal connections = "RDP LoS" or walking distance to water <200m and minimum supply of 25ℓ/c/d
- No income and informal supplies with yard connection = "YC" or water at yard boundary
- House connections = "HC" with sub-categories:
  - Low Income (R 1 to R 9,600): flatlets, bedsits with kitchen and bathroom, informal household
  - Low Middle Income (R 9,601 to R 38,400): small houses or flats with WC, one kitchen, one bathroom
  - Average Middle Income (R 38,401 to R 153,600): 2-3 bedroom houses or flats within 1 or 2 WC, kitchen and one bathroom, shower
  - Upper Middle Income (R 153,601 to R 1,228,000): detached houses, large flats
  - Very High Income (>R 1,228,000): villas, large detached house, large luxury flats

Table 30 indicates the Commercial / Institutional / Industrial (CII) norms.

Table 30: Commercial / Institutional / Industrial Norms

Commercial/Institutional/Industrial Norms					
Ref	Description	Units	Low	Probable	High
A	Comm/Inst/Indust Floor area per HH (Urban)	m2/HH	12.0	20.0	28.0
B	Comm/Inst/Indust Floor area per HH (Rural)	m2/HH	3.0	5.0	7.0
C	Comm/Inst/Indust Water Demand	kl/mnth /100m2	14.0	20.0	25.0
D	Equivalent Comm/Inst/Industrial Water Demand (Urban)	l/HH/d	55.2	131.5	230.1
E	Equivalent Comm/Inst/Industrial Water Demand (Rural)	l/HH/d	13.8	32.9	57.5
F	Comm/Inst/Indust Summer Peak Factor .	f		1.1	

The following is to be noted with regard to the CII inputs above:

- Ratios of Commercial, Institutional and Industrial roof areas to number of households exist for all small areas / settlements
- These ratios will vary according to the formality of the small area / settlement. For the purpose of this model, two (2) categories of formality have been adopted as "Urban" and "Rural"
- Typical ratios have been combined into a single weighted range of ratios for CII water demands expressed as kℓ/households per day for urban and rural settlements
- There exists a large spread for these demands
- Where a small area is mainly industrial of nature, these small areas are specifically defined and the water demands uniquely identified. The water demands for such small areas are populated in the model directly, using actual records where available. For Ugu District Municipality, individual lists of the top 15 Commercial, Institutional and Industrial water users were made available to Bigen Africa. The location of the specific users were identified and their AADD (base date: 2013/14) was input as the probable with variations to the probable calculated for the high and low demands of the respective small areas

The norms utilised list low, probable and high as the range of unit demands. For purposes of this model, the low and high have been adopted as the extreme low and extreme high respectively. These have been equated to the 0.1% and 99.9% probability. Using a normal distribution, the 5% and 95% probabilities have been interpolated and these figures have been used in the model for the low and high unit demands.

6.3.2.2. *Supply Areas*

For the purpose of analysis, WSAs were demarcated into supply areas based on existing regional schemes / infrastructure, planned schemes and then on areas currently being served by local solutions. This provided wall-to-wall coverage of the WSA. All supply areas align with Census Small Area Places.

6.3.2.3. *Water Loss Targets*

Inputs are as described in Section 4.2.

6.3.2.4. *WTP Losses*

Inputs are as described in Section 4.2.

6.3.3. Outputs

The predicted "zero based" water demands as derived through the model are calculated against time as:

- AADD (Average Annual Daily Demand): Average water demands excluding water losses
- GAADD (Gross Average Annual Daily Demand): AADD plus water losses
- SDD (Summer Daily Demand): GAADD x Summer Peak Factor

The predicted populations, AADD, GAADD and SDD are aggregated per:

- Small Area
- Sub-place
- Supply Area
- Local Municipality
- Quaternary Catchment
- Study Area

Annexure C, provides the demand model input sheet and respective outputs in the structure noted above for the two (2) scenarios.

6.4. Reliability of Demand Modelling

The following limitations, constraints and definitions are to be noted with regard to the Census 2011 data used and the range of results produced:

6.4.1. Census Data

Although the Census 2011 data is considered the most reliable source of statistical data regarding demographics, this data should be seen in context when utilised in determining water demands. One should remember that Census data is obtained over a single week in a particular year and this data is not necessarily fully representative of the location where services are utilised throughout the year (e.g. holiday homes, people working in other places and returning home over holidays).

It can also be noted that some data obtained by the census is subjected to deceitful responses by the people being questioned with regard to issues like illegal immigrants and incomes.

The existing levels of service as reported by the census are also not as reliable as one would hope as the reporting is based on the experiences of the consumer according to his/her recent recollection/experience.

6.4.2. Probable Results

The results reported as the probable are the results of adding/multiplying/dividing each of the average/probable input and Census 2011 data values. The results are only as accurate as the combined accuracy of the input values.

Low and high estimates are the result of adding/multiplying/dividing each of the low/high input data values in the modelling process. The methodology used for the modelling can therefore not provide any statistically meaningful measure of the accuracy of the model estimates, except to say that the truth lies somewhere between the low and high estimates as predicated by the model. The only way to determine statistically meaningful and quantifiable predictions would be to utilise statistically defined probability distributions for each of the data inputs. Such modelling can be carried out and it is highly recommended that such techniques be utilised before committing any funding to any project required to be financed.

7. DEMAND MODEL OUTPUTS

The Demand Model has been run for Scenarios 2 and 3 for AADD, GAADD and SDD. The GAADD (Probable) and SDD (Probable) have been used in Chapters 8 and 9 for resources and infrastructure assessments.

7.1. Demand Model Inputs for Ugu DM

The Demand Model Inputs for the Ugu DM are discussed in this section.

7.1.1. Levels of Service

The water supply service levels (as per Census 2011) are summarised in Table 31. The total water supply backlog within the Ugu DM is 34.1% (or 61,213 households) the bulk of which are from uMzumbe LM with 22,243, households, accounting for 36.3% of the backlog. This backlog figure is different to those recorded in the UAP Phase 1 study 16,540 households and the Ugu 2014/2015 IDP review report of 29,828 households with a service below the minimum standards. The latter is likely a misquote as it is only for households with no access but excludes those with Below RDP services. The Census 2011 figure of 61,213 is adopted, in this instance.

Table 31: Service Levels by Households per Local Municipality (Census 2011)

Local Municipality	Total No. of Households	Water Inside Dwelling	Yard Connection	Stand pipe, <200m	Below RDP	No Access
Ezinqoleni	11 473	783	857	4 769	3 401	1 663
Hibiscus Coast	72 176	29 229	7 296	23 103	9 825	2 723
uMdoni	22 869	9 289	2 786	7 278	3 037	479
uMuziwabantu	21 620	2 230	1 754	8 919	5 394	3 323
Umzumbe	35 171	1 782	2 981	8 165	6 122	16 121
Vulamehlo	16 135	902	1 803	4 305	3 607	5 518
Ugu	**179 444**	**44 215**	**17 477**	**56 539**	**31 386**	**29 827**

Based on the above table, the backlogs will comprise households at “No Access” or “Below RDP” levels of service. Thus the backlogs, based on Statistics of 2011 can be summarised as per **Table 32**.

Table 32: Backlogs by Households per Local Municipality (Census 2011)

Local Municipality	Total No. of Households	Below RDP	No Access	Total Backlogs	%age Backlogs	Backlog as % of DM Backlog
Ezinqoleni	11 473	3 401	1 663	5 064	44%	8.4%
Hibiscus Coast	72 176	9 825	2 723	12 548	17%	20.5%
UMdoni	22 869	3 037	479	3 516	15%	5.7%
uMuziwabantu	21 620	5 394	3 323	8 717	40%	14.2%
Umzumbe	35 171	6 122	16 121	22 243	63%	36.3%
Vulamehlo	16 135	3 607	5 518	9 123	57%	14.9%
Ugu	**179 444**	**31 386**	**29 827**	**61 213**	**34%**	**100.0%**

As can be seen from **Table 32**, the greatest backlogs by number of households, is attributed to the Umzumbe Local Municipality constituting about 36.3% of the Ugu District Municipality’s backlog, followed by Hibiscus Coast constituting 20.5% of the district backlog.

Statistics of water connection types within UDM are summarised in the “UDM’s IDP 2014/15 Review” and are summarised in **Table 33**.

Table 33: Water Connection Types (IDP 2014/15)

Service Level	No. of Households
No access	29 827
Communal Standpipe > 1 000m	5 083
Communal Standpipe >500m and < 1 000m	8 822
Communal Standpipe >200m and < 500m	17 482
Communal Standpipe < 200m	56 635
Yard connection	17 478
House connection	44 213
Total	**179 540**

The figures quoted by the UDM differ by a household or two for number of households for all service levels, with the exception of the households for the level “Communal Standpipe < 200m” which differs with the Census 2011 statistics figure quoted of 56 539, resulting in a total number of households for the DM of 179 540. Again, the differences are considered insignificant, thus, Census 2011 statistics will be assumed as correct for the year 2011.

7.1.2. Water Service Level Migration

In general for WSA’s appointed for, three (3) development scenarios are analysed in the modelling process. Each of these scenarios are defined by the change / improvement of the levels of service expected over differing time scales and differentiate between urban and rural areas, defined as per the DWS Infrastructure Reference Database.

In the case of Ugu DM, the DM has adopted the PGDP as a guiding document, thus the Model was run only for Scenarios 2 and 3. Table 34 provides the respective inputs utilised per scenario.

Table 34: Respective Inputs Utilised per Scenario

Scenario 2	Urban			Rural			KZN Prov Growth and Dev Plan(PGDP)
	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.	100%	2015	2025	100%	2015	2025	100% of pop. with RDP LOS is converted to YC LOS by 2025
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	**Urban**			**Rural**			**Realistic Achievable Estimate**
	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	2025	All pop. With <RDP LOS converted to RDP level of service by 2020 in Urban Areas and by 2025 in Rural Areas
Convert from RDP LOS to Yard Conn.	100%	2015	2025	100%	2015	2035	100% of pop. with RDP LOS is converted to YC LOS by 2025 in Urban Areas and by 2035 in Rural Areas
Convert from Yard Conn. to House Conn.	30%	2020	2035	10%	2025	2040	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 2040 for Rural

7.1.3. Water Loss Inputs

The Ugu DM Annual Report of 2013/14 contains some historical municipal performance levels with respect to water supply which are reproduced in **Error! Reference source not found.**. It is however unclear if the unaccounted water loss figures quoted are actually the volume of non-revenue water or may exclude some components such as the unbilled authorised consumption as part of the IWA Standard Water Balance.

Table 35: 2013/14 Annual Report Water Loss Statistics

Year	Industrial Water, m^3	Domestic Water, m^3	Unaccounted Water Losses, m^3	% Losses (Calculated)
2012/2013	1 680 876	33 295 000	9 988 500	22.2%
2013/2014	2 389 452	35 134 492	9 837 657	20.8%

The 2014/15 IDP Review provides for 30% as allowances for water losses for both rural and urban water systems for demand modelling purposes. According to Ugu DM, the level of UAW is currently recorded as being in the range of 26%. A %NRW target of 21% is quoted as part of the basic service delivery key performance indicator and is targeted to be achieved by the end of the 2017 financial year (June 2018). Reports from Ugu DM indicate that for the 22 months period from May 2014 to February 2016, the system NRW (excluding WTP losses) ranged from 23.1% to 33.7% with an average of 28.2%.

The demand modelling with therefore adopt losses in the region of 20%.

7.1.4. Water Treatment Losses

For purposes of this model, a fixed allowance of 10% is made for the water lost during water treatment.

7.1.5. Water Supply Areas

In UDM, supply areas were demarcated as sub-areas of the sixteen (16) major schemes in the area.

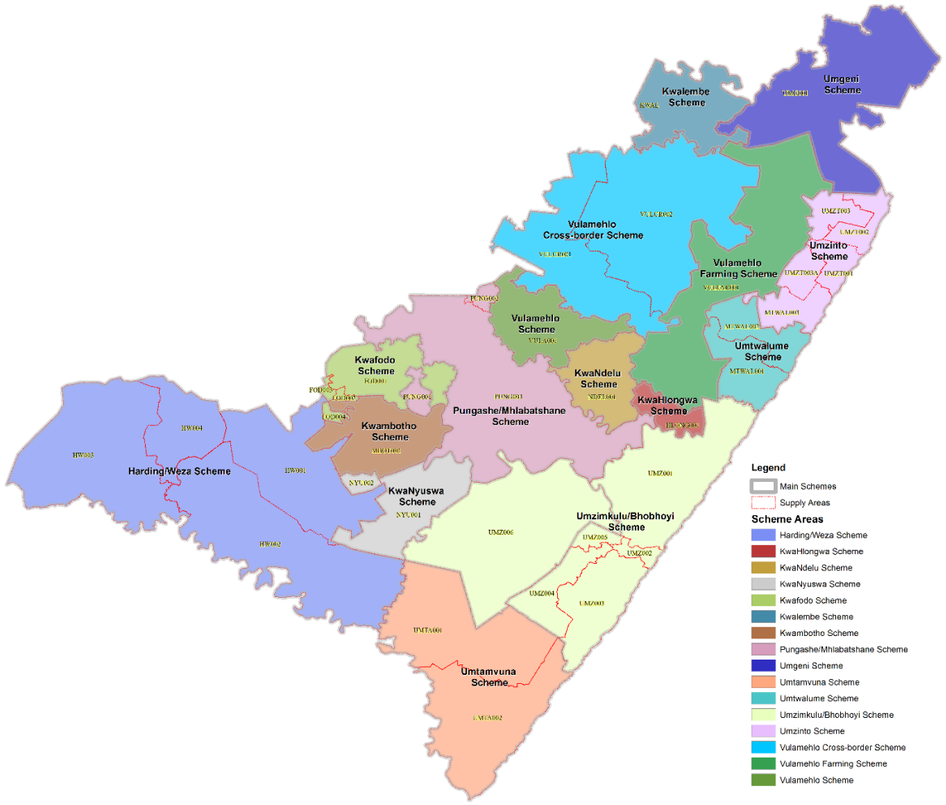

Figure 28: UDM Supply Areas

In the Demand Model utilised on this project, the Schemes have been further re-demarcated into supply areas, conveniently defined to enable the analysis of adequacy of existing infrastructure and the planning, thereof of planned infrastructure. These supply areas are detailed in **Table 36**.Error! Reference source not found.

Table 36: UDM Supply Areas

	Scheme	Supply Area	Local Municipality (LM) to which WSS allocated
1	Umgeni Water	UMG 001	uMdoni LM
2	uMzinto	UMZT 001	
		UMZT 002	
		UMZT 003	
3	uMtwalume	MTWAL 001	
		MTWAL 002	
		MTWAL 003	
4	uMzimkhulu	UMZ 001	Hibiscus Coast LM
		UMZ 002	
		UMZ 003	
		UMZ 004	
		UMZ 005	
		UMZ 006	
5	uMtamvuna	UMTA 001	
		UMTA 002	
6	Harding Weza	HW 001	uMuziwabantu LM
		HW 002	
		HW 003	
		HW 004	
7	kwaMbotho	MBOT 001	
8	kwaFodo	FOD 001	
		FOD 002	
		FOD 003	
		FOD 004	
9	kwaNyuswa	NYU 001	
		NYU 002	
10	Phungashe/Mhlabatshane	PUNG 001	Umzumbe LM
		PUNG 002	
11	KwaNdelu	NDEL 001	
12	kwaHlongwa	HLONG 001	
13	Vulamehlo	VULA 001	Vulamehlo LM
14	Vulamehlo Farming	VULFAR 001	
15	Vulamehlo Cross Border	VULCR 001	
		VUL CR 002	
16	KwaLembe	KWAL	

It is noted that some WSS's serve more than one LM, although allocated to one LM, notably:

- uMtamvuna WSS also serves the Ezinqoleni LM,
- Vulamehlo Cross Border also serves some parts of Umzumbe LM

It is also noted that the Umgeni WSS has been allocated to uMdoni LM, although it geographically falls under the Vulamehlo LM. However, because it benefits from the same bulk infrastructure as Umzinto WSS and uMtwalume WSS, this has been allocated to uMdoni LM.

Existing schemes are detailed in Section 5. Analysis of projected demands per supply area versus existing schemes and planned interventions are detailed in Section 8.

7.1.6. Quaternary Catchments

The GIS database was utilised to determine which quaternary catchments each small area falls into. The quaternary catchments related to UDM's boundaries includes 28 quaternary catchments mapped in **Figure 29**.Error! Reference source not found.

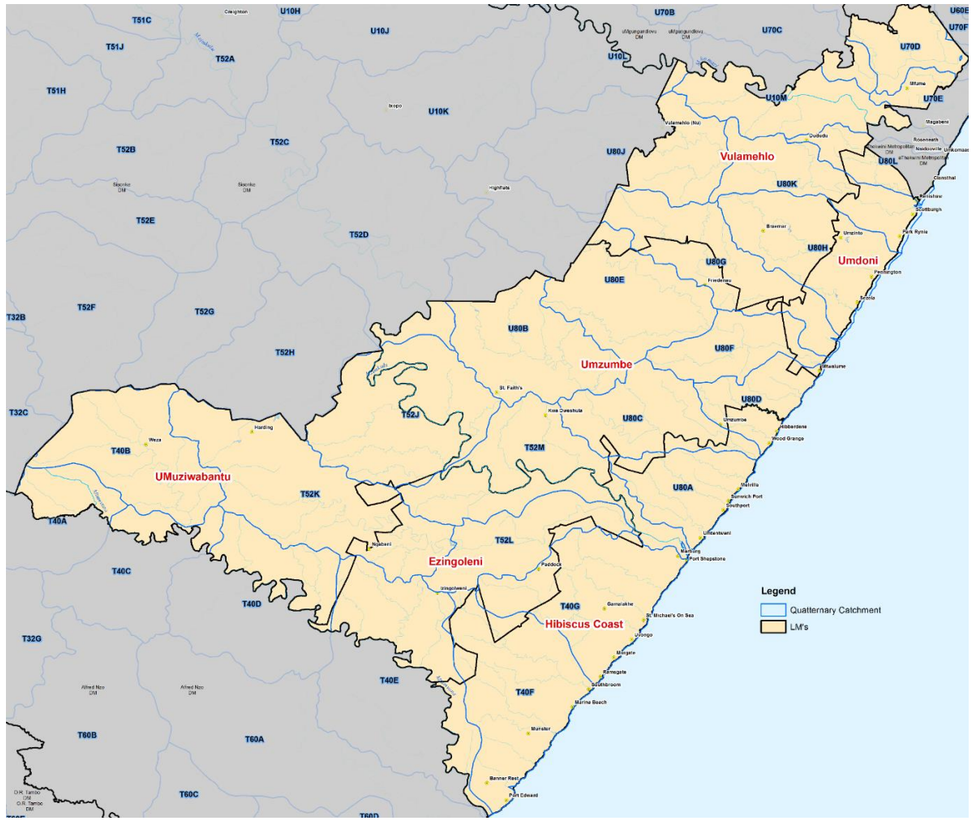

Figure 29: UDM Quaternary Catchments

7.2. Demand Projections

This section discusses the projected demands' output from the model. The GAADD (Probable) for Scenario 3 per LM are extracted from the Model and reproduced in **Table** 37.

Table 37: GAADD per LM (Ml/Day)

Local Municipality	2011 Census			GAADD (Ml/Day)					Overall % Increase 2015 to 2045	Overall Quantity Increase 2015 to 2045
	Total H/holds	RDP LoS	B/log	2011	2015	2025	2035	2045		
Ezingoleni	11 473	4 769	5 064	3.25	3.40	6.12	7.86	8.67	255	5.27
Hibiscus Coast	72 176	23 103	12 548	41.88	43.42	53.12	62.85	69.34	59.7	25.92
uMdoni	22 869	7 278	3 516	13.55	13.98	16.75	19.54	21.58	54.4	7.6
uMuziwabantu	21 620	8 919	8 717	7.02	7.36	12.48	15.75	17.40	236	10.04
Umzumbe	35 171	8 165	22 243	7.79	8.15	18.74	24.12	27.03	332	18.88
Vulamehlo	16 135	4 305	9 123	4.13	4.32	9.00	11.55	12.87	298	8.55
Ugu	**179 444**	**56 539**	**61 213**	**77.6**	**80.6**	**116.2**	**141.7**	**156.9**	**94.6**	**76.3**

As can be seen from the above table, the GAADD is expected to grow by an overall of 94.6% in the DM for the period 2015 to 2045. This will see an increase in water requirements by magnitude of 76.3Ml/day.

The GAADD (Probable) per WSS is presented in **Table 38**. This will be used to determine the adequacy of water resources.

Table 38: GAADD (Probable) Per WSS (Ml/Day)

	Water Supply Scheme	LM under which WSS allocated	GAADD (Ml/day)				
			2011	2015	2025	2035	2045
1	Umgeni Water	uMdoni LM	4.424	4.626	7.950	9.891	10.985
2	uMzinto		10.245	10.538	12.171	14.056	15.520
3	uMtwalume		5.470	5.710	8.508	10.457	11.635
	Sub-Total Umgeni, uMzinto, uMtwalume		20.139	20.874	28.629	34.405	38.140
4	uMzimkhulu	Hibiscus Coast LM	34.598	35.845	41.865	48.602	53.602
5	uMtamvuna		8.807	9.172	14.007	17.694	19.544
6	Harding/Weza	uMuziwabantu LM	6.579	6.894	11.846	14.944	16.499
7	kwaMbotho		0.818	0.858	1.429	1.851	2.051
8	kwaFodo		0.415	0.437	0.737	0.968	1.071
9	kwaNyuswa		0.400	0.421	0.961	1.260	1.391
	Sub-Total Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa		8.213	8.610	14.973	19.023	21.012

	Water Supply Scheme	LM under which WSS allocated	GAADD (Ml/day)				
			2011	2015	2025	2035	2045
10	Phungashe/Mhlabatshane	Umzumbe LM	2.333	2.437	6.458	8.451	9.484
11	KwaNdelu		0376	0.392	1.276	1.685	1.889
12	kwaHlongwa		0.186	0.195	0.578	0.768	
13	Vulamehlo	Vulamehlo LM	0.098	0.103	0.605	0.804	0.907
14	Vulamehlo Farming		0.708	0.738	1.980	2.557	2.864
15	Vulamehlo Cross Border		1.585	1.662	4.433	5.807	6.518
16	KwaLembe		0.577	0.604	1.412	1.866	2.072
	TOTAL		**77.621**	**80 633**	**116 217**	**141.661**	156.894

It is noted that in **Table 38**, a subtotal GAADD has been calculated individually and combined for the following schemes, because plans exist to supply the systems from common sources:

- Umgeni, uMzinto and uMtwalume as these may be served from the proposed Lower Mkhomazi BWSS and the South Coast Pipeline (SCP).
- Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa, as these may in future, be served from the Weza Dam and Weza WTP.

The SDD Projections per WSS are also extracted and presented in **Table 39**.

Table 39: SDD (Probable) Per WSS (Ml/Day)

Local Municipality	2011	SDD (Ml/day)			
		2015	2025	2035	2045
Umgeni Water	5.134	5.368	9.379	12.050	13.427
uMzinto	15.824	16.255	18.818	21.914	24.204
uMtwalume	7.797	8.131	12.059	15.474	17.286
Sub-Total Umgeni, uMzinto and uMtwalume	28.755	29.755	40.256	49.439	54.917
uMzimkhulu	56.201	58.133	66.977	78.059	86.085
uMtamvuna	11.857	12.311	18.554	23.943	26.502
Harding/Weza	7.713	8.079	14.105	18.351	20.305
kwaMbotho	0.898	0.941	1.645	2.224	2.472
kwaFodo	0.453	0.477	0.845	1.161	1.289
kwaNyuswa	0.440	0.462	1.106	1.515	1.678
Sub-Total, Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa	9.504	9.959	17.701	23.251	25.744
Phungashe/Mhlabatshane	2.621	2.739	7.464	10.189	11.471
KwaNdelu	0.412	0.430	1.465	2.023	2.275
Vulamehlo	0.112	0.117	0.695	0.966	1.095
kwaHlongwa	0.203	0.212	0.663	0.922	1.040
Vulamehlo Farming	0.824	0.858	2.308	3.098	3.482
Vulamehlo Cross Border	1.751	1.836	5.103	6.982	7.863
KwaLembe	0.630	0.660	1.621	2.241	2.495
TOTAL	**112.870**	**117.009**	**162.806**	**201.111**	**222.966**

Again, a subtotal SDD has been calculated individually and combined for the following schemes, because plans exist to supply the systems from common sources;

- Umgeni, uMzinto and uMtwalume as these may be served from the proposed Lower Mkhomazi BWSS and SCP,
- Harding Weza, kwaMbotho, kwaFodo and kwaNyuswa, as these may in future, be served from the Weza Dam and Weza WTP.

The projected demands for the different scenarios are discussed in this section, per WSS.

For each WSS, the demands are shown for the 2015, 2025, 2035 and 2045 design horizons. Both a high and probable scenario is given for the AADD, GAADD (AADD plus losses) and SDD (Nett SDD * GAADD/AADD). The high and probable scenarios are as described in Section **6.3.3**.

7.2.1. Umgeni WSS

The Umgeni Water Scheme comprises one (1) supply area as shown on the map included in **Annexure A, Figure A0**. A summary of the water demands for the Umgeni Water areas is shown in **Table 40** below:

Table 40: Summary of Water Demands for the Umgeni Water Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	3.558	3.558	7.145	6.309	8.501	8.107	9.388	9.154
AADD (High)	4.457	4.457	8.399	7.563	10.019	9.563	11.099	10.833
GAADD (Probable)	4.626	4.626	9.003	7.950	10.371	9.891	11.266	10.985
GAADD (High)	5.794	5.794	10.582	9.530	12.223	11.667	13319	13.000
SDD (Probable)	5.368	5.368	10.915	9.379	12.738	12.050	13.836	13.427
SDD (High)	6.691	6.691	12.786	11.211	14.957	14.162	16.291	15.827

This water scheme is served by the Umgeni Water, South Coast Pipeline which is currently providing the UDM approximately 2Ml/day. Future projections, based on the project demand model indicates a 2045 daily SDD (Probable) of 13.4 Ml/day.

It is assumed that further requirements can be supplied from the Umgeni Water SCP. Thus, it will be required that Umgeni Water confirm its ability to provide future supplies as per requirements.

7.2.2. uMzinto Scheme

The uMzinto Scheme has been divided into four (4) supply areas as shown on the map included in **Annexure A, Figure A0.** A summary of the water demands for the uMzinto supply areas is shown in **Table 41** below:

Table 41: Summary of Water Demands for the uMzinto Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	8.106	8.106	10.328	10.024	11.789	11.663	13.008	12.933
AADD (High)	10.183	10.183	12.751	12.447	14.596	14.448	16.219	16.132
GAADD (Probable)	10.538	10.538	12.554	12.171	14.210	14.056	15.610	15.520
GAADD (High)	13.238	13.238	15.492	15.109	17.591	17.411	19.462	19.359
SDD (Probable)	16.255	16.255	19.386	18.818	22.142	21.914	24.337	24.204
SDD (High)	19.845	19.845	23.354	22.771	26.725	26.460	29.525	29.372

It was established that the yields of the available raw water sources total 3.2 Mm^3/annum (Umgeni Water Infrastructure Master Plan). This translates to 8.9Mℓ/day. The existing WTP is reported to be operating at capacity of 12Ml/day. This indicates that the source could be insufficient to meet the current and 2035 demands, depending on the demand scenario.

It is the intention of Ugu DM to reduce some of the demand for the uMzinto WTP source arising from the coastal strip areas of Scottburgh, Park Rynie, by augmenting supply to this WSS with supplies from the Umgeni Water SCP and LMBWSS, to meet 2035 and future demands for the scheme.

7.2.3. uMtwalume Scheme

The uMtwalume Scheme has been demarcated into three (3) supply area as shown on the map included in **Annexure A, Figure A0**. A summary of the water demand for the uMtwalume supply area is shown in **Table 42** below:

Table 42: Summary of Water Demands for the uMtwalume Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	4.392	4.392	7.584	6793	8.960	8.587	9.925	9.695
AADD (High)	5.510	5510	9.013	8.222	10.676	10.450	11.871	11.611
GAADD (Probable)	5.710	5.710	9.505	8.508	10.912	10.457	11.910	6.635
GAADD (High)	7.163	7.163	11.291	10.295	12.999	12.474	14.245	13.933
SDD (Probable)	8.132	8.131	13.936	12.059	16.311	15.474	17.797	17.286
SDD (High)	10.005	10.005	16.372	14.414	19.199	18.236	21.010	20.432

The raw water source for this scheme is uMtwalume River. According to the Umgeni Water Master Plan the uMtwalume River has a 1:50 year Stochastic Yield of 1.2Mm^3/annum (3.5Ml/day). The uMtwalume WTP which sources its water from the uMtwalume River has a capacity of 7.5Ml/day and operates above the capacity.

The demands of the scheme are estimated to vary from 4.4Ml/day to 10Ml/day (presently) to between 8.6Ml/day and 19.2 Ml/day in year 2035. Based on the above, it is evident that the scheme would benefit from a combination of the following interventions:

- Augmentation of raw water supply (coupled with upgrade of the WTP). This will require identification of alternative raw water sources.
- Augmentation of treated water from other sources. Again, it is envisaged that the extended SCP could be an alternative source of treated water,
- Relief in demands by "shedding off" some scheme areas to other water supply schemes.

Based on the 2035 projected demands, the scheme, as presently defined, will be in a deficit of 1.9 Mm^3/annum to 5.7 Mm^3/annum. In this case, it is assumed that the additional treated water will be supplied via future phases of the SCP and the LMBWSS.

7.2.4. uMzimkhulu Scheme

The uMzimkhulu Scheme has been divided into six (6) supply areas as shown on the map included in **Annexure A, Figure A0**.

A summary of the water demands for the uMzimkhulu supply areas is shown in **Table 43** below:

Table 43: Summary of Water Demands for the uMzimkhulu Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	27.573	27.573	35.580	34.387	40.859	40.290	45.002	44.669
AADD (High)	34.384	34.384	43.700	42.508	50.358	49.699	55.805	55.427
GAADD (Probable)	35.845	35.845	43.368	41.865	49.297	48.602	54.002	53.602
GAADD (High)	44.699	44.699	53.239	51.736	60.746	59.942	66.966	66.513
SDD (Probable)	58.133	58.133	69.260	66.977	79.089	78.059	86.681	86.085
SDD (High)	70.325	70.325	82.933	80.584	94.944	93.754	104.512	103.841

The uMzimkhulu/Bhobhoyi WTP is served by a river run-off abstraction on the uMzimkhulu River. The uMzimkhulu River is estimated to have a yield of 18.3Mm^3/annum or 50.1Ml/day, (as per Feasibility Study Reports for the Ncwabeni Dam).

A feasibility study for an off-channel storage dam, the Ncwabeni Dam, has been completed. Based on a storage of 16 Mm^3, the dam will increase the estimated yield of the system to 30 Mm^3/annum (or 82Ml/day).

Following construction of the Dam, the system will meet the 2035 SDD, and slightly short for the 2045 SDD.

7.2.5. uMtamvuna Scheme

The uMtamvuna Scheme has been divided into two (2) supply areas as shown on the map included in **Annexure A as Figure A0**. A summary of the water demands for the uMtamvuna supply areas is shown in **Table 44** below:

Table 44: Summary of Water Demands for the uMtamvuna Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	7.056	7.056	12.839	11.227	15.209	14.547	16.723	16.287
AADD (High)	9.095	9.095	15.388	13.776	18.284	17517	20.195	19.698
GAADD (Probable)	9.172	9.172	16.039	14.007	18.501	17.694	20.068	19.544
GAADD (High)	11.824	11.824	19.211	17.179	22.238	21.302	24.234	23.638
SDD (Probable)	12.311	12.311	21.515	18.554	25.109	23.943	27.265	26.504
SDD (High)	15.518	15.518	25.512	22.475	29.855	28.507	32.541	31.674

The raw water source for this scheme is a run-of river abstraction from the uMtamvuna River.

No yields have been made available for this system. However, the uMtamvuna WTP is currently sized at 20Ml/day (7.2Mm^3/annum). It is reported that the uMtamvuna system has a surplus of 5Mm^3/annum. It is thus estimated that the yield of this system would be in the order of 12Mm^3/annum (32Ml/day).

The probable future demand (2035) is calculated at between 15.2Ml/day to 30Ml/day. The surplus in supply is in the order up to 17Ml/day.

7.2.6. Harding Weza Scheme

The Harding Weza Scheme has been divided into four supply areas as shown on the map included in **Annexure A, as Figure A0**. The current planning is to include the smaller scheme of kwaMbotho, kwaFodo and kwaNyuswa to be supplied from the Harding/Weza Scheme. The water demand assessment done on the scheme, however, is limited to the Harding/Weza Scheme as defined in this project, subject to adequacy if raw water source.

A summary of the water demands for the Harding Weza supply areas is shown in **Table 45** below:

Table 45: Summary of Water Demands for the Harding Weza Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	5.303	5.303	10.933	9.507	12.852	12.291	14.145	13.749
AADD (High)	6.955	6.955	13.076	11.650	15.421	14.770	17.045	16.596
GAADD (Probable)	6.894	6.894	13.643	11.846	15.628	14.944	16.974	16.499
GAADD (High)	9.041	9.041	16.308	14.511	18.749	17.955	20.454	19.915
SDD (Probable)	8.079	8.079	16.671	14.105	19.327	18.351	20.990	20.305
SDD (High)	10.493	10.493	19.818	17.190	23.047	21.919	25.121	24.353

The two (2) raw water sources for the scheme are as follows:

- Harding Dam with a yield of 0.6Mm^3/annum (1.6Ml/day),
- Weza River, it being noted that no details of yields were available. The "Harding Weza Regional Bulk Water Supply, planning Report for Weza Dam", dated 25 June 2010, indicates that during the dry season, the Weza River can sustain a consistent supply of 3.7Ml/day. Based on this, the yield of the Weza River has been assumed to be in the order of 1.3Mm^3/annum.

The planning report for Weza Dam also indicates that the yield of the source can be augmented through the construction of the proposed Weza Dam to 4.3Mm^3/annum (11.8Ml/day).

The 2045 SDD (Probable) is calculated at 20Ml/day.

7.2.7. KwaNyuswa Scheme

The KwaNyuswa Scheme area is as shown on the map included in **Annexure A, Figure A0**. A summary of the water demands for the KwaNyuswa supply areas is shown in **Table 46** below:

Table 46: Summary of Water Demands for the KwaNyuswa Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.324	0.324	0.917	0.763	1.096	1.033	1.204	1.160
AADD (High)	0.436	0.436	1.081	0.927	1.297	1.234	1.429	1.379
GAADD (Probable)	0.421	0.421	1.155	0.961	1.338	1.260	1.444	1.391
GAADD (High)	0.567	0.567	1.362	1.168	1.583	1.493	1.715	1655
SDD (Probable)	0.462	0.462	1.383	1.106	1.625	1.515	1.754	1.678
SDD (High)	0.622	0.622	1.625	1.341	1.915	1.789	2.074	1.988

The capacity of the WTP is 3 Ml/day. The probable future SDD (2035) is calculated to be 1.515Ml/day.

7.2.8. Phungashe/Mhlabatshane Scheme

The Phungashe/Mhlabatshane Scheme has been divided into two (2) supply areas as shown on the map included in **Annexure A as Figure A0**. A summary of the water demands for the Phungashe supply areas is shown in **Table 47** below:

Table 47: Summary of Water Demands for the Phungashe Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	1.875	1.875	6.094	5.125	7.282	6.927	8.123	7.903
AADD (High)	2.504	2.504	7.187	6.219	8.618	8.200	9.651	9.395
GAADD (Probable)	2.437	2.437	7.678	6.458	8.884	8.451	9.748	9.484
GAADD (High)	3.255	3.255	9.056	7.835	10.514	10.004	11.581	11.275
SDD (Probable)	2.739	2.739	9.206	7.464	10.799	10.189	11.846	11.471
SDD (High)	3.644	3.644	10.819	9.035	12.730	12.015	14.013	13.579

The Phungashe/Mhlabatshane Scheme is supplied from the Mhlabatshane Dam which is reported to have a yield of 1.6 Mm^3/annum (4.4 Ml/day).

The probable SDD (2035) is calculated to be 10.2Ml/day. The scheme, as envisaged will have a deficit in supply of 6Ml/day. This deficit is to be addressed by:

- The construction of the raw water pipeline abstracting raw water directly from the uMzimkhulu River to the WTP.

The current planning of Umgeni Water can be reviewed to provide for the 2035/2045 SDD.

7.2.9. KwaNdelu Scheme

The KwaNdelu Scheme is depicted on a map included in **Annexure A, Figure A0**. A summary of the water demands for the KwaNdelu supply areas is shown in **Table 48** below:

Table 48: Summary of Water Demands for the KwaNdelu Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.302	0.302	1.219	1.013	1.454	1.381	1.623	1.574
AADD (High)	0.426	0.426	1.444	1.238	1.731	1.644	1.940	1.883
GAADD (Probable)	0.392	0.392	1.535	1.276	1.774	1.685	1.948	1.889
GAADD (High)	0.554	0.554	1.820	1.560	2.112	2.006	2.328	2.59
SDD (Probable)	0.430	0.430	1.834	1.465	2.150	2.823	2.359	2.275
SDD (High)	0.607	0.607	2.166	1.787	2.547	2.398	2.806	2.709

The kwaNdelu Scheme is supplied with run-of river abstraction from the Mzumbe River. No details of assured yields are available. However, it is estimated that the yield of the Mzumbe River at the point of abstraction would be in the order of 1.7Mm3/annum (4.8Ml/day). The probable future SDD (2035) is calculated to be 2.4Ml/day. Thus, the source of raw water is sufficient to meet the required demands.

7.2.10. Vulamehlo Scheme

The Vulamehlo Scheme comprises one supply area as shown on the map included in **Annexure A, Figure A0**. A summary of the water demands for the Vulamehlo supply areas is shown in **Table 49** below:

Table 49: Summary of Water Demands for the Vulamehlo Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.079	0.079	0.578	0.480	0.692	0.659	0.777	0.756
AADD (High)	0.122	0.122	0.682	0.585	0.821	0.781	0.926	0.902
GAADD (Probable)	0.103	0.103	0.728	0.605	0.844	0.804	0.933	0.907
GAADD (High)	0.158	0.158	0.860	0.738	1.002	0.953	1.112	1.082
SDD (Probable)	0.117	0.117	0.870	0.695	1.023	0.966	1.131	1.95
SDD (High)	0.179	0.179	1.024	0.845	1.210	1.142	1.342	1.299

The scheme area is currently supplied from informal source(s). Thus a source needs to be identified for this area.

7.2.11. KwaHlongwa Scheme

The KwaHlongwa Scheme consists one supply area as shown on the map included in **Annexure A, Figure A0**. A summary of the water demands for the KwaHlongwa supply areas is shown in **Table 50** below:

Table 50: Summary of Water Demands for the KwaHlongwa Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.150	0.150	0.558	0.459	0.666	0.629	0.745	0.719
AADD (High)	0.209	0.209	0.656	0.558	0.788	0.744	0.884	0.854
GAADD (Probable)	0.195	0.195	0.702	0.578	0.813	0.768	0.863	0.863
GAADD (High)	0.271	0.271	0.827	0.703	0.961	0.908	0.894	1.025
SDD (Probable)	0.212	0.212	0.840	0.663	0.986	0.922	1.084	1.040
SDD (High)	0.295	0.295	0.985	0.804	1.161	1.086	1.281	1.230

The kwaHlongwa Scheme is supplied from a run-of river abstraction on the kwaMalukaka River. No firm yields have been made available for the river. The 2035 SDD (Probable) is calculated to be up to 1.0Ml/day.

7.2.12. Vulamehlo Farming Scheme

The Vulamehlo Farming Scheme comprises one (1) supply areas as shown on the map included in **Annexure A, Figure A0**. A summary of the water demands for the Vulamehlo Farming supply areas is shown in **Table 51** below:

Table 51: Summary of Water Demands for the Vulamehlo Farming Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.568	0.568	1.833	1.572	2.190	2.096	2.441	2.387
AADD (High)	0.741	0.741	2.159	1.898	2.589	2.477	2.896	2.832
GAADD (Probable)	0.738	0.738	2.310	1.980	2.671	2.557	2.929	2.864
GAADD (High)	0.963	0.963	2.721	2.391	3.158	3.022	3.476	3.399
SDD (Probable)	0.858	0.858	2.782	2.308	3.261	3.098	3.576	3.482
SDD (High)	1.113	1.113	3.265	2.779	3.841	3.648	4.224	4.115

This scheme has no formal supply. It is envisaged that the scheme will be supplied from stand-alone schemes as it covers mainly farming settlements.

7.2.13. Vulamehlo Cross Border Scheme

The Vulamehlo Cross Border Scheme has been divided into two (2) supply areas as shown on the map included in **Annexure A as Figure A0**. A summary of the water demands for the Vulamehlo Cross Border supply areas is shown in **Table 52** below:

Table 52: Summary of Water Demands for the Vulamehlo Cross Border Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	1.278	1.278	4.224	3.518	5.029	4.759	5.617	5.432
AADD (High)	1.751	1.751	4.987	4.282	5.961	5.647	6.686	6.473
GAADD (Probable)	1.662	1.662	5.322	4.433	6.135	5.807	6.741	6.513
GAADD (High)	2.276	2.276	6.284	5.395	7.273	6.889	8.023	7.768
SDD (Probable)	1.836	1.836	6.372	5.103	7.449	6.982	8.183	7.863
SDD (High)	2.508	2.508	7.496	6.196	8.794	8.251	9.637	9.330

The Vulamehlo Cross Border Scheme supplies areas of the UDM and the Harry Gwala DM. Raw water abstracted from a weir on the Upper uMtwalume River is treated at the Vulamehlo WTP.

The yield of the uMtwalume River at the abstraction point is estimated to be 0.6 Mm^3/annum (1.6Ml/day). A prefeasibility study for a dam, Vulamehlo Dam on uMtwalume River is currently in progress, with the Environmental process at final stages of a "Record of Decision, RoD". This dam will increase the yield of the system to 3.7 Mm^3/day (10.2Ml/day). The project for the dam and associated infrastructure has been registered with MIG.

7.2.14. KwaLembe Scheme

The KwaLembe Scheme comprises one (1) supply area as shown on the map included in **Annexure A as Figure A0**. A summary of the water demands for the KwaLembe supply areas is shown in **Table** 53 below:

Table 53: Summary of Water Demands for the KwaLembe Supply Areas (Ml/d)

Demands (Mℓ/day)	2015		2025		2035		2045	
	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3	Scenario 2	Scenario 3
AADD (Probable)	0.465	0.465	1.358	1.121	1.619	1.530	1.788	1.726
AADD (High)	0.630	0.630	1.602	1.365	1.917	1.813	2.125	2.054
GAADD (Probable)	0.604	0.604	1.712	1.412	1.975	1.866	2.146	2.072
GAADD (High)	0.820	0.820	2.019	1.719	2.339	2.212	2.550	2.465
SDD (Probable)	0.66	0.66	2.047	1.621	2.395	2.241	2.602	2.495
SDD (High)	0.894	0.894	2.406	1.969	2.825	2.646	3.079	2.957

The scheme is supplied from a run-of river abstraction on the Mkhomazi River. The yield of the Mkhomazi River at abstraction is estimated at 16.85Mm^3/annum (46Ml/day).

The current and estimated demands for the scheme is estimated to be between 0.47Ml/day to 2.8Ml/day.

Thus this system could have surplus of about 43Ml/day.

7.3. Synopsis of Demand vs Resources for WSS's

An analysis of water schemes (for demand) undertaken in this chapter together with the findings of the details of existing infrastructure as discussed in **Chapter 4** indicates that there are compelling reasons to develop new water resources to ensure adequate water services at the right level of assurance within the district. The following findings are specific:

- Four supply schemes could be abstracting, treating and distributing more water than the firm yield of the river/dam systems, including the following:
  - uMzinto
  - uMzimkhulu
  - Mhlabatshane
  - Vulamehlo Cross Border

These systems could benefit from raw/treated water augmentation or relief in supply areas.

- Five WSS's require immediate raw/treated water augmentation, as follows:
  - uMzinto
  - uMtwalume
  - uMzimkhulu
  - Vulamehlo Cross Border
  - Harding Weza

- Four supply scheme systems show allowable yields greater that current utilisation, namely:
  - uMtamvuna
  - Ndelu
  - kwaLembe
  - Umgeni Water SCP

These systems could be exploited to relieve other strained systems.

The Ugu DM (or other agents) need to invest in further investigations into potential raw/treated water sources.

7.4. Scheme Re-Demarcation

The Schemes have been re-defined to match existing raw water sources and align with current planning, as follows:

- uMzinto Scheme has been earmarked for relief off some coastal demands and extended inland. The scheme deficits will then be met by supplies from the SCP and Lower Mkomazi BWSS
- For the Harding Weza Scheme,
  - The demands of kwaMbotho, kwaFodo and kwaNyuswa WSS's have been incorporated into Harding Weza.
- uMtwalume Scheme has been assumed to obtain relief from further phases of the Umgeni Water SCP and Lower uMkhomazi BWSS. It is assumed that the uMtwalume WTP will be decommissioned in future and all demands will be met from the SCP and Lower Mkhomazi BWSS.

Other supply schemes remain as defined in Error! Reference source not found. **on page** Error! Bookmark not defined..

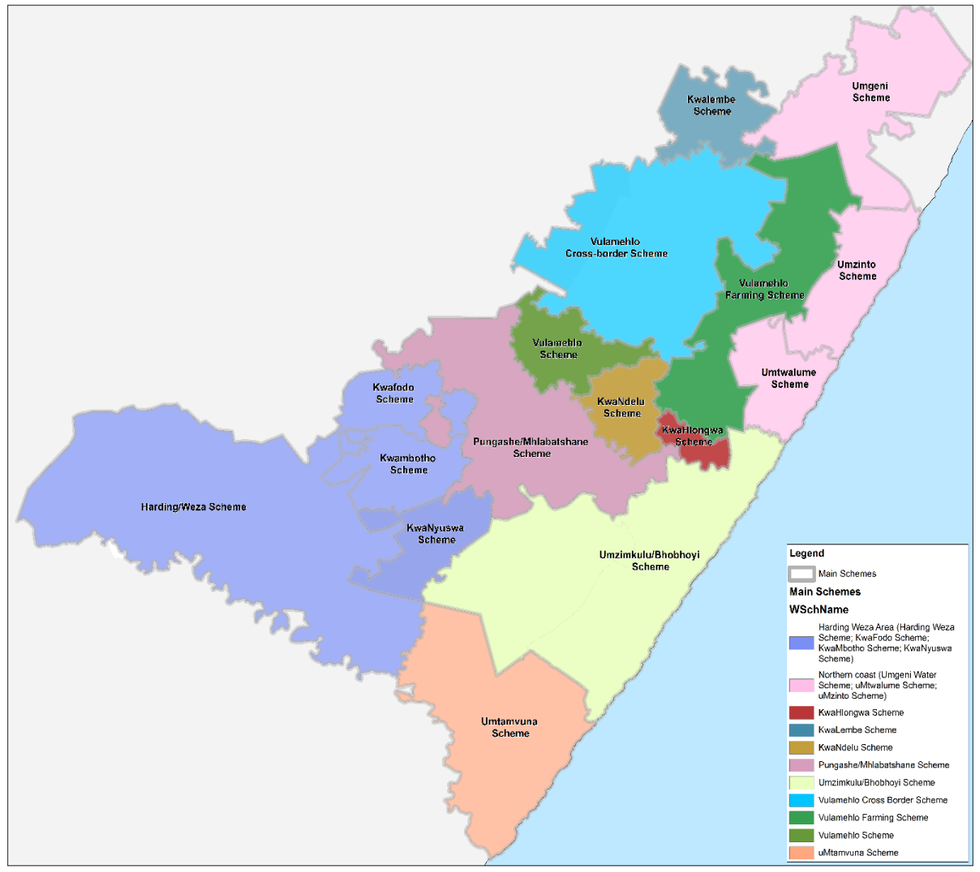

Figure 30: Re-Demarcated Schemes – Ugu DM

8. WATER RESOURCE INTERVENTIONS

The objective of this section of the report is to summarise the findings of the water resources and infrastructure assessments and the demand model outputs, culminating in proposals for interventions at two levels, namely, Water Resources and WSS infrastructure. This Chapter deals with interventions for Raw Water Resources and/or bulk water supplies from other parties other than the WSA (UDM).

8.1. Demand Model Outputs

The Demand Model has been run for a number of scenarios as described in section 6 of this report. For each scenario, demands are projected for AADD (Probable), AADD (High), GAADD (Probable), SDD (Probable) and SDD (High).

For the purposes of analyses of current the outputs from the Model will be utilised as follows:

- Scenario 3, the scenario considered more realistic will be utilised
- The GAADD (Probable) Demands will be utilised to determine the adequacy of the water resources, based on annual requirements,
- The SDD (probable) for Scenario 3 will utilised to do preliminary sizing of infrastructure, of infrastructure including raw water storage (Dams) and abstraction, water treatment works, bulk pipelines and clear water storage requirement.

At prefeasibility, feasibility, preliminary design and detailed design stages, these assumptions will be refined in line with design strategies/considerations taken at the stages. The outputs of the Model are further discussed in this section.

8.1.1. Population Projections

The population projections, per LM, as per Demand Model for the GAADD for Scenario 3 are reproduced in **Table 54**.

Table 54: Projected Population per LM

Local Municipality	2011 (Census)	Population				Overall % Growth 2015 to 2045	Equivalent Annual Growth (%)
		2015	2025	2035	2045		
Ezingoleni	52 540	55 146	62 463	68 810	77 104	39.8	0.97
Hibiscus Coast	256 135	267 075	306 134	341 613	382 923	43,3	0.97
Umdoni	78 875	81 927	93 289	103 854	116 820	42.6	0.97
UMuziwabantu	96 556	101 585	114 727	125 932	141 392	39.1	0.97
Umzumbe	160 975	168 588	191 379	211 485	241 248	43.1	0.97
Vulamehlo	77 403	81 090	91 991	101 757	115 271	42.1	0.97
Ugu	**722 484**	**755 410-**	**859 984**	**953 451**	**1 074 759**	**42.3**	**0.97**

The population of the district is expected to increase by about 42.3% over the 30 year period from 2015 to 2045 or at an average 1.0% per annum. This growth rate is consistent on all the LM's.

The projected number of households could also be extracted from the Model. These are presented in **Table 55**.

Table 55: Projected No. of Households Per LM

Local Municipality	2011 (Census)	No. of Households			
		2015	2025	2035	2045
Ezinqoleni	11 473	13 650	15 461	17 032	19 085
Hibiscus Coast	72 176	66 108	75 776	84 558	94 783
Umdoni	22 869	20 279	23 091	25 706	28 916
uMuziwabantu	21 620	25 145	28 398	31 171	34 998
uMzumbe	31 171	41 730	47 371	52 348	59 715
Vulamehlo	16 135	20 072	22 770	25 187	28 532
Ugu	**179 444**	**186 983**	**212 867**	**236 003**	**266 029**

The Ugu DM is expected to grow in number of households by 42% between 2015 and 2035.

The population is also projected per WSS and or WSS Areas. This is illustrated in **Table 56**.

Table 56: Projected Population per WSS

Water Supply Scheme	2011 (Census)	GAADD Population				Overall % Growth 20150 to 2045	Equivalent Annual Growth (%)
		2015	2025	2035	2045		
Umgeni Water	63 329	66 314	75 194	83 204	93 851	41.6	0.97
uMzinto	50 397	52 140	59 360	66 122	74 400	42.7	0.97
uMtwalume	61 118	64 002	72 757	80 545	91 199	42.5	0.97
uMzimkhulu	173 722	180 817	207 887	232 906	261 219	44.5	0.97
uMtamvuna	104 568	109 534	124 619	137 770	154 320	40.9	0.97
Harding/Weza	90 992	95 685	108 065	118 718	133 222	39.2	0.97
kwaMbotho	12 927	13 597	15 386	16 831	18 923	39.2	0.97
kwaFodo	6 819	7 195	8 132	8 904	10 006	46.7	0.97
kwaNyuswa	8 633	9 076	10 308	11 383	12 742	40.8	0.97
Phungashe/Mhlabatshane	57 650	60 371	68 523	75 694	86 389	43.1	0.97
KwaNdelu	11 554	12 067	13 751	15 240	17 397	44.2	0.97
Vulamehlo	5 506	5 756	6 548	7 269	8 368	45.4	0.97
kwaHlongwa	5 385	5 633	6 386	7 058	8 079	50.0	0.97
Vulamehlo Farming	16 878	17 664	20 101	22 332	25 486	44.2	0.97
Vulamehlo Cross Border	39 939	41 911	47 517	52 424	59 929	43.0	0.97
KwaLembe	13 025	13 649	15 452	17 048	19 229	40.9	0.97

Total	**722 442**	**755 410**	**859 984**	**953 451**	**1 074 759**	**42.2**	**0.97**

(8.55Ml/day).

The total figure of 722 442 (as extracted from the model) differs with the Census figure of 722 484 by 42 persons which is equivalent to an average of under 3 persons per WSS. This difference can be ignored as it will have no significance to the outcomes of this study.

8.1.2. Water Demands Per LM

The GAADD (in Ml/day) as obtained from the Model for years 2011, 2015, 2025, 2035 and 2045 are presented in **Table 57**.

Table 57: GAADD per LM (Ml/Day)

Local Municipality	2011 Census			GAADD (Ml/Day)					Overall % Increase 2015 to 2045	Overall Quantity Increase 2015 to 2045
	Total H/holds	RDP LoS	B/log	2011	2015	2025	2035	2045		
Ezingoleni	11 473	4 769	5 064	3.25	3.40	6.12	7.86	8.67	255	5.27
Hibiscus Coast	72 176	23 103	12 548	41.88	43.42	53.12	62.85	69.34	59.7	25.92
uMdoni	22 869	7 278	3 516	13.55	13.98	16.75	19.54	21.58	54.4	7.6
uMuziwabantu	21 620	8 919	8 717	7.02	7.36	12.48	15.75	17.40	236	10.04
Umzumbe	35 171	8 165	22 243	7.79	8.15	18.74	24.12	27.03	332	18.88
Vulamehlo	16 135	4 305	9 123	4.13	4.32	9.00	11.55	12.87	298	8.55
Ugu	**179 444**	**56 539**	**61 213**	**77.6**	**80.6**	**116.2**	**141.7**	**156.9**	**94.6**	**76.3**

The overall demand increase over the 30 year period (2015 to 2045) for the District is 94.6%. The percentage increase per LM in order of the highest is attributable to the following:

- The highest percentage increases are attributable to backlog alleviation, population growth and migration of service from low to high over the period, for the following municipalities:
  - uMzumbe LM at 332%
  - Vulamehlo LM at 298%
  - Ezinqoleni LM at 255%
  - uMuziwabantu LM at 236%

- The lower percentage increases are attributable mainly to population growth over the 30 year period for the following municipalities:
  - Hibiscus Coast LM at 59.7%
  - uMdoni LM at 54.4%

With respect to magnitude of the GAADD, the significant increases are for Hibiscus Coast LM (25.92Ml/d), uMzumbe LM (18.88 Ml/day) uMuziwabantu LM (10.04 Ml/day) and Vulamehlo LM

The GAADD per LM (in Mm^3/annum) is given in **Table 58**.

Table 58: Water Requirement per LM (Mm^3/annum)

Local Municipality	2011 Census		GAADD (Mm^3/annum)					Overall % Increase 2015 to 2045	Overall Quantity Increase 2015 to 2045
	Total Households	Backlog	2011	2015	2025	2035	2045		
Ezingoleni	11 472	5 064	1.19	1.24	2.24	2.88	3.17	255	1.98
Hibiscus Coast	72 175	12 548	15.32	15.89	19.44	23.00	25.38	59.7	9.49
Umdoni	22 869	3 516	4.96	5.12	6.13	7.15	7.90	54.4	2.94
UMuziwabantu	21 619	8 717	2.56	2.69	4.57	5.76	6.37	236	3.81
Umzumbe	35 171	22 243	2.85	2.98	6.85	8.82	9.89	332	6.91
Vulamehlo	77 403	9 125	1.51	1.58	3.29	4.22	4.71	298	3.13
Ugu	**179 440**	**61 213**	**28.40**	**29.50**	**42.5**	**51.86**	**57.42**	**94.6%**	**28.02**

8.1.3. Water Demands Per WSS or WSS Area

The Water Demands as obtained from the Model for years 2015, 2025, 2035 and 2045 are presented in **Table 59** (Mm^3/annum) and **Table 60** (kl/day). In addition, yields of current resources, where available, are also indicated. Water requirements against a constrained supply are highlighted.

Table 59: GAADD Per WSS Area (Mm^3/annum)

	Water Supply Scheme		GAADD (Mm^3/annum)				Annual Water Resource Availability (Mm^3/annum)
		2011	2015	2025	2035	2045	
1	Umgeni Water	1.62	1.69	2.90	3.62	4.02	SCP-13.73
2	uMzinto	3.74	3.86	4.45	5.14	5.68	3.2
3	uMtwalume	2.00	2.08	3.11	3.83	4.26	1.2
	Sub-Total Umgeni, uMzinto and uMtwalume	7.36	7.63	10.46	12.59	13.96	18.13
4	uMzimkhulu	12.66	13.12	15.32	17.79	19.62	18.3 31.0*
5	uMtamvuna	3.22	3.36	5.12	6.48	7.15	12.0
6	Harding/Weza	2.41	2.52	4.33	5.46	6.04	2.0 4.9+
7	kwaMbotho	0.30	0.31	0.52	0.68	0.75	NA
8	kwaFodo	0.15	0.16	0.27	0.35	0.39	NA
9	kwaNyuswa	0.15	0.15	0.35	0.46	0.51	NA
	Sub-Total Harding/Weza, kwaMbotho, kwaFodo and kwaNyuswa	3.01	3.14	5.47	6.95	7.69	2.0 4.9+
10	Phungashe/Mhlabatshane	0.85	0.89	2.36	3.09	3.47	1.6 2.9++
11	KwaNdelu	0.14	0.14	0.47	0.62	0.69	1.6
12	Vulamehlo	0.03	0.04	0.22	0.29	0.33	NA
13	kwaHlongwa	0.07	0.07	0.21	0.28	0.32	NA
14	Vulamehlo Farming	0.26	0.27	0.72	0.94	1.04	NA
15	Vulamehlo Cross Border	0.58	0.61	1.62	2.12	2.38	0.6 3.7**
16	KwaLembe	0.21	0.22	0.52	0.68	0.76	16.85
	TOTAL	**28.40**	**29.50**	**42.5**	**51.86**	**57.42**	

Notes + Water availability following construction of planned Weza Dam
++ Water Availability following augmentation of raw water by planned raw water pipeline on the uMzimkhulu River
** Water Availability following construction of Dam on the Mtwalume River
* Water Availability after Ncwabeni Dam

The above table indicates the following, regarding annual water resources for the schemes:

- The available water resources for the following schemes, as at present (2015), do not meet the GAADD water requirements as determined:
  - Harding Weza
- The available water resources require to be augmented for the GAADD, as follows:
  - 2035, for uMzimkhulu WSS
  - 2025, for Mhlabatshane WSS and Vulamehlo Cross Border WSS
- The planned augmentation projects, as currently planned, will become inadequate for the following GAADD's;
  - 2035 requirements for Harding Weza
  - 2035 requirements for Mhlabatshane WSS

It is further noted that the Umgeni Water, uMzinto and uMtwalume WSS's, combined show a deficit of approximately $3.63Mm^3$/annum (7.63-4.4) for the 2015 GAADD and $9.56Mm^3$ for the 2045 GAADD.

The combined 2045 GAADD for the Umgeni, uMzinto and uMtwalume WSS for 2045 are projected to be 38Ml/day. The capacity of the SCP is given as 37.5Ml/day. Thus the GAADD will be offset by the Umgeni Water SCP, which is being implemented in phases.

It is further noted that the following WTP's are planned for decommissioning, according to current planning:

- kwaFodo, kwaMbotho and kwaNyuswa with supply from the Harding Weza WSS
- uMtwalume WTP with supply from the Umgeni Water SCP in combination with the Lower uMkhomazi BWSS

The water requirements per WSS are reproduced in Ml/day in the following table.

Table 60: GAADD per WSS (Ml/Day)

	Water Supply Scheme	GAADD (Ml/day)					WTP Capacity (Ml/day0
		2011	2015	2025	2035	2045	
1	Umgeni Water	4.424	4.626	7.950	9.891	10.985	SCP – 37.5Ml/day
2	uMzinto	10.245	10.538	12.171	14.056	15.520	12.0
3	uMtwalume	5.470	5.710	8.508	10.457	11.635	7.5
	Sub-Total Umgeni, uMzinto, uMtwalume	20.139	20.874	28.629	34.405	38.140	57.0
4	uMzimkhulu	34.598	35.845	41.865	48.602	53.602	54 81 (2017)
5	uMtamvuna	8.807	9.172	14.007	17.694	19.544	20
6	Harding/Weza	6.579	6.894	11.846	14.944	16.499	3.7
7	kwaMbotho	0.818	0.858	1.429	1.851	2.051	
8	kwaFodo	0.415	0.437	0.737	0.968	1.071	
9	kwaNyuswa	0.400	0.421	0.961	1.260	1.391	
	Sub-Total Harding Weza, kwaMbotho, kwaFodo and	8.213	8.610	14.973	19.023	21.012	3.7

	Water Supply Scheme	GAADD (Ml/day)					WTP Capacity (Ml/day0
		2011	2015	2025	2035	2045	
	kwaNyuswa						
10	Phungashe/Mhlabatshane	2.333	2.437	6.458	8.451	9.484	4.0
11	KwaNdelu	0376	0.392	1.276	1.685	1.889	1.4
12	Vulamehlo	0.098	0.103	0.605	0.804	0.907	4.5
13	kwaHlongwa	0.186	0.195	0.578	0.768	0.863	
14	Vulamehlo Farming	0.708	0.738	1.980	2.557	2.864	
15	Vulamehlo Cross Border	1.585	1.662	4.433	5.807	6.518	4.5
16	KwaLembe	0.577	0.604	1.412	1.866	2.072	1.4
	TOTAL	**77.621**	**80 633**	**116 217**	**141.661**	**156.894**	

8.2. Projected SDD Versus infrastructure Capacity

The SDD (probable) for Scenario 3 and WSS's are summarised in the following table, together with capacities of existing infrastructure.

Table 61: Projected SDD per WSS (Ml/d)

Local Municipality	2011	SDD (Ml/day)				Equiv Daily Yield of Source (Ml/d)	WTP Capacity (Ml/d)
		2015	2025	2035	2045		
Umgeni Water	5.134	5.368	9.379	12.050	13.427	SCP-37.5	37.5
uMzinto	15.824	16.255	18.818	21.914	24.204	8.7	12.0
uMtwalume	7.797	8.131	12.059	15.474	17.286	3.3	7.5
Sub-Total Umgeni, uMzinto and uMtwalume	28.755	29.754	35.256	45.438	54.917	49.5	57.0
uMzimkhulu	56.201	58.133	66.977	78.059	86.085	50.1 85*	54 81 (2017)
uMtamvuna	11.857	12.311	18.554	23.943	26.502	33	20
Harding/Weza	7.713	8.079	14.105	18.351	20.305	3.8 13.3+	3.7
kwaMbotho	0.898	0.941	1.645	2.224	2.472		
kwaFodo	0.453	0.477	0.845	1.161	1.289		
kwaNyuswa	0.440	0.462	1.106	1.515	1.678		
Sub-Total Harding/Weza, kwaFodo, kwaMbotho and kwaNyuswa	9.504	9.959	17.701	23.251	25.744	3.8 13.3+	3.7
Phungashe/Mhlabatshane	2.621	2.739	7.464	10.189	11.471	4.4 8.0++	4.0
KwaNdelu	0.412	0.430	1.465	2.023	2.275	4.4	1.4

Local Municipality	2011	SDD (Ml/day)				Equiv Daily Yield of Source (Ml/d)	WTP Capacity (Ml/d)
		2015	2025	2035	2045		
Vulamehlo	0.112	0.117	0.695	0.966	1.095		
kwaHlongwa	0.203	0.212	0.663	0.922	1.040		
Vulamehlo Farming	0.824	0.858	2.308	3.098	3.482		
Vulamehlo Cross Border	1.751	1.836	5.103	6.982	7.863	1.6 10.2**	4.5
KwaLembe	0.630	0.660	1.621	2.241	2.495	46	1.4
Total	**112.870**	**117.009**	**162.806**	**201.111**	**222.966**		

Notes + Water availability following construction of planned Weza Dam
++ Water Availability following augmentation of raw water by planned raw water pipeline on the uMzimkhulu River
** Water Availability following construction of Dam on the Mtwalume River
* Water Availability after Ncwabeni Dam

Based on the SDD (Probable) the following observations are made:

- For the uMzimkhulu WSS, the following is noted:
  - The 2015 SDD exceeds the current capacity of the WTP. It is noted, however, that the uMzimkhulu WTP is currently being upgraded from its present capacity of 54Ml/day to a capacity of 81Ml/day. The upgrades are anticipated to be completed in mid-2017. This will meet the projected SDD up to about 2035.
  - The 2015 SDD exceeds the available raw water from uMzimkhulu River. DWS has commissioned a pre-feasibility study for the Ncwabeni Dam (which will improve the available water requirements to 85Ml/day). On completion of the Ncwaben Dam, the SDD up to about the 2045 projection will be met.

Thus it will be recommended, in this study, that the Ncwabeni Dam be implemented as soon as possible to mitigate supply constraints in the summer/holiday seasons:

- For the uMtamvuna WSS, the following is noted:
  - The 2035 SDD exceeds the current capacity of the WTP. It is noted, however, that the uMtamvuna WTP is currently being upgraded from its present capacity of 20Ml/day to a capacity of 30Ml/day. The upgrades are anticipated to be completed in mid-2017. This will be adequate to meet the 2045 SDD.
  - The hydrology of the river indicates that the off river abstraction can sustain the SDD, thus no further work will be proposed.

- For the Harding Weza WSS, the following is noted:
  - The 2015 SDD exceeds the current capacity of the WTP and the current water resource available.
  - The Ugu DM has concluded plans to construct a dam on the Weza River (Weza Dam) to augment raw water supplies to the WSS. The Weza Dam, as planned/designed will not meet the 2025 SDD.
  - The Weza Dam will increase the water availability to 11.8Ml/day.

This report has reviewed potential resource strategies to augment supplies to this WSS. The 2045 water requirements (including those for kwaMbotho and kwaFodo WSS's which are to be collapsed and integrated into Harding Weza WSS) will be in the order of 24Ml/day. The review of three potential options is included in **Annexure E** of this report.

It will be recommended that the planned Weza Dam be reviewed/revised to establish the feasibility of increasing the yield of the river system as much as possible. The deficit will then be supplied via the construction of a raw water pipeline supplied from a runoff river abstraction on the Mtamvuna River.

- For the Mhlabatshane WSS, the following is noted:
  - Umgeni Water has plans to augment raw water by direct abstraction from the uMzimkhulu River to the Mhlabatshane WTP. This will increase the available water resources for the WSS to 8Ml/day. In addition the WTP is to be upgraded to 8Ml/day.
  - The projected 2035 SDD exceeds the available raw resources after the construction of the construction of the raw water abstraction pipeline. This will also exceed the capacity of the WTP after implementation planned.

This report will, thus, recommend that the planned raw water abstraction infrastructure and the WTP upgrades be reviewed to meet the 2045 SDD.

- For the Vulamehlo Cross Border WSS, the following is noted;
  - The 2015 SDD exceeds the available water resources
  - Ugu DM has plans to augment raw water by the construction of a dam on the Mtwalume River, in the vicinity of the WTP to augment supplies to WTP. This will increase the raw water availability to WTP to 10.2Ml/day
  - The 2025 SDD exceeds the current capacity of the WTP

This report will, thus, recommend that the planned implementation of the dam on the uMtwalume River be implemented as planned and the WTP be further upgraded to meet 2025 SDD at the appropriate time.

- For the uMzinto WSS, the following is noted:
  - The local water resource has the capacity to provide about 8Ml/day
  - The 2045 SDD is projected at 24.2Ml/day
  - Umgeni Water has plans to augment treated water supplies to this scheme through the Lower Mkhomazi BWSS in combination with the South Coast Pipeline. Thus the deficit in supply to of treated water to meet SDD for the uMzinto WSS will be as follows:
    - 8.2Ml/day in 2015
    - 10.8Ml/day in 2025
    - 13.9Ml/day in 2035
    - 24.2Ml/day in 2045

- For the uMtwalume WSS, the following is noted:
  - The local water resource has a capacity to provide about 3.3Ml/day,
  - The 2045 SDD is projected at 17.3Ml/day.
  - Again, Umgeni Water has plans to continue providing treated water supplies to this scheme through the Lower Mkhomazi BWSS in combination with the South Coast Pipeline. It is also planned that the uMtwalume WTP, be decommissioned in future subject to availability of water from the Umgeni Water planned infrastructure. Thus the deficit in supply to of treated water to meet SDD for the uMzinto WSS will be as follows:
    - 5Ml/day in 2015, assuming the uMtwalume WTP is operational.
    - 12.1 M/day in 2025, with uMtwalume WTP decommissioned
    - 15.5 Ml/day in 2035, with uMtwalume WTP decommissioned
    - 17.3 Ml/day in 2045, with uMtwalume WTP decommissioned

- For the scheme denoted as Umgeni WSS, the following is noted:
  - The supply is direct from the Umgeni South Coast Pipeline
  - The projected SDD for this WSS is 13.4Ml/day in 2045. It is expected that this SDD will be met through the Umgeni water South Coast Pipeline.

- For the smaller schemes or scheme areas the following be recommended in this report:
  - kwaLembe WTP and kwaNdelu WSS's be upgraded as necessary to meet SDD, projected at 2.5Ml/day per WSS in 2045.
  - The areas to be served in the Vulamehlo and Vulamehlo Farming areas be served by stand-alone schemes to be developed privately or by the UDM, for the farming areas.

8.3. Water Resource Interventions

The assessment undertaken in this chapter deals with Water Resource Interventions already in planning/implementation and also proposes other interventions (UAP Proposed). The interventions are originated by three parties at this stage:

- UDM Planned/Implemented Interventions,
- Umgeni Water Planned/Implemented Projects
- UAP Proposed Interventions

These interventions are recommended and illustrated in the key map attached in **Annexure E, Figure E0**. These are summarised hereunder together with relevant remarks.

8.3.1. UDM/DWS Proposed Projects

Three significant water resources projects are planned by the UDM are supported by this report and are summarised with details in **Table 62** below.

Table 62: Raw Water Augmentation Projects by UDM or DWS

WSS	Intervention	Cost Details	Impacts	Remarks
uMzimkhulu	Ncwabeni Dam	Estimated at R900M (2017)	Increase of supply to meet 2045 SDD	Nil
Harding Weza	Weza Dam	Estimated at R120M (2010)	Increase of supply to meet 2025 SDD	Further augmentation required after 2025
Vulamehlo Cross Border	Vulamehlo Dam on Mtwalume River	Estimated at R170M (2014)	Increase of supply to meet 2045 SDD	Nil

8.3.2. Umgeni Water Proposed Interventions

Umgeni Water intends to develop the following projects:

- Lower Mkhomazi BWSS and implement further phases of the Lower South Coast Pipeline. In combination (based on the demands projected in this study) this infrastructure will be required to deliver a 2045 SDD of 49 Ml/day to the WSS's denoted as Umgeni WSS, uMzinto WSS and uMtwalume WSS. The planning documents indicate the system will supply of 37.5Ml/day to UDM. The planning has to be reviewed to accommodate the 2045 SDD. In the meantime, the two WTP, uMzinto (7Ml/day) and uMtwalume WTP (7.5Ml/d) can be retained to provide back-up to meet SDD.
- Implement further phases of the Mhlabatshane WSS, being the construction of a raw water pumping main from uMzimkhulu River to supply raw water to the WTP together with upgrade to the WTP. The current planning is based on an ultimate demand of 8Ml/day. This study projects a SD demand of 11.5Ml/day in year 2045. It is recommended that the size of both the raw water pipeline and WTP upgrades be reviewed taking into account the projections in this report. Alternatively a 2Ml/d WTP is proposed for construction at the proposed Ncwabeni Dam, following construction of the dam, to provide the deficit.

The above projects are both supported.

8.3.3. UAP Proposed Interventions

This study proposes future augmentation of the raw water supply to Harding Weza Scheme. This will require the construction of direct abstraction pipeline from a suitable location on the uMtamvuna River. This report proposes a position which will require the construction of a 12.5 km pipeline complete with pump station(s) pumping over a head of over 270m static head. The cost of this infrastructure is estimated at approximately R120M.

The pipeline can be constructed at the appropriate time (around 2020) following the construction of the planned Weza Dam. However as the raw water supply to the Harding Weza WSS is already in deficit, it may also be possible to construct this pipeline in advance of the dam, depending on the turn-around time for its construction.

8.4. Costs of Water Resources Interventions Per LM

The costs for water resources interventions were escalated to 2015 costs where necessary and allocated per LM and summarised in **Table 66** below.

Table 63: Raw Water Augmentation Projects per LM

Project	Original Estimate		Escalated Cost/LM				
	Year of Estimate	Estimate in that Year (RM)	Hibiscus Coast	Umdoni	uMuziwabantu	uMzumbe	Vulamehlo
Ncwabeni Dam	2017	R 900 000 000	R 900 000 000	-	-	-	-
Ngwadini Dam + Lower uMkhomazi BWSS	2015	R 2 900 000 000	-	R 1 241 200 000	-	-	-
4 Ml/day raw abstraction from uMzimkhulu	2015	R 500 000 000	-	-	-	R 535 000 000	-
Vulamehlo Dam	2014	R 480 031 200	-	-	-	-	R 513 633 384
Weza Dam	2010	R 114 360 000	-	-	R 160 395 816	-	-
Totals (R)		**R 4 894 391 200**	**R 900 000 000**	**R 1 241 200 000**	**R 160 395 816**	**R 535 000 000**	**R 513 633 384**
Totals (R Million		**R 4 894.39**	**R 900.00**	**R 1 241.20**	**R 160.40**	**R 535.00**	**R 513.63**

It is noted that the cost of Ngwadini Dam and LMBWSS allocated to uMdoni LM is only 40% of the escalated cost of the escalated development cost of R3 103 Million, as the WSS's in uMdoni LM will utilise 40% of the output of the development.

9. BULK WATER SUPPLY INTERVENTIONS CONSIDERED IN THIS STUDY

Chapter 8, provides proposals for interventions at water resource or bulk water supply level (from a resource perspective). This Chapter deals with the capacity of primary infrastructure. It includes outputs of the demand model and analyses the capacity of existing/planned infrastructure from abstraction to WTP and to first command reservoir. This is considered per WSS. It is noted that the following WSS's are considered individually and in combination, as they will share the same raw/treated water source:

- Umgeni, uMzinto and uMtwalume, as they will ultimately be served by the SCP and LMBWSS,,
- Harding/Weza, kwaMbotho, kwaFodo and kwaNyuswa, as they will be served via the Weza WTP and the Harding WTP.

The estimated cost of the interventions is estimated at R1 157 244 455 detailed per scheme as follows:

Table 64: Breakdown of Projects' Costs

Scheme Name	Costs per WSS	Cost Allocation Per LM					
		Ezinqoleni	Hibiscus Coast	uMdoni	uMuziwabantu	uMzumbe	Vulamehlo
Pungashe/ Mhlabatshane	R 147 899 089	-	-	-	-	R 147 899 089	-
Vulamehlo Cross-border	R 57 566 012	-	-	-	-	-	R 57 566 012
KwaNdelu	R 49 856 276	-	-	-	-	R 49 856 276	
KwaHlongwa	R 19 471 998	-	-	-	-	R 19 471 998	-
uMtwalume	R 58 425 181	-	-	R 58 425 181	-	-	-
uMzimkhulu	R 140 177 882	-	R 140 177 882	-	-	-	-
Harding/Weza	R 405 746 152	-	-	-	R 405 746 152	-	-
uMtamvuna	R 116 427 672	R 64 718 390	R 51 709 282	-	-	-	-
Umgeni	R 67 431 990	-	-	-	-	-	R 67 431 990
Kwalembe	R 48 337 862	-	-	-	-	-	R 48 337 862
Umzinto	R 45 904 342	-	-	R 45 904 342	-	-	-
Totals (R)	**R 1 157 244 455**	**R 64 718 390**	**R 191 887 164**	**R 104 329 523**	**R 405 746 152**	**R 217 227 363**	**R 173 335 864**
Totals (R Million)	**R 1 157.24**	**R 64.72**	**R 191.89**	**R 104.33**	**R 405.75**	**R 217.23**	**R 173.34**

These are further broken down per WSS in this section.

9.1. Umgeni, uMzinto and uMzikhulu WSS's

The Umgeni Water Scheme has been divided into one (1) supply area as shown on the map included in **Annexure A, Figure A0**.

9.1.1. Water Demand

A summary of the SDD (probable) for the combined areas is shown in **Table 65** below:

Table 65: Summary of SDD (Ml/day) for the Umgeni, uMzinto & uMtwalume WSS's

WSS	Year			
	2015	2025	2035	2045
Umgeni	5.368	9.379	12.050	13.427
uMzinto	16.255	18.818	21.914	24.204
uMtwalume	8.131	12.059	15.474	17.286
Total	**29.754**	**40.256**	**49.438**	**54.917**

9.1.2. Water Resource Consideration/Infrastructure

This water scheme is served by the Umgeni Water, South Coast Pipeline which is currently providing the UDM approximately 7Ml/day. Future projections, based on the project demand model indicates a 2045 daily SDD of 54.917 Ml/day. This will be met with the future capacity of the system served by the following:

- LMBWSS and SCP to provide at least 49 Ml/day to this system
- If required, the uMzinto WTP and uMtwalume WTP can be retained with capacities of 13.6Ml/day (operating at 12.0Ml/day)and 7.5Ml/day, respectively

9.1.3. Water Supply Infrastructure

The water supply infrastructure upgrades (limited to primary bulk) was analysed for adequacy resulting in proposals for the individual scheme areas, as follows:

9.1.3.1. Umgeni WSS

Details of existing infrastructure were not available. However it is assumed that the infrastructure is of reticulation/distribution nature and hence no future bulk infrastructure has been envisaged for this scheme.

9.1.3.2. uMzinto Scheme

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines etc.) for the uMzinto Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**.

A schematic of the proposed upgrades is included in **Annexure F** as **Figure F2**.

The estimated cost for the proposed upgrades for the uMzinto Scheme is shown in **Table 66** below.

Table 66: Estimated Cost for the Proposed Upgrades – uMzinto Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 5 238 294	R 3 900 543
Design and Tender Documentation	R 3 560 184	R 2 222 433
Geotech Survey	R 0	R 0
Land Survey	R 68 963	R 68 963
Cathodic Protection	R 0	R 0
Construction Monitoring	R 1 609 146	R 1 609 146
Construction	R 39 557 605	R 24 693 703
Pipelines	R 23 201 528	R 21 193 703
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 3 500 000	R 3 500 000
Water Works	R 0	R 0
Storage (Reservoir)	R 12 856 078	R 0
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 26 525 715	R 17 310 096
Land Acquisition - 7.5%	R 2 966 820	R 1 852 028
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 395 576	R 246 937
Project Office	R 1 384 516	R 864 280
Contingencies	R 19 778 803	R 12 346 852
TOTAL	**R 71 321 614**	**R 45 904 342**

9.1.3.3. uMtwalume Scheme

The raw water source for this scheme is uMtwalume River. According to the Umgeni Water Master Plan the uMtwalume River has a 1:50 year Stochastic Yield of 1.2Mm^3/annum (3.5Ml/day). The uMtwalume WTP which sources its water from the uMtwalume River has a capacity of 7.5Ml/day and operates above the capacity.

The demands of the scheme are estimated to vary from 4.4Ml/day to 10Ml/day (presently) to between 8.6Ml/day and 19.2 Ml/day in year 2035. Based on the above, it is evident that the scheme would benefit from a combination of the following interventions:

- Augmentation of raw water supply (coupled with upgrade of the WTP). This will require identification of alternative raw water sources.
- Augmentation of treated water from other sources. Again, it is envisaged that the extended SCP could be an alternative source of treated water,
- Relief in demands by "shedding off" some scheme areas to other water supply schemes.

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines) for the uMtwalume Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F** as **Figure F3**. The estimated cost for the proposed upgrades for the uMtwalume Scheme is shown in **Table 67** below.

Table 67: Estimated Cost for the Proposed Upgrades – uMtwalume Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 4 593 205	R 3 894 042
Design and Tender Documentation	R 3 617 560	R 2 918 397
Geotech Survey	R 0	R 0
Land Survey	R 40 095	R 40 095
Cathodic Protection	R 0	R 0
Construction Monitoring	R 935 550	R 935 550
Construction	R 40 195 112	R 32 426 629
Pipelines	R 12 455 948	R 11 541 869
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 0	R 0
Storage (Reservoir)	R 27 739 164	R 20 884 760
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 26 920 970	R 22 104 510
Land Acquisition - 7.5%	R 3 014 633	R 2 431 997
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 401 951	R 324 266
Project Office	R 1 406 829	R 1 134 932
Contingencies	R 20 097 556	R 16 213 315
TOTAL	**R 71 709 287**	**R 58 425 181**

9.2. uMzimkhulu Scheme

The Southern Scheme has been divided into six (6) supply areas as shown on the map included in **Annexure A, Figure A0**.

9.2.1. Water Demand

A summary of the water demands for the uMzimkhulu supply areas is shown in **Table 68** below:

Table 68: Summary of Water Demands for the uMzimkhulu Supply Areas (Ml/day)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2035
SDD (Probable)	58.133	66.977	78.059	86.085

9.2.2. Water Resource Consideration/Infrastructure

The uMzimkhulu/Bhobhoyi WTP is served by a river run-off abstraction on the uMzimkhulu River. The uMzimkhulu River is estimated to have a yield of 18.3Mm^3/annum or 50.1Ml/day, (as per Feasibility Study Reports for the Ncwabeni Dam).

A feasibility study for an off-channel storage dam, the Ncwabeni Dam, has been completed. Based on a storage of 16 Mm^3, the dam will increase the estimated yield of the system to 30 Mm^3/annum (or 82Ml/day). Funding has not yet been secured for this dam, however it is proposed that it be funded via the RBIG or Umgeni Water, the latter implying that Umgeni Water would then be responsible for the bulk water supply to the uMzimklhulu/Bhobhoyi Scheme. The 2017 cost of the proposed dam was estimated at R900M.

Following construction of the Dam, the system will meet the 2035 SDD, and slightly short for the 2045 SDD.

9.2.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines.) for the uMzimkhulu/Bhobhoyi Scheme was compared to the existing and future water demands to determine upgrade requirements.

Proposed bulk infrastructure was evaluated to delivery at the primary/command reservoirs. For this system, the infrastructure considered was as follows:

- The WTP, which is currently being upgraded to a capacity of 81Ml/day (from a capacity of 54Ml/day). This upgrade is due for completion by year 2017
- The following bulk pipelines:
  - Southern Mains from the WTP to the Ugu Sports Complex & Leisure Centre
  - Marburg Line from the WTP to the Reservoir
  - Albersville line from the WTP to the Albersville Reservoir
  - The Murchison line from WTP to Murchison
- The system reservoirs were sized and not located, based on a deficit in the system (current and future).

A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F** as **Figure F4**.

9.2.4. Financial Implications

The estimated cost for the proposed upgrades for the Southern Scheme is shown in **Table 69** below.

Table 69: Estimated Cost for the Proposed Upgrades – uMzimkhulu Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 20 287 887	R 10 692 413
Design and Tender Documentation	R 16 678 000	R 7 082 526
Geotech Survey	R 0	R 0
Land Survey	R 148 352	R 148 352
Cathodic Protection	R 0	R 0
Construction Monitoring	R 3 461 535	R 3 461 535
Construction	R 185 311 113	R 78 694 734
Pipelines	R 110 941 571	R 78 694 734
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 69 498 000	R 0
Storage (Reservoir)	R 4 871 543	R 0
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 116 892 890	R 50 790 735
Land Acquisition - 7.5%	R 13 898 333	R 5 902 105
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 1 853 111	R 786 947
Project Office	R 6 485 889	R 2 754 316
Contingencies	R 92 655 557	R 39 347 367
TOTAL	**R 322 491 890**	**R 140 177 882**

9.3. uMtamvuna Scheme

The uMtamvuna Scheme has been divided into two (2) supply areas as shown on the map included in **Annexure A as Figure A0**.

9.3.1. Water Demand

A summary of the water demands for the uMtamvuna supply areas is shown in **Table 70** below:

Table 70: Summary of Water Demands for the uMtamvuna Supply Areas (Ml/day)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	12.311	18.554	23.943	26.504

9.3.2. Water Resource Consideration/Infrastructure

The raw water source for this scheme is a run-of river abstraction from the uMtamvuna River.

No yields are known for this system. However, the uMtamvuna WTP is currently sized at 20Ml/day (7.2Mm^3/annum). It is reported that the uMtamvuna system has a surplus of 5Mm^3/annum. It is thus estimated that the yield of this system would be in the order of 12Mm^3/annum (32Ml/day).

The probable future demand (2035) is calculated at 23.943Ml/day.

9.3.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines etc.) for the uMtamvuna Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure A**.

A schematic of the proposed upgrades is included in **Annexure F** as **Figure F5**.

9.3.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the uMtamvuna Scheme is shown in **Table 71** below.

Table 71: Estimated Cost for the Proposed Upgrades – uMtamvuna Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 15 310 585	R 9 072 683
Design and Tender Documentation	R 10 237 231	R 5 853 055
Geotech Survey	R 0	R 0
Land Survey	R 208 494	R 132 314
Cathodic Protection	R 0	R 0
Construction Monitoring	R 4 864 860	R 3 087 315
Construction	R 113 747 017	R 65 033 943
Pipelines	R 57 719 173	R 38 303 943
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 48 114 000	R 26 730 000
Storage (Reservoir)	R 7 913 844	R 0
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 72 523 150	R 42 321 045
Land Acquisition - 7.5%	R 8 531 026	R 4 877 546
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 1 137 470	R 650 339
Project Office	R 3 981 146	R 2 276 188
Contingencies	R 56 873 508	R 32 516 972
TOTAL	**R 201 580 752**	**R 116 427 672**

9.4. Harding Weza Scheme

The Harding Weza Scheme has been divided into two supply areas as shown on the map included in **Annexure A, Figure A0**.

9.4.1. Water Demand

The current planning is to include the smaller schemes of kwaMbotho, kwaFodo and kwaNyuswa to be supplied from the Harding/Weza Scheme. The water demand assessment done on the scheme is for the WSS's. A summary of the water demands for the supply areas is shown in **Table 72** below:

Table 72: Summary of SDD for Harding Weza, kwaFodo, kwaMbotho & kwaNyuswa WSS's (Ml/day)

WSS	Year			
	2015	2025	2035	2045
Harding/Weza	8.079	14.105	18.351	20.305
kwaFodo	0.477	0.845	1.161	1.289
kwaMbotho	0.941	1.645	2.224	2.472
kwaNyuswa	0.462	1.106	1.515	1.678
Total	9.959	17.701	23.251	25.744

9.4.2. Water Resource Consideration/Infrastructure

The two raw water sources for the scheme are as follows:

- Harding Dam with a yield of 0.6Mm^3/annum (1.6Ml/day)
- Weza River. No details of yields were available, however, the "Harding Weza Regional Bulk Water Supply, planning Report for Weza Dam", dated 25 June 2010, indicates that during the dry season, the Weza River can sustain a consistent supply of 3.7Ml/day. Based on this, the yield of the Weza River has been assumed to be in the order of 1.3Mm^3/annum

The planning report for Weza Dam also indicates that the yield of the source can be augmented through the construction of the proposed Weza Dam to 4.3Mm^3/annum (11.8Ml/day). The 2035 SDD (Probable) is calculated at 23.25Mℓ/day. Based on a proposal to augment raw water to the system, a raw water pipeline abstracting water from uMtamvuna River will be proposed to provide an additional 12Ml/day.

9.4.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines etc.) for the Harding Weza Scheme was compared to the existing and future water demands to determine upgrade requirements.

Infrastructure considered was the following:

- The Harding Weza WTP
- Bulk pipeline from the WTP to Ikhwezi Reservoir
- Bulk pipeline from the WTP to the kwaMachi/kwaJali Reservoir

A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F**, as **Figure F6**.

9.4.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades for the Harding Weza Scheme is shown in **Table 73** below.

Table 73: Estimated Cost for the Proposed Upgrades – Harding Weza Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 29 745 245	R 25 963 703
Design and Tender Documentation	R 24 769 455	R 20 987 914
Geotech Survey	R 0	R 0
Land Survey	R 204 485	R 204 485
Cathodic Protection	R 0	R 0
Construction Monitoring	R 4 771 305	R 4 771 305
Construction	R 275 216 169	R 233 199 042
Pipelines	R 81 247 231	R 73 067 205
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 10 000 000	R 10 000 000
Water Works	R 122 958 000	R 96 228 000
Storage (Reservoir)	R 61 010 938	R 53 903 837
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 172 634 025	R 146 583 406
Land Acquisition - 7.5%	R 20 641 213	R 17 489 928
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 2 752 162	R 2 331 990
Project Office	R 9 632 566	R 8 161 966
Contingencies	R 137 608 084	R 116 599 521
TOTAL	**R 477 595 438**	**R 405 746 152**

9.5. Phungashe/Mhlabatshane Scheme

The Phungashe/Mhlabatshane Scheme has been divided into two (2) supply areas as shown on the map included in **Annexure A as Figure A0**.

9.5.1. Water Demand

A summary of the water demands for the Phungashe supply areas is shown in **Table 74** below:

Table 74: Summary of Water Demands for the Phungashe Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	2.739	7.464	10.189	11.471

9.5.2. Water Resource Consideration/Infrastructure

The Phungashe/Mhlabatshane Scheme is supplied from the Mhlabatshane Dam which is reported to have a yield of 1.6 Mm^3/annum (4.4 Ml/day).

The probable SDD (2035) is calculated to be 10.2Ml/day. The scheme, as envisaged will have a deficit in supply of 6Ml/day. This deficit is to be addressed by:

- The construction of the raw water pipeline abstracting raw water directly from the uMzimkhulu River to the WTP.
- A package WTP is planned to augment supplies (by 2Ml/day) to the southern areas of the WSS with raw water supplied from the proposed Ncwabeni Dam once it is constructed.

The current planning of Umgeni Water can be reviewed to provide for the 2035/2045 SDD.

9.5.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines) for the Phungashe Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**.

A schematic of the proposed upgrades is included in **Annexure F** as **Figure F10**.

9.5.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the Phungashe Scheme is shown in **Table 75** below.

Table 75: Estimated Cost for the Proposed Upgrades – Phungashe/Mhlabatshane Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 11 773 665	R 10 168 396
Design and Tender Documentation	R 9 145 863	R 7 540 594
Geotech Survey	R 0	R 0
Land Survey	R 107 992	R 107 992
Cathodic Protection	R 0	R 0
Construction Monitoring	R 2 519 810	R 2 519 810
Construction	R 101 620 703	R 83 784 378
Pipelines	R 32 621 943	R 31 332 845
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 48 114 000	R 37 422 000
Storage (Reservoir)	R 20 884 760	R 15 029 533
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 65 004 836	R 53 946 315
Land Acquisition - 7.5%	R 7 621 553	R 6 283 828
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 1 016 207	R 837 844
Project Office	R 3 556 725	R 2 932 453
Contingencies	R 50 810 351	R 41 892 189
TOTAL	**R 178 399 204**	**R 147 899 089**

9.6. KwaNdelu Scheme

The KwaNdelu Scheme is depicted on a map included in **Annexure A as Figure A0**.

9.6.1. Water Demand

A summary of the water demands for the KwaNdelu supply areas is shown in **Table 76** below:

Table 76: Summary of Water Demands for the KwaNdelu Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	0.430	1.465	2.823	2.275

9.6.2. Water Resource Consideration/Infrastructure

The kwaNdelu Scheme is supplied with run-of river abstraction from the Mzumbe River. No details of assured yields are available. However, it is estimated that the yield of the Mzumbe River at the point of abstraction would be in the order of 1.7Mm^3/annum (4.8Ml/day). Thus, the source of raw water is sufficient to meet the required 2035 SDD of 2.4Ml/day.

9.6.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines) for the KwaNdelu Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F** as **Figure F11**.

9.6.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the KwaNdelu Scheme is shown in **Table 77** below.

Table 77: Estimated Cost for the Proposed Upgrades – KwaNdelu Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 3 626 676	R 2 943 927
Design and Tender Documentation	R 3 177 880	R 2 495 131
Geotech Survey	R 0	R 0
Land Survey	R 18 444	R 18 444
Cathodic Protection	R 0	R 0
Construction Monitoring	R 430 353	R 430 353
Construction	R 35 309 773	R 27 723 672
Pipelines	R 4 242 240	R 4 175 595
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 16 038 000	R 10 692 000
Storage (Reservoir)	R 15 029 533	R 12 856 078
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 23 892 059	R 19 188 677
Land Acquisition - 7.5%	R 2 648 233	R 2 079 275
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 353 098	R 277 237
Project Office	R 1 235 842	R 970 329
Contingencies	R 17 654 887	R 13 861 836
TOTAL	**R 62 828 509**	**R 49 856 276**

9.7. Vulamehlo Scheme

The Vulamehlo Scheme comprises one supply area as shown on the map included in **Annexure A as Figure A0**.

9.7.1. Water Demand

A summary of the water demands for the Vulamehlo supply areas is shown in **Table 78** below:

Table 78: Summary of Water Demands for the Vulamehlo Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	0.117	0.695	0.966	1.95

9.7.2. Water Resource Consideration/Infrastructure

The scheme area is currently supplied from informal source(s). As it is sparsely populated and the demands are small, it is proposed that individual stand-alone systems be utilised for this WSS.

9.7.3. Water Supply Infrastructure

The infrastructure for this scheme was considered of a reticulation nature and hence was not detailed.

9.8. KwaHlongwa Scheme

The KwaHlongwa Scheme consists one supply area as shown on the map included in **Annexure A as Figure A0.**

9.8.1. Water Demand

A summary of the water demands for the KwaHlongwa supply areas is shown in **Table 79** below:

Table 79: Summary of Water Demands for the KwaHlongwa Supply Areas (Ml/day)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	0.212	0.663	0.922	1.040

9.8.2. Water Resource Consideration/Infrastructure

The kwaHlongwa Scheme is supplied from a run-of river abstraction on the kwaMalukaka River. No firm yields have been made available for the river. The 2035 demands are calculated to be up to 1.0Ml/day.

9.8.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage, bulk pipelines) for the KwaHlongwa Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F** as **Figure F13**.

9.8.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the KwaHlongwa Scheme is shown in **Table 80** below.

Table 80: Estimated Cost for the Proposed Upgrades – KwaHlongwa Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 1 193 386	R 919 579
Design and Tender Documentation	R 1 193 386	R 919 579
Geotech Survey	R 0	R 0
Land Survey	R 0	R 0
Cathodic Protection	R 0	R 0
Construction Monitoring	R 0	R 0
Construction	R 13 259 844	R 10 217 543
Pipelines	R 0	R 0
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 5 346 000	R 5 346 000
Storage (Reservoir)	R 7 913 844	R 4 871 543
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 10 221 103	R 8 334 876
Land Acquisition - 7.5%	R 994 488	R 766 316
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 132 598	R 102 175
Project Office	R 464 095	R 357 614
Contingencies	R 6 629 922	R 5 108 771
TOTAL	**R 24 674 333**	**R 19 471 998**

9.9. Vulamehlo Farming Scheme

The Vulamehlo Farming Scheme comprises one (1) supply areas as shown on the map included in **Annexure A as Figure A0**.

9.9.1. Water Demand

A summary of the water demands for the Vulamehlo Farming supply areas is shown in **Table 81** below:

Table 81: Summary of Water Demands for the Vulamehlo Farming Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	0.858	2.308	3.098	3.482

9.9.2. Water Resource Consideration/Infrastructure

This scheme has no formal supply. It is envisaged that the scheme will continue to be supplied from stand-alone systems.

9.9.3. Water Supply Infrastructure

No bulk infrastructure is envisaged other than that for the uMzinto WSS.

9.10. Vulamehlo Cross Border Scheme

The Vulamehlo Cross Border Scheme has been divided into three (2) supply areas as shown on the map included in **Annexure B**.

9.10.1. Water Demand

A summary of the water demands for the Vulamehlo Cross Border supply areas is shown in **Table 82** below:

Table 82: Summary of Water Demands for the Vulamehlo Cross Border Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	1.836	5.103	6.982	7.863

9.10.2. Water Resource Consideration/Infrastructure

The Vulamehlo Cross Border Scheme supplies areas of the UDM and the Harry Gwala DM. Raw water abstracted from a weir on the Upper uMtwalume River is treated at the Vulamehlo WTP.

The yield of the uMtwalume River at the abstraction point is estimated to be 0.6Mm^3/annum (1.6Ml/day). A prefeasibility study for a dam, Vulamehlo Dam on uMtwalume River is currently in progress, with the environmental process at final stages of a "Record of Decision, RoD". This dam will increase the yield of the system to 3.7 Mm^3/day (10.2Ml/day). The project for the dam and associated infrastructure has been registered with MIG.

9.10.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines) for the Vulamehlo Cross Border Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F** as **Figure F15**.

For this scheme, infrastructure upgrades have been considered only for the following:

- Abstraction
- WTP
- Bulk pipelines from the WTP to:
  - Nyavini Reservoir No. 1
  - Hluthunkungu Reservoir
- System Reservoirs, without locating them

9.10.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the Vulamehlo Cross Border Scheme is shown in **Table 83** below.

Table 83: Estimated Cost for the Proposed Upgrades – Vulamehlo Cross Border Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 5 580 167	R 4 347 942
Design and Tender Documentation	R 4 077 674	R 2 845 448
Geotech Survey	R 0	R 0
Land Survey	R 61 746	R 61 746
Cathodic Protection	R 0	R 0
Construction Monitoring	R 1 440 747	R 1 440 747
Construction	R 45 307 487	R 31 616 093
Pipelines	R 16 009 643	R 15 578 093
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 21 384 000	R 16 038 000
Storage (Reservoir)	R 7 913 844	R 0
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 30 090 642	R 21 601 978
Land Acquisition - 7.5%	R 3 398 062	R 2 371 207
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 453 075	R 316 161
Project Office	R 1 585 762	R 1 106 563
Contingencies	R 22 653 744	R 15 808 047
TOTAL	**R 80 978 297**	**R 57 566 012**

The above costs exclude the costs of the development of a dam on the Upper uMtwalume River. The cost for the dam is estimated to be RM.

9.11. KwaLembe Scheme

The KwaLembe Scheme comprises one (1) supply area as shown on the map included in **Annexure A as Figure A0**.

9.11.1. Water Demand

A summary of the water demands for the KwaLembe supply areas is shown in **Table 84** below:

Table 84: Summary of Water Demands for the KwaLembe Supply Areas (Ml/d)

Demands (Mℓ/day)	Year			
	2015	2025	2035	2045
SDD (Probable)	0.66	1.621	2.241	2.495

9.11.2. Water Resource Consideration/Infrastructure

The scheme is supplied from a run-of river abstraction on the Mkhomazi River. The yield of the Mkhomazi River at abstraction is estimated at 16.85Mm^3/annum (46Ml/day). The current and estimated demands for the scheme is estimated to be between 0.47Ml/day to 2.8Ml/day. Thus this system could have surplus of about 43Ml/day.

9.11.3. Water Supply Infrastructure

The existing capacities of the bulk water infrastructure (WTP, storage bulk pipelines) for the KwaLembe Scheme was compared to the existing and future water demands to determine upgrade requirements. A printout of the Excel spreadsheet calculating the above is shown in **Annexure G**. A schematic of the proposed upgrades is included in **Annexure F**.

9.11.4. Financial Implications and Implementation Programme

The estimated cost for the proposed upgrades shown in the schematic layout above for the KwaLembe Scheme is shown in **Table 85** below.

Table 85: Estimated Cost for the Proposed Upgrades – KwaLembe Scheme

Costing of Proposed Infrastructure	Scenario 3	
	Based on High Demand	Based on Probable Demand
Consultants	R 3 773 366	R 3 252 215
Design and Tender Documentation	R 2 914 798	R 2 393 647
Geotech Survey	R 0	R 0
Land Survey	R 35 284	R 35 284
Cathodic Protection	R 0	R 0
Construction Monitoring	R 823 284	R 823 284
Construction	R 32 386 644	R 26 596 079
Pipelines	R 8 838 566	R 8 394 001
P&G	R 0	R 0
Pipeline Construction (Bulk)	R 0	R 0
Pipe Bridge/Jack	R 0	R 0
Pumpstation	R 0	R 0
Water Works	R 10 692 000	R 5 346 000
Storage (Reservoir)	R 12 856 078	R 12 856 078
Dam	R 0	R 0
Abstraction	R 0	R 0
Additional	R 22 079 719	R 18 489 569
Land Acquisition - 7.5%	R 2 428 998	R 1 994 706
Environmental, Community Liaison	R 2 000 000	R 2 000 000
Health & Safety, Quality Assurance	R 323 866	R 265 961
Project Office	R 1 133 533	R 930 863
Contingencies	R 16 193 322	R 13 298 039
TOTAL	**R 58 239 728**	**R 48 337 862**

10. SUMMARY AND RECOMMENDATIONS

The Ugu District Municipality comprises six local municipalities Vulamehlo Local Municipality, uMdoni Local Municipality, Umzumbe Local Municipality, Ezinqoleni Local Municipality, Hibiscus Coast Local Municipality and uMuziwabantu Local Municipality.

10.1. 2011 Levels Of Service

According to the Census 2011 Statistics, the total number of households and the levels of service in the district per local municipality are as indicated in the following table.

Table 86: 2011 Levels of Service

Local Municipality	Total No. of Households	Below RDP	No Access	Total Backlogs	%age Backlogs	Backlog as % of DM Backlog
Ezinqoleni	11 473	3 401	1 663	5 064	44%	8.4%
Hibiscus Coast	72 176	9 825	2 723	12 548	17%	20.5%
uMdoni	22 869	3 037	479	3 516	15%	5.7%
uMuziwabantu	21 620	5 394	3 323	8 717	40%	14.2%
Umzumbe	35 171	6 122	16 121	22 243	63%	36.3%
Vulamehlo	16 135	3 607	5 518	9 123	57%	14.9%
Ugu	**179 444**	**31 386**	**29 827**	**61 213**	**34%**	**100.0%**

10.2. Existing Water Supply Schemes

The DM is currently served through 16 No. Water Supply Schemes. The major water supply schemes (WSS) are uMzimkhulu WSS, uMtamvuna WSS, Harding Weza WSS, uMzinto WSS, uMtwalume WSS, Vulamehlo WSS and Mhlabatsahne WSS.

10.3. Projects In Planning

A number of projects are in planning/implementation, including, the following water resources projects, which are detailed in the following table.

Table 87: Bulk Water Resources Projects in Planning

Water Supply Scheme	Intervention	Cost Details	Impacts
uMzimkhulu	Ncwabeni Dam	Estimated at R900M (2017)	Increase of supply to meet 2045 SDD
Harding Weza	Weza Dam	Estimated at R120M (2010)	Increase of supply to meet 2025 SDD
Vulamehlo Cross Border	Vulamehlo Dam on Mtwalume River	Estimated at R170M (2014)	Increase of supply to meet 2045 SDD
Umgeni, uMzinto and uMtwalume WSS's	South Coast Pipeline and Lower uMkhomazi BWSS	R2.6B (2015)	Provision of at least 37.5 Ml/day to these systems
Mhlabatshane WSS	Raw water Augmentation Pipeline	R500M (2015)	Provision of a further 4Ml/day to WSS

Other projects exist, however, these are for infrastructure upgrades and service coverage extensions.

10.4. Projected Population

The projected population of the District, per Local Municipality for the period 2011 to 2045 is as follows.

Table 88: Population Projections

Local Municipality	2011 (Census)	Population				Overall % Growth 2015 to 2045	Equivalent Annual Growth (%)
		2015	2025	2035	2045		
Ezingoleni	52 543	55 146	62 463	68 810	77 104	39.8	0.97
Hibiscus Coast	256 118	267 075	306 134	341 613	382 923	43,3	0.97
Umdoni	78 871	81 927	93 289	103 854	116 820	42.6	0.97
UMuziwabantu	96 551	101 585	114 727	125 932	141 392	39.1	0.97
Umzumbe	160 967	168 588	191 379	211 485	241 248	43.1	0.97
Vulamehlo	77 392	81 090	91 991	101 757	115 271	42.1	0.97
Ugu	**722 442**	**755 410-**	**859 984**	**953 451**	**1 074 759**	**42.3**	**0.97**

The population of the district is, thus, expected to increase by about 42.3% over the 30 year period from 2015 to 2045 or at an average 1.0% per annum.

Comment [S2]:

10.5. Projected Water Demands

The projected daily demands per Local Municipality were determined to be as follows:

Table 89: Projected Daily Demands per LM

Local Municipality	2011 Census Statistics		Projected Daily Demands (Ml/d)					Overall % Increase 2015 to 2045	Overall Quantity Increase 2015 to 2045
	Total No. Households	Back logs (HH)	2011	2015	2025	2035	2045		
Ezingoleni	11 473	5 064	3.25	3.40	6.12	7.86	8.67	255	5.27
Hibiscus Coast	72 176	12 548	41.88	43.42	53.12	62.85	69.34	59.7	25.92
uMdoni	22 869	3 516	13.55	13.98	16.75	19.54	21.58	54.4	7.6
uMuziwabantu	21 620	8 717	7.02	7.36	12.48	15.75	17.40	236	10.04
Umzumbe	35 171	22 243	7.79	8.15	18.74	24.12	27.03	332	18.88
Vulamehlo	16 135	9 123	4.13	4.32	9.00	11.55	12.87	298	8.55
Ugu	**179 444**	**61 213**	**77.6**	**80.6**	**116.2**	**141.7**	**156.9**	**94.6**	**76.3**

10.6. Proposed Interventions

Based on the capacities of existing infrastructure, projection of demands to year 2035 and a review of projects in planning and/or currently under implementation, the study proposes the implementation of the following projects:

- All water resources projects in planning, as in **Table 87** above, with the addition of the following:
  - A raw water pipeline from uMtamvuna River to Harding Weza WTW to augment raw water resources to the WSS,
  - A 2Ml/d WTP situated at the proposed Ncwabeni Dam to augment supplies to the Mhlabatshane WSS
- Infrastructure upgrades to the remainder of infrastructure to meet growing demands.

These projects are summarised per LM area as follows:

Table 90: Proposed Interventions per LM

Type of Intervention	Local Municipality						Total
	Ezinqoleni	Hibiscus Coast	Umdoni	uMuziwabantu	Umzumbe	Vulamehlo	
Dams	Nil	1 No. – Ncwabeni Dam	1 No. Ngwadini Dam	1 No. – Weza Dam	Nil	1 No. – Vulamehlo Dam on uMtwalume River	**4 No. dams**
Raw/Treated Water Augmentation	Nil	Nil	Umgeni Water SCP	Raw Water Abstraction from uMtamvuna River	Raw water abstraction from uMzimkhulu River	Nil	**3 No. Projects**
New WTP	Nil	Nil	1 No. 100Ml/d WTP - LMBWSS	Nil	1 No. 2Ml WTP at Ncwabeni Dam		**2 No. new WTP**
WTP Upgrades	Nil	1 No. - uMtamvuna WTP	Nil	1 No. – Harding Weza WTP	3 No.; Mhlabatshane WTP, kwaNdelu WTP & kwaHlongwa WTP	2 No.; Vulamehlo WTP & kwaLembe WTP	**7 No.**
Primary Bulk Pipelines (km)	14.5	50.4	13.6	25.5	15.7	12.1	**103.7**
Additional Reservoir Capacity (Ml)	Nil	20	15	20	10	6	**71**

10.7. Cost of Wall to Wall BWS Interventions

The proposals from this project include the following:

- Minor re-demarcation of some water supply schemes,
- Proposals for Water Resource Augmentation,
- Proposals for development of primary water supply infrastructure, including;
  - Abstraction infrastructure,
  - WTP's
  - Bulk Pipelines and Pump stations
  - Reservoirs

The 2016 Estimated Costs (Overall) for the proposed interventions are as follows:

Table 91: Costs of Interventions R (millions)

Type of Intervention	Local Municipality						Total No
	Ezinqoleni LM	Hibiscus Coast	Umdoni	uMuziwabantu	Umzumbe	Vulamehlo	
Water Resources	0	900.00	1 241.20	160.39	535.00	513.63	3 350.23
UAP Proposed Projects	64.72	191.89	104.33	405.75	217.23	173.34	1 157.24
Total R(Millions)	**64.72**	**1 091.89**	**1 345.53**	**586.14**	**752.23**	**686.97**	**4 507.47**
2035 Households (refer to section Error! Reference source not found.**)**	17 032	84 558	25 706	31 171	52 348	25 187	236 003
Cost per Household	R 3 800	R 12 913	R 52 342	R 18 162	R 14 370	R 27 274	R 19 099

These are further broken down as follows:

10.7.1. Costs of Water Resources Projects

The following is a breakdown of proposed water resources interventions:

Table 92: Breakdown of Projects' Costs for Water Augmentation Projects

Project	Escalated Cost/LM				
	Hibiscus Coast	Umdoni	uMuziwabantu	uMzumbe	Vulamehlo
Ncwabeni Dam	R 900 000 000	-	-	-	-
Ngwadini Dam + Lower uMkhomazi BWSS	-	R 1 241 200 000	-	-	-
4 Ml/day raw abstraction from uMzimkhulu	-	-	-	R 535 000 000	-
Vulamehlo Dam	-	-	-	-	R 513 633 384
Weza Dam	-	-	R 160 395 816	-	-
Totals (R)	**R 900 000 000**	**R 1 241 200 000**	**R 160 395 816**	**R 535 000 000**	**R 513 633 384**
Totals (R Million)	**R 900.00**	**R 1 241.20**	**R 160.40**	**R 535.00**	**R 513.63**

10.7.2. Costs for Recommended Primary Infrastructure

The cost of these proposals are summarised in the following **Table 93**. It is noted that these costs exclude the costs of dams in planning, namely Weza Dam, Ncwabeni Dam and Vulamehlo Dam.

Table 93: Breakdown of Projects' Costs

Scheme Name	Costs per WSS	Cost Allocation Per LM					
		Ezinqoleni	Hibiscus Coast	uMdoni	uMuziwabantu	uMzumbe	Vulamehlo
Pungashe/ Mhlabatshane	R 147 899 089	-	-	-	-	R 147 899 089	-
Vulamehlo Cross-border	R 57 566 012	-	-	-	-	-	R 57 566 012
KwaNdelu	R 49 856 276	-	-	-	-	R 49 856 276	
KwaHlongwa	R 19 471 998	-	-	-	-	R 19 471 998	-
uMtwalume	R 58 425 181	-	-	R 58 425 181	-	-	-
uMzimkhulu	R 140 177 882	-	R 140 177 882	-	-	-	-
Harding/Weza	R 405 746 152	-	-	-	R 405 746 152	-	-
uMtamvuna	R 116 427 672	R 64 718 390	R 51 709 282	-	-	-	-
Umgeni	R 67 431 990	-	-	-	-	-	R 67 431 990
Kwalembe	R 48 337 862	-	-	-	-	-	R 48 337 862
Umzinto	R 45 904 342	-	-	R 45 904 342	-	-	-
Totals (R)	**R 1 157 244 455**	**R 64 718 390**	**R 191 887 164**	**R 104 329 523**	**R 405 746 152**	**R 217 227 363**	**R 173 335 864**
Totals (R Million)	**R 1 157.24**	**R 64.72**	**R 191.89**	**R 104.33**	**R 405.75**	**R 217.23**	**R 173.34**

10.8. Conclusions

Based on impacts of interventions to backlog alleviation and other factors, the study recommends a proposal for phasing of projects, starting with the highest priority, as follows:

- Projects in Umzumbe LM,
- Projects in Hibiscus Coast LM
- Projects in uMuziwabantu LM
- Projects for Umdoni LM
- Projects for Vulamehlo LM and
- Projects for Ezinqoleni LM

It is noted that the proposals in the report are based on high level assessment and review of available documents. On implementation, all proposals require to be taken through detailed feasibility studies and design processes.

11. REFERENCES

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ANNEXURE A

MAPS SHOWING EXISTING SCHEMES

ANNEXURE B

SCHEMATICS FOR THE EXISTING SCHEMES

ANNEXURE C

INPUTS TO THE DEMAND MODEL

ANNEXURE D

OUTPUTS OF THE DEMAND MODEL

ANNEXURE E

PROPOSED WATER RESOURCES INTERVENTIONS

ANNEXURE F

SCHEMATICS FOR PROPOSED INFRASTRUCTURE

ANNEXURE G

COST SCHEDULES FOR UAP INTERVENTIONS