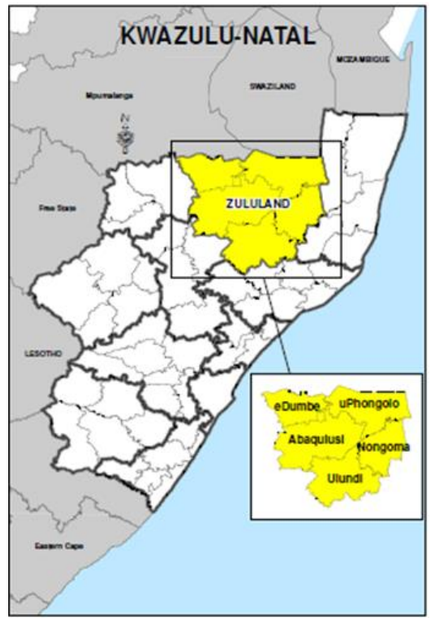
UNIVERSAL ACCESS PLAN (FOR WATER SERVICES) PHASE 2

PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT PLAN – ZULULAND DISTRICT MUNICIPALITY

CONTRACT NO. 2015/178

RECONNAISSANCE STUDY
FINAL



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REPORT CONTROL PAGE

Report Control

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EXECUTIVE SUMMARY

This report is the Reconnaissance Study for the Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for Zululand District Municipality. This Executive Summary (of the findings of the report is presented) to summarise, the following:

- Study Area
- Projected Population
- Projected Water Requirements
- Existing Water Supply Scheme
- Projects in Planning
- Planned/Proposed Water Resources Interventions
- Estimated Costs of Interventions

STUDY AREA

The Zululand District Municipality comprises five local municipalities uPhongolo Local Municipality, Abaqulusi Local Municipality, Nongoma Local Municipality, Ulundi Local Municipality and eDumbe Local Municipality.

CURRENT BACKLOGS

The current backlog of water services in Zululand District Municipality is 37.6% or 59 344 households with level of service below RDP standard. This backlog is broken down per local municipality as follows:

Municipality Name	Above RDP	Below RDP	Total	% Below RDP
Abaqulusi	33 669	9 631	43 300	22.2%
eDumbe	11 775	4 363	16 138	27.0%
UPhongolo	18 414	10 357	28 771	36.0%
Nongoma	12 705	21 635	34 340	63.0%
Ulundi	21 840	13 358	35 198	38.0%
Total	**98 403**	**59 344**	**157 747**	**37.6%**

PROJECTED POPULATION

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

LM	2011		2035		2045		Overall % Growth 2015 to 2045	Equivalent Annual Growth %
	Pop	HH	Pop	HH	Pop	HH		
Abaqulusi	211060	43 300	276667	54037	293310	57287	32.4%	0.94%
eDumbe	82053	16 138	106794	20858	112437	21960	30.3%	0.89%
UPhongolo	127238	28 772	165112	32249	173676	33921	29.8%	0.87%
Nongoma	194908	34 340	251336	49089	263448	51455	28.6%	0.84%
Ulundi	188317	35 198	244261	47707	257139	50222	29.9%	0.88%
	803576	**157747**	**1044171**	**203940**	**1100010**	**214846**	**30.3%**	**0.89%**

The population of the district is, thus, expected to increase by about 30.3% over the 30 year period from 2015 to 2045 or at an average 0.89% per annum.

PROJECTED WATER REQUIREMENTS

The water requirements can also be summarised per LM as follows:

LM	Census 2011			Water Requirements GAADD (Ml/day)				
	No of HH	RDP & Above LOS	Backlog	2011	2015	2025	2035	2045
Abaqulusi	43299	33669	9630	35.76	37.44	40.94	47.24	49.73
eDumbe	16138	11775	4363	9.56	10.03	11.42	13.56	14.15
uPhongolo	28772	18414	10358	13.47	14.13	16.19	19.01	19.86
Nongoma	34341	12705	21636	12.60	13.23	18.92	25.27	26.30
Ulundi	35198	21840	13358	20.70	21.72	24.66	28.89	30.19
Total	**157748**	**98403**	**59345**	**92.10**	**96.56**	**112.12**	**133.97**	**140.23**

As can be seen from the above table, the GAADD is expected to grow by an overall of 45.2% in the ZDM for the period 2015 to 2045. This will see an increase in water requirements by magnitude of 43.7Ml/day.

EXISTING WATER SUPPLY SCHEMES

The ZDM falls within the Mfolozi (W2), Mkuze (W3) and Pongola (W4) secondary catchments of the Usuthu/Mhlathuze Water Management Area (WMA), which drains towards the east coast of South Africa. The most prominent surface resources in this WMA include the Phongola River, Black Mfolozi River, White Mfolozi River and Mkuze Rivers.

The DM is currently served with water supplies through 10 (ten) regional water schemes which are made up of a number of individual water schemes. The supply schemes are namely; Simdlangentsha East RWSS, Simdlangentsha Central RWSS, Simdlangentsha West RWSS, Hlahlindlela (Mondlo) RWSS, Nkonjeni RWSS, Usuthu RWSS, Coronation RWSS, Gumbi RWSS, Mandlakazi RWSS and Khambi WSS.

PROJECTS IN PLANNING

ZDM planned water supply projects to address the backlogs within the district. The projects planned and under implementation are summarised as follows:

Provincial Ref Number	Project Title	Project Status	Approved MIG Funding	Project Scope of work
2006MIGFDC265325	Usuthu RWSS Phase 3	Construction	R 89 093 640.00	60kl reservoir; water networks of about 20 km of 25-90 mm dia pipes; refurbishment of existing 30kl reservoir, break pressure tanks, air, scour and isolation valves; and other associated infrastructure
2006MIGFDC265328	Usuthu RWSS Phase 2	Construction	R 32 483 514.00	The beneficiaries in Usuthu area covering over 21,000 km2 between Nongoma and Mahlabathini. Water source is the Black Mfolozi river near Mjeni. Project will be implemented in numerous phases No data
2006MIGFDC265329	Usuthu RWSS Phase 1	Construction	R 96 259 053.00	
2006MIGFDC265332	Simdlangentsha Central RWSS Ph 2 AFA	Construction	R 56 000 493.76	Reticulation for increased population from 39,569 to 54,160 beneficiaries
2006MIGFDC265333	Khambi RWSS Water Supply AFA	Construction	R 74 785 687.00	• Water abstraction from a weir on Kwamthazi River, WTW • pumping to the settlements Kwamakweshe, Ndlandla, Hlazeni, Ngenetheni. Ntumbane, Nsunduzane, Cibilili, Mahalaqoka, Esihlengeni and Bhekephi; • 3 x 1 kl, 1 x 10 kl and 6 x 30 kl break pressure reservoirs; Construction of 1 x 100 kl, 2 x 200 kl, 1 x 400 kl and 1 x 500 kl storage reservoirs; • Reticulation and distribution networks to above settlements and Development of six spring
2006MIGFDC265334	Hlahlindlela/ Mondlo Regional Water Supply	Construction	R 167 579 680.00	Project has 3 phases and first phase will be to develop local sources as a short-term solution. The second phase will be to supply water from Klipfontein Dam to eMondlo. The third phase will be to join all stand-alone schemes to the bulk supply from Klipfontein dam.
2006MIGFDC265336	Simdlangetsha East RWSS Phase 1	Construction	R 25 683 733.70	Construction of the Spekboom River Abstraction unit; Installation of bulk water meters; flow controllers; additional reticulation lines; flow regulators on bulk lines; access road to storage reservoir no.1 (S1); telemetry system; Geohydrological study - Maguda Mountain Settlement; Rising main and stand alone scheme to Gumbi Settlement
2006MIGFDC265339	Simdlangetsha West RWSS Phase 2.1 (AFA) MIS 210576	Construction	R 229 829 490.00	Installation of additional networks at Bilanyoni & Mangosuthu; Additional capacity at Frischgewaagd WTW & new rising main line to Frischgewaagd; Bulks & infill networks for the Upper & Lower Simdlangentsha settlements; Bulk supply & network extensions at Opuzane; Networks for 8 new land reform areas.
2006MIGFDC265351	Coronation RWSS Enyathi (AFA) MIS 155365	Construction	R 34 927 055.48	Weir repairs, water treatment plant and pumpstations, 2 x clear water storage tanks, spring protection, 4.22 km bulk water supply lines, 3 x break pressure tanks.
2008MIGFDC26162234	Mandlakazi Regional Water Supply Scheme (Phase 4)	Construction	R 125 793 218.00	• Installation of 43km primary bulk water mains, 15km secondary bulk mains, reticulation to approximately 3900 households, • Upgrading of 3 pumpstations, • Construction of 3 bulk resevoirs and 6 supply zone reseviors and the augmentation of the Mandlakazi water purification plant.
2008MIGFDC26165601	Gumbi Emergency Water Supply	Construction	R 26 464 362.00	The project will establish infrastructure to take raw water from Jozini Dam via pumpstation and main pipeline to a water purification plant and storage facility at the Gumbi Community including reticulation.
2009MIGFDC26171056	Usuthu Regional Water Supply Scheme Phase 05	Construction	R 665 847 909.96	This phase 5 of the scheme is intended to supply water to 20,764 households with a population of 140,484. This population figures include the towns of Nongoma, Mahlabathini and Ceza which have been partly served with water but the CWSS are not sustainable. The scope of works includes 7 number of pump stations, total length of 127 km (Bulk Line), total length of 385 km (Secondary Bulk) and a total of 80 reservoirs.
2009MIGFDC26171057	Nkonjeni Regional Water Supply Scheme Phase 04	Construction	R 310 103 565.51	The scope of works includes 7 number of pump stations, total length of 136 km (Bulk Line), total length of 385 km (Secondary Bulk) and a total of 21 reservoirs.
2012MIGFDC26207602	Simdlangetsha East Water Supply - Phase 2	Registered	R 97 162 185.96	• Upgrading and extension of the main source of water. • The introduction of flow and pressure control in the existing distribution network • Development of internal reticulation distribution network to villages that are currently without such infrastructure.
2013MIGFDC26213508	Simdlangentsha Central Water Supply Project: Phase 3	Registered	R 148 006 808.34	• expansion of Belgrade Water Treatment works • 10.31Km of 23.3 Km of gravity main lines • 2xbooster pump stations (Kiphuyawo and Bongaspoort • 3 main supply resrvoirs (Ombimbini1 – R2, Klipwal – R4 and Emabomvini – R3) • Telemetry Communication system.
2013MIGFDC26211793	Coronation Regional water Supply Scheme: Planning Phase	Registered	R 2 884 800.00	Feasibility study for borehole water supply
2013MIGFDC26220802	Zululand Rudimentary Water Supply Programme - Phase 4	Registered	R 122 128 226.52	• Testing and verification of existing sources - 163 • New Production Borehole with small network - 38 • Develop existing borehole with small network - 7 • New borehole with small network - 56 • New borehole with handpump - 153 • Existing spring with small network - 6 • New spring with small network - 3 • The total number of work items for Phase 3 will therefore be 426.
2014MIGFDC26215437	Mandlakazi Regional Water Supply - Phase 5	Registered	R 447 768 410.25	Project scope includes construction of 16 new reservoirs, with a total of 490km of pipelines, construction of metered yard connection to approximately 12809 household. Network will include air valves, isolating valves and scour valves.
Total			**R 2 752 801 833.48**	

WATER INTERVENTIONS CONSIDERED

The study developed a demand model that was used to estimate projected demands per Local Municipality Area and per RWSS and in some instances per WSS. The “Probable” Summer Daily Demands (SDD) were used to determine the adequacy of existing water resources and 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 in red indicate potential supply constraints.

Local Municipality	Water Scheme Name	Water Requirements (SDD Ml/d)				WTW Capacity (Ml/day)
		2015	2025	2035	2045	
Abaqulusi LM	Hlahlindlela WSS	39.66	41.61	46.71	49.25	69.50
	Coronation WSS	2.14	2.38	2.84	2.96	0.40
	Louwsburg WSS	0.93	1.00	1.19	1.25	0.72
	Hlobane WSS	1.28	1.32	1.51	1.60	2.00
	Khambi A & Mountain View WSS	2.00	2.93	4.03	4.22	0.20
	Khambi B WSS	1.41	2.08	2.86	3.01	Farms
	Enyathi WSS	0.40	0.58	0.78	0.81	1.00
Subtotal for Abaqulusi LM		***47.82***	***51.9***	***59.92***	***63.1***	**73.82**
eDumbe LM	Simdlangentsha West A WSS	7.35	8.07	9.37	9.73	2.0
	Simdlangentsha West B WSS	1.85	2.54	3.33	3.49	Farms
	Paulpietersburg WSS	2.90	3.09	3.66	3.87	3.0
Subtotal for eDumbe LM		***12.1***	***13.7***	***16.36***	***17.09***	**5.0**
uPhongolo LM	Simdlangentsha East WSS	10.76	12.05	14.19	14.81	12.0
	Simdlangentsha Central WSS	4.00	4.58	5.39	5.61	4.0
	Gumbi WSS	2.44	2.90	3.45	3.65	Farms
Subtotal for uPhongolo LM		***17.2***	***19.53***	***23.03***	***24.07***	**16.0**
Nongoma LM	Nongoma (Vuna) WSS	11.42	15.23	19.85	20.68	6.54
	Mandlakazi WSS	12.13	14.29	17.21	17.52	10.5
	Khangela Royal Palace (Kombuzi) WSS	0.80	1.21	1.66	1.73	0.06
Subtotal for Nongoma LM		**15.85**	**22.23**	**29.72**	**30.93**	**17.1**
Ulundi LM	Greater Ulundi WSS	21.18	22.54	25.38	26.56	26.40
	Ulundi East WSS	1.38	2.35	3.40	3.53	
	Ceza WSS	1.73	2.29	2.96	3.08	0.60
	Babanango WSS	0.68	0.83	1.07	1.11	0.33
	Mpungamhlophe WSS	2.30	2.57	3.03	3.16	0.80
Subtotal for Ulundi LM		**27.27**	**30.58**	**35.84**	**37.44**	**28.13**
TOTAL for ZDM		***120.24***	***137.94***	***164.87***	***172.63***	***120.24***

The highlighted schemes indicate that there will be infrastructure capacity constraints to deliver the projected demands by 2035 (and in some instances 2015).

RECOMMENDATIONS

The reconciliation study report has undertaken a gap analysis between available water resources and existing infrastructure capacity and projected demand. The gap analysis has culminated in recommendations for addressing the resulted gaps where these occur. The recommendations are summarised in the table below.

Local Municipality	Water Scheme Name	Amount	Comments
Abaqulusi	Hlahlindlela WSS	R 646 386 777	Bulk supply from Klipfontein WTW to Mondlo & raising of Klipfontein Dam wall
	Coronation WSS	R 65 658 310	Existing infrastructure adequate
	Louwsburg WSS	R 67 342 422	Abstraction and WTW upgrades at Louwsburg WTW & raising of Louwsburg Dam wall
Subtotal for Abaqulusi LM		**R 779 387 509**	
eDumbe LM	Paulpietersburg WSS	R 95 142 527	Abstraction and WTW upgrades at Paulpietersburg WTW & raising of Dumbe Dam wall
Subtotal for eDumbe LM		**R 95 142 527**	
uPhongolo LM	Simdlangentsha East WSS	R 162 888 310	Abstraction and WTW upgrades at Phongola WTW
	Simdlangentsha Central WSS	R 118 079 538	Abstraction and WTW upgrades at Belgrade WTW
Subtotal for uPhongolo LM		**R 280 962 848**	
Nongoma	Nongoma (Vuna) WSS (Includes Ceza WSS)	R 1 268 409 655	New Sikwebezi Dam and WTW
Subtotal for Nongoma LM		**R 1 268 409 655**	
Ulundi LM	Greater Ulundi WSS	R 548 110 842	Abstraction and WTW upgrades at Ulundi WTW
	Ulundi East WSS		
	Babanango WSS	R 19 523 085	Abstraction and WTW upgrades at Babanago WTW
	Mpungamhlophe WSS	R 81 330 893	Abstraction and WTW upgrades at Mpungamhlophe WTW
Subtotal for Ulundi LM		**R 648 964 820**	
Total for ZDM		**R3 072 872 359**	

The provision of water services remains the responsibility of the ZDM as the WSA. The ZDM should thus ensure that they meet all the requirements to take the proposed interventions into detailed feasibility assessment and implementation readiness.

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LIST OF ABBREVIATIONS

Ave.	Average
CoGTA	Department of Cooperative Governance and Traditional Affairs
ZDM	Zululand 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
LoS	Level of Service
m^3	Cubic meters
PSP	Professional Service Provider
RDP	Reconstruction and Development Plan
RF	Reference Framework
TBD	TO BE DETERMINED
UAP	Universal Access Plan
UW	Umgeni Water
WARMS	Water Authorisation and Registration Management System
WSA	Water Service Authority
WSDP	Water Services Development Plan
WSP	Water Service Provider
WSS	Water Supply Scheme
WTW	Water Treatment Works
RWSS	Regional Water Supply Scheme
NRW	Non Revenue Water
MAR	Mean Annual Runoff
WMA	Water Management Area

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 Zululand 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 WSAs 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 WSAs 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; and
- 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 Phase 2 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) Limited, in association with ZIYANDA Consulting cc , to review the Phase 1 of 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.

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, WTW, 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.

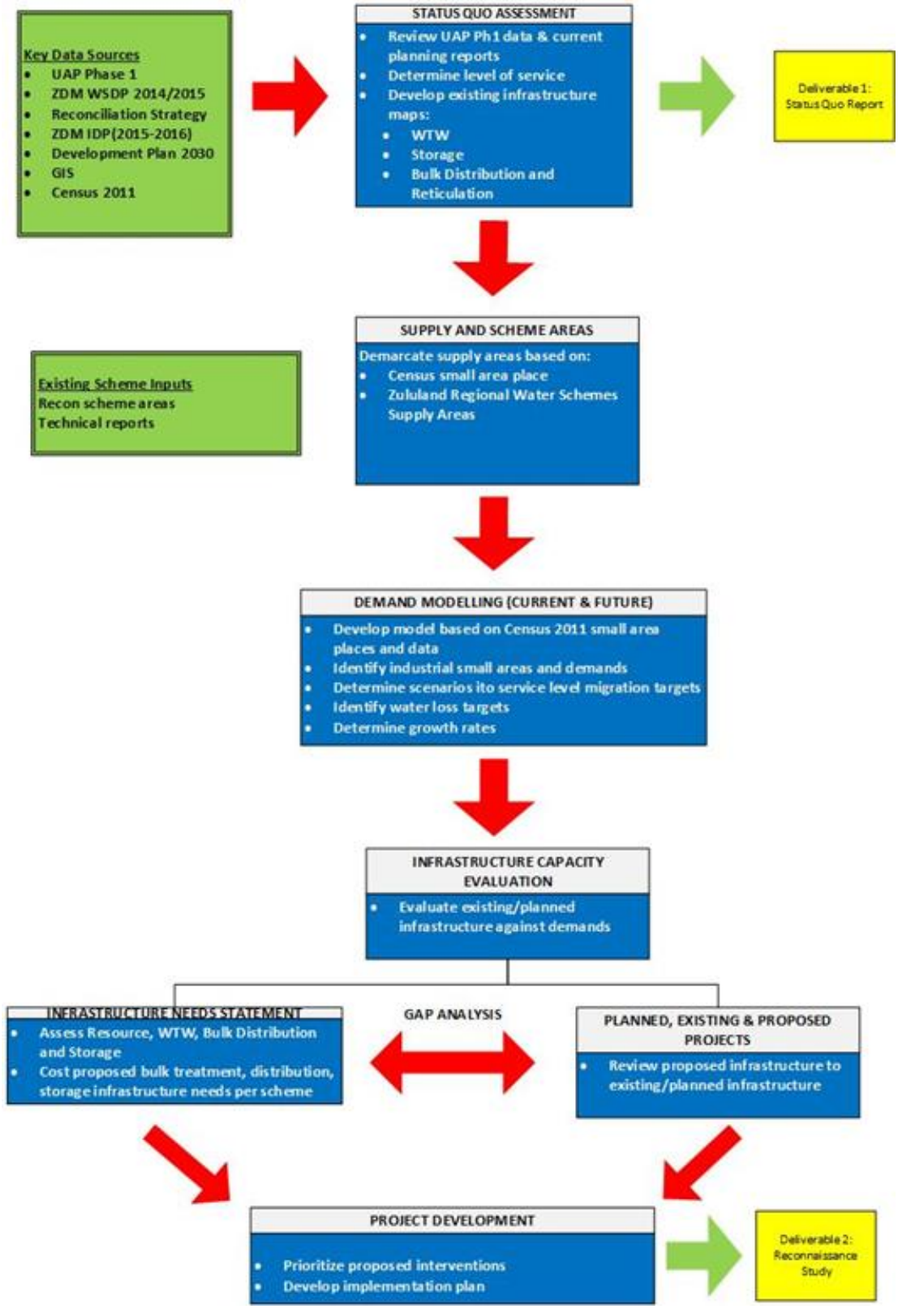


Figure 1: Study Process

1.5. Data Sources

A summary of the data sources is found in **Table 1**.

Table 1: Data Sources

Document	Compiler(s)	Document Owner (Client)	Date
First Stage Reconciliation Strategy for Eastern Region Zululand District Municipality • Greater Ulundi Water Supply Scheme Area • Greater Nongoma (Vuna) Water Supply Scheme Area • Usuthu (Ceza) Regional Water Supply Scheme Area • Vryheid Regional Water Supply Scheme Area • Simdlangentsha East Regional Water Supply Scheme Area • Simdlangentsha West Regional Water Supply Scheme Area • Greater Paulpietersburg Water Supply Scheme Area • Mandlakazi Water Supply Scheme Area • Greater eMondlo Water Supply Scheme Area • Greater Mpungamhlope Water Supply Scheme Area	• Water for Africa (Pty) Ltd in association with Aurecon (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 Zululand District Municipality	• Focus • Mott McDonald PDNA • MHO Geospace • Isivuno Consulting	Umgeni Water	October 2014
Zululand District Municipality Water Treatment works Assessments:			
• Babanango WTW	Kwezi V3 Engineers	ZDM	Sep 2009
• Louwsburg WTW	Ernest Cloete & Associates (Pty) Ltd	ZDM	October 2009
• Mpungamhlophe WW	Kwezi V3 Engineers	ZDM	Septr 2009
The Zululand District Municipality Integrated Development Plan (IDP) 2012-2016	• Zululand District Municipality	ZDM	Not dated
The Zululand District Municipality Water Services Development Plan (WSDP) 2014	Zululand District Municipality	ZDM	February 2014 (Draft)
The Zululand District Municipality Integrated Development Plan (IDP) Final 2015-2016	Zululand District Municipality	ZDM	May 2015
Zululand DM Blue Drop Score cards	Zululand District Municipality	ZDM	Nov 2011
Zululand District Municipality Growth and Development Plan 'Vision 2030'	Lazarus Developments	ZDM	undated

1.6. Limitations

The Reconnaissance Study Report has got limitations mainly due to unavailability of information. PSPs undertaking planning and feasibility studies for the ZDM have not provided details of planning information resulting in assumptions being made as necessary. However, where assumptions have been made, they have been clearly articulated so that further investigations may be made as necessary.

2. STUDY AREA

2.1. Context

ululand District Municipality (ZDM) is one of the 14 Water Services Authorities (WSA) in KwaZulu-Natal Province. The Zululand District is located on the northern regions of the KwaZulu-Natal Province. The location of the district municipality at provincial level is shown in **Figure 2**.

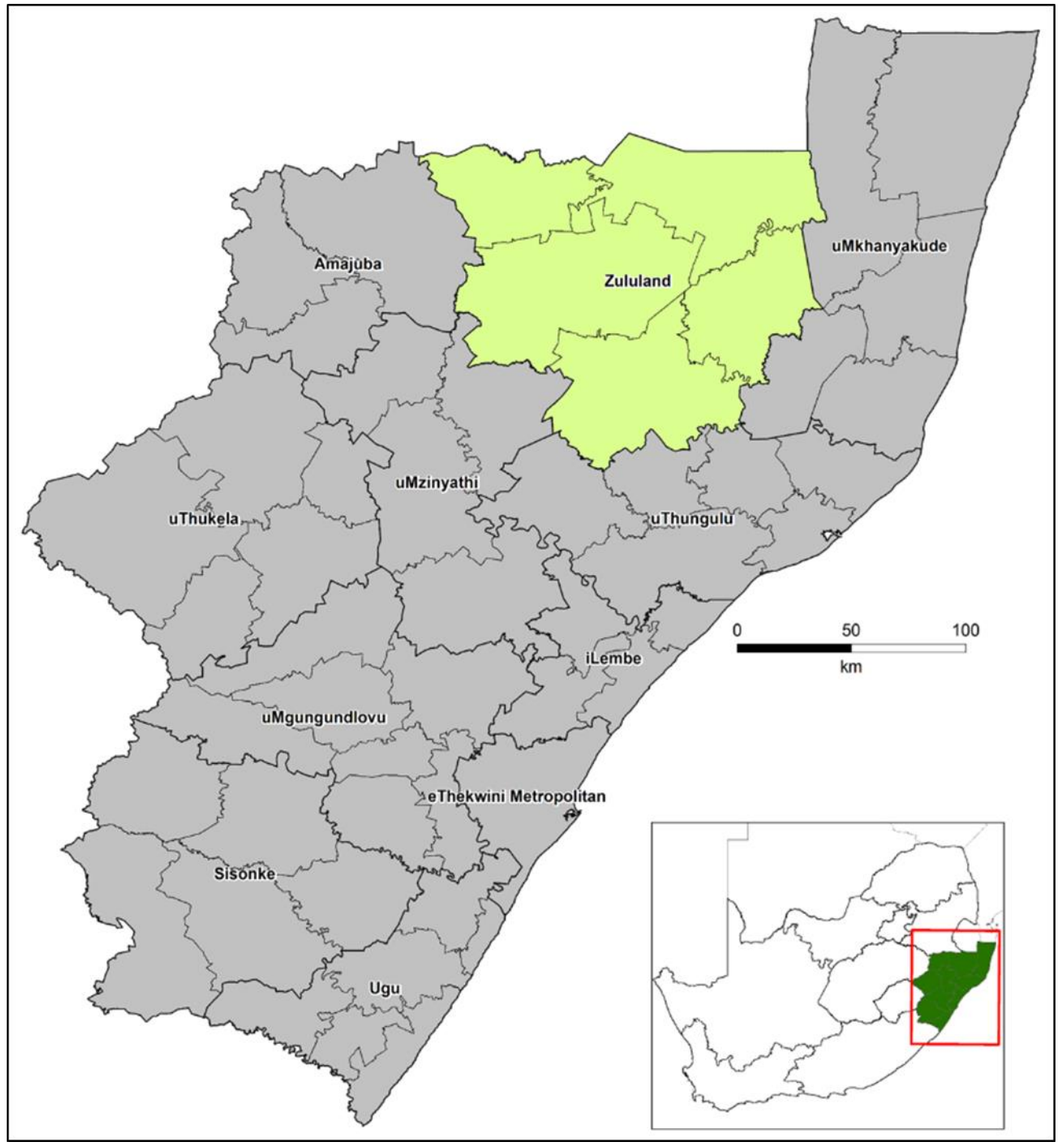


Figure 2: Zululand District Municipality Locality Map (IDP 2015/16)

2.2. Boundaries of Study Area

The district is bounded by Swaziland and Mpumalanga Province on the north, Amajuba District Municipality to the west, Umkhanyakude District Municipality to the east and Umzinyathi and Uthungulu District Municipalities to the south. Approximately half of the area is under the jurisdiction of traditional authorities while the remainder is divided between commercially-owned farms and conservation areas. ZDM covers an area of approximately 14 810 km². Most of the Zululand had a population leaves in isolated rural settlements and six urban areas. Most of the rural settlements are small, making service delivery costly. The district experiences high levels of poverty and has a high incidence of HIV/AIDS infection. Another major setback is poor accessibility to basic services and facilities. Zululand remains one of the poorest districts in South Africa in part due to its history as a marginalized homeland area (IDP 2015-2016).

The District comprises the following five local municipalities as depicted in **Figure 3**.

- eDumbe (KZ 261)
- uPhongolo (KZ 262)
- Abaqulusi (KZ 263)
- Nongoma (KZ 265)
- Ulundi (KZ 266)

The Municipal area consists of scattered rural settlement in Traditional Authority Areas resulting in a total of 21 Traditional Councils. The south-eastern part of the Municipal Area, a small portion to the central-west and portion in the central-north constitutes Ingonyama Trust Land. It is particularly the Ulundi and Nongoma LMs that have large tracts of Ingonyama Trust Land upon which scattered, relatively low density rural settlement is evident. The land use demarcation of the ZDM area of jurisdiction is shown in **Figure 4**.

Figure 3: Zululand District Municipality LM Breakdown

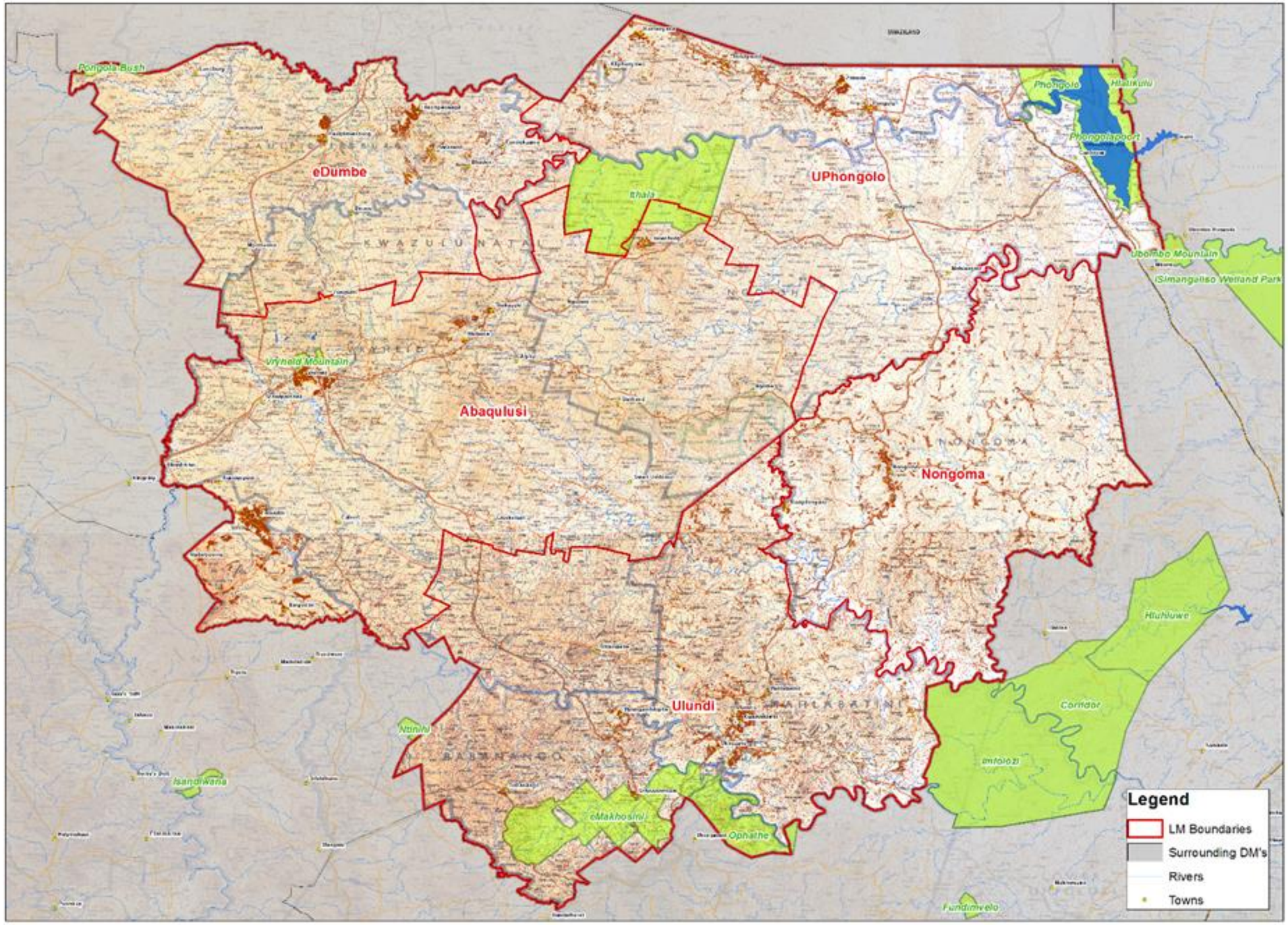
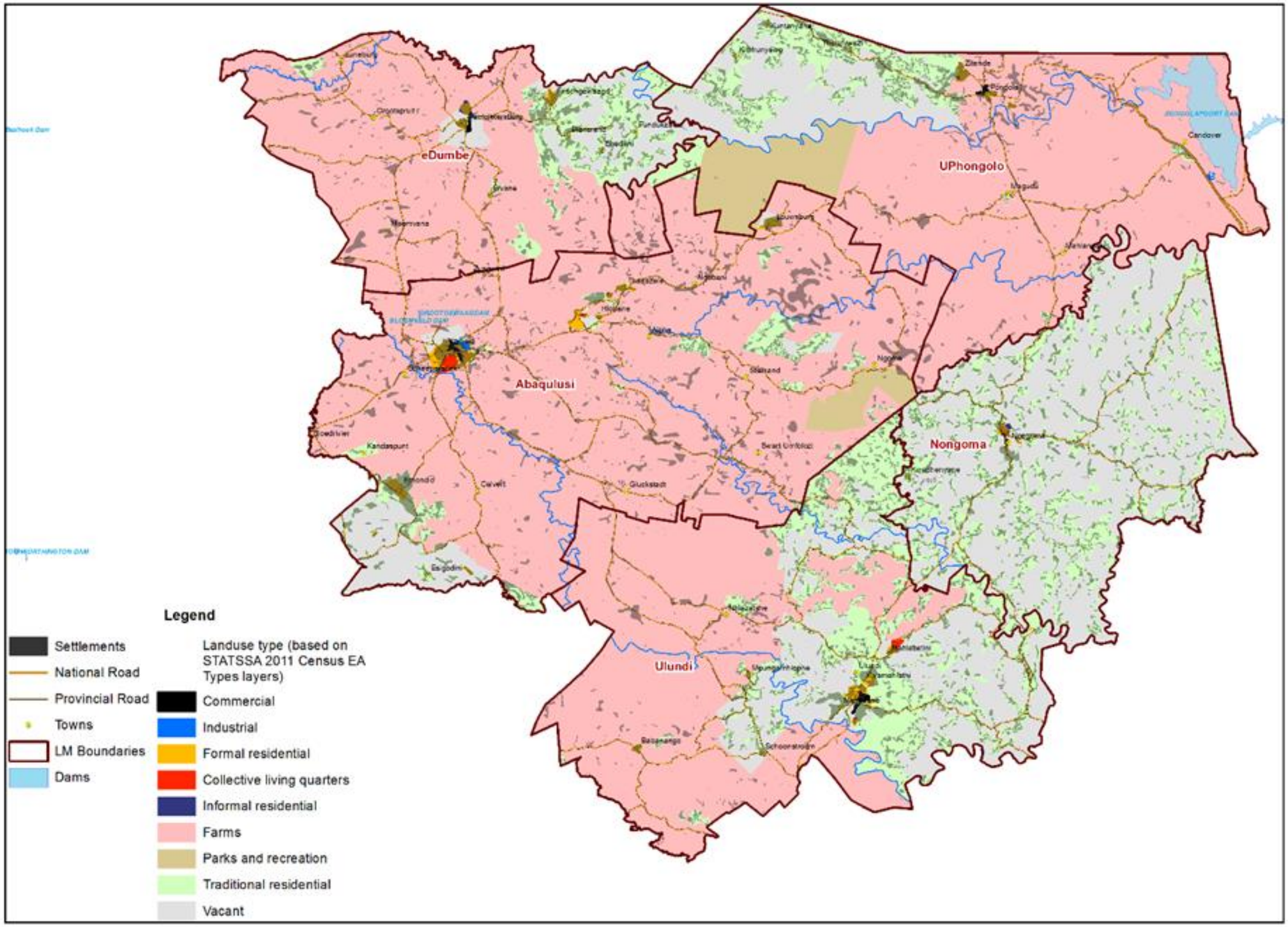


Figure 4: Zululand District Municipality Land Use



There are five (5) main commercial centres under the ZDM area of jurisdiction, namely Vryheid, Ulundi, Phongola, Nongoma and Paulpietersburg. Main Roads that transect the ZDM linking these commercial centres include the N2 highway along the northern border linking Phongola and Piet Retief to the north and Richards Bay to the south, R33, R34, R66 and R69. There are also two airports in Ulundi and Vryheid.

2.3. Physical characteristics of Study Area

The characteristics of the study area are provided per local municipality under this section.

2.3.1. eDumbe Local Municipality

The eDumbe Municipality is located on the north-western part of ZDM and forms part of the northern border of KwaZulu Natal Province and Mpumalanga Province. The municipality covers an area of approximately 3 239 km^2 and is a predominantly rural municipality with forestry and agriculture constituting the main economic activities. The population of 82 053 people (census 2011) lives mostly in the rural areas with only 35% (28 718) living in the urban area. There are a total of 52 settlements made up of 48 dispersed rural settlements, 3 urban areas and one major town, Paulpietersburg, also referred to as Dumbe Town. The municipality is the smallest under ZDM with the population constituting 10.2% of the entire population within ZDM.

The Natal Hot Springs Resort, Pongola Bush Nature Reserve, Ithala Game Reserve and Dumbe Trail along the Dumbe Mountains (popular with hikers) provide the main tourist attraction into the municipality area of jurisdiction. Heritage sites such as the Residence and the Grave of Mkabayi kaJama of the Zulu Nation at kwaGamakazi and the Voortrekker Park at Paulpietersburg also boost the eco-tourism in the area. eDumbe Municipality is also a gateway to KwaZulu Natal Province and provides an alternative shorter route from Mpumalanga Province to Durban and/or Pietermaritzburg via the Main Road R33 hence it becomes an attractive entry point into KwaZulu Natal Province.

2.3.2. uPhongolo Local Municipality

The uPhongolo Municipality is predominantly a rural Municipality consisting of 14 wards, tribal land patterns and high density rural settlements with 82% of the population living in rural areas. Covering a geographical area of 3239 km², the municipality is the second smallest under ZDM in terms of occupation with the population of 127 238 people (census 2011) constituting 15.8% of the entire population within ZDM. uPhongolo Municipality has a relatively diverse economy, with a particularly strong primary and secondary sector, in the form of Agriculture and retail and game farming, which together contribute over 30% of the municipality's GVA. General Government has a comparatively small economic role in the municipality as compared to the rest of the region, although it remains the biggest sectorial contributor (18%). It is strategically located along the N2, adjacent to the Swaziland Border and the Mpumalanga Province. It forms part of LEBOMBO SDI Corridor as a gateway to Swaziland and Mozambique using its Golela and Onverwacht border gates as well as access to the eastern-central parts of the province in the form of Richards Bay and Durban.

The municipality is surrounded by a unique natural scenic beauty, with endless water resources
The uPhongolo Municipality provides regional access to a wide range of tourist activities outside its own boundaries. It has within its area of jurisdiction unique natural scenic beauty, with endless water resources and two key tourist attractions, the Ithala Game Reserve and the Pongolapoort Dam. These attractions are complemented by a large number of private game farms and game reserves, on which a number of lodges and other tourist facilities are located.

2.3.3. Abaqulusi Local Municipality

The Abaqulusi Municipality is named after the AbaQulusi, a Zulu clan whose descendants live in the vicinities of Vryheid, Utrecht, eDumbe and eNgoje. Abaqulusi Municipality comprises of many settlements, both rural and urban, with Vryheid being its main urban settlement/town. Other areas of interest that fall within the boundaries of Abaqulusi also include Louwsburg, eMondlo, Hlobane and Bhekuzulu. The municipality covers an area of approximately 4 185 km2 making it the largest in the district with a population of approximately 211 060 people (Census 2011) constituting 26.3% of the population in ZDM. The population of Abaqulusi has been growing steadily since 2001.

The AbaQulusi Municipality economy was particularly affected by the closure of the Coronation, Mnyathi, and Hlobane mines in 1997 and 1998 respectively (Zululand Coordination LED Framework: 2003). Recently, the Coal Mining sector seems to gain more momentum and it is coming back to dominate the economic sector. This is due to high demand of coal in the country and internationally for various reasons. The study done by KwaZulu Natal Trade Investment reflects that there are high volumes of coal available into coal reserves especially in the former mines of Vryheid. As a result, the applications for coal prospecting have increased in the region by interested investors. This initiative will boost AbaQulusi local economic regeneration.

The AbaQulusi geographical location plays a huge role in terms of regional access in the Northern KwaZulu Natal. The AbaQulusi has a secondary corridor of national significance. The coal line corridor, which runs from Richards Bay, through Ulundi, Vryheid and Paulpietersburg and on to the mining areas of Mpumalanga, is an important route in the national rail and road network. The other secondary corridor of national significance is Vryheid town being located in the intersection of major transportation routes (R34 and R69), which transverse the region. These developments make Vryheid a catchment area for surrounding small towns such as Pongola, Paul Pietersburg, Nongoma, and Ulundi. This is further boosted by the development of P 700 road that will link Richards Bay and Gauteng via Ulundi and Vryheid.

2.3.4. Nongoma Local Municipality

The Nongoma Municipality is predominantly a rural municipality with 98.3% of the population residing in rural areas and 60% under the age of 20 years. Covering a geographical area of 2 184 km², the municipality is the smallest under ZDM in terms area but the second largest in terms of occupation with the population of 194 908 people (census 2011) constituting 24.3% of the entire population within ZDM. The education levels in Nongoma are very poor with 36.2% of the population are functionally illiterate and 32.8% having no schooling at all. These levels of education impact drastically on the type of work opportunities that can be created within the municipality. The Nongoma economy is dependent on two sectors: On the government services and retail / commercial sector with these sectors contributing close to 75% of the GDP of the municipality. Considering the mining contributes 10% this suggests that the contribution of the agricultural and manufacturing sectors specifically are negligible.

The Nongoma town is the only urban centre that provides social and commercial services and facilities within the predominantly rural landscape. Nongoma is popularly known as the seat of the Zulu monarch. It is the home of King Goodwill Zwelithini, the hereditary traditional leader of the Zulu nation, and his royal palaces are among the main tourist attractions in the region. Other tourist attractions include the following:

- Annual Royal Reed Dance: uMkhosi woMhlanga;
- Ceza Mountain: The stronghold of King Dinuzulu and his supporters during the uSuthu Rebellion of 1888;
- Ngome Marian Shrine: A Catholic nun based at Benedictine Hospital in Nongoma claimed to have 10 visions of Mother Mary between 1955 – 1971 and on visiting Ngome believed that this was the holy site referred to in the visions;
- Ntendeka Wilderness Area in the Ngome State Forest: The forest is a 5 230 ha reserve of indigenous high forest, exceptionally rich in plant life that exhibits strong tropical e unusual for an area far from the sea;
- Thangami Hot Springs : Offering accommodation, a restaurant, can conference facilities which overlook the Black Mfolozi River.

2.3.5. Ulundi Local Municipality

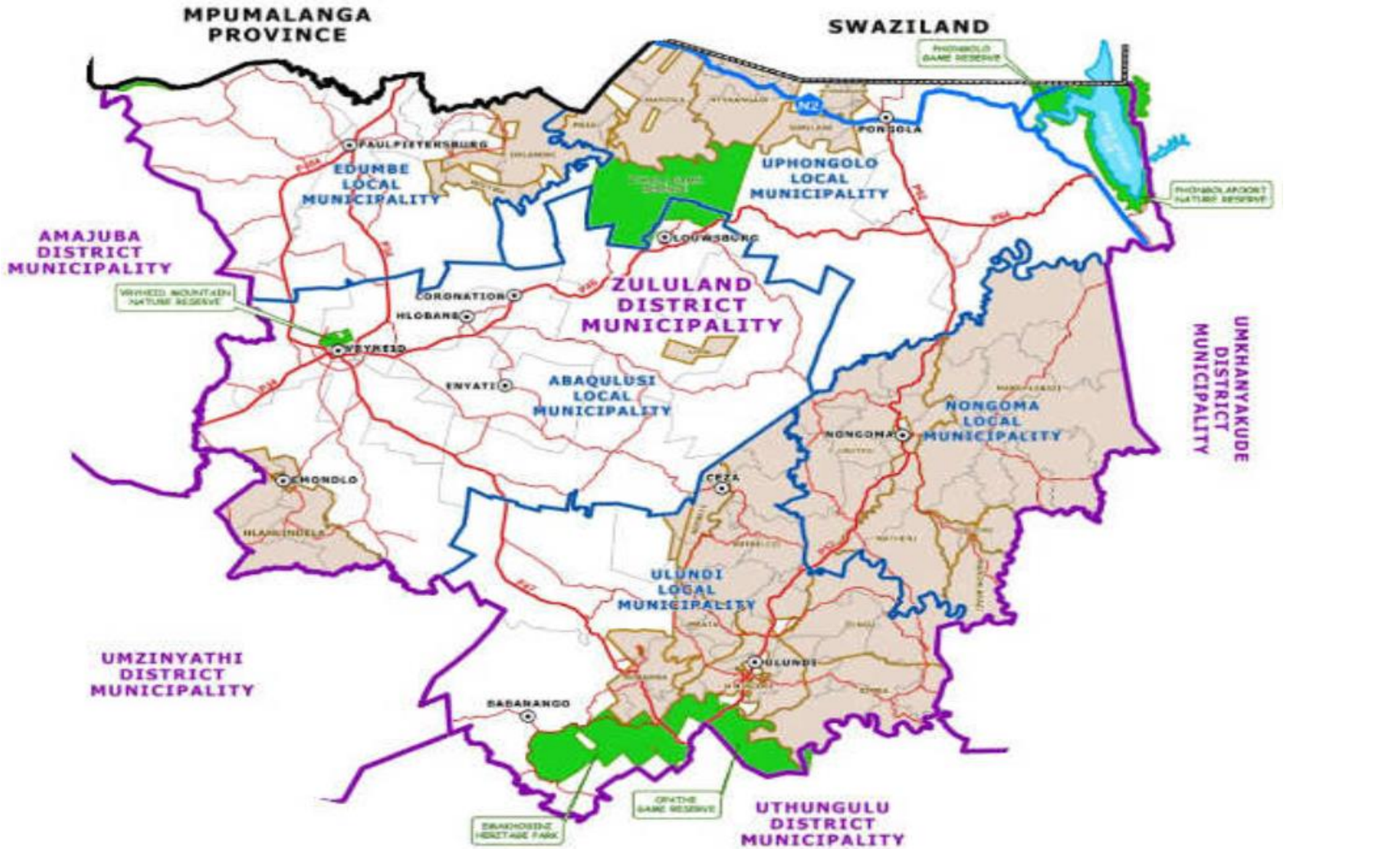
The Ulundi Local Municipality is located on the southern boundary of the Zululand District Municipality. The Ulundi municipal area is approximately 3 250 km2 in extent and includes only one town of Ulundi and several Traditional Authorities. The largest part of its area is rural and underdeveloped. Approximately half of the Municipal area consists of commercial farms and the area supports a substantial agricultural community. The municipality is the third largest under ZDM in terms of occupation with the population of 188 317 people (census 2011) constituting 23.4% of the entire population within ZDM.

The settlement pattern reveals a high population concentration in the town of Ulundi and densely populated peri-urban area surrounding the town and along the main routes R34, R66 and P700. Other settlement concentrations include Nqulwane as a result of Okhukho Coal Mine and Babanango. The town of Ulundi is situated on the R66 which connects Ulundi directly to Nongoma in the North and Melmoth to the south, then leading to the N2 which connects the town to the coastal cities. The town of Ulundi is the only formal urbanised nodes and houses all formal (first Economy) economic activities within the Municipality. The areas surrounding the town of Ulundi are characterised as large, densely populated tribal areas with an informal settlement pattern. These areas are completely reliant on Ulundi for employment, goods and services. Due to the high population density, concentration and service demands, large sections of these tribal areas can be classified as emerging urban settlements.

The Ulundi Municipality is traversed by two corridors namely the R34 and the R66 routes. The R34 is the main transport link road between Richards Bay and Mpumalanga. The R66 on the other hand provides regional access within the Zululand District Municipality. Ulundi is situated at the north-western end of the P700 corridor which links Ulundi to Richards Bay, Ntambanana and the Hluhluwe-Mfolozi Park which presents further opportunities for tourism development. This route will provide a shorter travel distance to the Park from Gauteng and Mpumalanga. In addition, the P700 and the P701 provide access to a number of lower order nodes.

The “Coal Line” Rail Corridor runs largely along the R34 alignment, but passes through the town of Ulundi and provides opportunities for development in the secondary sector if the possibility of importing and exporting freight. The road network infrastructure connecting the urban centres in ZDM is shown in **Figure 5**.

Figure 5: ZDM Urban Centres & Road Network Infrastructure



2.4. Climate

The ZDM region is in the sub tropical coast and Escarpment areas (**Figure 6**) subject to summer rainfall with dry winters, with rain predominantly falling in early summer, apart from Ithala Quartzite Sourveld (peak rains in midsummer). Mean Annual precipitation ranges from 493mm to 1682mm in the District (predominantly below 900mm in the District), with large scale variations over relatively short distances in certain areas (on account of topographical influences). Rainfall in form of thunderstorms is the prevalent form of precipitation, whilst mist also contributes to precipitation at higher elevations. Mist is however generally an uncommon feature and hail is almost absent across the majority of the District.

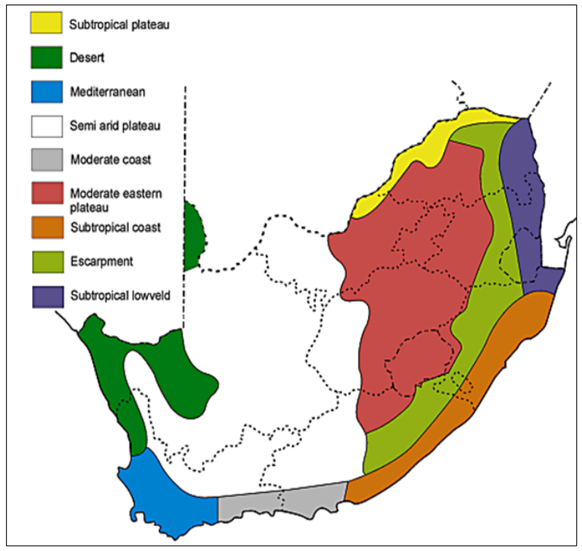


Figure 6: Climatic Zones of South Africa

Summers are generally warm to hot, and winters are cool. Mean Annual Temperature ranges generally from approximately 4ºC to 20ºC, temperatures generally become cooler moving towards the west. Mean annual evaporation varies considerably in the District depending on the relationship of rainfall and temperature (IDP 2015/16).

2.5. Topography, Geology and Soils

The landscape is generally mountainous. The slope categories range from smaller than 1:10 (10% incline), 1:6 (17% incline), 1:3 (33% incline) and steeper. The higher the gradient, the more difficult and more expensive construction and the provision of services becomes. The terrain therefore plays an integral part in determining settlement patterns. The central and north-western parts of the Municipal area are mountainous with slope of 1:3 and steeper. The slopes decrease (become less steep) towards the eastern half of the Municipal Area. A topographical map is included as **Figure 7**).

Due to limitations on climate, soils and slope limited arable potential exists in the District. The more arable land is confined to the wetter high lying western areas of the municipality in eDumbe, Abaqulusi and parts of Ulundi municipalities, where plantation crops such as sugar and commercial timber are produced. The remainder of the District includes lower rainfall areas resulting in production levels being marginal. Livestock and game operations are successful in the drier areas, although stocking rates are lower due to sparser vegetation cover than in the higher rainfall areas. An important feature of the land cover of Zululand is that there are limited areas under cultivation and plantation owing to the climatic conditions in the District (low rainfall). These are mainly located in the higher rainfall areas around Vryheid and Paul Pietersburg, and in the drier areas around irrigation schemes such as uPhongolo. The drier parts of the District are under bushlands and grasslands. The eastern parts of the District are under bushveld forests and grasslands.

2.6. Environmental

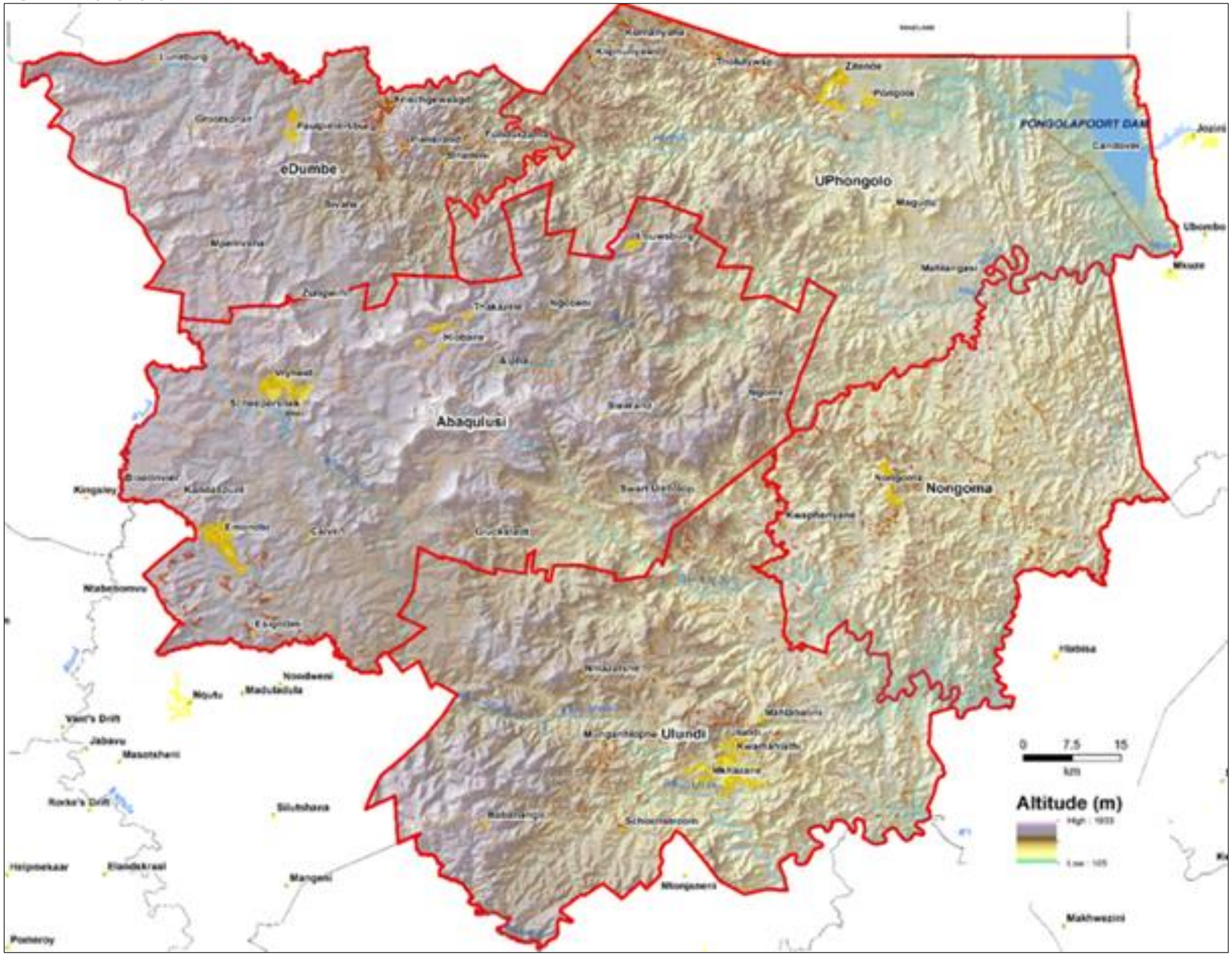
Agricultural and grazing potential in the Zululand District are largely a reflection of rainfall in particular parts of the district, which in turn is largely determined by altitude. The majority of high value arable land is located in the western highlands of the District whilst the poor and restricted is located in the remainder of the municipality. Whilst the lower lying drier areas may not be ideally suited to dryland arable cropping, they are of value for livestock and game production.

Good to high potential agricultural land is particularly evident in the north-western parts of Zululand i.e. the area from Emondlo to Paul Pietersburg. There is also some land to the south of Emondlo (as well as surrounding the town) which is classified as very high potential agricultural land. Most of these tracts of land are used for commercial agricultural purposes. High potential in the Pongola valley are as a result of irrigation opportunities that been developed in this area. The agricultural potential of the communal areas of Ulundi and Nongoma is marginal to poor, except for high lying plateaus in each locality, but these make up a small portion of the total area. Valley bushveld of the two Umfolozi Rivers does provide considerable potential for the development of irrigation schemes. Given the high temperatures in the valleys and the moderate winters, these areas are perfectly suited for the production of vegetables in the winter or off-season. The deep low altitude river valleys of the two Umfolozi's and the Phongola are hot and dry with a valley bushveld climate, which provide an opportunity for intensive agricultural production where irrigation is available. This land is suitable for sugar cane, out of season vegetables and sub-tropical fruit crops. Agricultural potential outside these valleys is limited to stock and game farming.

Due to few industrial activities in the area, the district is considered to have "clean air". Although mining activity is evident in the district, the dust inside the mines is usually addressed through occupational boundary and usually does not affect the whole community as it is below the acceptable threshold levels. Veld fires are prevalent and need to be monitored and maintained at acceptable levels (ZDM Growth & Development Plan 2030).

The Zululand District Municipality forms part of this 20% of the land in the country that provides a wealth of surface water resources as a result of the high rainfall over the area. The north-western most corner and the high-lying central area of the District have been designated areas of importance to water production through surface runoff (Schulze et al, 1997). There are three main catchments i.e. Pongola catchment (developed through the Pongolapoort Dam), Mkhuze catchment (resources are mostly undeveloped) and Umfolozi catchment (There is a deficit in the lower White Mfolozi during the winter months and The Black Mfolozi catchments. The District is therefore critical for the provision of good quality water to the Pongolapoort Nature Reserve, Pongola, Bush Nature Reserve, Ithala Game Reserve, Lake St Lucia, False Bay, eMakhosini-Ophathe Heritage Park, HluhluweiMfolozi Park, Mkhuze Game Reserve, and other smaller protected areas, sustaining water resources within provincially and nationally important ecotourism destinations.

Figure 7: Topography of the ZDM



3. DEMOGRAPHICS

3.1. Existing Population and Distribution

The population of ZDM as at Census 2011 was 803 576. This constitutes 7.8 % of the total population of the entire KwaZulu Natal Province. There are slightly more females (54.2%) than males (45.8%) in the district municipality (**Figure 8).**

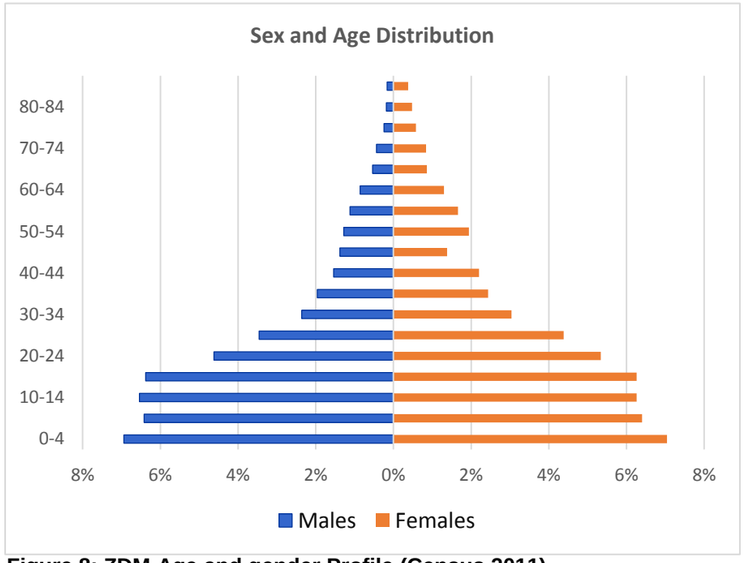


Figure 8: ZDM Age and gender Profile (Census 2011)

A total of 74.6% of the population resides within Tribal Authority/rural areas and 25.4% in urban areas. The age profile of the municipality shows a dominance in the 15-64 year age brackets, which is the population is in the economically active age group. This population accounts for 55.79% of the population in ZDM. The average occupancy rate per household is 5.1.

3.2. Social and Economic Indicators

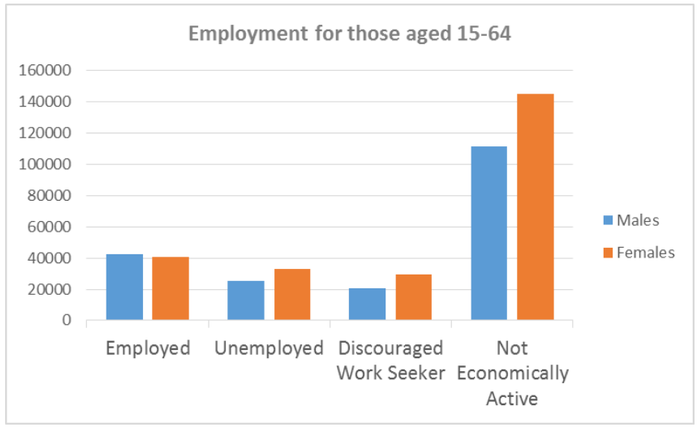


Figure 9: ZDM Employment Status by Gender (Census 2011)

The unemployment rate (**Figure 9**) in ZDM is 41.5% a decrease compared to 60.8% in 2001 (IDP 2015/16). The employment levels in the district are close or similar between males and females in the district, but the unemployment, discouraged and not economically-active counts are higher for females. This could be as a result of the higher male: female ratio or as a result of males finding employment outside the district.

The socio-economic profile of ZDM is summarised in the key demographic statistics in **Table 2**.

Table 2: Key Demographic Statistics (Census 2011)

Total population	803576
% rural population	74.6%
% urban population	25.4%
Age Structure	
Young (0-14)	39.6%
Working Age (15-64)	55.8%
Elderly (65+)	4.7%
Dependency Ratio	
Dependency ratio	79.7
Sex Ration	
Sex ratio	86.6
Population Growth Rate	
Growth rate (2001-2011) per annum	0.28%
Population density	54 persons/km2
Labour Market	
Unemployment rate	41.5%
Youth unemployment rate	51.2%
Education (+20)	
No schooling aged	19.2%
Higher education aged	5.2%
Matric aged	26.7%
Household Dynamics	
Number of households	157748
Number of Agricultural households	73634
Average household size	5.1
Female headed households	54.60%
Formal dwellings	72.42%
Housing owned/paying off	60.66%
Household Services	
Flush toilet connected to sewerage	18.68%
Weekly refuse removal	21.73%
Piped water inside dwelling	21.89%
Electricity for lighting	69.54%

The average household income statistics, as shown in **Figure 10**, show that over 80% of households have an annual income of R38 200 per annum (R 3000 or less per month). There is a large proportion of the economically active population that earns less than R1600 per month. A total 13% of households have no income whatsoever.

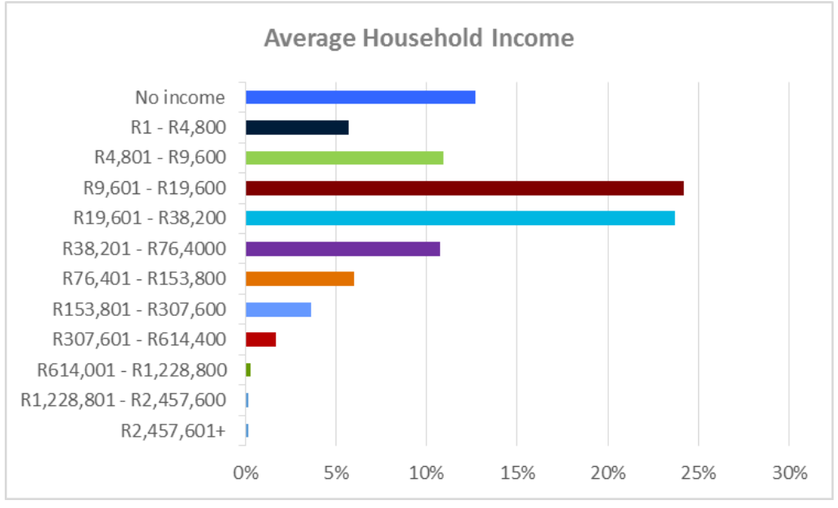


Figure 10: Employment and household income per annum (Census 2011)

The dependency ratio is 79.7. The dependency ratio measures the proportion of the population that is outside the labour force and is dependent on the economic activity of those working. A high dependency ratio is not a good economic indicator because it implies that a large proportion of the government's expenditure is on health, pension, social security and education which are most used by old and young population. Accordingly, the high population below the 14 years of age and above 65 is placing an additional burden on the economically active population.

More than 5.2 million people or 49% of the province's population is considered to be living in poverty. Zululand contributes 602,895 or 11.5% to that figure, and has a poverty rate of 65.8%. Poverty in Zululand and in the broader province was on a decreasing trend until 2008, when the recessionary global climate pushed the incidence of poverty back up again. The majority of Zululand's impoverished population can be found residing in Abaqulusi and Nongoma municipalities.

3.3. Commercial Industrial and Institutional Development

The agricultural sector is of key strategic importance in Zululand District. As a primary sector, agriculture contributes about 9% to district GVA. At present, the primary agricultural sector contributes over 16.5% to total employment. If appropriately harnessed, the agricultural sector in Zululand has the potential to create a substantially higher number of jobs in a shorter time frame. Over the short to medium term the agricultural value chain can support labour-intensive absorbing activities generating large-scale employment. This in turn contributes towards addressing food security and enabling sustainable livelihoods.

Notwithstanding the above, this sector currently faces severe constraints which have resulted in a significant decline in production and has contributed towards increased job losses. These constraints include:

- inadequate access to funding for infrastructure;
- lack of agri-industries and therefore value-adding;
- ineffective linking of graduates to commercial farms;
- increased competition due to subsidisation of international farming;
- land reform process, and
- access to Ingonyama Trust Board (ITB) Land for agricultural production.

The enhancement of sectoral development is fundamental to the creation of employment and to growth and development within the district. A total of five established urban centres exist with the Zululand District Municipality. The fact that the local government demarcation process ensured that at least one established urban centre is located in each of the local municipalities is important for the future development of the economies of each of the municipalities. Manufacturing activity within the District is low, at an estimated 11% contribution to the GGP for the area. The only agri-processing of note in the District is the Illovo sugar mill in the uPhongolo Municipality. Despite the lack of large scale manufacturing in the District a number of interesting ventures have historically established in the District.

Manufacturing activity within the District is low, with the sector contributing 15% to the Gross Value Added in the District in 2011. Abaqulusi makes the most significant contribution to this sector, but it is suggested that the manufacturing industry in the Vryheid area can only be viewed as a service sector for mainly the mining and agriculture sector and is not an exporter of goods. The only agri-processing of note in the District is the TSB (previously Illovo) sugar mill in uPhongolo Municipality.

3.4. Population Growth

The ZDM population growth trends (**Figure 11**) show a decrease from 954 020 in 2001 to 803 576 in 2011 (Census 2011 figures). This is an annual reduction rate of 1.7%. The uPhongolo LM and eDumbe LM are the only municipalities in the Zululand District that had a positive growth rate for this period. Abaqulusi LM has remained the municipality with the largest population contributing 26.3% to the district total.

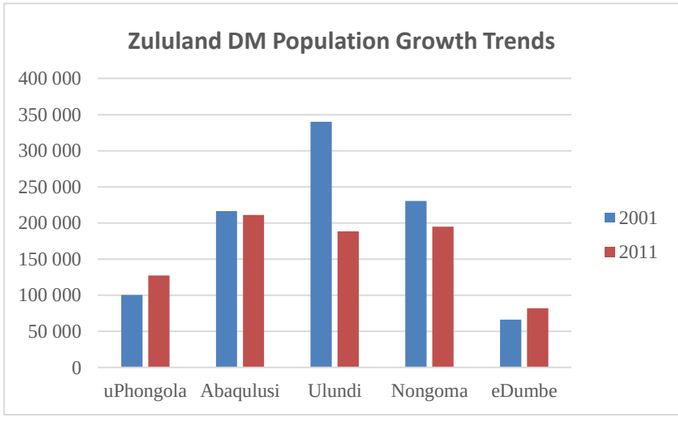


Figure 11: ZDM Population Growth Trend (Census 2011)

3.5. Projected Population Growth Trends

From 2001 onwards, it is anticipated that there will be a population growth in Zululand. The demand model used in the determination of water requirements for 2035 has applied population growth projections as detailed in **Table 3** for the various level of service migration scenarios considered.

Table 3: Projected Annual Population Growth Rates

Annual Growth Rates for District Council	Low Annual Growth Rates						
Zululand District Municipality	2011	2015	2020	2025	2030	2035	2040
	2015	2020	2025	2030	2035	2040	2045
	1.19%	1.25%	0.96%	0.99%	0.61%	0.50%	0.35%
	Probable Annual Growth Rates						
	2011	2015	2020	2025	2030	2035	2040
	2015	2020	2025	2030	2035	2040	2045
	1.25%	1.35%	1.07%	1.13%	0.72%	0.61%	0.44%
	High Annual Growth Rates						
	2011	2015	2020	2025	2030	2035	2040
	2015	2020	2025	2030	2035	2040	2045
	1.31%	1.45%	1.18%	1.27%	0.83%	0.71%	0.53%

A high growth rate is anticipated in uPhongolo and eDumbe. The resultant projected population of the District, per Local Municipality for the period 2011 to 2045 is summarised in **Table 4**.

Table 4: Projected Population Figures

Municipality Name	Census 2011 Pop	Probable Population Estimates				Overall % Growth 2015 to 2045	Equivalent Annual Growth %
		2015	2025	2035	2045		
Abaqulusi	211 060	221 472	250 980	276 667	293 310	32.4%	0.94%
eDumbe	82 053	86 312	97 422	106 794	112 437	30.3%	0.89%
UPhongolo	127 238	133 839	150 745	165 112	173 676	29.8%	0.87%
Nongoma	194 908	204 927	230 120	251 336	263 448	28.6%	0.84%
Ulundi	188 317	197 932	222 952	244 261	257 139	29.9%	0.88%
Total	**803 576**	**844 481**	**952 220**	**104 4171**	**1 100 010**	**30.3%**	**0.89%**

The population of the district is, thus, expected to increase by about 30.3% over the 30-year period from 2015 to 2045 or at an average 0.89% per annum.

The anticipated population growth projections from 2015 to 2035 are illustrated in **Figure 12**.

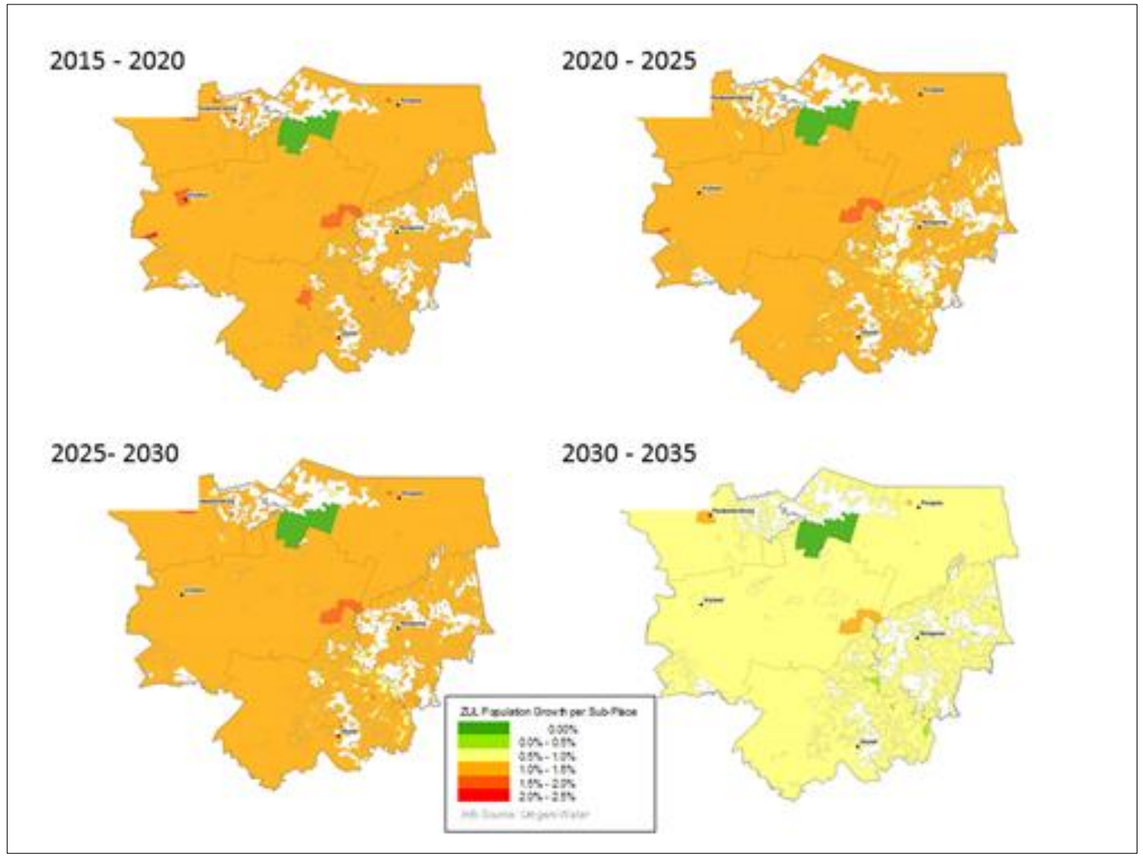


Figure 12: ZDM Population Growth Projections

4. WATER DEMANDS

4.1. Institutional Arrangement for Water Supply

The Zululand DM is responsible for the core function of bulk water services provision (water and wastewater) in ensuring that infrastructure is managed properly and that quality water (class 1) that meets stringent compliance requirements is provided to the communities. This service is provided to all municipalities with the exception of Abaqulusi's urban water and wastewater infrastructure. Although not specifically mentioned, it is understood that Zululand DM has a service level agreement with Abaqulusi Local Municipality for the WSP function (ZDM IDP 2014-2016).

The WSP function is achieved through the roles as depicted in the organogram below (**Figure 13**).

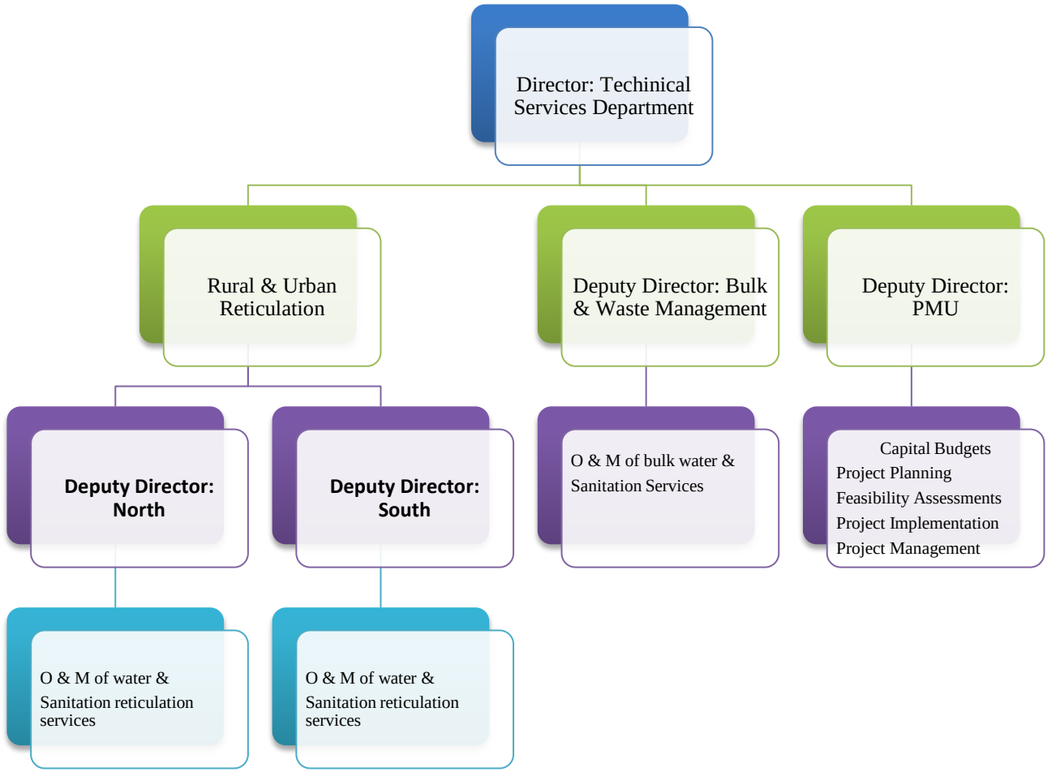


Figure 13: WSP Function Organisational Structure

The Water Services Authority Function is located under the Planning Department and is headed by a Deputy Director: WSA.

4.2. Levels of Service

The ZDM 2015/2016 WSDP indicates that 32.1% of the population have access to water that is below RDP standard. This includes the population that does not have any access to water supplies. The breakdown of service provision is as per **Table 5**.

Table 5: Water Services Household Backlogs (WDSP 2014)

LM	None or Inadequate	Rudimentary <RDP	Communal Standpipes RDP	Yard Connections >RDP	Totals
Urban					
Abaqulusi LM	0	0	0	15 283	15 283
eDumbe LM	0	0	0	5 157	5 157
Nongoma LM	0	0	0	1 239	1 239
Ulundi LM	0	0	0	5 520	5 520
uPhongolo LM	0	0	0	3 557	3 557
Subtotal (Urban)	**0**	**0**	**0**	**30 756**	**30 756**
Rural					
Abaqulusi LM	7 436				
eDumbe LM	3 048	616	1097	6 962	11 723
Nongoma LM	10 868	9 917	9 273	6 874	36 932
Ulundi LM	7 133	3 456	10 497	10 759	31 845
uPhongolo LM	5 730	1 130	1 626	13 093	21 579
Subtotal (Rural)	**34 215**	**16 438**	**29 510**	**46 935**	**127 098**
Total Households	**34 215**	**16 438**	**29 510**	**77 691**	**157 854**

According to Census 2011 figures, approximately 30.7% of households in ZDM obtain water from boreholes and springs and have no access municipal services whatsoever. In addition, 37.63% of the population has water services that are below RDP standard where RDP standard is defined as access to municipal water supplies within a distance of 200m from the dwelling.

Nongoma Municipality has the highest backlogs with 63% of the households having below RDP standard level of service to no access to municipal water supplies. This equates to a total of 21 635 households and also equates to 13.7% of the total households in the Zululand district. The breakdown of the water services backlogs as provided by Stats SA broken down to local municipal level is provided in

Table 6.

Table 6: Census 2011 Backlogs

Water Supply Service Level	Description	Number of Households	% of Total Per DM / LM
Above RDP Standards	House Connection	35 165	62%
	Yard Connection	48 813	
At RDP Standards	Communal Standpipe within 200m	14 425	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	5 704	7%
	Communal Standpipe within 500m - 100m	3 352	
	Communal Standpipe within > 1 000m	1 938	
No Services	No Services	48 350	31%
ZULULAND		**157 747**	**100%**
Above RDP Standards	House Connection	16 807	78%
	Yard Connection	13 797	
At RDP Standards	Communal Standpipe within 200m	3 065	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	1 473	6%
	Communal Standpipe within 500m - 100m	653	
	Communal Standpipe within > 1 000m	339	
No Services	No Services	7 166	17%
Abaqulusi		**43 300**	**100%**
Above RDP Standards	House Connection	7817	62%
	Yard Connection	10696	
At RDP Standards	Communal Standpipe within 200m	3327	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	938	5%
	Communal Standpipe within 500m - 100m	648	
	Communal Standpipe within > 1 000m	289	
No Services	No Services	11 483	33%
Ulundi		**35 198**	**100%**
Above RDP Standards	House Connection	3 305	37%
	Yard Connection	6 130	
At RDP Standards	Communal Standpipe within 200m	3 270	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	1 406	9%
	Communal Standpipe within 500m - 100m	921	
	Communal Standpipe within > 1 000m	798	
No Services	No Services	18 510	54%
Nongoma		**34 340**	**100%**
Above RDP Standards	House Connection	5 017	64%
	Yard Connection	10 009	
At RDP Standards	Communal Standpipe within 200m	3 388	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	1 498	9%
	Communal Standpipe within 500m - 100m	801	
	Communal Standpipe within > 1 000m	394	
No Services	No Services	7 664	27%
uPhongolo		**28 771**	**100%**
Above RDP Standards	House Connection	2 219	73%
	Yard Connection	8 181	
At RDP Standards	Communal Standpipe within 200m	1 375	
Below RDP Standard but with Infrastructure	Communal Standpipe within 200m - 500m	389	5%
	Communal Standpipe within 500m - 100m	329	
	Communal Standpipe within > 1 000m	118	
No Services	No Services	3 527	22%
eDumbe		**16 138**	**100%**

The percentage levels of service in ZDM per local municipality is further illustrated in **Figure 14**.

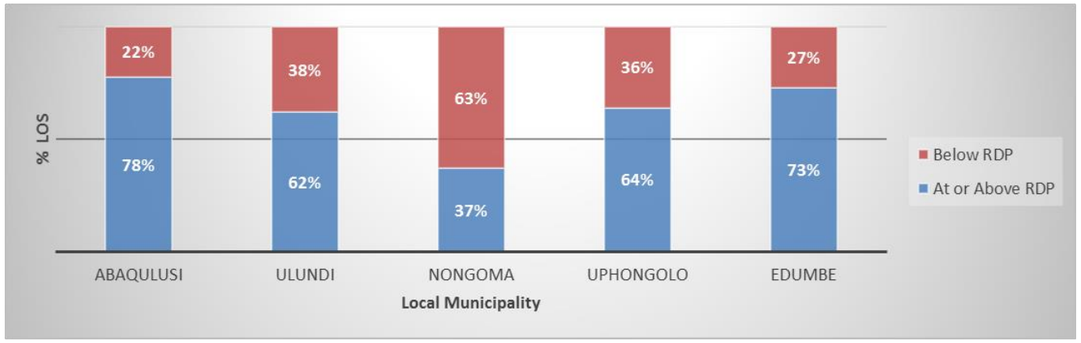


Figure 14: Water Services Backlog per LM (Census 2011)

Abaqulusi Municipality has the lowest backlogs at 22% mainly as a result of the concentration of populations in the urban areas

The location of the communities with backlog in water services is illustrated in **Figure 16.**

In terms of sanitation services, 19% of the population does not have access to any form of toilet facilities and 1% still use the bucket system as illustrated in **Figure 15**.

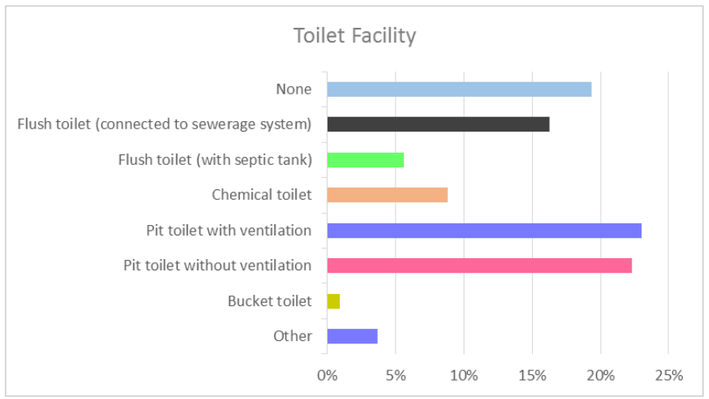
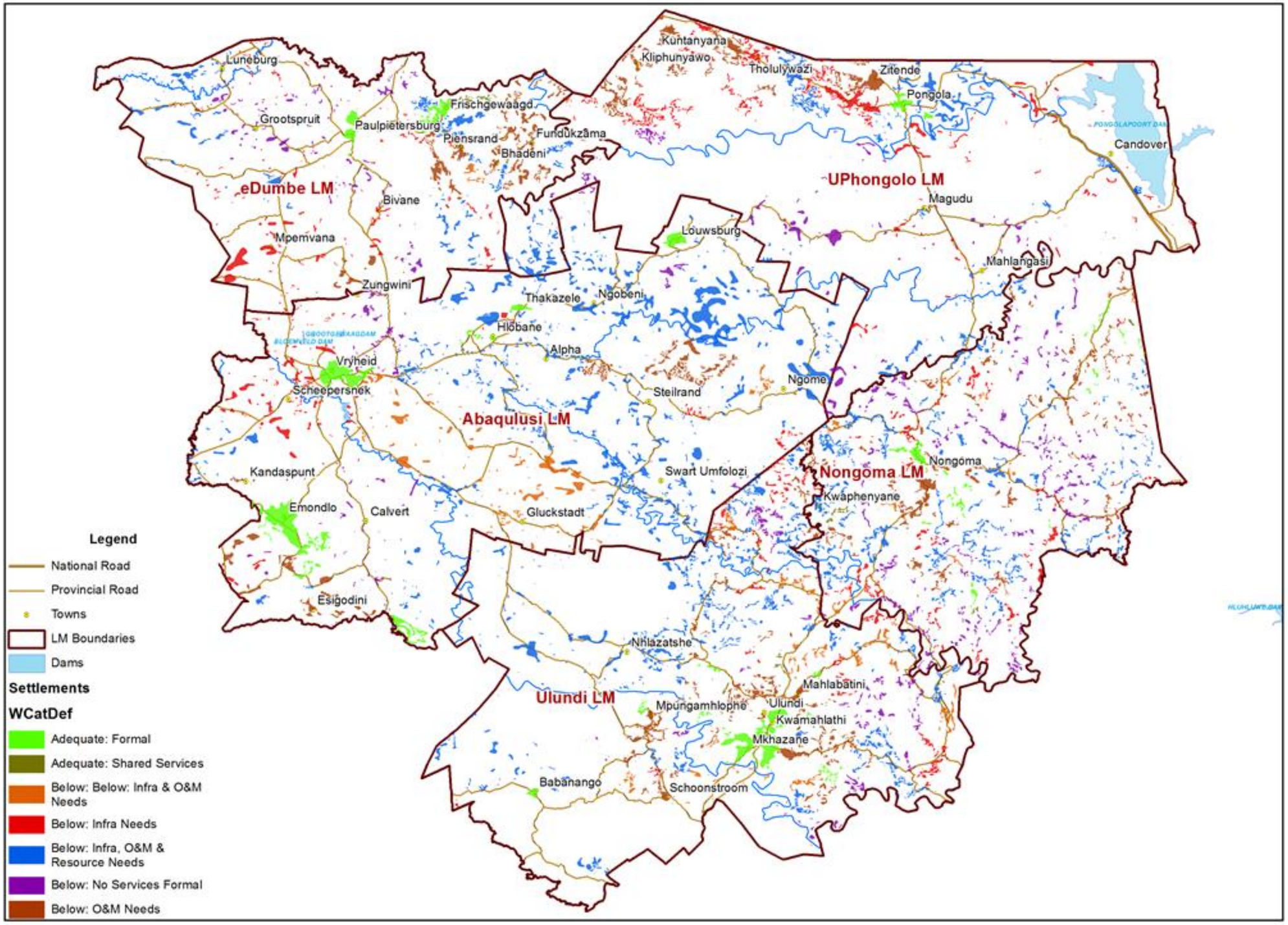


Figure 15: Sanitation Service Levels (Census 2011)

Figure 16: Levels of Service and Backlogs in ZDM (Census 2011)



4.3. Water Conservation and Demand Management

Water is an important resource to the sustainability of human nature as well as environment thus communities need to take care and protect available water resources. ZDM is involved in annual campaigns whereby road shows are made to the various communities where there is municipal water supply infrastructure to provide tactics of conserving water. The ZDM 2014/15 WSDP reports that the current status of non-revenue water within the district is approximately 40% based on a pilot study undertaken in 2014. The 2014/15 WSDP further provides water loss statistics as shown in **Table 7**.

Table 7: 2014/15 WSDP List of schemes with total monthly production and estimated UAW

Plant Name	Production (Ml/month)	Estimated NRW	% of Total District NRW
Vryheid Klipfontein / Bloemveld	373	71%	20.1%
Coronation	39.1	47%	2.1%
Hlobane	12.2	59%	0.7%
Paulpietersburg – eDumbe	82.5	63%	4.5%
Louwsburg	12.3	11%	0.7%
Mpungamhlope	39.5	78%	2.1%
eMakhosini	8.5	43%	0.5%
Babanango	13.6	53%	0.7%
Mandlakazi	29.5	94%	1.6%
Enyokeni Royal Palace	0.9	65%	0.1%
Kombuzi	1.9	0%	0%
Nongoma	156.4	78%	8.4%
Ophuzane	13.1	57%	0.7%
Tholakela	8.5	38%	0.5%
Mangosuthu	32.3	10%	1.7%
eMondlo	39	12%	2.1%
Msibi	10.1	23%	0.5%
Nkonsentsha	1.2	50%	0.1%
Belgrade	23.8	67%	1.3%
Khiphunyawo	12	66%	0.6%
Khambi Village	8.6	80%	0.5%
Mountain View	2.5	98%	0.1%
Osingisingini	1.7	50%	0.1%
Ceza	3.4	50%	0.1%
Sidinsi	6	11%	0.3%
Ulundi – Nkonjeni	623	79%	33.6%
Pongola Town/ Simdlangentsha East	228.8	59%	12.4%
Spekboom	30.3	44%	1.6%
Khangela Royal Palace	0.3	29%	0.1%
Total/Average	**1852**	**43%**	**100.0%**

The ZDM is in the process of planning a NRW programme to be implemented progressively throughout the District with the initial focus primarily on the Nkonjeni RWSS/Ulundi and Frischgewaagd areas where there are serious losses of up to 70%.

The Ulundi - Nkonjeni Water Scheme has the highest NRW at 79% which equates to 486Ml per month.

4.3.1. ZDM NRW Programme

According to the ZDM WSDP 2014, The ZDM has established a dedicated NRW team for North and South Regions in preparation for implementation of the programme. The programme is focused on a number of key interventions as follows:

- Ensuring that adequate measures are implemented at a planning stage to facilitate the ongoing management of NRW including zone determination, meter sizing / specification and positioning etc;
- Compiling a comprehensive infrastructure database to facilitate NRW management;
- Datalogging of flow profiles;
- Meter zone identification;
- Pressure management;
- NRW management training;
- Installation of GSM data loggers at key locations;
- Leak detection and repair – linked to customer service centre; and
- Establishment of a web based management system linked to Siza/Manzi.

The ZDM has also procured the services of a specialist NRW service provider to assist in capacitating the ZDM NRW team and to establish the NRW management systems.

4.3.2. Water Demand Management Interventions

ZDM has also identified the development of a Water Demand Management Strategy (WDMS), in conjunction with the NRW programme, as a very high priority for the District. Excessive water usage in many areas is putting the bulk infrastructure under immense pressure and upgrading will soon become necessary unless this can be postponed through effective demand management interventions. The WDMS will focus on a number of ways to ensure the reduction of water demand by consumers and will include the following interventions:

- Influencing the behaviour of consumers through:
  - School and public educational and awareness programmes aimed at promoting effective usage of water (brochures, advertising, newsletters, demonstrations, exhibits, informative, billing, etc);
  - Water services tariff that promotes efficient water usage;
  - Any other “win-win” initiatives that could influence consumers positively.

- Specific targeted projects which include:
  - o Repair plumbing leaks inside properties
  - Installation of water flow control devices, etc.
  - ZDM by-laws have also been promulgated in 2008 and this will assist the municipality to effectively regulate water usage in the district and is currently being updated.

The ZDM WSDP 2014 also notes that to date the WDMS has largely been driven at project level by the ISD Service Providers and at a political level by councillors. However, the plan is to implement more focused WDMS interventions in alignment with the NRW programme rollout.

4.4. Water Demand Modelling

A water demand model has been developed to determine the projected future demand for ZDM. The methodology thereof is detailed under this section.

4.4.1. General

The modelling is performed at Census "Small Area" level.

4.4.2. Source Data

Census 2011 was used to define the reference numbers, names and associations between Small Areas, Sub-Places, Local Municipalities and District Municipalities.

4.4.2.1. Demographics

The 2011 Census data was used as the base data for Population, Number of Households, Heads per Household, Income Level categories and 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 will fall within a 10% wide band round the data provided in the Census.

The definition of Urban vs Rural used in the model is derived by using the urban definition applied in the Census and defining the balance as Rural.

4.4.2.2. Growth Rates

Population growth rates were derived by Umgeni Water, utilising algorithms provided by Statistics SA and provided to the Authors on a Sub-Place level to be utilised in the Model. 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 of 10% width is allowed for the period 2011 to 2015, increasing linearly up to 30% for the period 2030 to 2035.

4.4.2.3. Unit Water Demands

Various categories of unit water demands are used in the model. The basis of these unit demands is as dictated by the DWSS and Umgeni Water as set out in UAP Phase 1. There are mainly two categories of demand as follows:

4.4.2.3.1. Domestic Demands

Domestic demand categories include the following:

- Informal below 25 l/c/d = "<RDP" or no formal supply
- Informal with no formal connections = "RDP LOS" : Walking distance to water < 200m and min 25l/c/d supply
- No income & informal supplies with Yard connections = "YC" : Water at yard boundary
- House Connections = "HC" with sub-categories:
  - Low income (R1 to R9,600): flatlets, bedsits with kitchen & bathroom, informal household
  - Low middle Income (R9,601 to R38,400): Small houses or flats with WC, one kitchen, one bathroom
  - Average Middle Income (R38,401 to R153,600): 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower
  - Upper middle income (R153,601 to R1,228,000): detached houses, large flats
  - Very High Income (>R1,228,001): villas, large detached house, large luxury flats

4.4.2.3.2. Commercial, Industrial and Institutional Demands

Ratios of Commercial, Industrial and institutional roof areas to number of households exist for all settlements. These ratios will vary according to the formality of the settlement. For purposes of this model 2 categories of formality have been adopted as "Urban" and "Rural", where Urban denotes a formal residential settlement and rural denotes all other settlement types.

Typical ratios have been combined into single weighted range of ratios for CII water demands expressed as kl/Household 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 DLA GIS data indicating Industrial Land Use is used to identify areas of concentrated Industrial use. The Water demands for such Small Areas are populated in the model directly, using roof areas or actual records where available.

4.4.2.3.3. Unit Water Demand spread

The norms utilised and identified in UAP 1 list Low, Average 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 used in the model for the Low and High unit demands. The unit demand s used in the model are shown in **Figure 17**.

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	R1 228 001	R9 999 999	360	410	460	1.5	2.5
2	Upper middle income: detached houses, large flats HC	R153 601	R1 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	R38 401	R153 600	200	228	255	1.4	2.3
4	Low middle Income: Small houses or flats with WC, one kitchen, one bathroom HC	R9 601	R38 400	140	170	200	1.4	2.2
5	Low income: flatlets, bedsits with kitchen & bathroom, informal household HC	R1	R9 600	80	100	120	1.3	2.0
6	No income & informal supplies with Yard connections	R0	R0	70	80	90	1.2	1.5
7	Informal with no formal connection RDP LOS	R0	R0	40	50	60	1.1	1.1
8	Informal below 25 l/c/d <RDP	R0	R0	5	12	20	1.0	1.0

Figure 17: Demand Model Unit Demands

4.5. Water Service Level Migration

4.5.1. General

Three development scenarios are analysed in the modelling process. Each of these scenarios is defined by the change/improvement of levels of service expected over differing time scales, and differentiate between Urban and Rural areas. The scenarios are summarised in **Figure 18**:

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

	Urban			Rural			
Scenario 2	Portion to Convert	Start Year	End Year	Portion to Convert	Start Year	End Year	KZN Prov Growth and Dev Plan (PGDP)
Convert from No Service to RDP LOS	100%	2015	2020	100%	2015	2020	All pop. without supply converted to RDP level of service by 2020
Convert from <RDP LOS to RDP LOS	100%	2015	2020	100%	2015	2020	All pop with <RDP LOS converted to RDP level of service by 2020
Convert from RDP LOS to Yard Conn.	100%	2015	2025	100%	2015	2025	100% of Pop with RDP LOS in 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 2013 for Urban and between 2025 and 2035 for

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

Figure 18: Scenario Description

4.5.2. Peak Factors

Each of the defined Demand types has an associated Summer Peak factor, which is used to determine the "Summer Daily Demand" (SDD). Much higher Summer Peak factors apply to areas where holiday accommodation is prevalent. For purposes of this modelling, a higher summer peak factor is applied to all small areas within 2km from the sea.

4.5.3. Unaccounted for water/Water Losses

4.5.3.1. General

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

- Physical Water Losses
- Excessive water use/wastage due to:
  - Unmetered connections
  - Inappropriate water tariffs
  - Inefficient invoicing or debt recovery

- Unauthorised water connections

4.5.3.2. Scenarios

For all three (3) scenarios, the estimated existing Water Loss is reduced over a defined period down to an expected reasonable water loss. Such water losses differentiate between Urban and Rural areas due to the differing capacity and circumstances of local authorities to manage such water losses.

4.5.3.3. Water Treatment Losses

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

4.5.4. Aggregation of Demands

The predicted "Zero-Based" water demands as derived through the model are calculated against time as summarised in **Table 8**.

Table 8: Demand Determination Criteria

Water Demand	Determination Criteria
AADD (Average Annual Daily Demand)	Average water demands excluding water losses
GAADD (Gross Average Annual Daily Demand)	Gross Average water demands = AADD plus water losses
SDD (Summer Daily Demand)	Summer Daily Demands = 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

4.6. Reliability of Demand Modelling

4.6.1. Census Data

Although the Census data is considered the most reliable source of statistical data regarding Demographics, this data should be properly 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 thus 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 etc.). Also some of the data obtained by the census is subject to deceitful responses by the people being questioned with regard to issues like Illegal immigrants, Incomes etc.). 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 experience of the consumer according to his recent recollection/experience.

4.6.2. Probable results

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

4.6.3. Low and High

The Low and High results represent the extremes of what the predicted water demands could be. These are calculated in the model by using the extremes of the range of each data item in determining the results. No statistical probability or reliability measure can be attributed to these figures, except to say that all actual results should fall somewhere within this predicted range.

4.7. Summary of Projected Demands

Based on the above approach, the GAADD will be used in the determination of water requirements while the SDD will be used in sizing proposed infrastructure to meet the projected requirements based on the gap analysis. The demand projections for ZDM in relation to all three (3) scenarios are reproduced in **Table 9** as extracted from the model.

Table 9: 2035 GAADD (Ml/day) per LM for All Scenarios

Local Municipality	2015 Water Requirements (GAADD Ml/day)		2035 Water Requirements (GAADD Ml/day)					
			Scenario 1		Scenario 2		Scenario 3	
	High	Probable	High	Probable	High	Probable	High	Probable
Abaqulusi	45.44	37.44	57.91	47.26	61.42	50.51	56.19	47.24
eDumbe	12.44	10.03	17.36	14.14	19.17	15.79	16.64	13.56
uPhongolo	18.21	14.13	26.46	21.65	29.12	24.16	24.69	19.01
Nongoma	16.53	13.23	34.03	28.29	39.10	33.12	29.38	25.27
Ulundi	27.31	21.72	40.48	33.53	44.14	37.00	37.48	28.89
Total	**119.94**	**96.56**	**176.24**	**144.87**	**192.96**	**160.59**	**164.37**	**133.97**

From the above table, the GAADD (Probable) for Scenario 3 is considered to be the most realistic and is used in the report. The water requirements based on Scenario 3 (Probable) are further broken down as detailed in **Table 10** for the projected ten year intervals up to 2045 per LM.

Table 10: 2035 GAADD (Ml/day & million m³/a) per LM

LM	Census 2011			Water Demand GAADD (Ml/day)				
	No of HH	RDP & Above LOS	Backlog	2011	2015	2025	2035	2045
Abaqulusi	43299	33669	9630	35.76	37.44	40.94	47.24	49.73
eDumbe	16138	11775	4363	9.56	10.03	11.42	13.56	14.15
uPhongolo	28772	18414	10358	13.47	14.13	16.19	19.01	19.86
Nongoma	34341	12705	21636	12.60	13.23	18.92	25.27	26.30
Ulundi	35198	21840	13358	20.70	21.72	24.66	28.89	30.19
Total	**157748**	**98403**	**59345**	**92.10**	**96.56**	**112.12**	**133.97**	**140.23**
LM	**Census 2011**			**Water Demand GAADD (Million m³/a)**				
	No of HH	**RDP & Above LOS**	**Backlog**	**2011**	**2015**	**2025**	**2035**	**2045**
Abaqulusi	43299	33669	9630	13.05	13.67	14.94	17.24	18.15
eDumbe	16138	11775	4363	3.49	3.66	4.17	4.95	5.16
uPhongolo	28772	18414	10358	4.92	5.16	5.91	6.94	7.25
Nongoma	34341	12705	21636	4.60	4.83	6.91	9.22	9.60
Ulundi	35198	21840	13358	7.56	7.93	9.00	10.54	11.02
Total	**157748**	**98403**	**59345**	**33.61**	**35.24**	**40.93**	**48.90**	**51.18**

As can be seen from the above table, the GAADD is expected to grow by an overall of 45.2% in the ZDM for the period 2015 to 2045. This will see an increase in water requirements by magnitude of 43.7Ml/day.

The Abaqulusi LM will have the highest water requirements requiring 35.5% of all the total water requirements in the district. The projected percentage water requirements per LM are illustrated in **Figure 10** below.

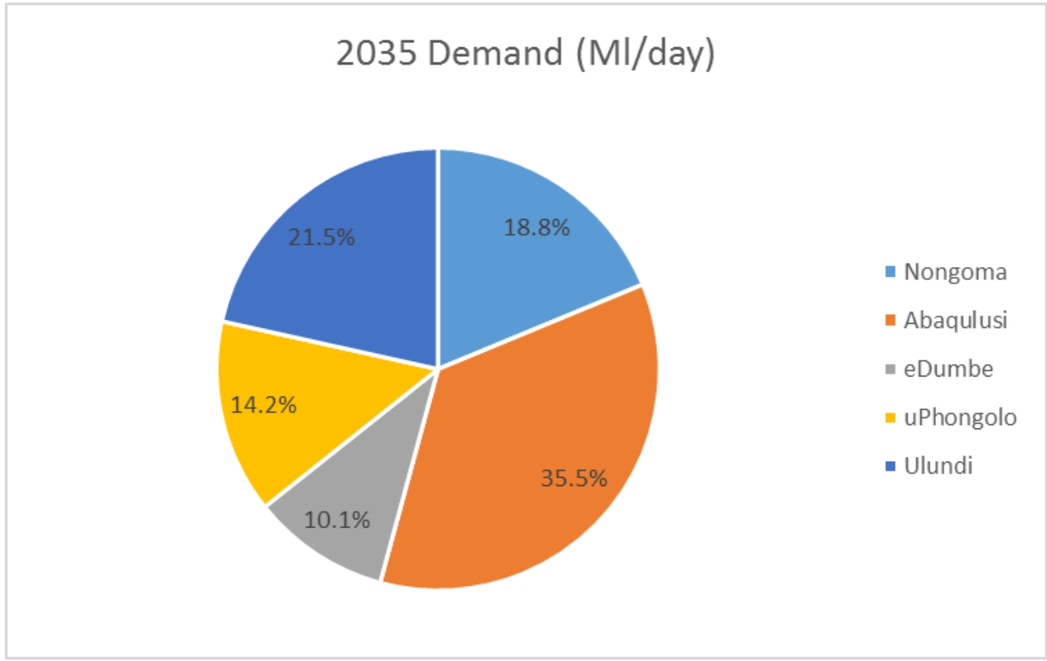


Figure 19: 2035 Demand Per LM

The output of the demand model is included as **Annexure D**.

5. WATER RESOURCES

The ZDM falls within the Mfolozi (W2), Mkuze (W3) and Pongola (W4) secondary catchments of the Usuthu/Mhlathuze Water Management Area (WMA)[1]. The aerial extent of the ZDM occupies approximately 22% of this WMA. The total available water and requirements as at year 2000, based on a 98% assurance of supply within these sub-areas, is summarised in the table below. It is evident that apart from the Pongola catchments, water from these sub-areas is currently over-utilised and a deficit is created. However, according to Basson and Rossouw[2], this deficit is a result of the provision made for future implementation of the Reserve. The Reserve is a legislated requirement of the amount of water required to satisfy the ecological needs of a river system (provisionally estimated at 20%), as well as the basic human needs (that have been established as 25 litres per person per day). (ZDM WSDP 2014).

The quaternary catchment areas located within the ZDM area of jurisdiction are shown in **Figure 20**.

The ZDM is also home to the following major rivers which are potential sources for bulk water supply schemes that could be proposed under this UAP Phase Reconciliation report:

- White Mfolozi River on the Southern which is a source of water for Vryheid and Ulundi
- Black Mfolozi River which is already a source of water for some communities residing in Nongoma
- Mkuze River which is a source for the Mandlakazi Water Scheme supplying areas in Nongoma LM and
- Phongola River in the north that supplies communities residing under the uPhongolo LM

The ZDM WSDP 2014 provides an anticipated water balance for year 2000 as detailed in **Table 11**.

Table 11: ZDM Water balance for the year 2000 (Million m³/a). (ZDM WSDP, 2014)

			Mfolozi	Mkuze	Pongola	Total
Available water	Natural resource	Surface water	36	15	616	667
		Ground water	5	12	8	25
	Usable return flow	Irrigation	5	6	21	32
		Urban	4	0	0	4
		Mining &bulk	1	0	0	1
	Total local yield*		**51**	**33**	**645**	**729**
	Transfers in		0	30	0	30
	Total available		**51**	**63**	**645**	**759**
Water requirements	Consumer groups	Irrigation	51	61	213	325
		Urban**	12	1	1	14
		Rural**	11	10	6	27
		Mining & bulk industrial***	4	0	1	5
		Afforestation****	2	6	34	42
	Total local requirements		**80**	**78**	**255**	**413**
	Transfers out		18	0	30	**48**
	Total used		**98**	**78**	**285**	**461**
Balance			**-47**	**-15**	**360**	**298**

Source: Basson and Rossouw (2003).

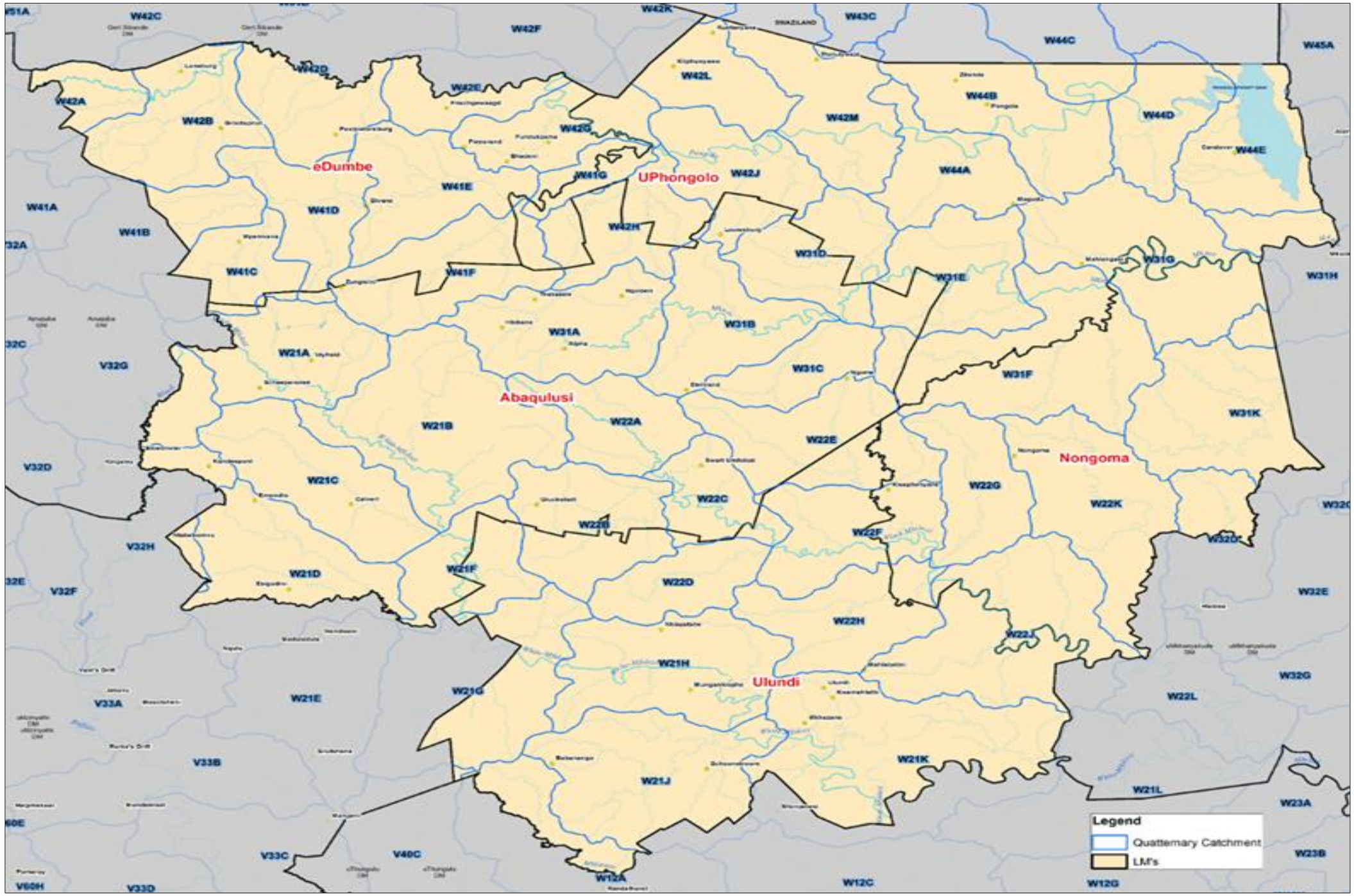
**Includes allowance for impacts of the ecological component of the Reserve, river losses, alien vegetation, rain-fed agriculture and urban run-off on yield.*
***Includes allowance for basic human needs component of the Reserve (25 ℓ/c/d).*
****Mining and bulk industrial water uses that are not part of the urban system.*
*****Afforestation quantities refer to the impact on yield only.*

The figures provided in the table above are the same as the DWS figures in their report titled “Usuthu to Mhlathuze Water Management Area: Internal Perspective” dated March 2004. The DWS report notes the following with regard the water resources specifically within the Zululand District Municipality area of jurisdiction:

[1] The Usuthu/Mhlathuze WMA is one of 19 areas defined across South Africa in terms of the National Water Act, 1998 (Act 36 of 1998). These WMAs have been defined to improve water resource management within South Africa. With time, each of the WMAs will establish a catchment management agency (CMA) for the regulation and control of water use in the WMA

[2] Data for this table have been extracted from Basson and Rossouw (2003). *Usuthu to Mhlathuze Water Management Area: Overview of water resources availability and utilisation, September 2003*. DWAF: BKS. Report no. P WMA 06/000/00/0203. 31pp. At 13 & 21.

Figure 20: Quaternary Catchments Area within ZDM



5.1.1. Mfolozi Catchment

At present the total available water resource, at a 1:50 year level of assurance, is estimated at 51 million m^3/a. The total current requirement is in the order of 98 million m^3/a. This requirement includes the 18 million m^3/a of water transferred out of the lower Mfolozi to the Mhlathuze catchment for mining use and also allows for the ecological Reserve. The extent of the deficit means that the catchment is severely stressed from a resource provision point of view. Significant towns in the catchment are Vryheid, Ulundi, Babanango, Nongoma and Mtubatuba. The most significant water resource development is the Klipfontein Dam (capacity 18.09 million m^3), which is situated in the upper reaches of the White Mfolozi River. This was constructed to supply water to the town of Vryheid but can also be used to supplement supplies to Ulundi if necessary. Downstream irrigators have been granted an allocation from Klipfontein Dam but this is only partially utilised due to its high cost. There is therefore some surplus yield available from this dam. Because of the lack of storage in the system there is still significant wet-season flow, which could be utilised as a seasonal run of river allocation to irrigators, or alternatively harnessed through the provision of storage and all year use. The crunch in this catchment is not that there is not enough water but that lack of storage (i.e. dams), results in low firm yields, which are less than the water requirements. Hence water shortages occur during severe drought events. In general, there appears to be enough water in the upper reaches of the catchment. However, the deficit in the lower reaches of the catchment constrains further upstream use, as this flow is required downstream. The only way to remove the constraint would be to further develop the resource through the construction of dams. Shortages are often reported at Ulundi but these appear to be due to operational problems since water is available in Klipfontein Dam to supplement the supply should this be necessary.

5.1.2. Pongola Catchment

By far the largest water use in the Pongola River catchment is irrigation, with an estimated requirement of 213 million m^3/a. Most of the irrigation in the Pongola River catchment takes place upstream of the Pongolapoort Dam in the vicinity of the town of Pongola, with an estimated area of 15 180 ha currently listed. The dominant crop is sugarcane. The irrigated area, and hence water requirement has increased over the years, and this, coupled with afforestation in the upper catchment, reduced the level of assurance to irrigators to unacceptably low levels. As a result the Bivane Dam was recently constructed on the Bivane River, using private finance and considerable assistance from DWAF. The dam has a full supply capacity of 113 million m^3 which is relatively small in relation to the natural MAR of 320 million m^3/annum. This substantially increased the assurance of supply to irrigators and the option of increasing the irrigation areas by reducing assurance is now on the table. The water resources of the Pongola River System are dominated by the existence of the large Pongolapoort Dam (capacity 2 445 million m^3) situated where the river breaks through the Lebombo mountains just above the Makhathini Flats. The dam was originally constructed in the 1060's with the irrigation potential of the Makhathini Flats in mind. The historic firm yield is now estimated at 530 million m^3/a. This is substantially less than original estimates of about 900 million m^3/a. This reduction is largely due to the substantial irrigation and forestry development upstream of the dam which has taken place since the dam's construction. Although only 67 million m^3/a of the yield of the Pongolapoort Dam has been formally allocated, there are many competing uses for the surplus of 352 million m^3/a referred to above, some of which are difficult to quantify.

Implication of Projected Demand on Water Balance

The projected 2035 water requirements for ZDM are split into the various catchments based on the sources of water supply for the respective areas. The total water requirements amount to 48.9 million m/a broken down as detailed in **Table 12**.

Table 12: ZDM 2035 Water Requirements per Catchment (Million m^3/a)

LM	Mfolozi	Mkuze	Phongolo	Umhlathuze	Boreholes (Farms)	Total
Abaqulusi	13.22	2.77	0.36		1.94	18.28
eDumbe			3.92		1.03	4.95
UPhongolo			5.90			5.90
Nongoma	7.02	3.11				10.13
Ulundi	9.30			0.33		9.63
Total	**29.54**	**5.88**	**10.17**	**0.33**	**2.97**	**48.90**

The water requirements are then factored into the water balance table (Table 12) and the results show a deficit in the Mfolozi and Mkuze catchments and a surplus in the Phongola catchment.

Table 13: ZDM Water Balance with 2035 Water Requirements (Million m^3/a)

			Mfolozi	Mkuze	Pongola	Total
Available water	Natural resource	Surface water	36	15	616	667
		Ground water	5	12	8	25
	Usable return flow	Irrigation	5	6	21	32
		Urban	4	0	0	4
		Mining &bulk	1	0	0	1
	Total local yield*		**51**	**33**	**645**	**729**
	Transfers in		0	30	0	30
	Total available		**51**	**63**	**645**	**759**
Water requirements	Consumer groups	Irrigation	51	61	213	325
		2035 water requirements	30	6	10	46
		Mining & bulk industrial	4	0	1	5
		Afforestation	2	6	34	42
	Total local requirements		**87**	**73**	**258**	**418**
	Transfers out		18	0	30	**48**
	Total used		**105**	**73**	**288**	**466**
Balance			**-54**	**-10**	**357**	**293**

The crunch in the Mfolozi catchment is not that there is not enough water but that lack of storage (i.e. dams), results in low firm yields, which are less than the water requirements (DWS Usuthu to Mhlathuze Water Management Area: Internal Perspective).

The provision of raw water storage is thus critical to improve the firm yield in the catchment area.

5.1.3. Groundwater

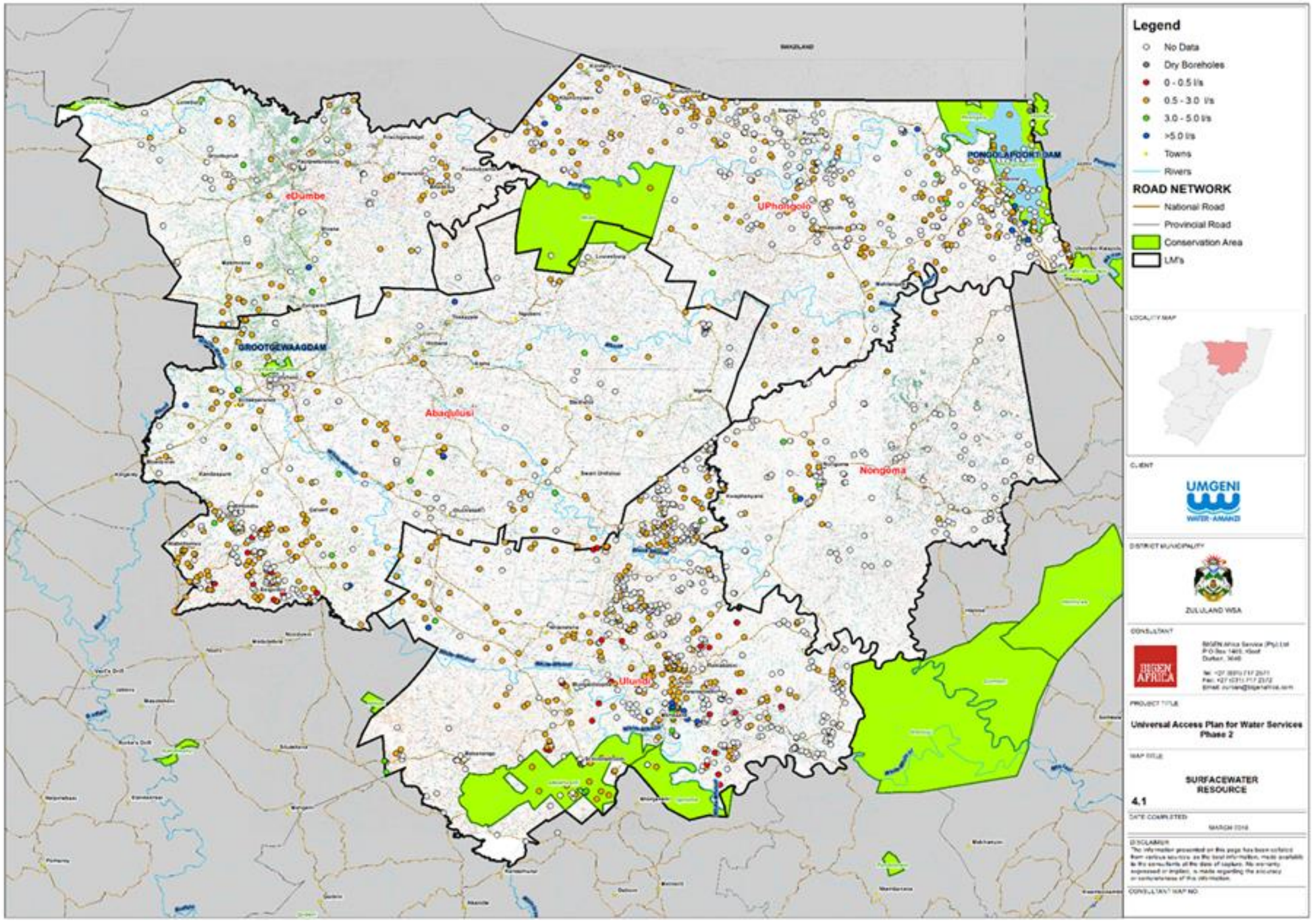
Groundwater is a useful water resource with potential quality and quantity being controlled by the geology of an area. The Zululand district is underlain predominantly by Karoo Sequence basalts, shales, siltstones, sandstones and conglomerates that have been intruded by dolerite dykes, sills and plugs of Jurassic age. The formations making up the Karoo Supergroup sediments are often relatively massive such that primary storage and permeability is negligible. Groundwater storage and movement is confined to joints and bedding planes within the rock mass that yield between 0.5 and 2 ℓ/s. In the absence of faulting or dolerite intrusions, the groundwater potential of these sediments is marginal to poor (i.e. 0 to 0.5 ℓ/s (0 to 1,800 ℓ/h)). In addition, water quality is generally poor (Class 2) and some boreholes produce high concentrations of dissolved salts (Nyoka Formation), with high NaCl and SO4 concentrations (Vryheid and Dwyka Formations) or high Iron and/or Manganese (Pietermaritzburg Formation). The indurated contact zones in the sediments adjacent to the intrusive Jurassic age dolerite intrusions are often highly fractured and these discrete zones enhance groundwater storage and rockmass permeability. As a result, boreholes drilled to intersect these structures usually produce higher yields and superior quality groundwater than that of the surrounding host rock. These contact zones usually produce yields ranging from 0.1 – 10 l/s and groundwater quality range from Class 0 to Class 3 depending on the composition of the sedimentary host rock.

In general, the overall groundwater quality in the ZDM is good with the water quality in eDumbe, uPhongolo and Abaqulusi LMs falling within Class 0 and 1 (Kempster Classification) and Nongoma and Ulundi LMs ranging from Class 0 to Class 4 (mostly due to the high NaCl concentrations). It is pertinent to note that a large number of the Traditional Authority areas are situated within these areas of poorer groundwater quality. The deterioration of groundwater quality from west to east, can be ascribed to the following:

- Declining rainfall from west to east.
- Concentration of dissolved solids from through flow below the Dwyka Formation and coal seams in the Vryheid Formation in the central and eastern regions of the catchments.

The location of existing boreholes is illustrated in **Figure 21**.

Figure 21: Existing Borehole site in the ZDM Area



6. EXISTING WATER SUPPLY INFRASTRUCTURE

According the ZDM 2014 WSDP, there are 37 water schemes with formal water treatment plants. This excludes the rudimentary schemes where water is sourced form localised springs etc. ZDM has now summarised the water schemes into 10 regional schemes that cover wall to wall supply to the entire district. The proposed regional schemes incorporate some of the existing water treatment plants into the supply regime while others are planned for decommissioning due to a combination of their remote location and small capacities resulting in high O&M costs. The regional water schemes are summarised in **Table 14**.

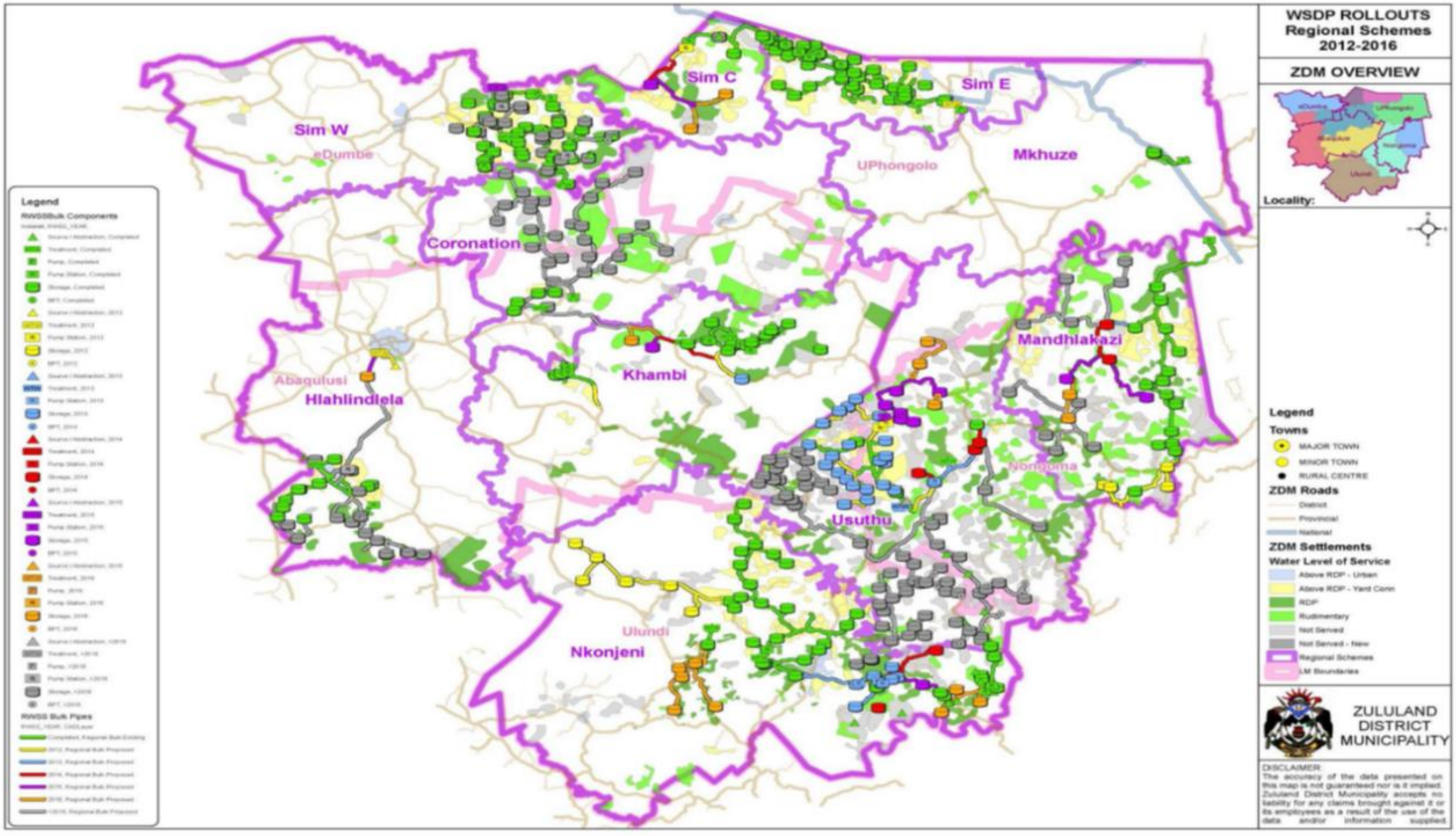
The coverage of the regional water schemes of the ZDM is depicted in **Figure 22**.

The details of the existing water schemes are also discussed per LM under this section.

Table 14: ZDM Regional Water Schemes

Item No	Name of Regional Water Scheme	Water Schemes (Based on Coverage Area)	Local Municipality
1	Hlahlindlela RWSS	Klipfontein Bloemveld Mondlo Mvuzini Purim	Abaqulusi
2	Coronation RWSS	Hlobane Louwsburg Coronation	
3	Khambi RWSS	Khambi Village Mountain View Enyathi	
4	Simdlangentsha West RWSS	Frischgewaard Dumbe Town (Pualpietersburg) Ophuzana Tholakele	eDumbe
5	Simdlangentsha East RWSS	Spekboom Pongola Town (Simdlangentsha)	uPhongolo
6	Simdlangentsha Central RWSS	Belgrade Khiphunyawo Msibi	
7	Gumbi/Candover RWSS	Gumbi	
8	Usuthu RWSS	Nongoma (Vuna) Usuthu Ceza Thulasizwe Hospital	Nongoma
9	Mandlakazi RWSS	Mandlakazi Khangela Palace Sidinsi Kombusi	
10	Nkonjeni RWSS	Ulundi - Nkonjeni Osingisingini Nkonjeni Hospital Mpungamhlophe Babanango Masokaneni	Ulundi

Figure 22: Bulk RWSS Coverage Area in the Zululand District Municipality



6.1. Abaqulusi LM

6.1.1. Hlahlindlela Regional Water Scheme

The Hlahlindlela RWSS supplies water to communities located under the Abaqulusi Local Municipality and is made up of two water schemes as follows:

- Vryheid Town Water Scheme
- Emondlo Water Scheme

These are further discussed hereunder.

6.1.1.1. Vryheid Town Water Scheme

6.1.1.1.1. Water Resource Consideration

The Vryheid Town WSS supplies water to the Town of Vryhied from two water treatment plants namely, the Klipfontein WTW and Bloemveld WTW. The Water resource situation for the plants is as follows:

- Klipfontein WTW supplies water to the Vryheid Town and receives raw water supplies from Klipfontein Dam located south of the town on the White Mfolozi River. The capacity of the dam is 18.09 million m³.
- The Bloemveld WTW supplies water to the Vryheid Town and receives raw water supplies from Bloemveld Dam and Grootegewaagd Dams situated on the aMagoda River and located north of the town. The capacities of the dams are 2.3 Mm³ and 1.1 Mm³ respectively.

Abstraction from dams is registered with DWS for a total of 5.66 million m³/a. The available water resources will be checked against the projected 2035 demand as part of the gap analysis.

6.1.1.1.2. Water Supply Infrastructure

The capacity of the Klipfontein WTW is 53Ml/day and the upgrade works were completed recently. Raw water is pumped from Klipfontein Dam via an 800mm and 450mm diameter rising mains to the waterworks. Once treated, potable water is then delivered to the command reservoir via a 350mm diameter rising main. The capacity of Bloemveld WTW is 7.5Ml/d. The capacities/sizes of raw water abstraction, pumping and conveyance to the WTWs infrastructure are not known. However, potable water is pumped from Bloemveld WTW to a command reservoir via a 475mm diameter rising main.

The available combined storage in Vryheid is 15.5Ml.

6.1.1.1.3. Condition of Bulk Supply Infrastructure

The Klipfontein WTW has recently been upgraded and the condition of bulk supply infrastructure is considered to be in good condition. There is however no information of the condition of infrastructure of the Bloemveld WTW.
The layout of the existing infrastructure is included as Figure B1 in Annexure B.

6.1.1.2. Emondlo Water Scheme

6.1.1.2.1. Water Resource Consideration

The Emondlo WSS supplies water to Mondlo Township located on the southern boundary of the Abaqulusi LM. Water is supplied from two water treatment plants namely the Mondlo WTW and Mvuzini WTW. The Water resource situation for the plants is as follows:

- Emondlo WTW supplies water to the Emondlo (Hlalindlela) Township and receives raw water supplies from Mvunyana Dam located south-east of the town on the Mvunyana River. The capacity of the dam is not known.
- Mvuzini WTW supplies water to the Emondlo (Hlalindlela) Township and receives raw water supplies from Mvunyana Dam located south-east of the town on the Mvunyana River. The capacity of the dam is not known.

6.1.1.2.2. Water Supply Infrastructure

The capacities of the Emondlo WTW and Mvuzini WTW are 9.0Ml/d and 0.5Ml/d respectively. The capacities of the associated raw water abstraction and pumping equipment are not known. However raw water is pumped to the Emondlo WTW via a 200mm diameter rising main. The command reservoir is located at the waterworks and the combined total storage capacity is 15Ml.

6.1.1.2.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Emondlo Water Scheme is not known. The layout of the existing infrastructure is included as Figure B1 in Annexure B.

6.1.2. Coronation Regional Water Supply Scheme

The Coronation RWSS covers communities residing under the Abaqulusi and Phongola Local Municipalities and is made up four water schemes as follows:

- Louwsburg Water Scheme
- Coronation Water Scheme
- Hlobane Water Scheme
- Boreholes and Springs Supply

These are further discussed hereunder.

6.1.2.1. Louwsburg Water Scheme

6.1.2.1.1. Water Resource Consideration

The Louwsburg Water Scheme supplies water to the Town of Lowsburg. Water is supplied to the area from the Louwsburg WTW. Raw water is sourced from a dam located on the south western edge of the town. The capacity/yield details of the dam are not known.

6.1.2.1.2. Water Supply Infrastructure

Raw water is pumped from the dam to the WTW via a 100mm dia pumping main. The capacity of the Louwsburg WTW is 0.72Ml/d. Clear water is pumped from the waterworks to a command reservoir reportedly via a 110mm dia rising main. The combined capacity of the clear water storage reservoir is 0.6Ml (Louwsburg WTW Assessment – October 2009)

6.1.2.1.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Louwsburg Water Scheme is not known. The layout of the existing infrastructure is included as Figure B4 in Annexure B.

6.1.2.2. Coronation Water Scheme

6.1.2.2.1. Water Resource Consideration

The Coronation Water Scheme supplies water to the coal mining town of Coronation and surrounding villages of Kengolanga, Shongololo and Thukuzele. Potable water is supplied to the area from the Coronation WTW and raw water is sourced from Coronation dam located on Mbilane River, a tributary of Mkuze River to the south of the supply area. The capacity/yield details of the dam are not known.

6.1.2.2.2. Water Supply Infrastructure

The details and capacity of the abstraction and pumping works are not known, however, raw water is pumped from the dam to the WTW via a 200mm dia pumping main. The capacity of the Coronation WTW is 0.4Ml/d. Clear water is pumped from the waterworks to a command reservoir reportedly via a 110mm dia rising main. The capacity of the command reservoirs is not known but is estimated at 0.4Ml based on google earth imagery.

6.1.2.2.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Coronation Water Scheme is not known. The layout of the existing infrastructure is included as Figure B4 in Annexure B.

6.1.2.3. Hlobane Water Scheme

6.1.2.3.1. Water Resource Consideration

The Hlobane Water Scheme supplies water to the villages of Hlobane and Vaalbank. Potable water is supplied to the area from the Hlobane WTW and raw water is sourced from Hlobane Dam located upstream of Coronation dam on Mbilane River, a tributary of Mkuze River to the south east of the supply area. The capacity/yield details of the dam are not known.

6.1.2.3.2. Water Supply Infrastructure

The details and capacity of the abstraction and pumping works are not known, however, raw water is pumped from the dam to the WTW via a 200mm dia pumping main. The capacity of the Hlobane WTW is 2.0Ml/d. Clear water is pumped from the waterworks to a command reservoir reportedly via a 150mm dia rising main. The capacity of the command reservoirs is not known but is estimated at 0.4Ml based on google earth imagery.

6.1.2.3.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Coronation Water Scheme is not known. According to the Hlobane WTW Assessment report dated October 2009, the water treatment works requires refurbishment and the bulk storage reservoir is badly corroded.

The layout of the existing infrastructure is included as Figure B4 in Annexure B.

6.1.2.4. Borehole Supply

The other communities residing around Louwsburg Town mainly to the south and west of the town are farming communities with pockets of localised rural communities. ZDM is not planning to provide a regional water supply to these communities but rather intends to supply from localised sources such as boreholes and springs.

6.1.3. Khambi Regional Water Supply Scheme

The Khambi RWSS supplies water to communities located under the Abaqulusi Local Municipality and is made up three water schemes as follows:

- Khambi Water Scheme
- Enyathi Water Scheme
- Mountain View Water Scheme

These are further discussed hereunder.

6.1.3.1. Khambi Water Scheme

6.1.3.1.1. Water Resource Consideration

The Khambi WSS supplies water to the Ngenetsheni village located under the Abaqulusi LM. The village is located 18km due South (as the crow flies) of the town of Louwsburg. Potable water is supplied to the area from the Khambi WTW and is obtained through river abstraction on a tributary of Mkuze River. The MAR on the river has not been established.

6.1.3.1.2. Water Supply Infrastructure

The capacities of the abstraction works and associated raw water pumping equipment is not known. However, raw water is abstracted from the river reportedly via a 100mm dia pipeline to the Khambi WTW with a capacity of 0.2Ml/d. Clear water is pumped from the waterworks to a command reservoir reportedly via a 100mm dia rising main. The combined capacity of storage reservoirs is not known.

6.1.3.1.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Khambi Water Scheme is not known. The layout of the existing infrastructure is included as Figure B5 in Annexure B.

6.1.3.2. Enyathi Water Scheme

6.1.3.2.1. Water Resource Consideration

The Enyathi WSS supplies water to the localised villages of Enyathi and Bloemendal under the Abaqulusi LM. The villages are located 25km due South east (as the crow flies) of the town of Vryheid and are in the midst of farm lands. Potable water is supplied to the area from the Enyathi WTW and is obtained through abstraction from a weir on the Black Umfolozi River. The MAR on the river has not been established.

6.1.3.2.2. Water Supply Infrastructure

The capacities of infrastructure for the abstraction works and associated raw water pumping and conveyance to the WTWs and the Enyathi WTW are not known. However raw water is reportedly abstracted from the weir to the WTW via a 200mm dia rising main. Clear water is pumped from the waterworks to a command reservoir reportedly via a 16mm dia rising main. The combined capacity of storage reservoirs is not known.

6.1.3.2.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Enyathi Water Scheme is not known. The layout of the existing infrastructure is included as Figure B2 in Annexure B.

6.1.3.3. Mountain View Water Scheme

6.1.3.3.1. Water Resource Consideration

The Mountain View WSS supplies water to the Salvation village located under the Abaqulusi LM. The village is located 27km due South east (as the crow flies) of the town of Louwsburg. Potable water is supplied to the area from the Mountain View WTW and is obtained from a spring on top of the mountain. The yield of the spring has not been established.

6.1.3.3.2. Water Supply Infrastructure

The capacities of infrastructure for the abstraction works and associated raw water pumping and conveyance to the WTWs and the Mountain View WTW are not known. Clear water conveyancing and an storage capacities are also not known.

6.1.3.3.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Mountain View Water Scheme is not known.

6.2. eDumbe LM

6.2.1. Simdlangentsha West Regional Water Scheme

The Simdlangentsha West RWSS supplies water to communities located under the eDumbe Local Municipality and is made up two water schemes as follows:

- Simdlangentsha West Water Scheme
- Paulpietersburg Town Water Scheme
- Borehole supply

These are further discussed hereunder.

6.2.1.1. Simdlangentsha West Water Scheme

6.2.1.1.1. Water Resource Consideration

The Simdlangentsha West water Scheme supplies water to the Town of Frischgewaagd and surrounding villages up to the Bivane River on the south. Water is supplied from three plants namely the Frischgewaagd WTW, Tholakela WTW and Bivane WTW. The Water resource situation for the plants is as follows:

- The Frischgewaagd WTW receives raw water that is pumped from the Phongolo River. The capacity of the existing raw water pumping plant is unknown. Therefore, it is not known whether there is sufficient raw water pumping capacity including the raw water intake works.

- For Tholakela WTW, there is limited information as to the type of intake works as well as the capacity of the raw water pumping system. The source of raw water for the plant is a tributary of the Phongolo River.
- The Bivane WTW is owned and operated by Impala Water User Association (WUA). It draws its raw water from the Bivane Dam to supply the communities in the surrounding area of the dam (tourism). The storage capacity of Bivane Dam is 115.2 million m^3.

The total registered domestic water use for Frischgewaagd WTW is 1.12 million m^3/a and there is no registered water use for the Tholakele and Bivane WTW.

6.2.1.1.2. Water Supply Infrastructure

The capacities of the Frischgewaagd WTW, Tholakela WTW and Bivane WTW are 2Ml/d, 1.0 Ml/d and 1.0Ml/d respectively. The capacities/sizes of raw water abstraction, pumping and conveyance to the WTWs infrastructure are not known including clear water bulk pipelines and storage reservoirs.

6.2.1.1.3. Condition of Bulk Supply Infrastructure

The condition of bulk supply infrastructure for the Simdlangentsha West WSS is not known. The layout of the existing infrastructure is included as Figure B6 in Annexure B.

6.2.1.2. Paulpietersburg Town Water Scheme

6.2.1.2.1. Water Resource Consideration

The Paul Pietersburg Town Water Scheme supplies water to the Town of Paul Pietersburg (also referred to as Dumbe Town) and receives raw water supplies from Dumbe Dam located on the Egoda River 3,5km from the Dumbe Town CBD along the Main Road R33 from Vryheid. The capacity of the dam is 0.25 Mm^3. A water use of 0.53 million m^3/a is registered for Paulpietersburg Water Supply. The registered water resources for the scheme is summarised in **Table 15**.

Table 15: Registered water users in the catchment of Paul Pietersburg Town WSS (Mm^3/a)

Sub-catchment	Irrigation	Industry	Forestry	Municipal	Total
Dumbe Dam catchment in Egoda River in quaternary catchment W42D	0.01	-	0.68	0.5[(2)]	0.69
Total	0.01	-	0.68	0.5[(2)]	0.69

[(2)] *includes registered water use of 0.53 million m3/a for Paulpietersburg Water Supply*

The catchment area of the Dam is estimated to be 20.5 km^2 and the natural MAR of the dam catchment is estimated to be 4.0 million m^3 when using the natural MAR of 0.193 million m^3/km^2 for quaternary catchment W42D (WR90, 1994). The storage capacity of Dumbe Dam is given as 0.25 million m^3 (WR90, 1994) or 6.4% of the natural MAR, which is small. There is therefore significant potential to increase the yield of the Dumbe Dam by raising the dam to increase its storage capacity. The available water resources will be checked against the projected 2035 demand as part of the gap analysis.

6.2.1.2.2. Water Supply Infrastructure

For the Paulpietersburg WTW, the capacity of the plant, abstraction and raw water conveyance pipeline is 3.0Ml/d. Total storage on the scheme is 5Ml.

6.2.1.2.3. Condition of Bulk Supply Infrastructure

The Paulpietersburg WTW requires refurbishment as the flocculation and clarification infrastructure is now worn out. The layout of the existing infrastructure is included as Figure B7 in Annexure B.

6.2.1.3. Borehole Supply

The other communities residing around Paulpietersburg Town mainly to the west, north and south of the town are farming communities with pockets of small households that are served from localised borehole sources. Due to the scattered nature of such “pocket communities”, ZDM is not planning to provide a regional water scheme. Any water supply upgrades would be based on localised sources.

6.3. uPhongolo LM

6.3.1. Simdlangentsha East Regional Water Scheme

6.3.1.1. Water Resource Consideration

The Simdlangentsha East Regional Water Supply Scheme is the main source of domestic water supplies to the town of Phongolo and villages which cover the area stretching from the border with Swaziland in the north, the communities of Manyandeni and Highlands to the east and the Pongola River to the south and Spekboom to the west. The raw water for the treatment plant is obtained by means of abstraction, via a calibrated sluice from the Impala irrigation primary canal, which passes above the Pongola WTW. Water is gravitated directly into the works or into one of three balancing dams. Water can also be pumped directly from the Pongola River into the same delivery canal, as a backup. The registered water resources for the schemes is summarised 2.33 million m^3/a.

6.3.1.2. Water Supply Infrastructure

The capacity of the Phongola WTW has recently been upgraded to a capacity of 12Ml/day. Water is abstracted from the Pongola River via the Impala irrigation primary canal or a 300mm diameter pumping main when the canal is decommissioned for maintenance purposes. Treated water is pumped via a 300mm cast iron and 355mm dia uPVC pipelines to command reservoirs. The capacity of the existing storage/command reservoirs is 9.5Ml.

The spekboom WTW is a Wataka package plant with a capacity of 1.2 Ml/day which receives raw water supplies via direct river abstraction from Spekboom River.

6.3.1.3. Condition of Bulk Supply Infrastructure

Having been recently upgraded, the condition of Phongolo WTW may classified as good. The bulk supply pipelines from Phongolo WTW to the command reservoirs are currently being upgraded. The bulk supply infrastructure associated with Spekboom WTW is reportedly in a fair condition with minor repair works required.

The layout of the existing infrastructure is included as Figure B8 in Annexure B.

6.3.2. Simdlangentsha Central Regional Water Scheme

6.3.2.1. Water Resource Consideration

The Simdlangentsha Central (Belgrade) Water Supply Scheme is supplied by a water treatment works which gets its raw water from a weir situated in the Mozana River. The storage capacity of the weir is unknown. The Annual Runoff (MAR) of the quaternary catchments W42K and W42L is 99.8 Mm^3/a.

The registered water resources for the schemes is summarised in **Table 16.**

Table 16: Registered water users in the catchments of Simdlangentsha Central RWSS (Mm^3/a)

Sub-catchment	Irrigation	Industry	Forestry	Domestic	Total
Upper Pongola	58.3		34.34	1.12	93.77
Bivane	4.52		18.18	0.02	22.72
Pongola: Impala Scheme	162.37	2.5		2.33*	167.2
Mozana	5.31		1.84	1.23	8.38
Pongola: Diffuse	32.43		0.26	0.11	32.8
Total	262.93	2.5	54.63	4.81	324.87

**This is the registered water use for the Pongola WTW plus an allocation of 0.29 million m^3/a, for the Nshangashe Tribal Authority.*

There are three other small package water treatments plants that receive raw water supplies from tributaries of the Mozana River which is also a tributary of Phongola River and serve localised communities. These are namely Khiphunyawo WTW, Nkosentsha WTW and Msibi WTW.

The available water resources will be checked against the projected 2035 demand as part of the gap analysis.

6.3.2.2. Water Supply Infrastructure

The Belgrade WTW is supplied from two sources of supply namely a weir in the Mozana River and a small dam in the tributary of Mozana River near the water treatment works. Raw water supply for the Belgrade WTWs is pumped from the abstraction works at the weir on the Mozana River through a raw water pumping main to the Belgrade WTW located in the rural town. The maximum capacity of the raw water supply mains from the Mozana River is unknown. Raw water is also pumped from a small dam near the Belgrade WTW. The dam is situated in the tributary of the Mozana River. The capacity of the raw water abstraction works, including the storage capacity of the dam and pumping system is unknown.

The capacity of Belgrade WTW is 4.0Ml/d. raw water is conveyed to the WTW via a 250m diameter ductile iron pipeline while clear water is pumped from the WTW via a 250mm dia pipeline to a 2.5Ml command reservoir. Khiphunyawo WTW, Nkosentsha WTW and Msibi WTW are currently producing 0.37Ml/d, 0.13Ml/d and 0.03Ml/d respectively (ZDM WSDP 2014)

6.3.2.3. Condition of Bulk Supply Infrastructure

There is no information on the condition of the Belgrade WTW, Khiphunyawo WTW, Nkosentsha WTW and Msibi WTW and other bulk supply infrastructure such as reservoirs and pipelines.

The layout of the existing infrastructure is included as Figure B8 in Annexure B.

6.3.3. Gumbi/Candover Regional Water Supply Scheme

The Gumbi/Candover RWSS covers communities residing on the eastern end of the uPhongolo Local Municipality next to the Phongolo Dam but on the western side of the N2. However, the area covered by the scheme is vast stretching to the west to include portions of Ithala Game Reserve.

6.3.3.1. Water Resource Consideration

The community residing next to the N2 close the Phongolo Dam are served with potable water supplies by the Gumbi Water Scheme. Potable water is supplied to the area from the Gumbi WTW and raw water is reportedly sourced from Phongolo Dam located on the Phongolo River. The capacity of the Phongola Dam is 2 445.9 million m^3.

6.3.3.2. Water Supply Infrastructure

The details and capacity of the abstraction and pumping works are not known, however, raw water is pumped from the dam to the WTW via a 160mm dia pumping main. The capacity of the Gumbi WTW is 1Ml/day. Clear water is stored in a reservoir at the waterworks. The capacity of the command reservoirs is not known.

6.3.3.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Gumbi Water Scheme is not known. The layout of the existing infrastructure is included as Figure B13 in Annexure B.

6.4. Nongoma LM

6.4.1. Usuthu Regional Water Supply Scheme

The Usuthu RWSS supplies water mainly to communities located under the Nongoma Local Municipality and communities located on the northern border of the Ulundi Local Municipality. The scheme covers almost the entire Nomgoma area of jurisdiction except for the eastern portion which is supplied from the Mandlakazi Water Scheme.

6.4.1.1. Water Resource Consideration

The scheme area is served by seven water treatment facilities namely, Vuna WTW, Usuthu WTW, Ceza WTW, Embile WTW, Thulasizwe WTW, Sidinsi WTW and osingisingni WTW. The raw water resources available in the scheme are as follows:

- **Vuna WTW** gets its raw water from the Vukwana Dam situated in the Vuna River, a tributary of the Black Mfolozi River. The storage capacity of the Vukwana Dam is unknown. The Annual Runoff (MAR) of the quaternary catchment W22G is 20.07 million m^3/a.
- **Ceza WTW** obtains its water from the weir situated in the Vungu River, a tributary of the Black Mfolozi River. Besides the surface water allocation, the surrounding communities in the area are also supplied from groundwater. There is no registered water for both surface and groundwater use for the scheme.
- **Usuthu WTW** obtains its water from the Black Mfolozi River through river abstraction. The site of the abstraction is in the same catchment as the Vuna WTW and the MAR is 20.07 million m^3/a.
- **Embile WTW** is located in Nongoma Town and receives raw water from a dam located to the east of Nongoma Town. The capacity of the dam in not known.
- **Thulasizwe WTW** is located in the northern border of Ulundi Municipality and also north of Ceza village. Raw water supplies are received from Sikwebezi River where it is pumped to the work
- **Osingisingini WTW** supplies the communities south of the town. The treatment works is supplied with raw water from Nhlekisa River where it is pumped to the works. The maximum capacity of the raw water supply main is not known.

The raw water sources and the respective registered allocations are detailed in **Table 17**.

Table 17: Registered water users in the Black Mfolozi River catchments which may share the water supplies with the Ceza Scheme up to W22K quaternary catchment (million m3/a) Sub-catchment

	Irrigation	Industry	Forestry	Municipal	Total
Upper Black Mfolozi River (W22A…W22D)	2.69	0.00	5.74	-	8.43
Sikwebezi River (W22E&F)	0.42	0.01	4.72	-	5.14
Vuna River (W22G)	-	-	-	1.59 (1)	1.59
Mona River (W22K)	-		-	1.64 (2)	1.64
Total	3.11	0.01	10.46	3.23	16.81

Notes:
(1) There are two registrations, one from Vukwana Dam and the other from the Vokwana River
(2) This is registered use for users in the lower catchment of the Mona River.

The storage capacity of Vukwana Dam is 1.7 million m^3. The natural MAR of the Vuna River at the confluence with the Black Mfolozi River is 20.0 million m3/a (WR90, 1994), while the upper catchments of the Black Mfolozi River (i.e. W22A.W22D, which is above the Nongoma abstraction point) is 108.01 million m^3/a. The natural MAR of the Mona River at the outlet of quaternary catchment W22K is 35 million m^3/a.

The available water resources will be checked against the projected 2035 demand as part of the gap analysis.

6.4.1.2. Water Supply Infrastructure

The details of bulk water supply infrastructure from the various WTW are detailed as follows:

Vuna WTW details and capacity of Vukwana Dam, the abstraction and pumping works are not known, however the capacity of the water treatment works is 4.5Ml/day and potable water is pumped from the WTW via a 400mm dia pumping main to a command reservoir. The WTW also supplies water to Nongoma Town. The capacity of bulk storage is 12Ml.

Ceza WTW details and capacity of the abstraction and pumping works are not known, however, the capacity of the water treatment works is 0.4Ml/day and potable water is pumped from the WTW via a 90mm dia pumping main to a command reservoir. The capacity of bulk storage is 7Ml.

Usuthu (Ceza) WTW details and capacity of the abstraction, pumping works are not known. However, the capacity of the water treatment works is 2.0Ml/day and potable water is pumped from the WTW via a 90mm dia pumping main to a command reservoir. The capacity of bulk storage is also unknown.

Embile WTW details and capacity of the abstraction, pumping and water treatment works is not known. However potable water is pumped from the WTW via a 125mm dia pumping main to a command reservoir. The capacity of bulk storage is 12Ml.

Thulasizwe WTW details and capacity of the abstraction, pumping and water treatment works is not known. However, potable water is pumped from the WTW via a 50mm dia pumping main to a command reservoir. The capacity of bulk storage is 7Ml.

Osingisingini WTW details and capacity of the abstraction and pumping works are not known, however, the capacity of the water treatment works is 0.04Ml/day. The capacity of bulk storage is also unknown.

6.4.1.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Usuthu Regional Water Scheme is not known. The layout of the existing infrastructure is included as Figure B9 and B9A in Annexure B.

6.4.2. Mandlakazi Regional Water Supply Scheme

The Mandlakazi RWSS supplies water to communities located on the eastern side of the Nongoma Local Municipality up the boundary with Hlabisa LM under the Umkhanyakude DM and is made up two water schemes as follows:

- Mandlakazi Water Scheme
- Sidinsi Water Scheme

These are further discussed hereunder.

6.4.2.1. Mandlakazi Water Scheme

6.4.2.1.1. Water Resource Consideration

Raw water is currently being purchased from the Charl Senekal Trust in terms of a memorandum of agreement for treatment at Mandlakazi WTW. Raw water supply for the Mandlakazi WTW is pumped from the weir upstream of Blackie Dam through a raw water pumping main to the Mandlakazi WTW located in Madulaleni village. ZDM currently have no abstraction facility on the Pongolapoort Dam. However, an abstraction license in the favour of Zululand District Municipality for a volume of 5.22 Million m^3/year (14.3 Ml/day) for the Mandlakazi RWSS has been submitted to DWS. (Mandlakazi Water Scheme Technical Assessment Report: Existing Bulk Infrastructure to Meet Long Term Water Demands, Project No: ZDM 1368/2012).

The plan showing the existing infrastructure for the Mandlakazi RWSS is shown in Annxure
The 2008 average production for the scheme was within the allocated municipal usage. This will be however, be tested against the projected 2035 demand for the water scheme. ZDM is currently implementing a project to upgrade the bulk supply infrastructure.

6.4.2.1.2. Water Supply Infrastructure

The existing raw water pump station is configured on a Duty:Duty:Duty:Standby basis and has previously been operating at approx. 90kl/hr, recently improved to approx. 160kl/hr (3.84 Ml/day). The existing 350mm dia ductile iron raw water rising main has a capacity to deliver 109l/s (9.4Ml/day) to Mandlakazi WTW at a total pumping head of approximately 250m.

The Mandlakazi WTW (package plant) has recently been upgraded from 2Ml/d to 4Ml/d as part of the immediate emergency upgrade to meet current demand. This is due for upgrade to 10Ml/day and a contractor has been appointed for this work. From the waterworks clear water is pumped in two stages via a 350mm dia potable water rising main with a capacity of 109ℓ/s (9.4Mℓ/day) to a command reservoir. The two pump stations however were fitted with pumps for lower initial water demands of 36ℓ/s (1Mℓ /day).

6.4.2.1.3. Condition of Bulk Supply Infrastructure

The raw water pumpstation is need of refurbishment as a result of sever differential settlement that has occurred while the bulk raw water pipeline requires replacement of broken valves and fittings. The layout of the existing infrastructure is included as Figure B10 in Annexure B.

6.4.2.2. Sidinsi Water Scheme

6.4.2.2.1. Water Resource Consideration

Raw water is also obtained from the Mona River and treated at Sidinsi (KwaMpanza) WTW whose capacity is 0.28Ml/day and is located on the southern end of the water scheme area. According to the First Stage Reconciliation Strategy for Greater Mandlakazi Water Supply Scheme Area, the natural MAR of the Mona River at the outlet of quaternary catchment W22K is 35 million m^3/a. There is sufficient flows in these rivers to meet the existing water requirements on a long term basis.

6.4.2.2.2. Water Supply Infrastructure

Ra w water is abstracted from Mona River through two rudimentary installations to a booster installation. The first installation consists of a 2.2kW Grundfos submersible pumps pumping through a 63mm diameter HDPE pipe. The second installation consists of a 4kW 7 stage Grundfos pump pumping through a 50mm diameter HDPE pipe. The booster installion has 3 x10 000 litre jojo tanks that act as reservoirs from which water is pumped to the WTW through a 90 mm diameter uPVC pipe.

The storage reservoirs consists of 3 concrete reservoir each with a capacity of approximately 120m^3.

6.4.2.2.3. Condition of Bulk Supply Infrastructure

The infrastructure at the WTW requires refurbishment as all the structures are now leaking (Sidinsi WTW Assessment Report).

The layout of the existing infrastructure is included as Figure B10 in Annexure B.

6.5. Ulundi LM

6.5.1. Nkonjeni Regional Water Supply Scheme

The Nkonjeni RWSS supplies water to communities located under the Ulundi Local Municipality and is made up two water schemes as follows:

- Greater Ulundi Water Scheme
- Babanango Water Scheme
- Mpungamhlophe Water Scheme

These are further discussed hereunder.

6.5.1.1. Greater Ulundi Water Scheme

6.5.1.1.1. Water Resource Consideration

The Greater Ulundi WSS supplies water to the Town of Ulundi and the surrounding villages. Water is supplied to the area by only the Ulundi WTW. Water is sourced from the Ulundi Weir situated on the White Mfolozi River, some 8 km north west of the Town. Water is released from the Klipfontein Dam, near Vryheid, 71 km away and meanders for 144 km along the river to the weir, which provides the balancing needs for abstraction. The Klipfontein Dam was built to supply both domestic water to Vryheid and Ulundi as well as irrigation water for the farmers downstream of the dam. Besides the surface water allocation, the surrounding communities in the Ulundi Water Supply Scheme area are also supplied from groundwater. There is no registered groundwater use for the scheme. The registered users in the White Mfolozi River catchments up to outlet of quaternary catchment W21K using the same resource as Ulundi (million m3/a) sub-catchment are shown in **Table 18**.

Table 18: Registered water users in the White Mfolozi River catchments up to outlet of quaternary catchment W21K using the same resource as Ulundi (million m^3/a) Sub-catchment

	Irrigation	Industry	Forestry	Municipal	Total
Upstream of Klipfontein Dam (W21A)	0.85	-	4.38	3.21	8.64
Downstream of Klipfontein Dam up to outlet of quaternary catchment W21K at Ulundi (W21B to K)	10.04	-	9.15	7.80(1)	27.00
Total	**10.89**	**-**	**13.53**	**11.01**	**35.64**

(1) Includes the registered use of 5 million m^3/a from the Klipfontein Dam for Vryheid as well as the registered water use of Ulundi.

The storage capacity of Klipfontein Dam is given as 18.09 million m^3 (Department of Water Affairs, 2010). The Grootgewaagd Dam with a storage capacity of 1.1 million m^3 and the Bloemveld Dam with a storage capacity of 2.3 million m^3 are situated in the catchment of the Klipfontein Dam. The natural MAR of the quaternary catchments downstream of Klipfontein Dam (W21B to W21J) is 293.8 million m^3 (WR90, 1994), while that of the gross catchment of Klipfontein Dam (i.e. W21A) is 49.1 million m^3. Therefore the total storage capacity of the Grootgewaagd, Bloemveld and Klipfontein Dams is relatively small compared with the natural MAR (38% of the natural MAR). There is therefore a significant potential to increase the yield of the Klipfontein Dam by raising the dam to increase its storage capacity (First Stage Reconciliation Strategy for Greater Ulundi Regional Water Scheme)

6.5.1.1.2. Water Supply Infrastructure

The capacity of the weir and abstraction works is not known. However, Klipfontein Dam which feeds water into the weir has a capacity of 18.09 million m^3. The capacity of Ulundi WTW is 26.4Ml/d. Clear water is pumped from the waterworks to a command reservoir via a 500mm dia rising main. The combined capacity of storage reservoirs is 27Ml.

6.5.1.1.3. Condition of Bulk Supply Infrastructure

The condition of bulk water supply infrastructure of the Ulundi Water Scheme is not known. The layout of the existing infrastructure is included as Figure B11 in Annexure B.

6.5.1.2. Babanango Water Scheme

6.5.1.2.1. Water Resource Consideration

Babanango sits on the watershed of quaternary catchment W12A, which is the Mhlatuze River to the west, and quaternary catchment W21J, which is in the White Mfolozi River to the east. Babanango Water Supply Scheme area is supplied by a water treatment works (WTW) which gets its raw water from the weir situated in the Gologodo River, a tributary of the Mhlatuze River. The natural MAR of the Gologodo River at the confluence with the Mhlatuze River has been estimated based on the catchment area to be 2.86 million m^3/a (WR90,1994), while The Annual Runoff (MAR) of the quaternary catchment W12A is 56.03 million m^3/a. the registered users of available resources are detailed in **Table 19**.

Table 19: Registered water users in the catchments which may share the water supplies with Babanango Water Supply Scheme (million m3/a) Sub-catchment

	Irrigation	Industry	Forestry	Municipal	Total
Gologodo River (W12A)	0.37	0.00	11.87	1.42 (1)	13.66
Mpembeni River (W21J)	0.07	-	3.71	-	3.78
Total	0.44	0.00	15.58	1.42	17.44

(1) This is the registered water use for domestic users in Uthungulu District Municipality in the lower catchment of the Mhlatuze River

The available water resources will be checked against the projected 2035 demand as part of the gap analysis.

6.5.1.2.2. Water Supply Infrastructure

The abstraction works consists of a submersible pump that delivers 18m^3/hr to the WTW. The capacity of the Babanango WTW is 0.33Ml/d. Clear water is pumped from the waterworks to a command reservoir via a 160mm dia rising main. The combined capacity of available storage reservoirs is 0.65Ml.

6.5.1.2.3. Condition of Bulk Supply Infrastructure

According to the Babanango WTW Assessment Report, the water treatment works requires general refurbishment in terms of painting and general maintenance work. The layout of the existing infrastructure is included as Figure B12 in Annexure B.

6.5.1.3. Mpungamhlophe Water Scheme

6.5.1.3.1. Water Resource Consideration

The Mpungamhlophe WTW is located 17km upstream of the White Mfolozi River along the river course. The water resources are thus the same as discussed under the Greater Ulundi Water Scheme above.

6.5.1.3.2. Water Supply Infrastructure

The abstraction works consists of a submersible pump that delivers 36m^3/hr to the WTW. The capacity of the Mpungamhlophe WTW is 0.8Ml/d. Clear water is pumped from the waterworks to a command reservoir via a 150mm dia rising main. The combined capacity of available storage reservoirs is 0.65Ml.

6.5.1.3.3. Condition of Bulk Supply Infrastructure

According to the Mpungamhlophe WTW Assessment Report, the water treatment works requires general refurbishment in terms of painting and general maintenance work. The layout of the existing infrastructure is included as Figure B11A in Annexure B.

7. BULK WATER SUPPLY INTERVENTIONS CURRENTLY IN PLANNING

Bulk water supply planning is primarily undertaken by Zululand DM for the area under its jurisdiction. Planning is undertaken under the WSA function of the ZDM. New schemes are not needed, and therefore are not in planning. There are vast areas that still require water supply and the existing infrastructure generally requires refurbishment and upgrade. All projects have to work within water use license allocation as per the compulsory licensing project, and additional water is not available. A summary of some of these key bulk augmentation projects is in **Table 20**.

Table 20: ZDM Planned Water Projects (2015)

Provincial Ref Number	Project Title	Project Status	Approved MIG Funding	Project Scope of work
2006MIGFDC265325	Usuthu RWSS Phase 3	Construction	89 093 640.00	60kl reservoir; water networks of about 20 km of 25-90 mm dia pipes; refurbishment of existing 30kl reservoir, break pressure tanks, air, scour and isolation valves; and other associated infrastructure
2006MIGFDC265328	Usuthu RWSS Phase 2	Construction	32 483 514.00	The beneficiaries in Usuthu area covering over 21,000 km2 between Nongoma and Mahlabathini. Water source is the Black Mfolozi river near Mjeni. Project will be implemented in numerous phases No data
2006MIGFDC265329	Usuthu RWSS Phase 1	Construction	96 259 053.00	
2006MIGFDC265332	Simdlangentsha Central RWSS Ph 2 AFA	Construction	56 000 493.76	Reticulation for increased population from 39,569 to 54,160 beneficiaries
2006MIGFDC265333	Khambi RWSS Water Supply AFA	Construction	74 785 687.00	• Water abstraction from a weir on Kwamthazi River, WTW • pumping to the settlements Kwamakweshe, Ndlandla, Hlazeni, Ngenetheni. Ntumbane, Nsunduzane, Cibilili, Mahalaqoka, Esihlengeni and Bhekephi; • 3 x 1 kl, 1 x 10 kl and 6 x 30 kl break pressure reservoirs; Construction of 1 x 100 kl, 2 x 200 kl, 1 x 400 kl and 1 x 500 kl storage reservoirs; • Reticulation and distribution networks to above settlements and Development of six spring
2006MIGFDC265334	Hlahlindlela/ Mondlo Regional Water Supply	Construction	167 579 680.00	Project has 3 phases and first phase will be to develop local sources as a short-term solution. The second phase will be to supply water from Klipfontein Dam to eMondlo. The third phase will be to join all stand-alone schemes to the bulk supply from Klipfontein dam.
2006MIGFDC265336	Simdlangetsha East RWSS Phase 1	Construction	25 683 733.70	Construction of the Spekboom River Abstraction unit; Installation of bulk water meters; flow controllers; additional reticulation lines; flow regulators on bulk lines; access road to storage reservoir no.1 (S1); telemetry system; Geohydrological study - Maguda Mountain Settlement; Rising main and stand alone scheme to Gumbi Settlement
2006MIGFDC265339	Simdlangetsha West RWSS Phase 2.1 (AFA) MIS 210576	Construction	229 829 490.00	Installation of additional networks at Bilanyoni & Mangosuthu; Additional capacity at Frischgewaagd WTW & new rising main line to Frischgewaagd; Bulks & infill networks for the Upper & Lower Simdlangentsha settlements; Bulk supply & network extensions at Opuzane; Networks for 8 new land reform areas.
2006MIGFDC265351	Coronation RWSS Enyathi (AFA) MIS 155365	Construction	34 927 055.48	Weir repairs, water treatment plant and pumpstations, 2 x clear water storage tanks, spring protection, 4.22 km bulk water supply lines, 3 x break pressure tanks.
2008MIGFDC26162234	Mandlakazi Regional Water Supply Scheme (Phase 4)	Construction	125 793 218.00	• Installation of 43km primary bulk water mains, 15km secondary bulk mains, reticulation to approximately 3900 households, • Upgrading of 3 pumpstations, • Construction of 3 bulk resevoirs and 6 supply zone reseviors and the augmentation of the Mandlakazi water purification plant.
2008MIGFDC26165601	Gumbi Emergency Water Supply	Construction	26 464 362.00	The project will establish infrastructure to take raw water from Jozini Dam via pumpstation and main pipeline to a water purification plant and storage facility at the Gumbi Community including reticulation.
2009MIGFDC26171056	Usuthu Regional Water Supply Scheme Phase 05	Construction	665 847 909.96	This phase 5 of the scheme is intended to supply water to 20,764 households with a population of 140,484. This population figures include the towns of Nongoma, Mahlabathini and Ceza which have been partly served with water but the CWSS are not sustainable. The scope of works includes 7 number of pump stations, total length of 127 km (Bulk Line), total length of 385 km (Secondary Bulk) and a total of 80 reservoirs.
2009MIGFDC26171057	Nkonjeni Regional Water Supply Scheme Phase 04	Construction	310 103 565.51	The scope of works includes 7 number of pump stations, total length of 136 km (Bulk Line), total length of 385 km (Secondary Bulk) and a total of 21 reservoirs.
2012MIGFDC26207602	Simdlangetsha East Water Supply - Phase 2	Registered	97 162 185.96	• Upgrading and extension of the main source of water. • The introduction of flow and pressure control in the existing distribution network • Development of internal reticulation distribution network to villages that are currently without such infrastructure.
2013MIGFDC26213508	Simdlangentsha Central Water Supply Project: Phase 3	Registered	148 006 808.34	• expansion of Belgrade Water Treatment works • 10.31Km of 23.3 Km of gravity main lines • 2xbooster pump stations (Kiphuyawo and Bongaspoort • 3 main supply resrvoirs (Ombimbini1 – R2, Klipwal – R4 and Emabomvini – R3) • Telemetry Communication system.
2013MIGFDC26211793	Coronation Regional water Supply Scheme: Planning Phase	Registered	2 884 800.00	Feasibility study for borehole water supply
2013MIGFDC26220802	Zululand Rudimentary Water Supply Programme - Phase 4	Registered	122 128 226.52	• Testing and verification of existing sources - 163 • New Production Borehole with small network - 38 • Develop existing borehole with small network - 7 • New borehole with small network - 56 • New borehole with handpump - 153 • Existing spring with small network - 6 • New spring with small network - 3 • The total number of work items for Phase 3 will therefore be 426.
2014MIGFDC26215437	Mandlakazi Regional Water Supply - Phase 5	Registered	447 768 410.25	Project scope includes construction of 16 new reservoirs, with a total of 490km of pipelines, construction of metered yard connection to approximately 12809 household. Network will include air valves, isolating valves and scour valves.
Total			**2 752 801 833.48**	

7.1. Mandlakazi Water Scheme

ZDM is undertaking upgrade works on the Mandlakazi Water Scheme details of which are provided under this section.

7.1.1. Water Resource Consideration/Infrastructure

The available water resources on the Mkuze River according to the First Stage Reconciliation Strategy for Greater Mandlakazi Water Supply Scheme Area (June 2011) is 43.02Mm³/a. The additional water resources required by the planned upgrade to a capacity of 20Ml/d (7.3Mm/a) will be available. However, the allocation of resources may require to be agreed between the stakeholders concerned.

7.1.2. Planned water supply infrastructure

According to the report titled "Technical Assessment Report: Existing Bulk Infrastructure to Meet Long Term Water Demands, Project No: ZDM 1368/2012" dated November 2014 and prepared by Mbona Saunders & Wium, the planned infrastructure components include *inter alia* the following:

- The existing raw water pump station is being upgraded to nominal 10Ml/day capacity including the mechanical upgrade of the pump station including installation of new pumps and associated mechanical pipework manifolds and valves, etc.
- Upgrading the existing package WTW from 2Ml/day to 4Ml/day to match existing raw water supply capacity and meet current demand has been completed. The plant will be further increased to 20Ml/day and ultimately to 30Ml/d.
- The existing 350mm dia potable water rising main has a capacity to supply 109l/s (9.4Ml/day for the immediate short term intervention).
- The 1st lift pump station is a brick building with RC roof (12.5 x 8m) situated within the existing WTW complex (@ 324m MSL). There are two KSB WKLn 65/5 pumps (operating duty/duty at 36 l/s) with two spare.
- The intermediate pump station lifts potable water from the intermediate 300Kl Reservoir (@ 512m MSL) to the Command Reservoir at 703m. The pump station is a subsurface RC chamber with horizontal submersible borehole type pumps (Grundfos SP 77-14), delivering at an equivalent flow rate to the above (Duty/duty at 36 l/s).
- Intermediate Pump Reservoir (300Kl): also provides storage for distribution to 362 households, with an ultimate demand of 242Kl/day. This reservoir is thus undersized for both the domestic and pump storage requirement standard of 48hrs storage.
- The ultimate design capacity for the command reservoir is 4 x 2Ml reservoirs with interconnectivity.
- Bulk and reticulation pipelines in Mandlakazi

The Mandlakazi RWSS is also planned to supply 8.5Ml/day to communities residing under the Hlabisa LM under the Umkhanyakude District Municipality.

7.1.3. Financial Implications

The financial implication of planned upgrade works based on an ultimate capacity of 30Ml/d is R447 768 410.00 as registered with the Funder MIG.

7.2. Hlahlindlela/ Mondlo RWSS

According to Mr P Mnguni, the ZDM WSA Manager (also confirmed on MIG project basic data schedules obtained from DWS), ZDM intends to supply the township of Mondlo from the Klipfontein WTW as a result of the reliability and security of supply. This would entail the construction of bulk supply infrastructure from Klipfontein WTW to Mondlo. The project is registered with MIG for a budget of R167 579 680.00.

7.3. Nkonjeni Regional Water Supply Scheme

ZDM is providing water reticulation to communities in Nkonjeni and the project budge amount is R310 103 565.51.

7.4. Coronation Regional Water Supply Scheme

Coronation RWSS foot print covers mainly areas located under Wards 1, 2, 3 and 6 of the Abaqulusi LM under and Ward 1 of Uphongolo Municipality. The area is characterised by farms, a game reserve and scattered localised villages. Due to the scattered nature of the settlements, Zululand DM has planned a borehole exploration and drilling project to serve the localised villages.

The project is registered with MIG for a budget of R2 884 800.00 to cover the feasibility study phase.

7.5. Simdlangentsha East RWSS

ZDM has completed the upgrading of the Phongolo WTW to 12Ml/day (2014). Subsequent to the upgrading of the WTW, the bulk clear water pipelines from Phongolo WTW to the command reservoirs are also being upgraded. The pipelines under construction include a 300mm diameter cast iron pipeline and a 350mm diameter uPVC pipeline. The project is registered with MIG for a budget of R25 683 733.70 to cover the construction costs of the pipelines.

A Phase 2 of the project has been registered with MIG for a project budget amount of R97 162 185.96. The scope of work of the project includes the following:

- The upgrading and extension of the main source of water.

- The introduction of flow and pressure control in the existing distribution network with a view to divide the available water on a more economic and equal base between the various communities as well as
- The development of internal reticulation distribution network to villages that are currently without such infrastructure.

7.6. Simdlangentsha Central RWSS

ZDM has completed the upgrading of the Belgrade WTW to 4Ml/day. Subsequent to the upgrading of the WTW, a 200mm diameter bulk clear water pipeline is being constructed from the command reservoir to supply Belgrade.

The project is registered with MIG for a budget of R148 006 808.34. The scope of work of the project includes the following:

- Expansion of Belgrade Water Treatment works (no details of capacity upgrade)
- Construction of 10.31km of 23.3 Km of gravity main lines
- 2xbooster pump stations (Kiphuyawo and Bongaspoort)
- 3 main supply reservoirs (Ombimbini1 – R2, Klipwal – R4 and Emabomvini – R3)
- Provision of telemetry communication system..

7.7. Simdlangentsha West RWSS

According to the ZDM WSA Manager, ZDM is in the process of upgrading the 2.0Ml/day Frischgewaagd WTW package plant to a capacity of 10Ml/day. The plant will be upgraded in future to an ultimate capacity of 20Ml/day. This would equate to 7.3 million m^3/a. This is within the total the natural Mean Annual Runoff (MAR) of the Phongolo River up to the confluence with Bivane River of 532.16 million m^3 as per WR90 (1994)

An approved project budget amount of R229 829 490.00 is registered with MIG and the scope of work includes the following:

- Upgrage of Frischgewaagd WTW from a capacity of 4 to 9.8Ml/day;
- Bulk supply to 8 new land reform areas were added since 2006.
- Installation of additional networks at Bilanyoni & Mangosuthu
- Additional capacity at Frischgewaagd WTW (Ultimate 20Ml/d) & new rising main line to Frischgewaagd
- Bulks & infill networks for the Upper & Lower Simdlangentsha settlements
- Bulk supply & network extensions at Opuzane; Networks for 8 new land reform areas.

7.8. Usuthu RWSS

The project has approved phased projects (Phases 1 to 5) registered with MIG for a total amount of R879 684 117.00. According to the ZDM WSA Manager, the scope of work reportedly includes the upgrading of the Usuthu WTW from 2.0Ml/day to 14Ml/day. This will ultimately be increased to a total of 28Ml/day. Construction works for the upgrade to 14Ml/day are in reportedly in progress.

The detailed breakdown of the scope of works includes provision of reticulation, reservors and BPTs in Usuthu area covering over 21,000 km2 between Nongoma and Mahlabathini. Water source is the Black Mfolozi river near Mjeni.

7.9. Gumbi/Candover RWSS

The community served with potable water supplies resides in Gumbi and Candover located along the Nation Road N2 across the road opposite Pongola Dam. The rest of the footprint covered by the Gumbi/Candover RWSS is scattered rural with a game reserve forming part of the footprint. The feasibility of supplying potable water to the scattered communities becomes very costly hence ZDM is planning on the provision of water supplies from localised sources. A project referred to as *"Gumbi Emergency Water Supply"* is registered with MIG for an amount of R26 464 362.00. The detailed planned scope of work is to provide bulk supply and reticulation from The Phongola Dam.

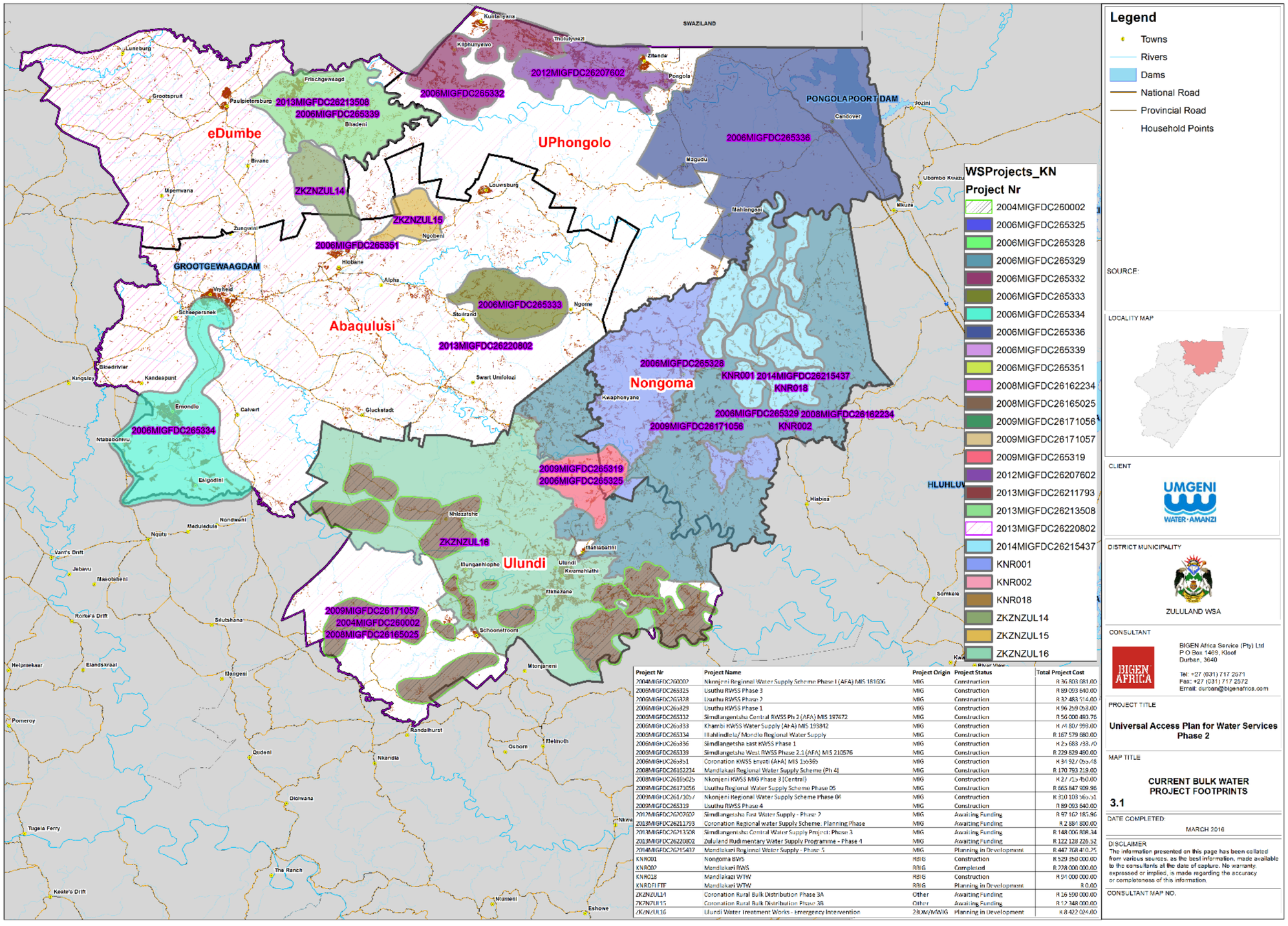
7.10. Khambi RWSS

The community served with potable water supplies under the Khambi RWSS foot print is made up of localised centres with individual WTW such as Enyathi. The rest of the area is made up of farms and scattered rural areas. The feasibility of supplying potable water to the scattered communities becomes very costly hence ZDM is planning on the provision of water supplies from localised sources. A project referred to as "Khambi Water Supply (AFA)" is registered with MIG for an amount of R74 785 687.00. The detailed planned scope of work includes the following:

- Water abstraction from a weir on Kwamthazi River, WTW
- pumping to the settlements Kwamakweshe, Ndlandla, Hlazeni, Ngenetheni. Ntumbane, Nsunduzane, Cibilili, Mahalaqoka, Esihlengeni and Bhekephi;
- 3 x 1 kl, 1 x 10 kl and 6 x 30 kl break pressure reservoirs; Construction of 1 x 100 kl, 2 x 200 kl, 1 x 400 kl and 1 x 500 kl storage reservoirs;
- Reticulation and distribution networks to above settlements and Development of six spring.

The area of coverage of the planned projects is shown in **Figure 23** overleaf.

Figure 23: ZDM Planned Projects footprint



Project Nr	Project Name	Project Origin	Project Status	Total Project Cost
2004MIGFDC260002	Nkonjeni Regional Water Supply Scheme Phase I (AFA) MIS 181606	MIG	Construction	R 36 803 681.00
2006MIGFDC265325	Usuthu RWSS Phase 3	MIG	Construction	R 89 093 640.00
2006MIGFDC265328	Usuthu RWSS Phase 2	MIG	Construction	R 37 463 514.00
2006MIGFDC265329	Usuthu RWSS Phase 1	MIG	Construction	R 96 259 068.00
2006MIGFDC265332	Simdlangentsha Central RWSS Ph 2 (AFA) MIS 197472	MIG	Construction	R 56 000 493.75
2006MIGFDC265333	Khambi RWSS Water Supply (AFA) MIS 193842	MIG	Construction	R 46 800 998.00
2006MIGFDC265334	Hlahlindlela/ Mondlo Regional Water Supply	MIG	Construction	R 167 579 680.00
2006MIGFDC265336	Simdlangentsha East RWSS Phase 1	MIG	Construction	R 25 683 783.70
2006MIGFDC265339	Simdlangentsha West RWSS Phase 2.1 (AFA) MIS 210576	MIG	Construction	R 229 829 490.00
2006MIGFDC265351	Coronation RWSS Enyati (AFA) MIS 186986	MIG	Construction	R 34 927 [illegible]
2008MIGFDC26162234	Mandlakazi Regional Water Supply Scheme (Ph 4)	MIG	Construction	R 170 793 219.00
2008MIGFDC26165025	Nkonjeni RWSS MIG Phase 3 (Central)	MIG	Construction	R 27 [illegible] 450.00
2009MIGFDC26171056	Usuthu Regional Water Supply Scheme Phase 05	MIG	Construction	R 665 847 909.96
2009MIGFDC26171057	Nkonjeni Regional Water Supply Scheme Phase 04	MIG	Construction	R 310 103 365.31
2009MIGFDC265319	Usuthu RWSS Phase 4	MIG	Construction	R 89 093 640.00
2012MIGFDC26207602	Simdlangentsha East Water Supply - Phase 2	MIG	Awaiting Funding	R 97 162 185.96
2013MIGFDC26211793	Coronation Regional water Supply Scheme: Planning Phase	MIG	Awaiting Funding	R 2 884 800.00
2013MIGFDC26213508	Simdlangentsha Central Water Supply Project: Phase 3	MIG	Awaiting Funding	R 148 006 808.34
2013MIGFDC26220802	Zululand Rudimentary Water Supply Programme - Phase 4	MIG	Awaiting Funding	R 122 128 226.52
2014MIGFDC26215437	Mandlakazi Regional Water Supply - Phase 5	MIG	Planning in Development	R 447 768 410.25
KNR001	Nongoma BWS	RBIG	Construction	R 529 350 000.00
KNR002	Mandlakazi BWS	RBIG	Completed	R 228 000 000.00
KNR018	Mandlakazi WTW	RBIG	Construction	R 95 000 000.00
KNRDFLFTF	Mandlakazi WTW	RBIG	Planning in Development	R 0.00
ZKZNZUL14	Coronation Rural Bulk Distribution Phase 3A	Other	Awaiting Funding	R 16 590 000.00
ZKZNZUL15	Coronation Rural Bulk Distribution Phase 3B	Other	Awaiting Funding	R 12 348 000.00
ZKZNZUL16	Ulundi Water Treatment Works - Emergency Intervention	ZDM/MWIG	Planning in Development	R 8 422 026.00

8. BULK WATER SUPPLY INTERVENTIONS CONSIDERED IN THIS STUDY

8.1. Gap Analysis

A gap analysis has been undertaken for the water schemes in the Zululand DM. The gap analysis has taken into account current planning interventions by the WSA as far as information could be obtained and as well as based on discussions with ZDM staff. In this regard, the entire Zululand District has been demarcated into water schemes in line with short and long term plans by the WSA as much as possible since the demands have been determined based on small areas rather than other landmark boundary features. A total of 21 water schemes (supply areas) have been identified in **Table 21**:

Table 21: ZDM Planned Water Projects (2015)

Local Municipality	Water Schemes
Abaqulusi	• Hlahlindlela RWSS • Louwsburg WSS • Enyathi WSS • Coronation WSS • Hlobane WSS • Khambi A WSS • Khambi B WSS
eDumbe LM	• Simdlangentsha West A WSS • Simdlangentsha West B WSS • Paulpietersburg Town WSS
uPhongolo LM	• Simdlangentsha East RWSS • Simdlangentsha Central RWSS • Gumbi/Candover WSS
Nongoma LM	• Mandlakazi RWSS • Ceza WSS • Nongoma (Vuna) WSS • Khangela Royal Palace WSS
Ulundi LM	• Greater Ulundi WSS • Ulundi East WSS • Mpungamhlophe WSS • Babanango WSS

The gap analysis for the 21 water schemes is discussed under this section. The gap analysis has taken into account Scenarios 1 to 3 for backlogs eradication as per WSA targets, KZN Province growth development plan and realistic estimate as per the PSP's opinion respectively as requested by Umgeni Water.

The schemes are as illustrated in **Figure 24** overleaf and further discussed under this section per local municipality.

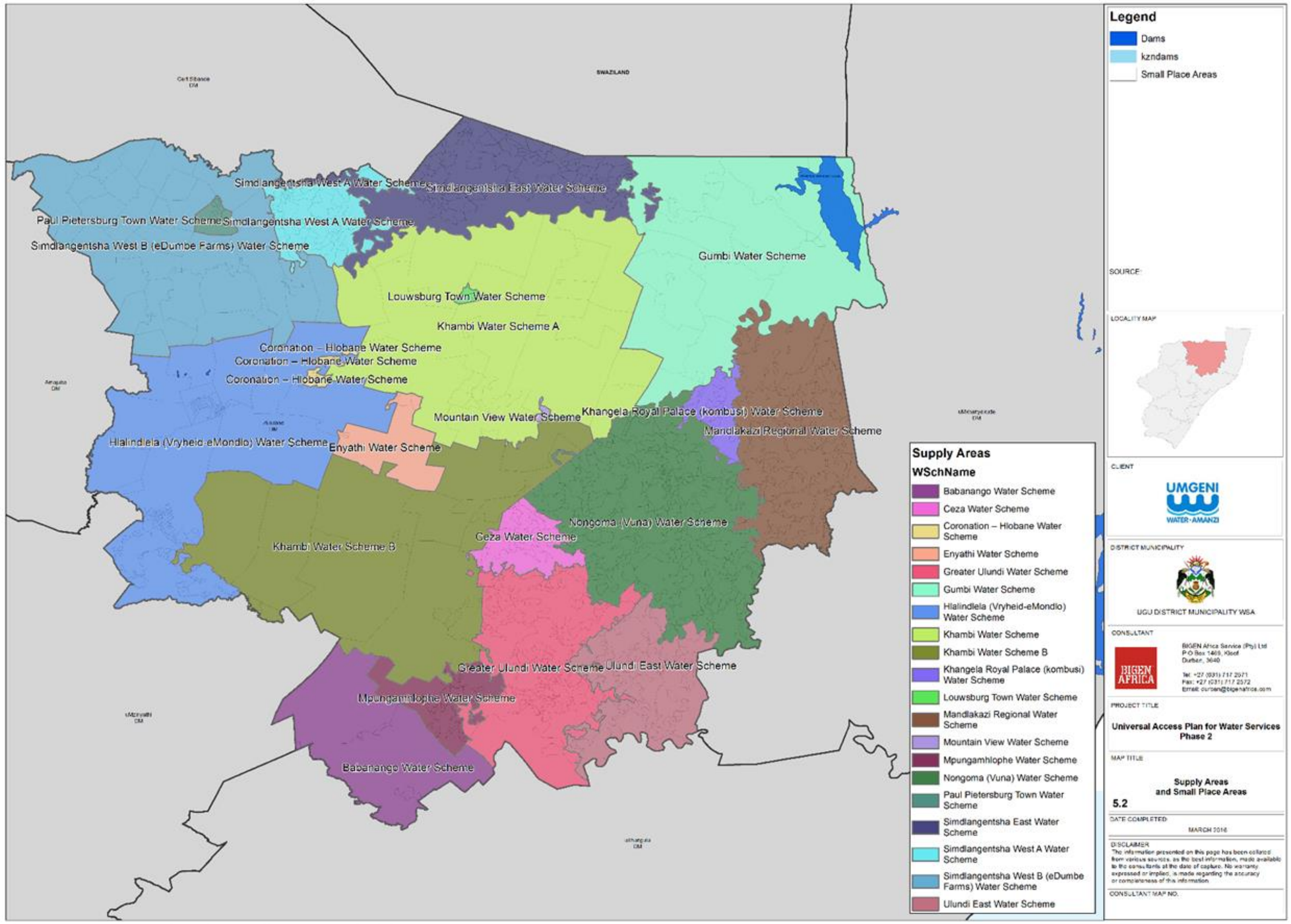


Figure 24: Water Supply Schemes (for Gap Analysis)

8.2. Abaqulusi LM

8.2.1. Hlahlindlela (Vryheid and Mondlo) WSS

8.2.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from Vryheid and surrounding areas and the Township of Mondlo can be summarised as detailed in **Table 22**.

Table 22: Hlahlindlela water demand projections

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/d)	30.75	32.36	36.21	38.18
SDD (Ml/d)	39.66	41.61	46.71	49.25

According to the First Order Reconciliation Strategy: Vryheid Regional Water Supply Area, the average production a WTW for the Vryheid WSS in 2008 was 18.23Ml/d, which is 59.3% of the projected 2015 demand.

8.2.1.2. Existing and committed planned Schemes

ZDM intends to create a regional scheme, the Hlahlindlela WSS with supply from Klipfontein WTW and Bloemveld WTW and with the Township of Mondlo supplied from Klipfontein WTW. The details of planned infrastructure was not available at the time of concluding this report hence the subsequent analysis will not take into account planning already completed.

8.2.1.3. Water Resource Consideration/Infrastructure

The area served by the Hlahlindlela RWSS has three sources of water supply namely, Klipfontein Dam, Bloemveld Dam and Grootgewaagd Dam. In terms of ZDM planning, the supply area is to be supplied from the Bloemveld and Klipfontein WTW. Therefore, in line with ZDM planning, the water resources, water treatment and bulk conveyance infrastructure requirements exclude infrastructure at Mondlo in terms of gap analysis.

From WR90 (1994) the natural Mean Annual Runoff (MAR) for the Klipfontein Dam catchment (W21A) is 49.1 million m3/a. The storage capacity of the Dams in the catchment of the Klipfontein Dam include Grootgewaagd Dam at 1.1 million m3, Bloemveld Dam at 2.3 million m3 and Klipfontein Dam at 18.09 million m3. The combined storage capacity is 21.49Mm3 which represents 43.8 % of the natural MAR. According to White Paper W.P.L- 80, the Klipfontein Dam was designed to be raised in two phases, of 5m and 3m respectively, which will significantly increase the yield of the Dam. This raising will need to take into account, the water requirements for Hlalindlela/eMondlo and Nkonjeni/Ulundi water supply schemes as they are dependent on the Klipfontein Dam (First Order Reconciliation Strategy: Vryheid Regional Water Supply Area).

The capacity details of the bulk water supply infrastructure is summarised in **Table 23**.

Table 23: Hlahlindlela Water Supply Scheme Summary

Scheme Name	Source	Dam Capacity (Million m^3)	Dam Yield (Mm^3/a)	WTW Name	Capacity (Ml/day)	Registered Usage (Million m^3/a)
Vryheid Water Scheme	Klipfontein Dam	18.09	*15.4	Klipfontein WTW	53.0	3.39
	Bloemveld Dam	2.30		Bloemveld WTW	7.5	2.27
	Grootgewaagd Dam	1.10			-	-
Total		**21.49**	**15.4**		**60.50**	***5.66**

**Yield at 1:50 year recurrence interval*

***excludes allocation for Ulundi located downstream of Klipfontein Dam*

The existing capacities of bulk infrastructure have been compared with the projected demand for 2035 as part of gap analysis. This comparison is provided in **Table 24.**

Table 24: Hlahlindlela WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
*Dam MAR (Mm^3/a)	49.1	-	49.1	13.22	-
Water Treatment (Ml/day)	60.5	-	60.5	46.71	-
Storage (Ml)	30.5	-	30.5	65.8	35.3
Bulk conveyance - Raw Water (Ml/day)	93.44	-	93.44	46.71	-
Bulk conveyance - Clear Water (Ml/day)	27.58	-	27.58	46.71	19.13

From the gap analysis above it is noted that available water resources are adequate for the projected 2035 demand for all scenarios. However, the bulk storage and bulk clear water conveyance from the water treatment works to Mondlo is required. Raising of the Klipfontein Dam is also considered necessary in order to secure supply for the periods when there is very little flow in the White Umfolozi River.

8.2.1.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements for Vryheid and Mondlo:

- Bulk storage reservoirs in Vryheid and at Mondlo with a combined capacity of 36Ml.

- A 33km long x 450 diameter pipeline from Klipfontein WTW to Mondlo
- 10 Ml reinforced concrete break pressure tank to receive potable water from the Mondlo clear water rising main.
- First stage raising of the Klipfontein Dam by 5m to increase storage capacity.

The proposed infrastructure is shown in **Figure E1 in Annexure E**.

8.2.1.5. Financial Implications and Implementation Programme

8.2.1.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **.Table 25**

Table 25: Costing for Hlahlindlela proposed infrastructure

Description	Include in costing?	Quantity	Amount
Consultants			**R 40 368 669**
Design and Tender Documentation	Y	Sum	R 33 556 562
Geotech Survey	N	Sum	R 372 851
Land Survey	Y	Sum	R 264 627
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 6 174 630
Construction			**R 372 850 684**
Pipelines	Y	32km	R 159 510 502
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	Y	included	R 797 553
Pumpstation	Y		R 13 000 000
Water Works	N		R 0
Storage (Reservoir)	Y		R 59 851 942
Dam	Y		R 99 779 062
Abstraction	Y		R 39 911 625
Additional			**R 233 167 424**
Land Acquisition - 7.5%	Y		R 27 963 801
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 3 728 507
Project Office	Y		R 13 049 774
Contingencies	Y	50%	R 186 425 342
TOTAL			**R 646 386 777**

8.2.1.5.2. Implementation Programme

The existing capacity of the WTW facilities is not affected as it will meet the projected demand requirements up to 2045. However, the bulk storage requires to be provided presently as it already lower than the current demand requirements.

8.2.2. Louwsburg Water Scheme

8.2.2.1. Water Demand and Projections

Table 25

The current and projected 2035 water demands arising from the area supplied by the Louwsburg Water Scheme can be summarised as detailed in **Table 26**.

Table 26: Current & Projected Water Demand

Demand Criteria	Water Demand (Ml/d)			
	2015	2025	2035	2045
GAADD (Ml/d)	0.77	0.82	0.98	1.02
SDD (Ml/d)	0.93	1.00	1.19	1.25

8.2.2.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.2.2.3. Water Resource Consideration/Infrastructure

The Town of Louwsburg is supplied from the Louwsburg WTW which receives raw water from a dam located on the south western edge of the town. The capacity/yield details of the dam are not known. The future water requirements are compared with the existing infrastructure capacity in **Table 27**. The available water resources or dam yield is critical to the sustainability of whatever infrastructure upgrades that may be proposed. A yield analysis is thus required.

Table 27: Louwsburg Town WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
Dam Yield (Mm^3/a)	No data	-	-	0.36	-
Water Treatment (Ml/day)	0.72	-	0.72	1.19	0.47
Storage (Ml)	0.60	-	0.60	2.10	1.50
Bulk conveyance - Raw Water (Ml/day)	0.68	-	0.68	1.19	0.51
Bulk conveyance - Clear Water (Ml/day)	0.68	-	0.68	1.19	0.51

The capacities of water treatment, bulk raw and clear water conveyance all require to be upgraded by 1.0 Ml/day. The dam wall could also be increased by the additional 1.0 Ml/d (0.4 million m^3/a) to increase the security of supply.

8.2.2.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Louwsburg WTW by 1.0 Ml/day.
- Construction of 100mm diameter x 0.55km long raw water rising pipeline from the dam to the WTW.
- Construction of 100mm diameter x 0.1km long clear water rising pipeline from Louwsburg WTW to command reservoir.
- Construction of 2.0Ml bulk storage reservoirs in Louwsburg.
- Increasing of the capacity of the dam by an additional 0.4 million m^3.

The proposed infrastructure is shown in **Figure E2 in Annexure E**.

8.2.2.5. Financial Implications and Implementation Programme

8.2.2.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 28**.

Table 28: Costing for infrastructure upgrades in Louwsberg

Description	Include in costing?	Quantity	Amount
Consultants			**R 3 918 438**
Design and Tender Documentation	Y	Sum	R 3 412 444
Geotech Survey	Y	Sum	R 379 160
Land Survey	Y	Sum	R 5 212
Cathodic Protection	N		R 0
Construction Monitoring	Y	Sum	R 121 622
Construction			**R 37 916 040**
Pipelines	Y	0.6km	R 1 161 214
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	Y	included	R 5 806
Pumpstation	N	Sum	R 0
Water Works	Y	1Ml/d	R 5 346 000
Storage (Reservoir)	Y	2Ml	R 7 913 844
Dam	Y		R 21 350 776
Abstraction	Y		R 2 138 400
Additional			**R 25 507 945**
Land Acquisition - 7.5%	Y		R 2 843 703
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 379 160
Project Office	Y		R 1 327 061
Contingencies	Y	50%	R 18 958 020
TOTAL			**R 67 342 422**

8.2.2.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 0.72 Ml/d is already exceeded based on 2015 demand estimates.
- Raw water conveyance capacity of 0.68 Ml/d is already exceeded based on 2015 demand estimates.
- Bulk water storage of 0.6Ml is already exceeded based on 2015 demand estimates.
- Clear water conveyance capacity of 0.68 Ml/d is already exceeded based on 2015 demand estimates.

Depending on funding availability the project needs to be implemented immediately.

8.2.3. Coronation Water Scheme

8.2.3.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Coronation Water Scheme can be summarised as detailed in **Table 29**.

Table 29: Water demands for the Coronation scheme

Demand Criteria	Water Demand (Ml/d)			
	2015	2025	2035	2045
GAADD (Ml/d)	1.68	1.89	2.26	2.36
SDD (Ml/d)	2.14	2.38	2.84	2.96

8.2.3.2. Existing and committed planned Schemes

ZDM has budgeted for a feasibility study for the provision of borehole water supply.

8.2.3.3. Water Resource Consideration/Infrastructure

Coronation water scheme supplies the coal mining town of Coronation with raw water sourced from the Coronation Dam located on Mbilane River, a tributary of Mkuze River to the south of the supply area. The capacity/yield details of the dam and the MAR in the catchment area is not known. The gap analysis (**Table 30**) is undertaken on the current and projected water requirements infrastructure.

Table 30: Coronation Town WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2035 (Ml/d)	
				GAADD	Shortfall
River Yield (Mm^3/a)	No data	-	-	0.83	-
Water Treatment (Ml/d)	0.4	-	0.4	2.84	2.44
Storage (Ml)	*0.4	-	*0.4	4.1	3.7
Bulk conveyance - Raw Water (Ml/d)	2.87	-	2.87	2.84	-
Bulk conveyance - Clear Water (Ml/d)	0.68	-	0.68	2.84	2.16

**assumed based on capacity of treatment works*

The bulk water supply infrastructure (raw water and water treatment) is already below capacity based on the 2015 demand estimates.

8.2.3.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Coronation WTW from 0.4Ml/d to 3Ml/d
- Construction of 200mm diameter x 0.9km long clear water rising pipeline from Coronation WTW to the existing command reservoir site.
- Construction of 4Ml bulk storage reservoir in Coronation.

The sustainability of proposed infrastructure requires verification against the yield of the river or dam.

The proposed infrastructure is shown in **Figure E4 in Annexure E.**

8.2.3.5. Financial Implications and Implementation Programme

8.2.3.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in .**Table 31** .

Table 31: Financial Implications for Proposed Infrastructure (Coronation Town)

Description	Include in costing?	Quantity	Amount
Consultants			**R 3 551 960**
Design and Tender Documentation	Y	Sum	R 3 339 242
Geotech Survey	Y	Sum	R 37 103
Land Survey	Y	Sum	R 7 217
Cathodic Protection	N		R 0
Construction Monitoring	Y	Sum	R 168 399
Construction			**R 37 102 685**
Pipelines	Y	0.9km	R 2 007 825
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	Y	included	R 200 782.45
Pumpstation	N	Sum	R 6 000 000
Water Works	Y	3Ml/d	R 16 038 000
Storage (Reservoir)	Y	4Ml	R 12 856 078
Dam	N		R 0
Abstraction	N		R 0
Additional			**R 25 003 665**
Land Acquisition - 7.5%	Y		R 2 782 701
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 371 027
Project Office	Y		R 1 298 594
Contingencies	Y	50%	R 18 551 342
TOTAL			**R 65 658 310**

8.2.3.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 0.4 Ml/d is already exceeded based on 2015 demand estimates.
- Assumed bulk water storage of 0.4Ml is already exceeded based on 2015 demand estimates.
- Clear water conveyance capacity of 0.68 Ml/d is already inadequate.

Depending on funding availability the project needs to be implemented immediately with regard bulk water treatment conveyance.

8.2.4. Hlobane Water Scheme

The current and projected 2035 water demands arising from the area supplied by the Hlobane Water Scheme can be summarised as detailed in. **Table 32**.

Table 32: Hlobane water demand

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/d)	0.99	1.02	1.16	1.23
SDD (Ml/d)	1.28	1.32	1.51	1.60

8.2.4.1. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.2.4.2. Water Resource Consideration/Infrastructure

The Hlobane Water Scheme supplies water to the coal mining town of Hlobane. Raw water is sourced from Hlobane Dam located south of the town on Mbilane River, a tributary of Mkuze River. The capacity/yield details of the dam are not known. The future water requirements are compared with the existing infrastructure capacity in the table below. The available water resources or dam yield is critical to the sustainability of whatever infrastructure upgrades may that may be proposed. The gap analysis is summarised in **Table 33**.

Table 33: Hlobane Town WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
Dam Yield (Mm^3/a)	No data	-	-	0.42	-
Water Treatment (Ml/day)	2.0	-	2.0	1.51	-
Storage (Ml)	*2.0	-	*2.0	2.1	0.1
Bulk conveyance - Raw Water (Ml/day)	2.87	-	2.87	1.51	-
Bulk conveyance - Clear Water (Ml/day)	1.56	-	1.56	1.51	-

**assumed based on capacity of treatment works*

The spare capacity can be used to supply communities residing in the nearby village of Job's Town located 4.5km east of Hlobane along Main Road 618. The scheme is not considered any further in this report.

8.2.5. Khambi A and Mountain View Water Scheme

8.2.5.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Khambi and Mountain View WSS can be summarised as detailed in .**Table 34.**

Table 34: Water demand for Khambi A and Mountain View

Demand Criteria	Water Demand (Ml/d)			
	2015	2025	2035	2045
GAADD (Ml/d)	1.70	2.53	3.47	3.64
SDD (Ml/d)	2.00	2.93	4.03	4.22

8.2.5.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.2.5.3. Water Resource Consideration/Infrastructure

The area supplied by the Khambi Wtaer Scheme surrounds the Town of Louwsburg with the Ithala Game Reserve on the north and east of the town. The south and eastern parts of the area consists mainly of farms and pockets of villages. Potable water where it available is supplied to the area from the Khambi WTW and is obtained through river abstraction on a tributary of Mkuze River. The MAR on the river has not been established. The Mountain View WTW on the other hand obtains raw water from a spring on top of the mountain and the yield thereof is also not known. The gap analysis of the Khambi and Mountain View Water scheme is detailed **Table 35.**

Table 35: Khambi and Mountain WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
Dam Yield (Mm^3/a)	No data	-	-	1.27	-
Water Treatment (Ml/day)	0.2	-	0.2	4.03	3.83
Storage (Ml)	*0.2	-	*0.2	6.3	6.10
Bulk conveyance - Raw Water (Ml/day)	*0.68	-	*0.68	4.03	3.35
Bulk conveyance - Clear Water (Ml/day)	0.68	-	0.68	4.03	3.35

**Assumed capacity based on 100mm diameter pipeline & reservoir capacity based WTW capacity*

According to the ZDM WSA Manager, ZDM intends to provide localised sources of water supply for the few villages in the area mainly as result of the following:

- The scattered nature of the settlements,
- the mountainous nature of the terrain and
- the relatively long distances between villages.

The water scheme area is thus not analysed further in this report.

8.2.6. Khambi Water Scheme B (Vryheid Farms)

8.2.6.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Khambi Water Scheme B can be summarised as detailed in **Table 36** .

Table 36: Water Demand in Khambi B

Demand Criteria	2035 Water Requirements			
	2015	2025	2035	2045
GAADD (Ml/d)	1.20	1.80	2.47	2.59
SDD (Ml/d)	1.41	2.08	2.86	3.01

The area is composed of farmlands stretching from Vryheid along the Main Road R34 to Ulundi Town with pockets of scattered isolated settlements. Supply of these communities from a water scheme would be costly and ZDM plans to supply from localised sources such as boreholes and springs. The water scheme is thus not analysed further.

8.2.7. Enyathi Water Scheme

8.2.7.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Enyathi Water Scheme can be summarised as detailed in **Table 37**.

Table 37: Enyathi Water Demands

Demand Criteria	Water Demand (Ml/d)			
	2015	2025	2035	2045
GAADD (Ml/d)	0.37	0.52	0.68	0.71
SDD (Ml/d)	0.40	0.58	0.78	0.81

8.2.7.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.2.7.3. Water Resource Consideration/Infrastructure

The Enyathi WSS supplies water to the localised villages of Enyathi and Bloemendal under the Abaqulusi LM. Potable water is supplied to the area from the Enyathi WTW and is obtained through river abstraction from a weir on a tributary of the Black Umfolozi River. The MAR on the river has not been established. The gap analysis of the Enyathi Water scheme is detailed in **Table 38.**

Table 38: Enyathi WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
River Yield (Mm^3/a)	No data	-	-	0.25	-
Water Treatment (Ml/d)	1.0	-	1.0	0.78	-
Storage (Ml)	**1.0	-	**1.0	1.2	0.2
Bulk conveyance - Raw Water (Ml/d)	*1.56	-	*1.56	0.78	-
Bulk conveyance - Clear Water (Ml/d)	1.56	-	1.56	0.78	-

**Assumed capacity based on 160mm diameter clear water rising main*

***Based on the capacity of the water treatment facilities*

The water supply infrastructure is adequate for the projected 2035 demand.

8.3. eDumbe LM

8.3.1. Simdlangentsha West A Water Scheme (Frischgewaagd)

8.3.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Simdlangentsha West A WSS can be summarised as detailed in **Table 39**.

Table 39: Simdlangentsha West A Water Demands

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	6.19	6.79	7.81	8.11
SDD (Ml/day)	7.35	8.07	9.37	9.73

8.3.1.2. Existing and Committed Planned Schemes

According to the ZDM WSA Manager, ZDM is in the process of upgrading the 2.0Ml/day Frischgewaagd WTW package plant to a capacity of 10Ml/day. The plant will be upgraded in future to an ultimate capacity of 20Ml/day.

8.3.1.3. Water Resource Consideration/Infrastructure

Raw is from three sources namely Phongolo River (Frischgewaagd WTW), a tributary of the Phongolo River (Tholakela WTW) and Bivane Dam located on the Bivane River (Bivane WTW). From WR90 (1994) the natural Mean Annual Runoff (MAR) of the Phongolo River up to the confluence with Bivane River is 532.16 million m3. The total registered domestic water use for Frischgewaagd WTW is 1.12 million m^3/a and there is no registered water use for the Tholakele and Bivane WTW. It is however assumed that the registered water use for the Bivane WTW could be included in the registered water use for irrigation out of Bivane Dam for the Impala Irrigation Scheme. (First Order Reconciliation Strategy: Simdlangentsha West Water Supply Area). **Table 40** shows the Registered water users in the catchments of Simdlangentsha West WSS.

Table 40: Registered water users in the catchments of Simdlangentsha West WSS (Million m^3/a)

Sub-catchment	Irrigation	Industry	Forestry	Municipal	Total
Phongolo River (W42A...G)	3.66	0.04	33.73	1.12[(1)]	38.56
Bivane River (W41A…F)	3.19	0.01	18.37	0.00	21.57
Total	6.85	0.05	52.10	1.12	60.13

(1) this includes the registered water use for Frischgewaagd WTW

The details of the bulk water supply infrastructure is summarised in **Table 41** The gap analysis undertaken hereunder will thus align with the planning as per ZDM and will exclude the other two WTW so the entire area is supplied from Frischgewaagd WTW.

Table 41: Simdlangentsha West A WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
River MAR (million m^3/a) at 3 month low flow period)	12.54	-	12.54-	2.85	-
Water Treatment (Ml/day)	9.8	10.2	20	9.37	-
Storage (Ml)	9.8	10.2	20	14.2	-
Bulk conveyance - Raw Water (Ml/day)	9.8	10.2	20	9.37	-
Bulk conveyance - Clear Water (Ml/day)	9.8	10.2	20	9.37	-

**Reservoir capacity estimated based capacity assumed as yield for analysis purposes*

According to the First Order Reconciliation Strategy: Simdlangentsha West Water Supply Area, an estimate of the low flow of the Phongolo River up to the confluence with Bivane River is 12.54 million m^3 for a 3-month period. This, when compared with the requirements for the catchment ie 2.85 million m3/a (2035 water requirements) indicates that there is sufficient raw water supplies that can be abstracted without storage requirements to meet the future water requirements of Simdlangentsha (West) Water Supply Area.

8.3.1.4. Water Supply Infrastructure Projects

From the gap analysis undertaken in section above, it is noted that the planned infrastructure capacities of 10.2Ml/day meet the 2035 water requirements. The project is registered with MIG for a total budget of R229 829 490.00 and is reportedly at preliminary design stage. In view of the foregoing the costing of the project has not been undertaken.

8.3.2. Paulpietersburg Town Water Scheme

8.3.2.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Simdlangentsha West A WSS can be summarised as detailed in **Table 42**.

Table 42: Paulpietersburg water demand

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	2.33	2.48	2.91	3.07
SDD (Ml/day)	2.90	3.09	3.66	3.87

8.3.2.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.3.2.3. Water Resource Consideration/Infrastructure

The Paul Pietersburg Town Water Scheme supplies water to the Town of Paul Pietersburg and receives raw water supplies from Dumbe Dam which has a capacity of 0.25 million m³. The registered water use for Paulpietersburg Water Supply is 0.53 million m^3/a is registered. The natural MAR of the dam catchment is estimated to be 4.0 million m^3 when using the natural MAR of 0.193 million m^3/km^2 for quaternary catchment W42D (WR90, 1994). Additional water supplies could be retained in the rainy season through the raising of the Dumbe Dam (First Order Reconciliation Strategy: Paulpietersburg Water Supply Area). The gap analysis for the water scheme is undertaken in **Table 43.**

Table 43: Paulpietersburg Town WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
River MAR (Mm^3/a)	4.0	-	-	1.06	-
Water Treatment (Ml/day)	3.0	-	3.0	3.66	0.66
Storage (Ml)	5.0	-	5.0	5.3	0.30
Bulk conveyance - Raw Water (Ml/day)	4.66	-	4.66	3.66	-
Bulk conveyance - Clear Water (Ml/day)	3.0	-	3.0	3.66	0.66

The Paulpietersburg WTW requires a 1.0Ml/d upgrade and the eDumbe Dam could be increased in capacity by this additional demand of 0.810 million m^3/a to a capacity of 1.06 million m^3/a for assurance of supply.

8.3.2.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Paulpietersburg WTW by 1.0Ml/day.
- Construction of 100mm diameter x 4km long clear water rising pipeline from Paulpietersburg WTW to the Command Reservoir.
- Construction of 1Ml reinforced concrete storage reservoir at the existing command reservoir site.
- Raising of Dumbe Dam wall to obtain an additional 0.81 million m^3 of storage capacity.

The proposed infrastructure is shown in Figure E3 in Annexure E.

8.3.2.5. Financial Implications and Implementation Programme

8.3.2.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 44**.

Table 44: Financial implications for infrastructure upgrades for Paulpietersburg

Description	Include in costing?	Quantity	Amount
Consultants			**R 6 150 400**
Design and Tender Documentation	Y	Sum	R 4 832 896
Geotech Survey	Y	Sum	R 536 988
Land Survey	Y	Sum	R 32 076
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 748 440
Construction			**R 53 698 844**
Pipelines	Y	4km	R 7 145 930
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	N	included	R 35 730
Pumpstation	N	Sum	R 0
Water Works	Y	1Ml/d	R 5 346 000
Storage (Reservoir)	Y	1Ml	R 4 871 543
Dam	Y		R 34 161 242
Abstraction	Y		R 2 138 400
Additional			**R 35 293 283**
Land Acquisition - 7.5%	Y		R 4 027 413
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 536 988
Project Office	Y		R 1 879 460
Contingencies	Y	50%	R 26 849 422
TOTAL			**R 95 142 527**

8.3.2.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 3 Ml/d will be exceeded by 2025.
- Bulk water storage of 5Ml will be exceeded by 2025 and will need to have been upgraded by then.
- Clear water conveyance capacity of 3.0 Ml/d wil be exceeded by 2025.

8.3.3. Simdlangentsha West B Water Scheme

8.3.3.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Simdlangentsha West B WSS can be summarised as detailed in **Table 45.**

Table 45: Water demands for Simdlangentsha West B

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	1.51	2.15	2.83	2.97
SDD (Ml/day)	1.85	2.54	3.33	3.94

The area is composed of farmlands with pockets of scattered isolated settlements. Supply of these communities from a water scheme would be costly and ZDM plans to supply from localised sources such as boreholes and springs. The water scheme is thus not analysed further.

8.4. uPhongolo LM

8.4.1. Simdlangentsha East Regional Water Scheme

8.4.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Simdlangentsha East WSS can be summarised as detailed in **Table 46**.

Table 46: Water Demands for Simdlangentsha East

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	8.74	9.87	11.58	12.09
SDD (Ml/day)	10.76	12.05	14.19	14.81

8.4.1.2. Existing and committed planned Schemes

The Phongolo WTW has been upgraded to a capacity of 12Ml/day (2014). Subsequent to the upgrading of the WTW, the bulk clear water pipelines from Phongolo WTW to the command reservoirs are also being upgraded. A 300mm diameter cast iron pipeline and 350mm diameter uPVC pipeline under construction

A Phase 2 of the project has been registered with MIG for a project budget amount of R97 162 185.96. The scope of work of includes the construction of the Spekboom River Abstraction unit; Installation of bulk water meters; Installation of flow controllers; Geohydrological study - Maguda Mountain Settlement; Installation of additional reticulation lines; Installation of flow regulators on bulk lines; Construction of access road to storage reservoir no.1 (S1); Rising main and stand-alone scheme to Gumbi Settlement; and Installation of telemetry system.

8.4.1.3. Water Resource Consideration/Infrastructure

Simandlangetntsha East WSS supplies areas under the uPhongolo LM bounded by Phongola Town in the west, Swaziland border in the north, Phongola River in the south and Spekboom to the west. The source of water supply for the scheme is the Phongolo River with water being supplied to the Phonolo WTW via the Impala Irrigation Canal. From WR90 (1994) the natural Mean Annual Runoff (MAR) of the Pongola River up to the outlet of quaternary catchment W44A where the Impala Irrigation canal abstracts the water is 1 089.7 million m^3/a. The Pongola River is a major tributary of the Maputo River, an international shared watercourse with Mozambique and Swaziland. This places constraints on the water use by South Africa from all sources (including groundwater) and the development of additional utilisable water sources (2002). A number of small springs also supplement the water supply from the Pongola WTW. The current abstraction from the springs is unknown.

The total registered water use for the Pongola WTW plus an allocation of 0.29 million m3/a, for the Ntshangashe Tribal Authority is 2.33 million m^3/a. The registered water resources for the schemes is summarised in **Table 47**.

Table 47: Registered water users in the catchments of Simdlangentsha East RWSS (Mm^3/a)

Sub-catchment	Irrigation	Industry	Forestry	Domestic	Total
Upper Pongola	58.3		34.34	1.12	93.77
Bivane	4.52		18.18	0.02	22.72
Pongola: Impala Scheme	162.37	2.5		2.33*	167.2
Mozana	5.31		1.84	1.23	8.38
Pongola: Diffuse	32.43		0.26	0.11	32.8
Total	262.93	2.5	54.63	4.81	324.87

**This is the registered water use for the Pongola WTW plus an allocation of 0.29 million m^3/a, for the Ntshangashe Tribal Authority.*

The gap analysis of existing infrastructure capacities compared with projected 2035 demand is summarised in **Table 48**.

Table 48: Simdlangentsha East RWSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
River MAR (Mm^3/a)	99.8	-	99.8	4.23	-
Water Treatment (Ml/d)	12.0	-	12.0	14.19	2.19
Storage (Ml)	12.0*	-	12.0	21.1	9.1
Bulk conveyance - Raw Water (Ml/day)	7.02	-	7.02	14.19	7.17
Bulk conveyance - Clear Water (Ml/day)	17.25	-	17.25	14.19	-

**In the absence of bulk storage information, the available storage has been assumed to be the same as the capacity of the WTW for analysis purposes*

Based on the MAR in the catchment area, there appears to be no deficit of water for the Simdlangentsha East RWSS to meet the projected 2035 demand. Trade-offs with other registered water users could be required though to balance the registered usage. However, bulk raw water conveyance, water treatment and storage capacities are not adequate and require upgrade.

8.4.1.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Phongola WTW from 12Ml/day Bulk to a maximum of 15Ml/day;
- Upgrade of bulk storage reservoirs in the supply area by an additional 10Ml;
- Construction of 300mm dia x 12km long raw water rising main from the Phongola River to Phongola WTW;

The proposed infrastructure is shown in Figure E5 in Annexure E.

8.4.1.5. Financial Implications and Implementation Programme

8.4.1.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 49**.

Table 49: Infrastructure costs for Simdlangentsha East

Description	Include in costing?	Quantity	Amount
Consultants			**R 10 773 901**
Design and Tender Documentation	Y	Sum	R 8 339 689
Geotech Survey	N	Sum	R 92 663
Land Survey	Y	Sum	R 96 228
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 2 245 320
Construction			**R 92 663 216**
Pipelines	Y	12km	R 31 232 826
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	Y	included	R 1 561 641
Pumpstation	Y		R 13 000 000
Water Works	Y	3Ml/d	R 16 038 000
Storage (Reservoir)	Y	10Ml	R 24 415 549
Dam	N		R 0
Abstraction	Y		R 6 415 200
Additional			**R 59 451 194**
Land Acquisition - 7.5%	Y		R 6 949 741
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 926 632
Project Office	Y		R 3 243 213
Contingencies	Y	50%	R 46 331 608
TOTAL			**R 162 888 310**

8.4.1.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Bulk raw water conveyance capacity of 7.02Ml/d is already inadequate
- Current Water treatment capacity of 12Ml/d will become inadequate by 2025.

- Bulk water storage is already inadequate (based on assumptions made)

Upgrade works may be planned for implementation to address shortfalls by the time frames given above.

8.4.2. Simdlangentsha Central Regional Water Scheme

8.4.2.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Simdlangentsha Central WSS can be summarised as detailed in **Table 50.**

Table 50: Water demands for Simdlangentsha Central

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	3.43	3.94	4.57	4.75
SDD (Ml/day)	4.00	4.58	5.39	5.61

8.4.2.2. Existing and committed planned Schemes

According to Mr P Mnguni, the ZDM WSA Manager (also confirmed by Makhaotse Narasimulu and Associates Pty Ltd), the Belgrade WTW has been upgraded to a capacity of 4Ml/day. The intention is to supply the nearby villages west and south of Belgrade up to the Phongola River from Belgrade WTW and to do away with the small package plants namely Nkosentsha WTW, Khiphunyawo WTW and Msibi WTW.

8.4.2.3. Water Resource Consideration/Infrastructure

Simdlangentsha Central RWSS supplies areas under the uPhongolo LM located on the northern west side of the municipal area and bounded by eDumbe LM to the west and Swaziland to the north, Belgrade to the east and Phongola River to the south. The water scheme supply area is to be served with water from Belgrade WTW which gets its raw water from a weir situated in the Mozana River. The storage capacity of the weir is unknown. The Annual Runoff (MAR) of the quaternary catchments W42K and W42L is 99.8 Mm^3/a. The gap analysis in **Table 51** is aligned with the planning as per ZDM and will exclude the other three WTW.

Table 51: Simdlangentsha Central RWSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2035 (Ml/d)	
				GAADD	Shortfall
River MAR (Mm^3/a)	99.8	-	-	1.67	-
Water Treatment (Ml/d)	4.0	-	4.0	5.39	1.39
Storage (Ml)	2.5	-	2.5	8.3	5.8
Bulk conveyance - Raw Water (Ml/d)	4.66	-	4.66	5.39	0.73
Bulk conveyance - Clear Water (Ml/d)	2.87	-	2.87	5.39	2.52

Details of planned infrastructure not available

The storage capacity of the weir in the Mozana River is not known to determine its net yield. From WR90 (1994) the natural MAR of quaternary catchment W42K & L where the weir and the small dam are located, is 99.8 million m^3. The maximum abstraction during a three-month low flow period is 0.94 million m^3 or 1.03 Ml/day. This, when compared with the requirements for the catchment ie 4.57 Ml/day (2035 water requirements) indicates that there might be insufficient raw water supplies that can be abstracted without storage requirements to meet the future water requirements and this could be made up from WCDM initiatives and use of the other smaller plants.

From the table above, it is noted that the bulk infrastructure will be inadequate to meet the projected 2035 water requirements.

8.4.2.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Belgrade WTW from 4Ml/day Bulk to a maximum of 6Ml/day;
- Construction of 0.1km x 100mm diameter raw water rising main from the weir to Belgrade WTW;
- Construction of 9.2km long x 200mm diameter clear water rising pipeline from Belgrade WTW to the Command Reservoir at Khiphunyawo WTW for supply to areas previously supplied from Nkosentsha WTW, Khiphunyawo WTW and Msibi WTW.
- Storage reservoirs with a combined capacity of 2Ml.

The proposed infrastructure is shown in Figure E5 in Annexure E.

8.4.2.5. Financial Implications and Implementation Programme

8.4.2.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 52**.

Table 52: Costing for the proposed infrastructure in Simdlangentsha Central

Description	Include in costing?	Quantity	Amount
Consultants			**R 7 891 906**
Design and Tender Documentation	Y	Sum	R 6 010 424
Geotech Survey	Y	Sum	R 66 782
Land Survey	Y	Sum	R 74 577
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 1 740 123
Construction			**R 66 782 489**
Pipelines	Y	9.3km	R 20 703 076
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	N	included	R 1 035 154
Pumpstation	N	Sum	R 13 000 000
Water Works	Y		R 10 692 000
Storage (Reservoir)	Y	6Ml	R 17 075 458
Dam	Y	N/A	R 0
Abstraction	Y	N/A	R 4 276 800
Additional			**R 43 405 143**
Land Acquisition - 7.5%	Y		R 5 008 687
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 667 825
Project Office	Y		R 2 337 387
Contingencies	Y	50%	R 33 391 244
TOTAL			**R 118 079 538**

8.4.2.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Bulk raw water conveyance capacity of 4.66 Ml/d will be inadequate after 2025.
- Current Water treatment capacity of 4 Ml/d is already inadequate.
- Bulk water storage of 2.5Ml is already inadequate
- Clear water conveyance capacity of 2.87 Ml/d is already inadequate.

Depending on funding availability the project needs to be implemented immediately.

8.4.3. Gumbi/Candover Water Scheme

8.4.3.1. Water Demand and Projections

The Gumbi/Candover RWSS supplies potable water to communities residing on the eastern end of the uPhongolo Local Municipality next to the Phongolo Dam but on the western side of the N2. This community is supplied from the Gumbi WTW with raw water sourced from the Phongola Dam. The rest of the area covered by the scheme is vast stretching to the west to include portions of Ithala Game Reserve and the farming community along the ZDM nothern border with Swaziland up to Phongola Town. ZDM plans to supply these villages from localised sources such as boreholes and springs.

The current and projected 2035 water demands arising from the area supplied by the Gumbi Water Scheme focuses on the area supplied by the Gumbi WTW and can be summarised as detailed in **Table 53.**

Table 53: Water demand in Gumbi

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	0.05	0.10	0.16	0.16
SDD (Ml/day)	0.11	0.15	0.20	0.21

8.4.3.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.4.3.3. Water Resource Consideration/Infrastructure

The Gumbi WTW obtains water from the Phongolo Dam with a capacity of 2 445.9 million m^3. The capacity of Gumbi WTW is 1Ml/day and will not be exceeded by the projected 2035 demand for the area. Accordingly, the scheme is not analysed further in this report.

8.5. Nongoma LM

8.5.1. Ceza and Nongoma Water Schemes

8.5.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Ceza and Nongoma Water Scheme can be summarised as detailed in. **Table 54.**

Table 54: Water demands in Ceza and Nongoma

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	10.89	14.78	19.24	20.04
SDD (Ml/day)	13.15	17.52	22.80	23.76

8.5.1.2. Existing and committed planned Schemes

ZDM is currently in the process of construction a 60kl reservoir, water networks of about 20 km of 25-90 mm dia pipes, refurbishment of existing 30kl reservoir, break pressure tanks, air, scour and isolation valves; and other associated infrastructure in Nongoma.

8.5.1.3. Water Resource Consideration/Infrastructure

Ceza WTW obtains its water from the weir situated in the Vungu River, a tributary of the Black Mfolozi River. Besides the surface water allocation, the surrounding communities in the area are also supplied from groundwater. There is no registered water for both surface and groundwater use for the scheme. According to the First Stage Reconciliation Strategy for the Usuthu (Ceza) Regional Water Supply Scheme Area, the Black Umfolozi River or the Sikwebezi River could be considered as an alternative source for the Ceza Water Scheme to provide the assurance for increased demand as follows:

- Constructing a dam on the Black Umfolozi River could be costly and siltation would high hence off channel storage could be the solution.
- The natural MAR of the Sikwebezi River catchment (W22E) is 84.33 million m3. This quaternary catchment is currently unregulated. The option that can be considered is a dam further downstream close to the outlet of W22E. A dam with a live storage capacity of 100% of the reduced MAR (i.e. to take account of the Reserve) will provide a yield of approximately 31.4 million m3/a, while a dam with a live storage capacity of 50% of the reduced MAR will provide a net yield of approximately 23.6 million m3/a.
- The net yield of a dam in the Sikwebezi River together with WC/WDM will be sufficient to provide the headroom required to meet the future raw water requirements for the high growth scenario until 2030 and beyond for the Usuthu Regional Water Supply Scheme (i.e. Ceza, Nongoma and Mandlakazi water supply scheme).

In view of the foregoing and for analysis purposes, the option of providing a dam on the Sikwebezi River will be the selected option.

The existing capacities of bulk infrastructure are compared with the projected demand for 2035 in Table **55**.

Table 55: Ceza & Nongoma WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Additional Requirement
Proposed Dam yield (Mm^3/a)	23.6	-	23.6	7.02	-
Water Treatment (Ml/day)	-	-	-	22.80	22.80
Storage (Ml)	19.0	-	19.0	35.0	22.80
Bulk conveyance - Raw Water (Ml/day)	-	-	-	22.80	22.80
Bulk conveyance - Clear Water (Ml/day)	-	-	-	22.80	22.80

Capacity of infrastructure to supply Ceza & Nongoma supply areas

8.5.1.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements based on a new source on the Sikwebezi River:

- A dam on the Sikwebezi River with a yield of 23.6 million m^3 (capacity of 10 million m^3)
- Sikwebezi WTW with a capacity of 23Ml/d.
- 250mm dia x 2km long rising main to Ceza command reservoir at Esidwadweni
- 42km of secondary bulk pipelines to Ceza
- 2km long x 500mm dia rising main from Sikwebezi WTW to Vuna/Nongoma command reservoir
- Construction of 5.9 km long bulk clear water rising main from new Ceza WTW to command Reservoir at the top of the hill
- Construction of a bulk storage reservoirs with a combined capacity of 16Ml.

The proposed infrastructure is shown in **Figure E6 in Annexure E.**

8.5.1.5. Financial Implications and Implementation Programme

8.5.1.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 56.**

Table 56: Infrastructure upgrade costs for Ceza & Nongoma

Description	Include in costing?	Qty	Amount
Consultants			**R 75 963 739**
Design and Tender Documentation	Y	Sum	R 66 135 884
Geotech Survey	Y	Sum	R 734 843
Land Survey	Y	Sum	R 373 685
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 8 719 326
Construction			**R 734 843 158**
Pipelines	Y	46.1km	R 109 556 572
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	N	included	R 5 477 829
Pumpstation	N	Sum	R 52 000 000
Water Works	Y	23Ml/d	R 122 958 000
Storage (Reservoir)	Y	16Ml	R 33 927 393
Dam	Y		R 361 740 165
Abstraction	Y		R 49 183 200
Additional			**R 457 602 758**
Land Acquisition - 7.5%	Y		R 55 113 237
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 7 348 432
Project Office	Y		R 25 719 511
Contingencies	Y	50%	R 367 421 579
TOTAL			**R 1 268 409 655**

8.5.1.5.2. Implementation Programme

The proposed infrastructure is for new bulk water supply infrastructure and an implementation programme would be dependent on securing of the funding for the project and the necessary feasibility studies. ZDM has secured funding approval for phased project implementation (Phases 1 to 5) amounting to R879 684 117.00 registered with MIG. The scope of work is for supply of water to 20,764 households with a population of 140,484. This population figures include the towns of Nongoma, Mahlabathini and Ceza which have been partly served with water but the CWSS are not sustainable. The scope of works includes 7 number of pump stations, total length of 127 km (Bulk Line), total length of 385 km (Secondary Bulk) and a total of 80 reservoirs the source of water is the Black Umfolozi River.

8.5.2. Mandlakazi Regional Water Scheme

8.5.2.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Mandlakazi WSS can be summarised as detailed in **Table 57**.

Table 57: Mandlakazi Water Demand

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	3.08	5.02	7.10	7.36
SDD (Ml/day)	3.63	5.79	8.21	8.52

8.5.2.2. Existing and committed planned Schemes

According to the ZDM a report for Project No: ZDM 1368/2012 titled *"Mandlakazi Regional Water Supply Scheme: Technical Assessment Report: Existing Bulk Infrastructure to Meet Long Term Water Demands"* dated November 2014, ZDM Intends to undertake phased upgrade of the water scheme with supply from Mandkakazi WTW. The Mandlakazi WTW is currently being upgraded to 10Ml/d complete with associated pumping and conveyance infrastructure. However, the ultimate design capacity of the works is 30Ml/day. This high capacity is for the anticipated demand from Hlabisa LM to be supplied from Mandlakazi. This demand from Hlabisa is projected to 9Ml/day in terms of this UAP Phase 2 study (Umkhanyakude District Municipality).

8.5.2.3. Water Resource Consideration/Infrastructure

The area served by the Mandlakazi Regional WSS has three sources of raw water supplies namely, Phongolo Dam, Mkuze River, Mona River and boreholes and springs. The area is located on the eastern border of Nongoma Municipality. According to the ZDM WSA Manager, the scheme will also supply 8.5Ml/day to areas under Hlabisa Local Municipality along the border with Nongoma LM. The details of the existing bulk water supply infrastructure is summarised in **Table 58**.

Table 58: Mandlakazi Regional Water Supply Scheme Summary

Scheme Name	Source	Dam Capacity (Million m³)	Yield (Mm³/a)	WTW Name	Capacity (Ml/d)
Mandlakazi RWSS	Phongola Dam	2 445.9	630	Mandlakazi WTW	20
	Mkuze River (MAR)		148.8		
Sidinsi (KwaMpanza)	Mona River (MAR)		35.5	Sidinsi (KwaMpanza)	0.5
	Springs/Boreholes		1.44		
Total		**2 445.9**	**815.7**		**20.5**

**dam yield originally estimated at 900Mm/a but reduced by 30% due to extensive forestry irrigation upstream (Usuthu to Mhlathuze Water Management Area: Internal Perspective – March 2004)*

The water allocation for the Mandlakazi Water Supply Scheme is the bulk purchase of raw water supply from the Charl Senekal Trust pipeline. The source of this water supply is the Pongolapoort Dam. The Charl Senekal Trust has a water use licence and registered water use of 32.6 million m3/a from the Pongolapoort Dam. The 2.6 million m^3/a, is water allocation for domestic use in the Mkuze and Mandlakazi Water Supply Schemes with the assumption each scheme has an allocation of 1.3 Mm^3/a. The planned works of which some are currently under implementation have been combined with existing capacities so that a comparison may be made with the projected demand for 2035. This comparison is provided in **Table 59.**

Table 59: Mandlakazi RWSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
Rivers MAR (Mm^3/a)	148.8	-	148.8	2.59	-
Water Treatment (Ml/d)	20.5	10	30.5	*17.21	-
Storage (Ml)	6	8	14	12.9	-
Bulk conveyance - Raw Water (Ml/day)	10	20	30	17.21	-
Bulk conveyance - Clear Water (Ml/day)	9.4	20.6	30	17.21	-

**Capacity includes projected 9Ml/d for Hlabisa LM*

The natural MAR of the Mkuze River at the confluence at the outlet of quaternary catchment W31G is 148.8 million m^3/a (WR90,1994), while the Msunduzi River (i.e. quaternary catchment W31K) which is a tributary of the Mkuze River, has a natural MAR of 23.35 million m^3/a. The natural MAR of the Mona River at the outlet of quaternary catchment W22K is 35 million m^3/a. There is sufficient flows in these rivers to meet the existing water and projected 2035. The Msunduzi River can be utilised as an alternative source for the Mandlakazi WSS (First Order Reconciliation Strategy for Mandlakazi Water Supply Scheme).

Based on the capacities of existing and planned infrastructure, there appears to be no gaps in water supply requirements for the projected 2035 demand. The shortfall in bulk storage could be as a result of inaccurate information of the total storage available in the scheme area.

8.5.2.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the planned infrastructure is considered adequate to meet the water requirements of the area.

8.5.2.5. Financial Implications and Implementation Programme

The planned project budget amounts to R447 768 410.25 and implementation thereof would be depended on funding availability.

The proposed infrastructure as planned by ZDM is shown in **Figure E9 in Annexure E.**

8.5.3. Khangela Royal Palace (Kombuzi) Water Scheme

8.5.3.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Khangela Royal Palace Water Scheme can be summarised as detailed in **Table 60.**

Table 60: Water Demand for Khangela Royal Palace

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	0.67	1.04	1.43	1.49
SDD (Ml/day)	0.80	1.21	1.66	1.73

8.5.3.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.5.3.3. Water Resource Consideration/Infrastructure

The Kombuzi WTW supplies the area around the Khangela Royal Palace and obtains raw water from through river abstraction on the Mkuze River. The ZDM 2014/15 WSDP indicates that the plant is producing 1.9Ml/month (0.06Ml/day). This will be assumed to be the capacity of the works for analysis purposes. Treated water is pumped via a 110mm dia rising main to a command reservoir at the top of the hill. Another treatment plant, the Khangela WTW supplies water specifically to the Royal Palace and also obtains raw water from the Mkuze River about 2.5km upstream of the Kombuzi WTW. For analysis purposes the Kombuzi WTW will be assumed to supply the entire water scheme area. Accordingly, the existing capacities of bulk infrastructure are compared with the projected demand for 2035 in **Table 61**.

Table 61: Kombuzi WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Additional Requirement
River yield (Mm^3/a)				0.52	-
Water Treatment (Ml/d)	0.06	-	0.06	1.66	1.6

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Additional Requirement
Storage (Ml)	0.1	-	0.1	2.60	2.5
Bulk conveyance - Raw Water (Ml/d)	0.68	-	0.68	1.66	0.98
Bulk conveyance - Clear Water (Ml/d)	0.68	-	0.68	1.66	0.98

8.5.3.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrading of water treatment facilities at Kombuzi WTW by 2Ml/d.
- Construction of raw water abstraction pipeline from the Mkuze River to Kombuzi WTW
- Construction of bulk clear water rising main from Kombuzi WTW to command Reservoirs.
- Construction of a bulk storage reservoir at the top of the hill.

In order to minimise O&M costs and the number of WTW in the district, this supply area can be supplied from the nearby Mandlakazi Water Scheme where there is spare capacity in terms of the gap analysis undertaken for the 2035 period and beyond.

8.6. Ulundi LM

8.6.1. Ulundi East Water Supply Scheme

8.6.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Greater Ulundi WSS can be summarised as detailed in **Table 62.**

Table 62: Water demand for Ulundi East

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	1.19	2.05	2.96	3.08
SDD (Ml/day)	1.38	2.35	3.40	3.53

8.6.1.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.6.1.3. Water Resource Consideration/Infrastructure

The Ulundi East Water Scheme Area is located on the south eastern boundary of the Zululand DM and on the eastern side of Ulundi LM. The potential source of water for the area is the White Mfolozi River which forms the southern boundary of the scheme area. The supply for the area is therefore included in the water requirements for the Greater Ulundi Water Scheme.

8.6.2. Greater Ulundi Water Supply Scheme

8.6.2.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Greater Ulundi WSS can be summarised as detailed in **Table 63**.

Table 63: Water Demand for Greater Ulundi

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	17.81	19.86	22.96	24.00
SDD (Ml/day)	22.56	24.89	28.78	30.09

Figure include demand for Ulundi East

8.6.2.2. Existing and committed planned Schemes

ZDM is implementing a project to supply potable water to approximately 158,688 people in the Usuthu area. These consumers are spread over an area of about 21,000 km2 between Nongoma and Mahlabathini. The option to use the supply from the Black Mfolozi river near Mjeni was opted for. The project will be implemented in numerous phases, with application for funding received for the first four phases.

8.6.2.3. Water Resource Consideration/Infrastructure

The Ulundi WTW obtains raw water supplies from a weir on the White Umfolozi River. Raw water is released from the Klipfontein Dam in Vryheid and meanders for 144 km along the river to the weir, which provides the balancing needs for abstraction. The Klipfontein Dam was built to supply both domestic water to Vryheid and Ulundi as well as irrigation water for the farmers downstream of the dam. Besides the surface water allocation, the surrounding communities in the Ulundi Water Supply Scheme area are also supplied from groundwater. There is no registered groundwater use for the scheme.

The storage capacity of Klipfontein Dam is given as 18.09 million m^3 (Department of Water Affairs, 2010). The natural MAR of the quaternary catchments downstream of Klipfontein Dam (W21B to W21J) is 293.8 million m^3 (WR90, 1994), while that of the gross catchment of Klipfontein Dam (i.e. W21A) is 49.1 million m^3. There is therefore a significant potential to increase the yield of the Klipfontein Dam by raising the dam to increase capacity (First Order Reconciliation Strategy: Greater Ulundi Water Supply Area). The existing capacities of bulk infrastructure are compared with the projected demand for 2035 in **Table 64**.

Table 64: Greater Ulundi WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	2035 Water Requirements	
				GAADD	Shortfall
River MAR (Mm^3/a)	49.1	-	49.1	8.38	-
Water Treatment (Ml/day)	26.40	-	26.40	28.78	2.38
Storage (Ml)	27.0	-	27.0	41.7	14.7
Bulk conveyance - Raw Water (Ml/day)	7.02	-	7.02	28.78	21.76
Bulk conveyance - Clear Water (Ml/day)	22.05	-	22.05	28.78	6.73

8.6.2.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrade of the Ulundi WTW by and additional 3Ml/day,
- 450mm diameter x 220m long rising main from the White Mfolozi River Weir to Ulundi WTW,
- 1.75km x 550mm dia long bulk clear water rising main from Ulundi WTW to command Reservoir.
- 100km of bulk primary and secondary pipelines.

The proposed infrastructure is shown in **Figure E7 in Annexure E.**

8.6.2.5. Financial Implications and Implementation Programme

8.6.2.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 65**

Table 65: Costing for infrastructure upgrades for Greater Ulundi

Description	Include in costing?	Quantity	Amount
Consultants			**R 47 884 114**
Design and Tender Documentation	Y	Sum	R 27 679 263
Geotech Survey	Y	Sum	R 307 547
Land Survey	Y	Sum	R 817 697
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 19 079 607
Construction			**R 307 547 363**
Pipelines	Y	2km	R 228 252 762
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	N	included	R 11 412 638
Pumpstation	N	Sum	R 13 000 000
Water Works	Y		R 16 038 000
Storage (Reservoir)	Y		R 32 428 763
Dam	N		R 0
Abstraction	Y	Included	R 6 415 200
Additional			**R 192 679 365**
Land Acquisition - 7.5%	Y		R 23 066 052
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 3 075 474
Project Office	Y		R 10 764 158
Contingencies	Y	50%	R 153 773 681
TOTAL			**R 548 110 842**

8.6.2.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 26.4 Ml/d will be exceeded by 2030
- Raw water bulk conveyance from the Weir to the Ulundi WTW is already inadequate
- bulk water storage of 27.0Ml will be exceeded by 2025 based on 2015 demand estimates.

8.6.3. Babanango Water Scheme

8.6.3.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Babanango WSS can be summarised as detailed in **Table 66.**

Table 66: Water Demand for Babanango

Demand Criteria	Water Demand (Ml/day)			
	2015	2025	2035	2045
GAADD (Ml/day)	0.57	0.71	0.90	0.94
SDD (Ml/day)	0.68	0.83	1.07	1.11

8.6.3.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.6.3.3. Water Resource Consideration/Infrastructure

The Babanango WTW receives raw water supplies from a weir situated in the Gologodo River, a tributary of the Mhlatuze River. The natural MAR of the Gologodo River at the confluence with the Mhlatuze River has been estimated based on the catchment area to be 2.86 million m^3/a (WR90,1994), while The Annual Runoff (MAR) of the quaternary catchment W12A is 56.03 million m^3/a. The existing capacities of bulk infrastructure are compared with the projected demand for 2035 in **Table 67**.

Table 67: Babanango WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2035 (Ml/d)	
				GAADD	Additional Requirement
River MAR (Mm^3/a)	2.86	-	-	0.33	-
Water Treatment (Ml/d)	0.33	-	0.33	1.07	0.74
Storage (Ml)	0.65	-	0.65	1.60	0.95
Bulk conveyance - Raw Water (Ml/d)	1.56	-	1.56	1.07	-
Bulk conveyance - Clear Water (Ml/d)	1.56	-	1.56	1.07	-

8.6.3.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrading of the Babanango WTW by 1Ml/d
- Construction of 1Ml bulk storage reservoir in Babanango.

The proposed infrastructure is shown in Figure E8 in Annexure E.

8.6.3.5. Financial Implications and Implementation Programme

8.6.3.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 68**.

Table 68: Cost of infrastructure upgrades for Babanango

Description	Include in costing?	Quantity	Amount
Consultants			**R 970 667**
Design and Tender Documentation	Y	Sum	R 919 579
Geotech Survey	Y	Sum	R 51 088
Land Survey	N	Sum	R 0
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 0
Construction	**Y**		**R 10 217 543**
Pipelines	N		R 0
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	N	included	R 0
Pumpstation	N	Sum	R 0
Water Works	Y	1Ml/d	R 5 346 000
Storage (Reservoir)	Y	1Ml	R 4 871 543
Dam	N		R 0
Abstraction	Y	Included	R 0
Additional			**R 8 334 876**
Land Acquisition - 7.5%	Y		R 766 316
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 102 175
Project Office	Y		R 357 614
Contingencies	Y	20%	R 5 108 771
TOTAL			**R 19 523 085**

8.6.3.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 0.33 Ml/d is already inadequate based on 2015 demand estimates.
- The current bulk water storage of 0.65 Ml is already inadequate based on 2015 demand estimates.

Depending on funding availability, the project should be implemented immediately.

8.7. Mpungamhlophe Water Scheme

8.7.1.1. Water Demand and Projections

The current and projected 2035 water demands arising from the area supplied by the Mpungamhlophe WSS can be summarised as detailed in **Table 69.**

Table 69: Water demand for Mpungamhlope

Demand Criteria	Water Demand (Ml/d)			
	2015	2025	2035	2045
GAADD (Ml/d)	1.94	2.17	2.53	2.64
SDD (Ml/d)	2.30	2.57	3.03	3.16

8.7.1.2. Existing and committed planned Schemes

There are no upgrade works planned for the water scheme.

8.7.1.3. Water Resource Consideration/Infrastructure

Mpungamhlope Water Supply Scheme area is supplied by a water treatment works (WTW) which gets its raw water from the abstraction works in the White Mfolozi River downstream of Klipfontein Dam. During low flow periods water is released from Klipfontein Dam to supply downstream demands which include Ulundi town as well as irrigation agriculture. The water supply scheme benefits from the releases from Klipfontein Dam.

The storage capacity of Klipfontein Dam is given as 18.09 million m^3.. According to the First Stage Reconciliation Study Report for the Greater Mpungamhlope Water Supply Scheme Area, the natural MAR of the quaternary catchments downstream of Klipfontein Dam (W21B to W21J) is 293.7 million m3 (WR90,1994), while the catchment of Klipfontein Dam (i.e. W21A) is 49.2 million m^3/a. Therefore, the storage capacity of the Klipfontein Dam is very small compared with the MAR. Although there is a yield reduction due to commercial forestry upstream of the dam of 3.1 million m^3/a, there is significant potential of increasing the yield of Klipfontein Dam by raising the dam (First Order Reconciliation Strategy: Greater Ulundi Water Supply Area).

The existing capacities of bulk infrastructure are compared with the projected demand for 2035 in **Table 70**.

Table 70: Mpungamhlophe WSS Gap Analysis

Criteria	Existing Capacity	Planned Additional	Total	Desired 2035 (Ml/d)	
				GAADD	Additional Requirement
River MAR (Mm^3/a)	49.1	-	49.1	0.92	-
Water Treatment (Ml/d)	0.8	-	0.8	3.03	2.23
Storage (Ml)	*0.8	-	0.8	4.6	3.8
Bulk conveyance - Raw Water (Ml/d)	0.86	-	0.86	3.03	2.17
Bulk conveyance - Clear Water (Ml/d)	0.86	-	0.86	3.03	2.17

**Assumed figure based on capacity of WTW*

8.7.1.4. Water Supply Infrastructure Projects

Based on the gap analysis above, the following infrastructure is required to meet the 2035 water demand requirements:

- Upgrading of the Mpungamhlophe WTW by an additional 3.0 Ml/d
- Construction of 100m long x 200mm diameter rising main from the White Mfolozi River to Mpungamhlophe WTW
- Construction of 3.2 km long x 200mm dia bulk clear water rising main from Mpungamhlophe WTW to command Reservoir at the top of the hill.
- Construction of a 4Ml bulk storage reservoir in Mpungamhlophe.

The proposed infrastructure is shown in **Figure E7 in Annexure E**.

8.7.1.5. Financial Implications and Implementation Programme

8.7.1.5.1. Financial Implications

The financial implications for the proposed infrastructure is detailed in **Table 71**.

Table 71: Costs for infrastructure upgrades in Mpungamhlope

Description	Include in costing?	Qty	Scenario 1 High Demand
Consultants			**R 5 020 768**
Design and Tender Documentation	Y	Sum	R 4 328 745
Geotech Survey	Y	Sum	R 48 097
Land Survey	Y	Sum	R 26 463
Cathodic Protection	N		R 0
Construction Monitoring	Y		R 617 463
Construction			**R 48 097 168**
Pipelines	Y	3.3km	R 7 362 023
P&G	Y	included	R 0
Pipeline Construction (Bulk)	Y	included	R 0
Pipe Bridge/Jack	Y	included	R 368 101
Pumpstation	N	Sum	R 10 000 000
Water Works	Y	3Ml/d	R 16 038 000
Storage (Reservoir)	Y	4Ml	R 7 913 844
Dam	N		R 0
Abstraction	Y	Included	R 6 415 200
Additional			**R 28 212 957**
Land Acquisition - 7.5%	Y		R 0
Environmental, Community Liaison	Y		R 2 000 000
Health & Safety, Quality Assurance	Y		R 480 972
Project Office	Y		R 1 683 401
Contingencies	Y	50%	R 24 048 584
TOTAL			**R 81 330 893**

8.7.1.5.2. Implementation Programme

The capacities of existing infrastructure may be compared against the projected demands detailed above and the following may be deducted with regard a possible implementation program:

- Current Water treatment capacity of 0.8 Ml/d is already inadequate based on 2015 demand estimates.
- The bulk raw and clear water pipeline capacities of 0.86Ml/d are already inadequate based on the 2015 demand projections.
- Current storage capacity of 0.8 Ml/d is already inadequate based on 2015 demand estimates.

Depending on funding availability, the identified upgrade requirements should be implemented immediately.

9. SUMMARY

9.1. Total Water Demand per Supply Area

Based on the demand model, the demand per water supply intervention area is summarized in detail within in **Table 72**.

Table 72: Water Requirements per Water Scheme

Local Municipality	Water Scheme Name	Water Requirements (GAADD Ml/d)			
		2015	2025	2035	2045
Abaqulusi LM	Hlahlindlela WSS	30.75	32.36	36.21	38.18
	Coronation WSS	1.68	1.89	2.26	2.36
	Louwsburg WSS	0.77	0.82	0.98	1.02
	Hlobane WSS	0.99	1.02	1.16	1.23
	Khambi A & Mountain View WSS	1.70	2.53	3.47	3.64
	Khambi B WSS	1.20	1.80	2.47	2.59
	Enyathi WSS	0.37	0.52	0.68	0.71
Subtotal for Abaqulusi LM		**37.44**	**40.94**	**47.24**	**49.73**
eDumbe LM	Simdlangentsha West A WSS	6.19	6.79	7.81	8.11
	Simdlangentsha West B WSS	1.51	2.15	2.83	2.97
	Paulpietersburg WSS	2.33	2.48	2.91	3.07
Subtotal for eDumbe LM		**10.03**	**11.42**	**13.56**	**14.15**
uPhongolo LM	Simdlangentsha East WSS	8.74	9.87	11.58	12.09
	Simdlangentsha Central WSS	3.43	3.94	4.57	4.75
	Gumbi WSS	1.96	2.39	2.85	3.02
Subtotal for uPhongolo LM		**14.13**	**16.19**	**19.01**	**19.86**
Nongoma LM	Nongoma (Vuna) WSS	9.49	12.86	16.74	17.44
	Mandlakazi WSS	3.08	5.02	7.10	7.36
	Khangela Royal Palace (Kombuzi) WSS	0.67	1.04	1.43	1.49
Subtotal for uPhongolo LM		**13.23**	**18.92**	**25.27**	**26.30**
Ulundi LM	Greater Ulundi WSS	16.62	17.80	20.00	20.93
	Ulundi East WSS	1.19	2.05	2.96	3.08
	Ceza WSS	1.40	1.92	2.49	2.60
	Babanango WSS	0.57	0.71	0.90	0.94
	Mpungamhlophe WSS	1.94	2.17	2.53	2.64
Subtotal for Ulundi LM		**21.72**	**24.66**	**28.89**	**301.9**
TOTAL		**96.56**	**112.12**	**133.97**	**140.23**

The total projected 2035 water requirements amount 133.97 Ml/day (48.90 million m^3/a) with the Hlahlindlela (Mondlo) WSS accounting for the largest portion at 27%.

The water requirements can also be summarised per LM as follows in **Table 73.**

Table 73: Water demand summary

LM	Census 2011			Water Requirements GAADD (Ml/day)				
	No of HH	RDP & Above LOS	Backlog	2011	2015	2025	2035	2045
Abaqulusi	43299	33669	9630	35.76	37.44	40.94	47.24	49.73
eDumbe	16138	11775	4363	9.56	10.03	11.42	13.56	14.15
uPhongolo	28772	18414	10358	13.47	14.13	16.19	19.01	19.86
Nongoma	34341	12705	21636	12.60	13.23	18.92	25.27	26.30
Ulundi	35198	21840	13358	20.70	21.72	24.66	28.89	30.19
Total	**157748**	**98403**	**59345**	**92.10**	**96.56**	**112.12**	**133.97**	**140.23**

As can be seen from the above table, the GAADD is expected to grow by an overall of 45.2% in the ZDM for the period 2015 to 2045. This will see an increase in water requirements by magnitude of 43.7Ml/day.

9.2. Total Required Resources

The resources required are compared side by side with the available water resources and water treatment capacity per water scheme. If should be noted that yield information has not been secured hence the comparison is against the MAR in the case of a river and the dam capacity in the case of a dam unless otherwise indicated. This comparison can be further reviewed once yield information has been secured. The water requirements per water scheme are summarised in **Table 74**.

Table 74: Water Requirements per Water Scheme

Local Municipality	Water Scheme Name	Water Requirements (GAADD Ml/d)				Water Resources (Ml/day)
		2015	2025	2035	2045	
Abaqulusi LM	Hlahlindlela WSS	30.75	32.36	36.21	38.18	*134.5
	Coronation WSS	1.68	1.89	2.26	2.36	No data
	Louwsburg WSS	0.77	0.82	0.98	1.02	No data
	Hlobane WSS	0.99	1.02	1.16	1.23	No data
	Khambi A & Mountain View WSS	1.70	2.53	3.47	3.64	No data
	Khambi B WSS	1.20	1.80	2.47	2.59	Farms
	Enyathi WSS	0.37	0.52	0.68	0.71	No data
Subtotal for Abaqulusi LM		**37.44**	**40.94**	**47.24**	**49.73**	
eDumbe LM	Simdlangentsha West A WSS	6.19	6.79	7.81	8.11	
	Simdlangentsha West B WSS	1.51	2.15	2.83	2.97	Farms
	Paulpietersburg WSS	2.33	2.48	2.91	3.07	*11.0
Subtotal for eDumbe LM		**10.03**	**11.42**	**13.56**	**14.15**	
uPhongolo LM	Simdlangentsha East WSS	8.74	9.87	11.58	12.09	*2 985
	Simdlangentsha Central WSS	3.43	3.94	4.57	4.75	*273.4
	Gumbi WSS	1.96	2.39	2.85	3.02	Farms
Subtotal for uPhongolo LM		**14.13**	**16.19**	**19.01**	**19.86**	
Nongoma LM	Nongoma (Vuna) WSS	9.49	12.86	16.74	17.44	**64.6
	Mandlakazi WSS	3.08	5.02	7.10	7.36	*407.7
	Khangela Royal Palace (Kombuzi) WSS	0.67	1.04	1.43	1.49	No data
Subtotal for Nongoma LM		**13.23**	**18.92**	**25.27**	**26.30**	
Ulundi LM	Greater Ulundi WSS	16.62	17.80	20.00	20.93	*134.5
	Ulundi East WSS	1.19	2.05	2.96	3.08	*134.5
	Ceza WSS	1.40	1.92	2.49	2.60	**64.6
	Babanango WSS	0.57	0.71	0.90	0.94	*1.04
	Mpungamhlophe WSS	1.94	2.17	2.53	2.64	*134.5
Subtotal for Ulundi LM		**21.72**	**24.66**	**28.89**	**301.9**	
TOTAL		**96.56**	**112.12**	**133.97**	**140.23**	

***MAR in the catchment*
***Yield on proposed dam*

9.3. Adequacy of Existing Infrastructure

The adequacy of existing infrastructure (treatment capacity) is compare with the projected water requirements in **Table 75**.

Table 75: Comparison of Water Requirements with Existing Treatment Capacities

Local Municipality	Water Scheme Name	Water Requirements (SDD Ml/d)				WTW Capacity (Ml/day)
		2015	2025	2035	2045	
Abaqulusi LM	Hlahlindlela WSS	39.66	41.61	46.71	49.25	69.50
	Coronation WSS	2.14	2.38	2.84	2.96	0.40
	Louwsburg WSS	0.93	1.00	1.19	1.25	0.72
	Hlobane WSS	1.28	1.32	1.51	1.60	2.00
	Khambi A & Mountain View WSS	2.00	2.93	4.03	4.22	0.20
	Khambi B WSS	1.41	2.08	2.86	3.01	Farms
	Enyathi WSS	0.40	0.58	0.78	0.81	1.00
Subtotal for Abaqulusi LM		***47.82***	***51.9***	***59.92***	***63.1***	**73.82**
eDumbe LM	Simdlangentsha West A WSS	7.35	8.07	9.37	9.73	2.0
	Simdlangentsha West B WSS	1.85	2.54	3.33	3.49	Farms
	Paulpietersburg WSS	2.90	3.09	3.66	3.87	3.0
Subtotal for eDumbe LM		***12.1***	***13.7***	***16.36***	***17.09***	**5.0**
uPhongolo LM	Simdlangentsha East WSS	10.76	12.05	14.19	14.81	12.0
	Simdlangentsha Central WSS	4.00	4.58	5.39	5.61	4.0
	Gumbi WSS	2.44	2.90	3.45	3.65	Farms
Subtotal for uPhongolo LM		***17.2***	***19.53***	***23.03***	***24.07***	**16.0**
Nongoma LM	Nongoma (Vuna) WSS	11.42	15.23	19.85	20.68	6.54
	Mandlakazi WSS	12.13	14.29	17.21	17.52	10.5
	Khangela Royal Palace (Kombuzi) WSS	0.80	1.21	1.66	1.73	0.06
Subtotal for Nongoma LM		**15.85**	**22.23**	**29.72**	**30.93**	**17.1**
Ulundi LM	Greater Ulundi WSS	21.18	22.54	25.38	26.56	26.40
	Ulundi East WSS	1.38	2.35	3.40	3.53	
	Ceza WSS	1.73	2.29	2.96	3.08	0.60
	Babanango WSS	0.68	0.83	1.07	1.11	0.33
	Mpungamhlophe WSS	2.30	2.57	3.03	3.16	0.80
Subtotal for Ulundi LM		**27.27**	**30.58**	**35.84**	**37.44**	**28.13**
TOTAL for ZDM		***120.24***	***137.94***	***164.87***	***172.63***	***120.24***

Based on the table above it noted that for the highlighted water schemes, the existing infrastructure capacities will not be able to provide the projected demand for the highlighted years. The water

requirements do not exceed the MAR of the catchment areas where raw water resources are extracted. This will need to be verified again actual yield data.

9.3.1. Proposed Dams

9.3.1.1. Sikwebezi Dam

For the Ceza and Nongoma Water Schemes, the current sources are failing to provide the demand. The first Stage Reconciliation Strategy Report for the Ceza Water Scheme has recommended that a dam be constructed on the Sikwebezi River where a possible dam yield of 23.6 million m^3/a can be achieved. The cost estimate for the scheme has thus included for a new water source/dam, abstraction works and a water treatment facility. This infrastructure will then supply water to the Ceza and Greater Nongoma areas

9.3.1.2. Klipfontein Dam

The existing Klipfontein dam supplies water to Vryheid, Mpungamhlophe and Ulundi. ZDM also plans to retire water supply infrastructure at Mondlo so that the township is supplied from the Klipfontein Dam. In addition, the Ulundi WTW requires to be upgraded to in order to be able to supply the Ulundi East Water Scheme. Accordingly, raising the dam wall of the Klipfontein Dam would allow the retention of increased volumes which can then be released during the periods when there is little flow. According to the First Stage Reconciliation Strategy Report for Vryheid Water Supply Area, the Klipfontein Dam wall was designed to be raised in two phases of 5m and 3m lifts. It is thus proposed that the first 5m lift be implemented to secure increased volumes for release during the low flow periods.

9.3.1.3. Dumbe Dam

The Dumbe Dam, supplying Paulpietersburg has a capacity of 0.25 million m^3/a. The projected demands 2035 demand is 1.06 million m^3/a. There is thus a need to increase the dam capacity in order to increased storage for the periods of low to no flow in the river system. An increase in storage capacity of 0.8 million m^3 is proposed.

9.3.1.4. Louwsburg Dam

The Louwsburg Dam, supplying Louwsburg requires to be increased to provide additional storage for the projected 2035 demand of 0.36 million m^3/a. There is no detailed information on the dam, however the additional demand required is proposed for storage hence raising the dam wall to provide additional 0.4 million m^3 is recommended.

9.4. Financing Requirements

The financial requirements for the provision of the infrastructure to eradicate the water supply backlog based on the demand model intervention by 2035 is summarised in **Table 76**.

Table 76: Financial Requirements per Water Scheme

Local Municipality	Water Scheme Name	Amount	Comments
Abaqulusi	Hlahlindlela WSS	R 646 386 777	Bulk supply from Klipfontein WTW to Mondlo & raising of Klipfontein Dam wall
	Coronation WSS	R 65 658 310	Existing infrastructure adequate
	Louwsburg WSS	R 67 342 422	Abstraction and WTW upgrades at Louwsburg WTW & raising of Louwsburg Dam wall
	Hlobane WSS	0	Existing infrastructure adequate
	Khambi A & Mountain View WSS	0	Farms scattered
	Khambi B WSS	0	Farms
	Enyathi WSS	0	Existing infrastructure adequate
Subtotal for Abaqulusi LM		**R 779 387 509**	
eDumbe LM	Simdlangentsha West A WSS	0	ZDM planned infrastructure adequate
	Paulpietersburg WSS	R 95 142 527	Abstraction and WTW upgrades at Paulpietersburg WTW & raising of Dumbe Dam wall
	Simdlangentsha West B WSS	0	Farms
Subtotal for eDumbe LM		**R 95 142 527**	
uPhongolo LM	Simdlangentsha East WSS	R 162 888 310	Abstraction and WTW upgrades at Phongola WTW
	Simdlangentsha Central WSS	R 118 079 538	Abstraction and WTW upgrades at Belgrade WTW
	Gumbi WSS	R 0	Existing infrastructure adequate
Subtotal for uPhongolo LM		**R 280 962 848**	
Nongoma	Nongoma (Vuna) WSS (Includes Ceza WSS)	R 1 268 409 655	New Sikwebezi Dam and WTW
	Mandlakazi WSS	R 0	ZDM planned infrastructure adequate
	Khangela Royal Palace (Kombuzi) WSS	R 0	To be supplied from Mandlakazi WSS
Subtotal for Nongoma LM		**R 1 268 409 655**	
Ulundi LM	Greater Ulundi WSS	R 548 110 842	Abstraction and WTW upgrades at Ulundi WTW
	Ulundi East WSS		
	Babanango WSS	R 19 523 085	Abstraction and WTW upgrades at Babanago WTW
	Mpungamhlophe WSS	R 81 330 893	Abstraction and WTW upgrades at Mpungamhlophe WTW
Subtotal for Ulundi LM		**R 648 964 820**	
Total for ZDM		**R3 072 872 359**	

9.5. Funding Options

While ZDM has secured funding for upgrade works on some of the water schemes, the details of proposed infrastructure have not been available to make the necessary comparisons with the estimates provided. In addition, the funding is mainly from grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG and RBIG their usage is constrained by the municipality annual budget allocations. It will thus take a minimum of ten years for the ZDM to address their water supply requirements. Another funding option that the ZDM could consider is loan funding through the Development Bank of Southern Africa (DBSA). Special submissions to National Treasury could also be considered to create an awareness of the DM's planning and implementation readiness to water services backlog eradication.

9.6. Implementation Programme

The ZDM has developed regional wall-to-wall bulk water plans to address their bulk water supply needs. Some of these studies are already funded through the RBIG funding programme whilst others are in the process to be prepared for implementation readiness and submission to the Department of Water and Sanitation. The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement the envisaged projects.

10.RECOMMENDATIONS

It is recommended that where information has not been obtained, this be verified first before this reconciliation strategy report is taken further for implementation and/or budget preparation purposes.

10.1. Responsibilities

The provision of water services remains the responsibility of the ZDM as the WSA. The ZDM should thus ensure that they meet all the requirements to take these interventions to implementation readiness.

10.2. Selection of Solutions

As requested by Umgeni Water, three scenarios have been considered in this report. The projected demands and cost estimates have been based on the probable Demand for Scenario 3 which is considered to be the most realistic towards in terms of level of service migration and eradication of backlogs.

10.3. Pertinent Legislation

Various Acts of Parliament make provision for existing or planned institutional structures for management of water resources and water and sanitation services. These are:

- Current Acts of Parliament: National Water, Water Services, Municipal Structures, Municipal Systems, Division of Revenue Acts; and
- Existing and proposed policy documents such as The White Paper on Water Services, the Local Government White Paper and the White Paper on Municipal Service Partnerships.

These Acts deal with the management of water resources and the provision of water services. Provision for the bodies listed below is made in these acts:

- The Catchment Management Agencies (CMA's) which will be established throughout South Africa over the next three years
- Water User Associations comprising co-operative associations of individual water users at a restricted local level
- National Government
- Water Service Authorities comprising District Municipalities or Local Municipalities
- Water Boards
- Water Service Providers
- Provincial Government
- Advisory Committees.

10.3.1.1. Municipal Structures Act

The Municipal Structures Act (117 of 1997), which was subsequently amended by the Municipal Structure Amendment Act (33 of 2000), addresses the basis for establishing municipalities (Category A,B & C) and stipulates that Category A and C (Metropolitan and District) municipalities are WSA's and the Category B (local) municipalities can only be WSA's if authorised by the Minister of DPLG.

10.3.1.2. Municipal Systems Act

The Municipal Systems Act (32 of 2000) legislates internal systems and addresses the differences between the authority and the provider functions and alternative mechanisms for providing municipal services.

10.3.1.3. Water Services Act

The Water Services Act (Act 108 of 1997) states that each WSA must for its area of jurisdiction, prepare a Water Services Development Plan (WSDP). Whilst the WSDP is a legal requirement, the real value in preparing the WSDP lies in the need to plan for Water Services (Water Supply and Sanitation Provision) whereby key targets are set over the next five years. At least six WSDP key focus areas need to be addressed during the planning process. These are:

- Basic Service: Water supply, sanitation, free basic water supply and free basic sanitation;
- Higher Levels of Service: Water supply, sanitation, associated needs and economic development;
- Water Resources: Appropriate choice, demand and water conservation management, water resource protection and integrated water resource management;
- Environmental Issues: Health, natural and social environment;
- Effective Management: planning, organisational or institutional aspects, management, financial and regulatory aspects;
- Transfers: Infrastructure related transfers

Water services development planning must also be done as part of the IDP process (section 12 (1) (a)) and the WSDP must be incorporated into the IDP (section 15 (5)).

Water Services Authorities must report on the implementation of its WSDP every year i.e. annual performance reporting (section 18).

Water Services Authorities must also comply with applicable regulations including Regulation No. R. 509, Government Gazette No. 22355, 8 June 2001 which requires the inclusion of a Water Services Audit as part of the annual performance report.

The Department must monitor the performance of every water services authority to ensure its compliance with every applicable water services development plan… section 62 (1) (c)
The Minister may- issue guidelines to water services institutions on performing their functions in terms of this Act section 73 (1) (h).

The Minister must ensure that there is a national information system on water services….to monitor the performance of water services institutions. section 68 (b) (i)

The Minister may require any water services institution to furnish information to be included in the national information system. section 68 (a).

Based on the above, the preparation of a WSDP is a legal requirement

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ANNEXURE A

ZDM OVERVIEW MAP

ANNEXURE B

EXISTING WATER SCHEMES LAYOUT MAPS

ANNEXURE C

EXISTING INFRASTRUCTURE SCHEMATICS

ANNEXURE D

DEMAND MODEL OUTPUTS

ANNEXURE E

PROPOSED UAP INTERVENTIONS PER WATER SCHEME