UNIVERSAL ACCESS PLAN PHASE III – PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT SECONDARY BULK WATER MASTER PLAN FOR THE ZULULAND DISTRICT MUNICIPALITY

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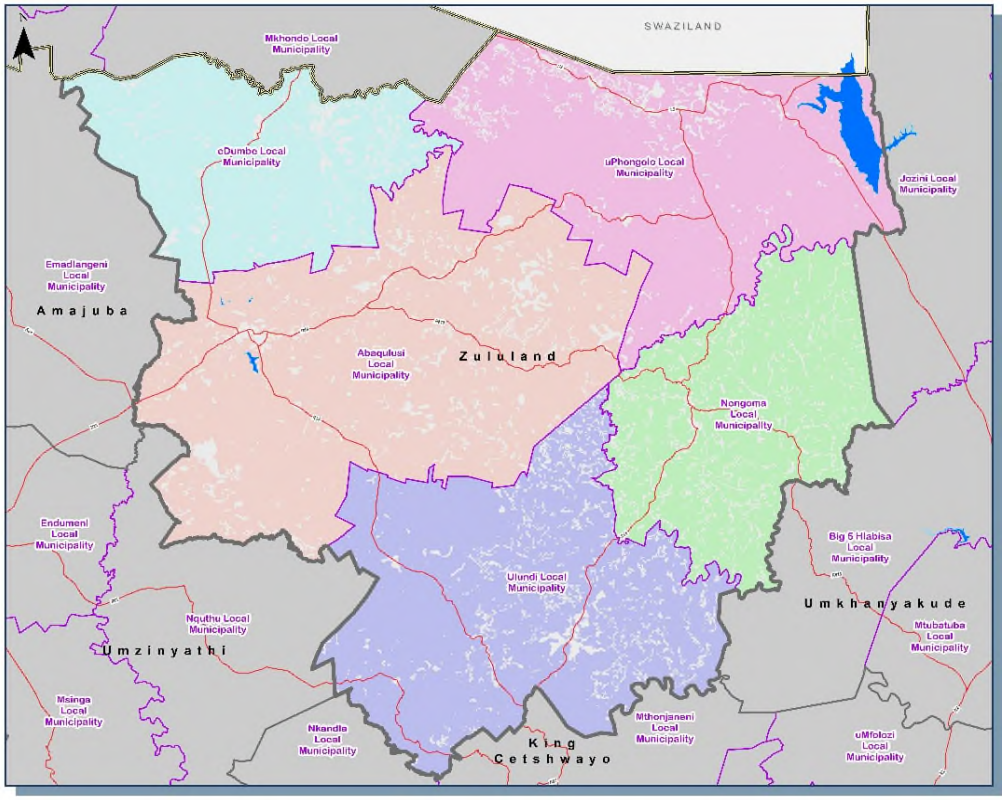

Reconnaissance Report

January 2021

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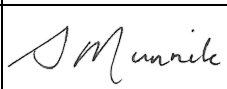
Checked by:	S Munnik	Executive Manager		January 2021
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EXECUTIVE SUMMARY

A. Introduction

Phase III follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

The deliverables for UAP Phase II were divided in two phases where Phase 1 included the information review and development of a High Level Status Quo Assessment and Phase 2 included the development of a demand model and needs development plan, culminating in a Reconnaissance Study report for each Water Services Authority (WSA) on bulk water supply. Water Supply Intervention Areas (WSIAs) were identified during UAP Phase II and were based on areas that could be served either by existing schemes or through planned scheme developments (planned projects).

However, the level of detail within the outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk.

This report is prepared for the Zululand District Municipality.

B. Demographics

The Zululand District Municipality (ZDM) is located in the northern region of the KwaZulu-Natal Province and it covers an area of approximately 14 810 km². The District is surrounded by Swaziland and Mpumalanga in the north, Amajuba District Municipality to the west, uMkhanyakude to the east and uMzinyathi and King Cetshwayo District Municipalities to the south.

ZDM consists of the following five Local Municipalities:

- ✓ AbaQulusi Local Municipality (KZN263);
- ✓ eDumbe Local Municipality (KZN261);
- ✓ Nongoma Local Municipality (KZN265);
- ✓ Ulundi Local Municipality (KZN266); and
- ✓ uPhongolo Local Municipality (KZN262).

The total population for Zululand WSA is 931 935 people living within 183 642 households. The population and household figures per Local Municipality are tabled in Table B-1 below. The average household size for the WSA is 5.1 persons per household.

Table B-1: Population & Household Figures for ZDM

Local Municipality	Population	Households
AbaQulusi Local Municipality	230 883	47 119
eDumbe Local Municipality	89 969	17 641
Nongoma Local Municipality	195 254	44 376
Ulundi Local Municipality	256 426	44 987
uPhongolo Local Municipality	159 403	29 519
Total for Zululand District Municipality	**931 935**	**183 642**

Source: ZDM Draft WSDP 2020/2021 Review

ZDM reported an annual average household growth of 2.1% from 2013 - 2016. There seems to be some migration from the rural areas to the various urban centres in the district as well as where infrastructure is provided.

Growth trends per local municipality can be summarised as follows:

- ✓ **AbaQulusi**
  High growth in the surrounding eMondlo town areas as well as in Nkongolwane. There is a substantial growth in the Kwa Shoba & Tinta's Drift areas, with a high decrease in rural households surrounding Vryheid town.
- ✓ **eDumbe**
  Strong growth in eDumbe, Frischgewaagd & Bilanyoni.
- ✓ **uPhongolo**
  High growth in Ncotshane as well as settlements all along the N2 going west towards Belgrade.
- ✓ **Nongoma**
  Positive growth along the Nongoma/Hlabisa road, with an overall slight negative growth in most of the rural areas.
- ✓ **Ulundi**
  Positive growth surrounding Ulundi town areas, with an overall slight negative growth in most of the rural areas between Ulundi and Nongoma.

eDumbe and uPhongolo show the highest urban growth. Rural growth is negative in Ulundi and Nongoma, with a slight growth in AbaQulusi, eDumbe and uPhongolo.

C. Service Levels

C.1 Water

Approximately 23% of the households do not have access to formal water supply.

Table C-1: Water Supply Backlog within Zululand District Municipality

Local Municipality	Total Nr of Households	Water Backlog	% Backlog	% of Total Backlog
Abaqulusi	47 119	10 996	23.34%	25.75%
eDumbe	17 641	3 501	19.85%	8.20%
Nongoma	44 376	19 995	45.06%	46.81%
Ulundi	44 987	5 801	12.89%	13.58%
uPhongolo	29 519	2 418	8.19%	5.66%
Total	**183 642**	**42 711**	**23.26%**	**100.00%**

Source: ZDM Draft WSDP 2020/2021 Review

C.2 Sanitation

ZDM provides sanitation in the rural areas in the form of dry-pit VIP toilets. Implementation is done according to the ZDM Prioritisation Model for rural sanitation services.

The current sanitation backlog is at 16.66%. However, settlements are continuously expanding, and household growth will maintain an increase in the future.

Table C-2: Sanitation Backlogs within Zululand District Municipality

Sanitation	Total Households	Backlogs	% Backlogs in LM
AbaQulusi	47 119	8 098	17.19%
eDumbe	17 641	1 288	7.30%
Nongoma	44 376	10 755	24.24%
Ulundi	44 987	3 222	7.16%
uPhongolo	29 519	7 223	24.47%
Total	**183 642**	**30 586**	**16.66%**

Source: ZDM Draft WSDP 2020/2021 Review

The number of residential consumers having access to sanitation is reflected in Table C-3 below.

Table C-3: Residential Consumers: Access to Sanitation

	None or Inadequate (Excl. Infills/Replacements)	VIP	Septic tank	Waterborne	TOTALS
		RDP	RDP	>RDP	
AbaQulusi LM	0	0	1035	14 965	16 000
eDumbe LM	0	2981	498	1 979	5 458
Nongoma LM	0	283	0	349	632
Ulundi LM	0	635	0	5 277	5 912
uPhongolo LM	0	698	0	3 311	4 009

	None or Inadequate (Excl. Infills/Replacements)	VIP	Septic tank	Waterborne	TOTALS
		RDP	RDP	>RDP	
Total (urban)	**-**	**4 597**	**1 533**	**25 881**	**32 011**
AbaQulusi LM	8 098	22 597	424	0	31 119
eDumbe LM	1 288	10 629	266	0	12 183
Nongoma LM	9 854	33 890	0	0	43 744
Ulundi LM	2 123	36 900	52	0	39 075
uPhongolo LM	7 223	17 951	336	0	25 510
Total (rural)	**28 586**	**121 967**	**1 078**	**0**	**151 631**
Total (households)	**28 586**	**126 564**	**2 611**	**25 881**	**183 642**

Source: ZDM WSDP 2020/2021 Review

D. Water Resources

The ZDM falls within the Pongola-Mtamvuna Water Management Area (WMA), one of nine WMAs that divides the large catchment areas of South Africa. The Pongola Mtamvuna WMA covers the whole of the KZN province, except a small part in the south, that falls within the Mzimvubu Tsitsikamma WMA.

The following major rivers run through ZDM and are sources for bulk water supply schemes:

- ✓ White Mfolozi River in the south of the District and 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 Supply Scheme supplying areas in the Nongoma Local Municipality; and
- ✓ Phongolo River in the north that supplies communities residing in the Phongolo Local Municipality.

The overall quality of groundwater in the ZDM is good in the northern parts, with the water quality in eDumbe, uPhongolo and AbaQulusi LMs falling within Class 0 and 1 (Kempster Classification). In the southern parts the water quality is generally poor however, with most boreholes falling in Class 3. It is important to note that most of the Traditional Authority areas are situated within these areas of poorer groundwater quality.

E. Existing Water Supply Schemes and Water Requirements

ZDM combined their original 37 water schemes into ten (10) regional water supply schemes however, the Coronation Regional Water Supply Scheme is currently under review to rather implement stand -alone schemes.

The water requirements for ZDM are presented per Local Municipality within Table E-1. These water requirements were calculated for consumers having formal water supply schemes and for consumers not yet supplied from a formal water supply scheme. The ZDM would require by the year 2050, 239.58Mℓ/day.

AbaQulusi LMs 2050 demand will be the highest with 74.9Mℓ/day followed by the Nongoma LM with 55.51Mℓ/day.

Table E-1: Water Requirements (Mℓ/day) per Local Municipality

Local Municipality	Population 2020	Water Requirements (Mℓ/day)						
		2020	2025	2030	2035	2040	2045	2050
eDumbe	87 583	15.82	16.32	16.86	17.50	18.19	18.92	19.69
uPhongolo	203 344	38.65	39.95	41.33	42.96	44.69	46.51	48.43
Abaqulusi	250 579	60.48	62.38	64.41	66.84	69.40	72.08	74.90
Nongoma	240 294	44.09	45.59	47.19	49.11	51.13	53.26	55.51
Ulundi	173 650	32.80	33.88	35.03	36.41	37.87	39.42	41.05
Total	**955 450**	**191.84**	**198.12**	**204.82**	**212.83**	**221.28**	**230.18**	**239.58**

F. Existing Sanitation Supply Schemes

There are 18 wastewater treatment plants within the ZDM that serves the major towns but all of them are in need of refurbishment and improved operations and maintenance. None of these plants have achieved Green Drop status.

G. Planned and Implementation Projects

The existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total “wall-to-wall” bulk water services needs perspective is visualised and realised. This was done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

The funding streams available for infrastructure development over the next three years within ZDM amounts to R1.5 billion. However, the proposed cost requirement for bulk water supply services within ZDM is R 7 billion and would represent a wall to wall coverage of the total need. ZDM currently has two (2) existing bulk interventions currently in planning under the Regional Bulk Infrastructure Grant earmarked for 2021 to the value of R 200 million.

H. Bulk Water Supply Interventions Considered

This study aims to ensure that the ZDM can make provision for and plan to supply all consumers within its area of jurisdiction with at least basic water supply services. Not all consumers are currently supplied with formal schemes and part of the objectives of this study were to determine where these consumers are, what their water requirements are and the options that could be considered to ensure universal access to water supply up to 2050.

Water Supply Intervention Areas (WSIAs) were identified during this process based on areas that can be served either by linkage to existing schemes or through planned scheme developments (planned projects).

These WSIAs, number of applicable households, population and their water requirements are illustrated within Table H-1 and H-2.

Table H-1: Conceptual Scheme Areas, Population and Water Requirements

WSIA No.	WSIA Name	Population 2020	Population 2050	Demand 2020 (Mℓ/day)	Demand 2050 (Mℓ/day)
ZUL001	Coronation	54 589	65 942	11.11	13.96
ZUL002	Hlahlindlela	178 926	216136	44.41	54.92
ZUL003	Khambi	30 018	36260	5.42	6.81
ZUL004	Mandhlakazi	97 503	117780	17.32	21.87
ZUL005	Mkuze	11 533	13931	2.24	2.84
ZUL006	Nkonjeni	160 952	194424	33.66	41.88
ZUL007	Simdlangentsha Central	32 567	39340	5.56	6.95
ZUL008	Simdlangentsha East	96 300	116327	18.24	22.80
ZUL009	Simdlangentsha West	87 583	105798	15.82	19.69
ZUL010	Usuthu	205 479	248211	38.05	47.87
Zululand:		**955 450**	**1 154 149**	**191.84**	**239.58**

The Hlahlindlela WSS/WSIA, Usuthu WSS/WSIA and Nkonjeni WSS/WSIA have the highest water demand of 23%, 20% and 17% respectively. These WSSs/WSIAs are also the biggest supply areas within ZDM and would be serving close to 50% of the ZDM population.

The total volume of water required is compared to the existing proposed water supply interventions and tabled within Table H-2:

Table H-2: Water Resources Required vs proposed WSI

Water Supply Scheme / WSIA		Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
ZUL001	Coronation	65 942	13.96	5.10	1.14	2.01	3.15	-1.95
ZUL002	Hlahlindlela	216 136	54.92	20.04	9.89	0.00	9.89	-10.18
ZUL003	Khambi	36 260	6.81	2.49	0.14	1.06	1.20	-1.29
ZUL004	Mandhlakazi	117 780	21.87	7.98	10.95	7.45	18.40	69.60
ZUL005	Mkhuze*	13 931	2.84	1.04	499.69	0.00	499.69	498.65
ZUL006	Nkonjeni	194 424	41.88	15.29	10.05	12.15	22.20	6.92
ZUL007	Simdlangentsha Central	39 340	6.95	2.54	1.65	3.65	5.30	2.77
ZUL008	Simdlangentsha East	116 327	22.80	8.32	5.48	0.00	5.48	-2.85
ZUL009	Simdlangentsha West	105 798	19.69	7.19	6.21	0.00	6.21	-0.98
ZUL010	Usuthu	248 211	47.87	17.47	12.37	14.97	27.34	9.87

***The Pongolapoort Dam is the source for the Mkhuze Scheme and includes allocations for all other users as well and not just the allocation for the Mkhuze Scheme.**

From the table above, it is noted that most of schemes will not have adequate raw water resources to meet the 2050 demand requirements. Groundwater and hydrology studies are required to determine the groundwater potential in some of the schemes as well as the yield of the rivers and dams. These studies will identify additional water sources that is needed to cover the water shortages in some of the schemes.

A total estimate of R 7 billion is required to address the total bulk water supply requirement within the ZDM. The total cost requirement per WSIA is tabled below.

Table H-3: Total Cost Requirement

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
ZUL001	Coronation	R22 526 500	R44 320 000	R0	R6 684 650	R73 531 150
ZUL002	Hlahlindlela	R476 091 000	R131 385 000	R116 170 000	R72 364 600	R796 010 600
ZUL003	Khambi	R53 491 000	R9 618 000	R18 892 000	R8 200 000	R90 201 100
ZUL004	Mandhlakazi	R660 543 000	R537 999 000	R201 642 000	R140 018 400	R1 540 202 400
ZUL005	Mkhuze	R15 000 000	R9 323 000	R0	R2 434 300	R26 755 300
ZUL006	Nkonjeni	R231 256 670	R436 551 000	R153 106 000	R82 091 367	R903 005 036
ZUL007	Simdlangentsha Central	R171 297 000	R84 436 000	R75 901 000	R33 163 400	R364 797 400
ZUL008	Simdlangentsha East	R37 780 000	R181 496 000	R149 741 000	R36 901 700	R405 918 700
ZUL009	Simdlangentsha West	R50 358 000	R215 990 000	R47 080 000	R31 342 800	R344 770 800
ZUL010	Usuthu	R1 243 820 000	R641 922 000	R389 859 000	R227 560 100	R2 503 161 100
Total		**R2 962 163 170**	**R2 293 040 000**	**R1 152 391 000**	**R640 759 417**	**R7 048 353 587**

I. Conclusions and Recommendations

The ZDM still faces a backlog in water supply – not only in providing all consumers within its area of jurisdiction with access to water supply according to its WSA duties, but also in ensuring sustainable water services of existing supply. 23% of the consumers within ZDM does not have access to reliable water supply. Furthermore, there are areas where the existing water supply infrastructure as well as water source, are insufficient to meet current and projected future water requirements. New developments and urbanisation put further strain on existing supplies and resources.

The ZDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG, WSIG and RBIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 42 years for the ZDM to address their bulk water supply requirements in some areas.

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

studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider as a Regional Utility to assist the ZDM to take this process further.

The ten (10) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within ZDM and are as follows:

- ✓ ZUL001 WSIA: Coronation;
- ✓ ZUL002 WSIA: Hlahlindlela;
- ✓ ZUL003 WSIA: Khambi;
- ✓ ZUL004 WSIA: Mandhlakazi;
- ✓ ZUL005 WSIA: Mkuze;
- ✓ ZUL006 WSIA: Nkonjeni;
- ✓ ZUL007 WSIA: Simdlangenthsa Central;
- ✓ ZUL008 WSIA: Simdlangenthsa East;
- ✓ ZUL009 WSIA: Simdlangenthsa West; and
- ✓ ZUL010 WSIA: Usuthu.

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all ten (10) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within Table H-4. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

H-4: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	ZUL007	Sim Central	New WTP (10Mℓ) at existing weir on Mozana River and bulk mains	R122 800 000
2	ZUL010	Usuthu Regional Scheme	Construction of an off-channel storage dam on the KwaNkweme River, a run-of-river scheme on the upper Black Mfolozi River. The dam will have a full supply height of 44.12 meters capacity of 5.109 X 10^6kℓ (5 106m³)	R800 000 000
3	ZUL004	Mandhlakazi Regional Scheme	New abstraction works, pump station and rising main from Pongolapoort Dam (Jozini Dam) to existing Mandhlakazi WTP	R302 840 000

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LIST OF ABBREVIATIONS

CoGTA	Department of Cooperative Governance and Traditional Affairs
CR	Command Reservoir
EMF	Environmental Management Framework
DM	District Municipality
DWS	Department of Water and Sanitation
GIS	Geographical Information System
IRDP	Integrated Residential Development Programme
IDP	Integrated Development Plan
KZN	KwaZulu-Natal
ℓ/c/d	Liters per capita per day
LED	Local Economic Development Programme
LM	Local Municipality
LoS	Level of Service
LTBWSS	Lower Thukela Bulk Water Supply Scheme
m^3	Cubic meter
Mm^3	Million Cubic meters
Mm^3/a	Million Cubic Meters per annum
MIG	Municipal Infrastructure Grant
Mℓ/day	Mega liter per day
NRW	Non-Revenue Water
PSP	Professional Service Provider
R ‘000	Rand Thousands
RBIG	Regional Bulk Infrastructure Grant
RDP	Reconstruction and Development Plan
Res	Reservoir
RF	Reference Framework
RWSS	Regional Water Supply Scheme
SDF	Spatial Development Programme
SIV	System Input Volume
UAP	Universal Access Plan
VAT	Value Added Tax
WMA	Water Management Area
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSI	Water Supply Intervention
WSIA	Water Supply Intervention Area

WSIG	Water Services Infrastructure Grant
WSP	Water Service Provider
WSS	Water Supply Scheme
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
ZDM	Zululand District Municipality

1. OBJECTIVES AND METHODOLOGY

This report is the Bulk Water Master Plan for the study titled "Universal Access Plan Phase III – Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the Zululand District Municipality (ZDM)" – in this instance also the Water Services Authority (WSA).

This section provides the background of the study, an introduction and description of the study objectives.

1.1 BACKGROUND AND INTRODUCTION

This study follows on the Phase II study for the Development of a Universal Access Plan (UAP) for Water Supply in the KwaZulu-Natal Province which was completed in June 2016 by various Professional Service Providers (PSP's) that were appointed by Umgeni Water.

However, the level of detail within the outcome of UAP Phase II varied between the various PSP's and the magnitude of the cost requirement resulted in Umgeni Water to revisit the process and the need for UAP Phase III was initiated. The main objective of Phase III will be to further develop the conceptual bulk water master plan that would clearly distinguish between primary and secondary bulk.

Umgeni Water appointed Mariswe (Pty) Limited (previously UWP Consulting), in association with JTN Consulting in November 2018 to review the UAP Phase II process by the developing of UAP Phase III for the whole of the KwaZulu-Natal province. The areas are as follows:

- ✓ Amajuba District Municipality (ADM);
- ✓ City of uMhlathuze Local Municipality (CoU);
- ✓ Harry Gwala District Municipality (HGDM);
- ✓ Ilembe District Municipality (IDM);
- ✓ King Cetshwayo District Municipality (KCDM);
- ✓ Newcastle Local Municipality (NLM);
- ✓ The Msunduzi Local Municipality (TMLM);
- ✓ Ugu District Municipality (Ugu);
- ✓ uMgungundlovu District Municipality (UMDM)
- ✓ uMkhanyakude District Municipality (UKDM);
- ✓ uMzinyathi District Municipality (UZDM);
- ✓ uThukela District Municipality (UTDM); and
- ✓ Zululand District Municipality (ZDM).

The abovementioned municipalities were allocated WSA status for their respective areas of jurisdiction. Amajuba, King Cetshwayo and uMgungundlovu's responsibilities as WSA excludes the areas covered by the Newcastle, City of uMhlathuze, and The Msunduzi Local Municipalities which themselves are WSA's. UAP Phase III reports are developed per WSA, i.e. 13 reports are prepared.

1.2 PURPOSE OF THE REPORT

This report is the second deliverable of the study, namely the Reconnaissance Study that outlines the conceptual master plan of primary and bulk regional schemes per WSA.

The UAP Phase III aims to review and update the UAP Phase II study reports in order to clearly distinguish between primary and secondary bulk water requirements. The implementation of the UAP Phase III study will be executed in two phases and are as follows:

Phase	Description	Deliverables
Phase 1	Due diligence of the conceptual Regional Bulk Scheme Reports from UAP Phase II	High Level Water Services Intervention Areas (WSIA) due diligence report outlining the viability and sustainability of the already proposed regional schemes
Phase 2	Reconnaissance into the Proposed Regional Primary and Secondary Bulk Schemes per Water Services Authority	Reconnaissance Study that outlines the conceptual master plan of primary and bulk regional schemes

Phase 1 includes the information review and conducting a due diligence of the conceptual regional bulk schemes proposed during UAP Phase II.

Phase 2 includes the development of a demand model up to 2050 and needs development plan, culminating in a Reconnaissance Study report on primary and secondary bulk water supply.

The Report would also provide status quo information on sanitation level of service per WSA inclusive of sanitation bulk scheme components. The sanitation status quo information was collected, verified and validated during the Municipal visits and incorporated within the geo database.

The UAP Phase III study information would be used to update the DWS Reference Framework (RF) geodatabase where possible.

1.3 INFORMATION SOURCES

Information used in this study was obtained from current and existing reports and inputs from knowledgeable municipal officials. The following reports were reviewed to contribute to this report:

- ✓ StatsSA Community Survey, 2016;
- ✓ UAP Phase II, Zululand District Municipality, 2016;
- ✓ Zululand District Municipality Final Draft Integrated Development Plan, Review 2019 – 2020;
- ✓ Zululand District Municipality Water Services Development Plan, 2019/2020 & 2020/2021 Review; and
- ✓ Monthly water balance reports as submitted by DWS (KZN) for each WSA.

Meetings were held with the WSA Manager, Technical Director and technical staff of the ZDM to obtain their input and to ensure the latest available specifications and information is used for the purpose of this study.

Existing spatial and non-spatial data sets were used as reference such as the 2016 Community Survey, UAP Phase II Study, 2016, the Department of Water and Sanitation (DWS) Reference Framework geodatabase as well as spatial data received from the WSA itself.

1.4 Stakeholder Engagement

The PSP engaged each WSA individually during inception meetings to introduce the study, its objectives and detailed approach.

The first deliverable was a Due Diligence Report on demographics, water services levels, existing bulk water supply infrastructure, water resources, water requirements, current and planned bulk infrastructure projects and viability of water supply intervention areas. The Due Diligence also reported on a preliminary gap analysis that was conducted utilising the outcome from the proposed WSIA from UAP II and the ZDM Water Services Development Plan that is currently being updated. Following the gap analysis, specific recommendations were made when determining the 2050 water demands suggested for the UAP Phase III study. Follow-up meetings were arranged with the WSAs to share the information that are presented in the Due Diligence Report and these reports were submitted to Umgeni Water.

The Due Diligence Report has now been followed by the development of a water requirements model for 2050. Further individual engagements were held with each WSA.

This resulted in the development of a Reconciliation Report, which presents the alignment of water requirements with existing and planned bulk infrastructure and available water sources for all areas within the WSA.

The Draft Reconciliation Report was presented to each WSA to obtain comments and inputs, which were considered for the final study report submitted to Umgeni Water, DWS and COGTA.

1.5 Water Requirements Model Methodology

A report outlining the methodology, design criteria and assumptions to be used to develop the water demand model for this study, UAP Phase III was approved by the Client. The approved water demand model was then applied to determine the demands for all areas included in the study, at least at a town level. The water demands are required to inform the concept design for a design horizon period up to 2050, with the minimum level of service a yard connection at 100ℓ capita per day.

1.5.1 *Total Water Demand Calculations*

This section provides information on the base data used for the modelling, assumptions made and outputs of the water demand model, based on a pilot Water Services Authority area.

1.6 BASE DATA

The base data used for this study includes the following:

- ✓ 2011 Census: Spatial data for the Main Places, Sub-Places and Small Areas Layer. Main Places are similar to the level of towns, Sub-Places are similar to the level of suburbs and the Small Areas Layer are of a smaller level of detail than Sub-Places, encompassing a number of enumerated census areas;
- ✓ 2011 Census: alpha-numeric data, linking to the spatial data, for household income categories, combined with water Level of Service (LoS). The derived household income and LoS information was combined into categories as follows:
    - o Category 1 (Very High Income): Households with a house connection and an income more than R 1 228 000 per year;
    - o Category 2 (Upper Middle Income): Households with a house connection and an income between R 153 601 and R 1 228 000 per year;
    - o Category 3 (Average Middle Income): Households with a house connection and an income of between R 38 401 and R 153 600 per year;
    - o Category 4 (Low Middle Income): Households with a house connection and an income of between R 9 601 and R 38 400 per year;
    - o Category 5 (Low Income): Households with a house connection and an income between R1 and R 9 600 per year;
    - o Category 6 (Yard Connections): all Households with a Yard Connection;
    - o Category 7 Households with access to interim services and
    - o Category 8 Households with access to below interim services.
- ✓ 2011 Census: categorisation of Main Places – similar to town level data, based on best-known characteristics of the Main Place. The types of Towns/Centre categories include:
    - o Category 1: Long Established Metropolitan Centres (M): Large conurbation of a number of largely independent local authorities generally functioning as an entity;
    - o Category 2: City (c): Substantial authority functioning as a single entity isolated or part of a regional conurbation;
    - o Category 3: Town: Industrial (Ti): A town serving as a centre for predominantly industrial activities;
    - o Category 4: Town: Isolated (Tis): A town functioning generally as a regional centre of essentially minor regional activities;
    - o Category 5: Town: Special (Ts): A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.);
    - o Category 6: Town: Country (Tc): A small town serving essentially as a local centre supporting only limited local activities.
    - o Category 7: Contiguous (Nc): A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or city and functioning as a component part of the whole conurbation;
    - o Category 8: Isolated (Nis): A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority;

- Category 9: Minor (Nm): Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity;
- Category 10: Rural (Nr): All other areas not having significant centres.

✓ Population Growth: Population numbers per Small Areas Layer as provided by Umgeni Water that developed with Statistics South Africa the population growth for the following years:

- 2016; 2020; 2025; 2030; 2035; 2040; 2045 and 2050.

✓ 2019 Updated Levels of Service as provided by Water Services Authorities. The 2019 LoS may be recorded in different formats and at different spatial levels (settlement / town, ward, other). The following categories were applicable the pilot WSA, based on wards and spatially allocated to the Small Areas Layer:

- Below: Assumed for the purposes of this study to include all areas below the standpipe level of service in 2019;
- At: All areas at standpipe level of service in 2019 and
- Above: All areas above the standpipe level of service in 2019.

1.6.1 Assumptions

The following assumptions were made in order to calculate the demands per Small Area:

✓ That the ratio of population within each income category in the House Connection LoS category has not changed since 2011. The assumption is that the individuals in each category may be earning more since 2011, but that the categories themselves should have also then moved upwards by the same average quantum. The ratio of population in each category may then be assumed to have stayed the same, even though the actual income values may have changed. This will not influence the demand allocated to each category.

✓ That the categorisation of Centres has not changed since the 2011 Census. The categorisation of Main Places may be reviewed if necessary.

✓ The projected population growth numbers as provided by Umgeni Water was used without any further analyses.

✓ The 2019 updated Level of Service as provided for the pilot WSA was used, which also indicated potential future levels of service. However, it was found that some areas are marked as below standpipe level when the 2011 Census recorded these areas as above RDP level. We assumed that these areas may have been marked as below standpipe level subsequent to the Census due to factors such as water availability / reliability or other factors. It was decided, in these cases, that the infrastructure probably still exists in these areas as recorded during the Census and that it would be prudent, for water demand modelling purposes, to assume the Census RDP levels still apply. In cases where the WSA indicated areas to be in higher categories than recorded in the Census, the WSA for Level of Service was used, since it is assumed that these areas have since been upgraded to a higher level of service. No area was therefore downgraded from the Census data, but some areas were upgraded to a higher LoS with the new 2019 data.

- ✓ Average of the Annual Average Daily Demand (AADD) values (Direct Demands) were assumed, as shown in Table 1-1. These were informed by the previous UAP Phase II study.
- ✓ Indirect demands, as a ratio of AADD, were assumed, as summarised in Table 1-2, as a ratio of direct demands per Centre classification per Centre category.

Table 1-1: Assumed average AADD per person per combined income and LoS category

Category	Description of consumer category	Household Annual Income range	Average AADD (l/c/d)
1	House Connections: Very High Income	>R1 228 000	410
2	House Connections: Upper middle income	R 153 601 – R 1 228 000	295
3	House Connections: Average Middle Income	R 38 401 – R 153 600	228
4	House Connections: Low middle Income	R 9 601– R 38 400	170
5	House Connections: Low income	R 1 – R 9600	100
6	Yard Connections		100
7	Households with access to interim services		70
8	Households with access to below interim services		12

Table 1-2 Indirect demands, as a ratio of direct demands per Centre classification

				Indirect demands as a ratio of direct demands			
Classification	**Type of Centre**	**Description**	**Typical CSIR / SACN Settlement Typology**	**Commercial**	**Industrial**	**Institutional**	**Municipal**
1	Long established Metropolitan centres (M)	Large conurbation of a number of largely independent local authorities generally functioning as an entity.	City Region	0.2	0.3	0.15	0.08
2	City (c)	Substantial authority functioning as a single entity isolated or part of a regional conurbation.	City / Regional Centre 1 / Regional Centre 2				
3	Town: Industrial (Ti)	A town serving as a centre for predominantly industrial activities.	Regional Centre 1 / Regional Centre 2				
4	Town: Isolated (Tis)	A town functioning generally as a regional centre of essentially minor regional activities	Service Town				
5	Town: Special (Ts)	A town having significant regular variations of population consequent on special functions. (Universities, holiday resorts, etc.)	Service Town / Local or Niche Town	0.3	0.15	0.08	0.03
6	Town: Country (Tc)	A small town serving essentially as a local centre supporting only limited local activities	Local or Niche Town	0.1	0.15	0.03	0.1
7	Contiguous (Nc)	A separate statutory authority or a number of authorities adjacent to, or close to, a metropolis or	Regional Centre 2	0.15	0.08	0.08	0.08

				Indirect demands as a ratio of direct demands			
Classification	**Type of Centre**	**Description**	**Typical CSIR / SACN Settlement Typology**	**Commercial**	**Industrial**	**Institutional**	**Municipal**
		city and functioning as a component part of the whole conurbation.					
8	Isolated (Nis)	A substantial authority or group of contiguous authorities not adjacent to an established metropolis or authority.	High Density Rural				
9	Minor (Nm)	Smaller centres with identifiable new or older established centres not constituting centres of significant commercial or industrial activity.	Local or Niche Town				
10	Rural (Nr)	All other areas not having significant centres.	Rest of South Africa				

The phased upgrading of Level of Service up to 2050 was assumed as summarised in Table 1-3 .

Table 1-3 Level of Service Upgrade

Dwelling Type	LoS Upgrade
House Connections: Very High Income	Grows with Population growth
House Connections: Upper middle income	Grows with Population growth
House Connections: Average Middle Income	Grows with population growth + additional 2.5% increase from Low Middle Income by between 2019 and 2030 + additional 5% increase from Low Middle Income between 2031 and 2050
House Connections: Low middle Income	Grows with population growth + additional 5% increase from Low Income by between 2019 and 2030 + additional 10% increase from Low Income between 2031 and 2050
House Connections: Low income	Grows with population growth + additional 7.5% increase from Yard Connections by between 2019 and 2030 + additional 15% increase from Yard Connections between 2031 and 2050
Yard Connections	Grows with Population growth + minimum LOS by 2030
Households with access to interim services	Reduce to 0 by 2030
Households with access to below interim services	Reduce to 0 by 2030

Finally, an additional 10 % and 15% were added to the total water demand (Sum of Direct and Indirect Demands) for water treatment losses and distribution losses, respectively.

1.6.2 Output of the Water Demand Model

The output of the water demand model is a total water demand (including direct demands, indirect demands and acceptable losses) for 2019; 2020; 2025; 2030; 2035; 2040; 2045 and 2050 per Small Area, in Million Cubic Meters per annum (Mm^3/a). This water demand will be compared to available supply demands if possible and an opinion on potential discrepancies will be given.

As the output is based on the Census Small Areas Layer and coded accordingly, it can be used in a GIS environment for further analysis.

1.7 DWS Reference Framework Geodatabase

The DWS Directorate: Water Services – Planning and Information – maintains a national database for water services planning. It is a spatial database, in a GIS format, that includes layers for settlements, water supply infrastructure, sanitation supply infrastructure, water resources and projects.

This study aims to update the service levels for settlements based on feedback from each WSA. Furthermore, where possible, the bulk and reticulation infrastructure components in the geodatabase were also updated to include not only the latest existing, but also planned water supply infrastructure.

1.8 Reconnaissance Report

The final deliverable of this study is a Reconnaissance Report – this report – to reconcile the water requirements, with available water sources, for all areas in a WSA. This includes the evaluation of existing capacities of infrastructure, potential extensions to new areas, or scheme development options for areas where linkage to existing schemes are not feasible.

The potential costs for scheme development and timeframes were investigated and are presented in this report. Umgeni Water provided unit reference costs for infrastructure components that have been applied where possible.

Information on available water sources were mainly obtained from existing DWS Reconciliation Strategies (larger systems and from the All Towns Studies). Where available, project-specific studies or technical reports were consulted to verify information on available water sources. Information on groundwater availability and quality is however not readily available to a sufficient level of detail.

2. STUDY AREA

This section provides an overview of the study area, setting the scene and discusses the institutional arrangements for water supply. It also provides a brief overview of the demographics in the area and the development opportunities.

2.1 CONTEXT

The Zululand District Municipality (ZDM) is located in the northern region of the KwaZulu-Natal Province and it covers an area of approximately 14 810 km². The District is surrounded by Swaziland and Mpumalanga in the north, Amajuba District Municipality to the west, uMkhanyakude to the east and uMzinyathi and King Cetshwayo 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. It is particularly the Ulundi and Nongoma LMs that have large tracts of Ingonyama Trust Land upon which scattered, relatively low-density rural settlements are evident. Most of the rural settlements are small, causing service delivery to these remote areas extremely costly. The District experiences high levels of poverty and has a high incidence of HIV/Aids infection. Poor accessibility to basic services and facilities is a major challenge (ZDM Draft WSDP, 2020/2021 Review).

ZDM consists of the following five Local Municipalities:

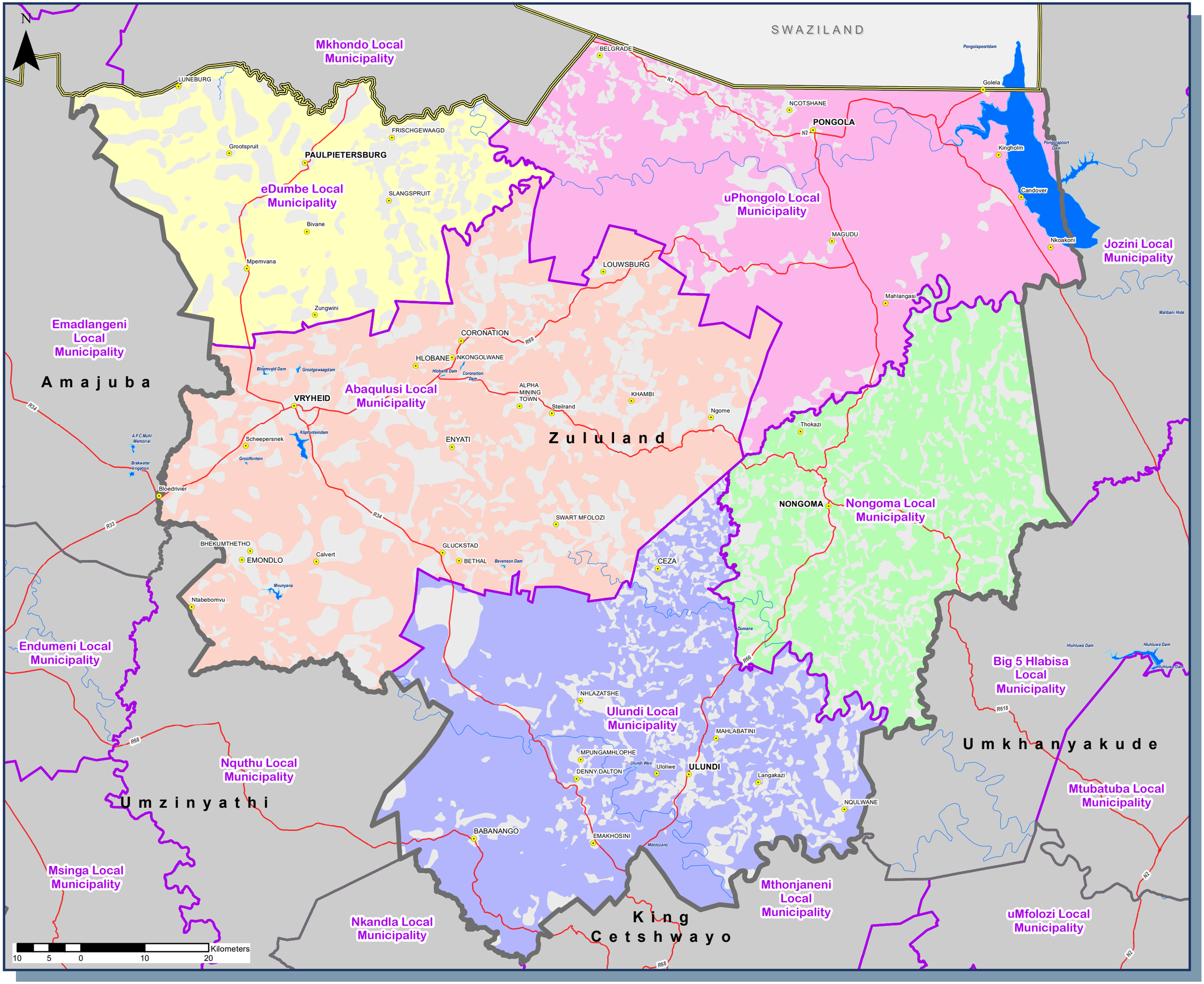
- ✓ AbaQulusi Local Municipality (KZN263);
- ✓ eDumbe Local Municipality (KZN261);
- ✓ Nongoma Local Municipality (KZN265);
- ✓ Ulundi Local Municipality (KZN266); and
- ✓ uPhongolo Local Municipality (KZN262).

Vryheid (AbaQulusi LM) and Ulundi (Ulundi LM) are the major towns. Vryheid is a commercial and business centre, while Ulundi is an administrative centre with the seat of the District Municipality and a well-equipped airport. (IDP Draft Review, 2019/2020). Pongola and Paulpietersburg (eDumbe LM) are small towns, which act as service centres, while Nongoma (Nongoma LM) fulfils the same role, but with far fewer and lower order services.

Zululand remains one of the poorest districts in South Africa, in part due to its history as a marginalized homeland area. The Final Draft IDP 2019/2020 Review and WSDP 2020/2021 Review, reports that 931 935 people are living within 183 642 households in ZDM.

Due to ZDM's location in relation to transport routes and its distance from major centres, the District is relatively isolated from the national economy, with high HIV/AIDS prevalence rates, high levels of unemployment and extreme poverty. The high agricultural potential of the land within the ZDM is key to the future development of the region and should be protected for long-term sustainability.

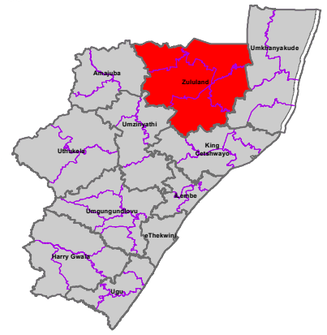
The Study Area is illustrated in Figure 2-1 overleaf.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- NONGOMA — Major Towns

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Study Area

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 2.1

2.2 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The district is predominantly rural with commercial farmland interspersed by protected areas, towns, and dense to scattered rural settlements within traditional authority areas. Most of these rural settlements are small, making service delivery to these remote areas extremely costly. Settlements are located as follows:

Table 2-1: Settlement Type

Settlement Location	Nr of Settlements
Urban Towns	27
Communal Property	27
Land Reform Areas	75
State-owned	26
Tribal Areas	857
Private Land	257
Total	**1 269**

Source: ZDM WSDP 2020/2021 Review

ZDM has updated the settlement boundaries to include new land reform areas as settlements. Household clusters on private farms have also been identified and will be addressed based on ZDM's policy regarding rural residents on privately owned farmlands. AbaQulusi and eDumbe LMs have major changes and updates with uPhongolo LM with minor updates and additions.

Land use in the ZDM is linked primarily to tenure and the land with the highest agricultural potential is in private ownership and is mostly used for commercial farming or conservation, with low settlement densities. Private farmlands constitute a large portion of the ZDM's land area. The land use potential varies throughout the district but are predominantly varieties of grassveld and thornveld. Agricultural activities are mainly forestry (eDumbe, AbaQulusi and around Babanango), sugar cane (uPhongolo), livestock (throughout the district), maize, soya beans, wheat, groundnuts, sorghum, vegetables, and sub-tropical fruit. These commercial farms mostly have well developed infrastructure and farming systems. The difficulties they experience relate more to broader economic factors than spatial factors and linkages in the ZDM. In recent years, a number of cattle farms throughout the ZDM have been converted into game farms. These may be linked to tourism and conservation in the district.

In contrast, the non-arable land and land with severe limitations to agriculture, fall into the traditional authority areas and are densely settled. These Ingonyama Trust areas support settlement and subsistence agriculture (there is moderate to restricted agricultural potential), with the Traditional Authorities (TAs) for each LM being divided as follows:

- ✓ eDumbe LM: Dlamini TA and Mtetwa TA;
- ✓ uPhongolo LM: Masidla TA, Msibi TA, Ntshangase TA and Simelane TA;
- ✓ AbaQulusi LM: Hlahlindhlela TA and Kambi TA;
- ✓ Nongoma LM: Mandhlakazi TA, Matheni TA and Usuthu TA; and

- ✓ Ulundi LM: Empetempithini TA, Mbata TA, Mpungose TA, Ndebele TA, Nobamba TA, Ximba TA and Zungu TA.

2.2.1 AbaQulusi Local Municipality

The AbaQulusi Local Municipality is the largest of the five municipalities in the district, making up a third of its geographical area. The AbaQulusi local Municipality is comprised of many settlements, both rural and urban, with Vryheid being its main urban town. The municipality is classified as having medium to low agricultural potential, with the local municipality consisting largely of commercial farms.

There are, however, some opportunities for development in the municipality, and as with other local municipalities in the region, these are largely in the areas of tourism and agriculture:

- ✓ Agriculture:
    - o Products produced in the area are timber, field crops and livestock. Although most of the timber is exported out of the area. Current products farmed are maize, groundnuts, soya beans, sunflowers, fruits, and sorghum. Cattle farming has also played a major role, but this market is strained due to rising input costs and stock theft. The Vryheid Economic Regeneration Study identified the development of agri-business as an opportunity for the area.
- ✓ Tourism:
    - o Eco-tourism is a great attraction for the AbaQulusi Local Municipality, with tourists drawn to its climate, wildlife, and landscape. The Ithala Game Reserve is located just outside the Municipal area north of Louwsburg, it offers wildlife, scenery, and accommodation. The Ngome Forest including the Thendeka Wilderness area, is also a draw card with locals claiming it to be *'more spectacular than Tsitsikamma'* on the Eastern Cape Coastline.

The Municipality has a population of approximately 240 200 people residing within 47 119 households (ZDM Draft WSDP 2020/2021 Review).

2.2.2 eDumbe Local Municipality

eDumbe Local Municipality is predominantly rural in nature (approximately 65% rural, and 35% urban), yet has the highest potential in the district for rain fed agriculture and consists mainly of commercial forestry farming. In the communal areas of this municipality there is the potential for smallholder forestry, but the distances to markets stifle this.

The major town in the local municipality is eDumbe/Paulpietersburg, which is situated close to the national rail network.

The Municipality has a population of approximately 89 900 people residing within 17 641 households (ZDM Draft WSDP 2020/2021 Review).

2.2.3 Nongoma Local Municipality

The Nongoma Local Municipality is the second largest in terms of area in the Zululand District Municipality and is popularly known as the seat of the Zulu monarch. It is a predominantly rural municipality, with over 98% of its population living in rural areas. The entire municipality consists of communal settlements, with a mixture of farming taking place by small holders with cattle and goats being the main enterprises. The agricultural potential of the area is considered to be low unless irrigation is made available.

The Municipality has a population of approximately 226 300 people residing within 44 376 households (ZDM Draft WSDP 2020/2021 Review).

2.2.4 Ulundi Local Municipality

The Ulundi Local Municipality is located on the southern boundary of the Zululand District Municipality in northeastern KwaZulu-Natal. The Ulundi municipal area includes the towns and settlements of Ulundi, Nqulwane, Mahlabathini, Babanango, Mpungamhlophe and Ceza as well as 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 town of Ulundi represents the only urban centre in the Ulundi Local Municipal area and accommodates approximately 40 000 people.

The Municipality has a population of approximately 229 400 people residing within 44 987 households (ZDM Draft WSDP 2020/2021 Review).

2.2.5 uPhongola Local Municipality

The uPhongolo Local Municipality 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. The local municipality is predominantly rural in nature with a relatively diverse economy, with a particularly strong primary and secondary sector, in the form of agriculture, retail and game farming. uPhongolo has vast tracts of untapped natural resources and the opportunity to take advantage of its tourism potential and take tourism in the area to another level. The main commercial enterprises in the local municipality are irrigated sugarcane and game farming, with the potential to develop citrus and subtropical fruit under irrigation.

The Municipality has a population of approximately 150 500 people residing within 29 519 households (ZDM Draft WSDP 2020/2021 Review).

2.3 Climate and Climate Change

Climatic conditions vary significantly from the northern highlands to the eastern low-lying areas around the town of Pongola. Rainfall is strongly seasonal with more than 80% occurring as thunderstorms between October and March, with the peak months being December to February in the inland areas. Rainfall varies from over 1 000mm in the north and west, dropping to below 600mm in the central area around Pongola. The

resultant Mean Annual Runoff (MAR) ranges from above 200mm in the north and west, to below 100mm in the central areas. Overall, the Mean Annual Precipitation (MAP) is 840mm, and the corresponding MAR 102mm (12 % of MAP). Annual variability of rainfall is indicated by the historic coefficient of variation of the rainfall record, which ranges from (20 % to 25 %) in the west to greater than35 % in the Pongola area. In accordance with the rainfall pattern the relative humidity is higher in summer than in winter. Potential mean annual gross evaporation ranges from 1 400mm in the west to 1 600mm in the lowveld. The highest mean monthly evaporation is in December and the lowest mean monthly evaporation in June. Mean Annual Temperature ranges from approximately 4ºC to 20ºC, temperatures generally become cooler moving towards the west.

One strategic dam, namely Pongolapoort/Jozini, has been developed. There is a vast amount of water in the area with both surface resources, as well as good ground water potential (ZDM Draft WSDP 2020/2021 Review).

The district is looking at adapting to climate change. Through the Local Government Climate Change Support Programme (LGCCSP) key climate change vulnerability indicators will be identified. The Zululand District Municipality Biodiversity Sector Plan reports that climate change impacts such as increased severity and unpredictability of droughts, storms and floods, and altered rainfall patterns, higher temperatures and higher evaporation and transpiration, will place more pressure on biodiversity assets and ecosystems.

2.4 Topography, Geology and Soils

The Zululand District Municipality has significant diversity of relief that is determined by altitude, slope position, aspect, climate, topography, and geology, which translates into exceptional terrestrial and aquatic biodiversity, species richness and endemicity.

The ZDM forms part of the Pongola, Mkuze and Mfolozi River Catchments of the Usuthu/Mhlathuze Water Management Area that extends from the high lying areas in the north and west to the Indian Ocean in the east. The northern and western edges of the ZDM are characterised by steep terrain. The Skurweberg and Elandsberg Mountains on the western side of the ZDM are approximately 1 700m above sea level. In the northeast there are the Lebombo Mountains. In general, the topography slopes and gets less steep from west to east, as well as from north to south, consequently all the main rivers flow in this direction. There are some large relatively flat areas between 200m and 300m around the town of Pongola, as well as on the lower reaches of the Mfolozi River.

The general topographic profile of the municipal area is reflected in Table 2-2. 70% of the total municipal area consists of rolling hills.

Table 2-2: Topography Type

Topography Type	Percentage of Total Municipal Area
Mountainous	30%
Rolling	70%
Flat	0%
Coastal	0%

Source: (ZDM Draft WSDP 2020/2021 Review)

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. Granite, quartzite, basalt, diabase, migmatite, and gneiss are also present; significant areas of granite prevail in the vicinity of Paulpietersburg. The District comprises very little alluvium, which is a feature of a rugged downward eroding landscape. A variety of Karoo Supergroup rocks occur in the area and the District includes Dwyka, Ecca, Beaufort, Lebombo, and Zululand Groups, with Jurassic dolerite intrusions and quartzite of the Mozaan Group (Pongola Supergroup). Ithala Game Reserve is an important asset in that it comprises almost all of the intact vegetation present within the Mozaan Group areas in the District. Geological exposure is confounded with altitude, especially for the well layered Karoo supergroup. Natal Group Sandstones are largely absent, apart from isolated areas south of Ulundi and east of Nongoma. Geologically the District comprises significant variation over a diverse landscape.

Concomitantly, soil forms are highly varied in terms of carbon content, sodium content, depth, drainage, stoniness, fertility, clay and sand content, and resistance to erosion, and include *inter alia* apedal, plinthic, melanic, duplex, and vertisols soils. Soil forms include Glenrosa, Rensburg, Arcadia, Bonheim, Mispah, Hutton, Clovelly, Griffin. Shortlands, Sterkspruit, Valsrivier, and Swartland, which represent a wide range of soil potential.

2.5 ENVIRONMENTAL

The concentration of cultural heritage sites in the district is mainly around Ulundi and Nongoma, where strong Zulu heritage provides a rich framework of attractions for visitors to the area, including battlefields and cultural heritage tourism routes. These are the key to tourism in the district; however, the high tourism potential has not been fully utilised, environmentally or otherwise with a number of sites of tourism significance being ignored or insufficiently marketed.

Sustainable use of natural resources is vital. It is important to utilise resources in a manner that does not diminish them over time. Freshwater resources need to be properly managed – including the river catchments. Improving the management of river catchments will help reduce potable water losses.

The Municipality is aware that environmental accounting needs to be become more integrated into the development planning process and must be considered in the very initial phases of planning any new development or upgrade, prior to any costly mistakes being made.

2.6 INSTITUTIONAL ARRANGEMENTS FOR WATER SUPPLY

The ZDM is the legislated Water Services Authority for five of the Local Municipalities within its area of jurisdiction namely:

- ✓ eDumbe Local Municipality (KZN261);
- ✓ uPhongolo Local Municipality (KZN262);
- ✓ AbaQulusi Local Municipality (KZN263);
- ✓ Nongoma Local Municipality (KZN265); and
- ✓ Ulundi Local Municipality (KZN266).

The ZDM undertook a Section 78 investigation process and the conclusion was that a single Water Services Provider for the entire district (internal department within ZDM) is the preferred water services provision arrangement for the future and that this be implemented progressively. Certain specialised functions were also listed that should rather be contracted out to private business, although still being part of the overall WSP structure. These are services that require skilled personnel that are expensive, difficult to source and which are more cost effective to contract in rather than source in-house, for example electrical/mechanical artisans, certain maintenance functions, etc.

All Water Services Provider functions were taken over by ZDM in 2003 from the Local Municipalities, except for the urban reticulation services within the AbaQulusi Local Municipality. An agreement between ZDM and AbaQulusi LM (better known as the Natal Spa Agreement) was reached in 2003 where AbaQulusi LM would serve as the WSP for an interim period, ending in June 2006. The purpose of this agreement was for AbaQulusi LM to assist ZDM in the WSP function for an interim period up until ZDM could function as the WSP. This agreement has however been extended on an annual basis since June 2006 but is currently under review by ZDM.

3. DEMOGRAPHICS

3.1 EXISTING POPULATION DISTRIBUTION

The ZDM Water Services Development Plan, 2019/2020 Review, dated June 2019, states that the ZDM uses its own household data set which contains actual household positions as opposed to numerical values provided by STATSSA per enumeration area. Households and projects are implemented per local settlement areas as defined by the ward councilors, and these settlement areas do not always coincide with the enumeration area boundaries of StatsSA. For population analysis, ZDM applies the 2011 Census figures to the ZDM household count per local municipality.

The total population for Zululand WSA is 931 935 people living within 183 642 households. The current consumer profile of the district reflects an updated household count which was done by ZDM from aerial photography taken in 2016 by National Geo-spatial Information (NGI). A total of 182 585 households and 1 057 farmhouses were captured, bringing the total dwellings in ZDM to 183 642.

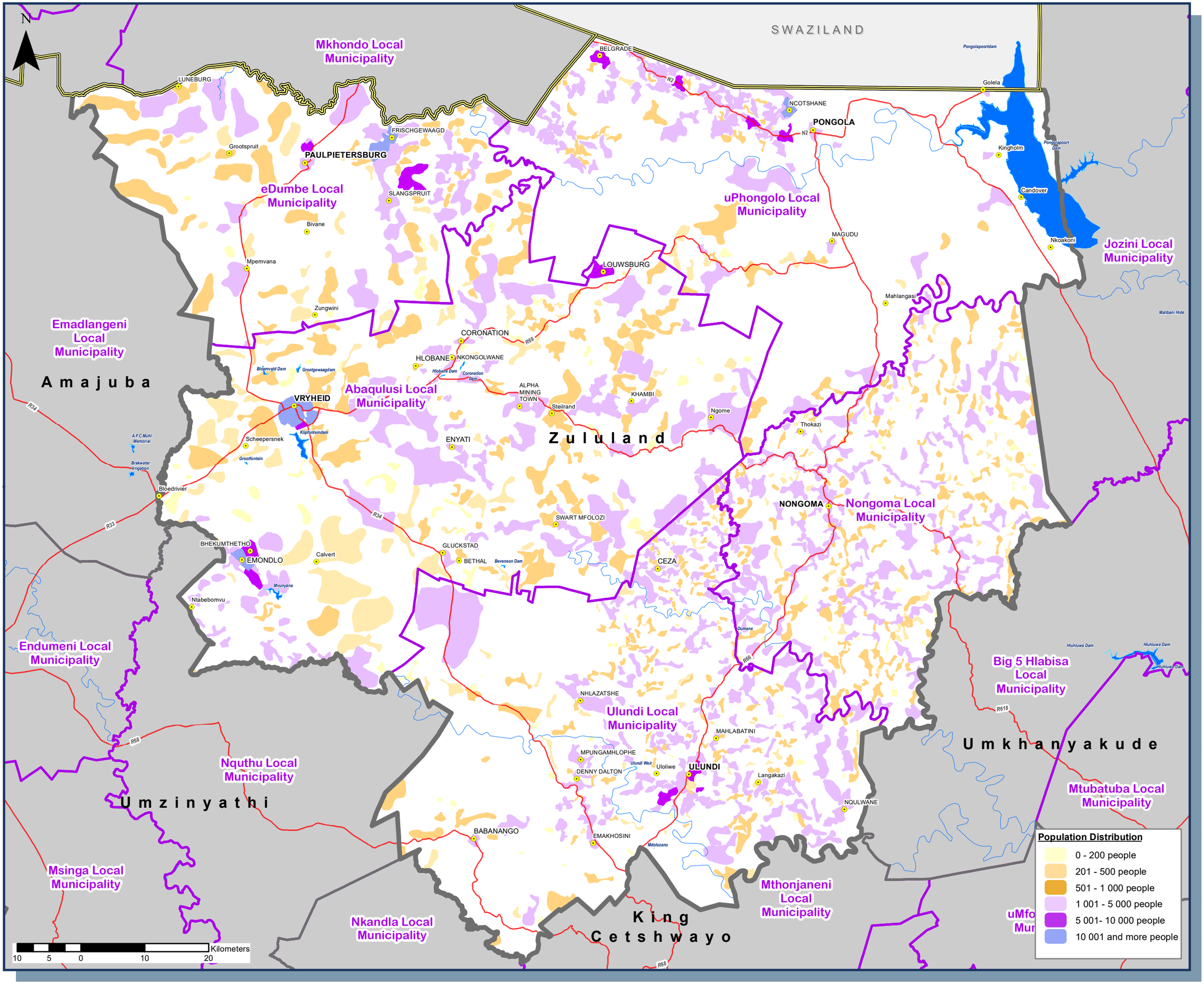
The population and household figures per Local Municipality are tabled in Table 3-1 below. The average household size for the WSA is 5.1 persons per household.

Table 3-1: Population & Household Figures for ZDM

Local Municipality	Population	Households
AbaQulusi Local Municipality	230 883	47 119
eDumbe Local Municipality	89 969	17 641
Nongoma Local Municipality	195 254	44 376
Ulundi Local Municipality	256 426	44 987
uPhongolo Local Municipality	159 403	29 519
Total for Zululand District Municipality	**931 935**	**183 642**

Source: ZDM Draft WSDP 2020/2021 Review

The ZDM WSDP 2020/2021 Review reports an annual average household growth of 2.1% from 2013 - 2016. There seems to be some migration from the rural areas to the various urban centres in the district as well as where infrastructure is provided.



Legend

- Provinical Boundaries
- District Municipality Boundaries
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- National Roads (N1)
- Main Roads
- Dams & Dam Names (Driel Dam)
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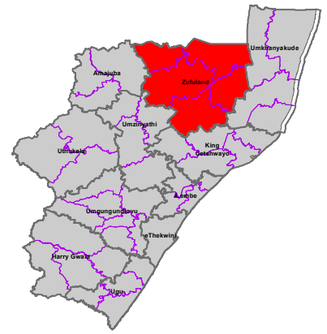
- NONGOMA — Major Towns

LOCALITY:



CLIENT: UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY: ZULULAND DISTRICT MUNICIPALITY

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Population Distribution
Zululand District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: **DC26: Figure 3.1**

3.2 SOCIAL AND ECONOMIC INDICATORS

The ZDM constitutes 16% of the area and ±8.5% of the population of KZN. The District has a lack of large economic investments to boost the local economy. Up to the late 1990's the District's economy was dependent on heavy coal mining. As a result of the open markets on coal mining (and agriculture) the economy of the area has declined. The potential for economic growth in Zululand lies in tourism and agriculture. The former has started to play a larger role in the economy of the area, this by no means fills the gap caused by the closure of mines. The mines had significant forward and backward linkages on all the economic sectors, particularly in Vryheid and surrounding areas.

The high agricultural potential of the land is considered to be the key to the future development of the region and should be protected for long term sustainability; this however does not mean that it should be excluded from consideration in projects that relate to land reform and commercial farming ventures. The high population numbers and livestock concentrations in the freehold settlements highlight the need for additional land and create possible opportunities for the development of commonage schemes. In addition, tenure upgrade projects could be considered for tenants presently living on portions of the freehold land.

A large percentage of the district is communal land. Within these areas there is considerable pressure to extend grazing rights into adjoining areas. Strategies to deal with the need to accommodate the increasing demands for grazing land need particular attention. This will require extensive consultation between all key role players in the region.

In terms of GVA contribution per local municipality (see Table 3-2 below), AbaQulusi is the economic hub of the Zululand District contributing over 40% to the district's GVA. Economic growth in Zululand is not equally distributed amongst its local municipalities. The spatial economic imbalance is not only unique to this district but rather a prevalent phenomenon across districts in the province.

Table 3-2: GVA Contribution (R'000), Zululand Local Municipalities, 2012 – 2015)

Municipality	2012 (R'000)	2013 (R'000)	2014 (R'000)	2015 (R'000)
eDumbe	1 254	1 244	1 313	1 310
uPhongolo	1 360	1 412	1 458	1 476
AbaQulusi	5 174	5 235	5 529	5 532
Nongoma	248	2 115	2 236	2 234
Ulundi	2 633	2 692	2 800	2 795
Zululand	**12 470**	**12 698**	**13 364**	**13 347**

Source: Global Insight, 2017

Out of all district municipalities in the province, Zululand District recorded the slowest GVA growth during the period under review. The amount of GVA per municipality does not necessarily have to correspond to the economic growth rate in that local municipality. Often local economies growing off a smaller base will grow faster.

Table 3-3: GVA Growth, Local Municipalities, 2006 - 2015

Local Municipality	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
eDumbe	2.90%	4.80%	2.30%	-0.70%	3.10%	1.50%	3.20%	-0.80%	5.50%	-0.20%
uPhongola	3.20%	0.10%	3.30%	-1.80%	2.30%	1.80%	-0.50%	3.80%	5.20%	-0.60%
AbaQulusi	-0.30%	3.60%	-0.10%	-2.30%	0.10%	-1.60%	3.40%	1.20%	5.60%	0.10%
Nongoma	3.80%	4.60%	4.80%	-1.80%	0.20%	-0.60%	1.20%	3.30%	5.70%	-0.10%
Ulundi	2.10%	3.50%	0.60%	-3.20%	0.00%	0.00%	2.30%	2.20%	4.00%	-0.20%
Zululand	**1.50%**	**3.50%**	**1.40%**	**-2.20%**	**0.60%**	**-0.40%**	**2.40%**	**1.80%**	**5.20%**	**-0.10%**

Source: Global Insight, 2017

Table 3-3 above illustrates GVA growth rates across all local municipalities in the District. AbaQulusi, the biggest municipality in terms of economic contribution for instance, has recorded four negative growth rates in the past ten years. Of note, growth in 2015 was very poor across all municipalities, in line with both national and provincial weak growth of 1.3 % and 0.6% respectively.

Table 3-4 below depicts Employment Levels per Local Municipality. It is clear from this table that the largest number of people employed are in AbaQulusi and more in particular Vryheid Town where economic activities are concentrated. Ulundi Municipality has the second largest number of people employed and these are concentrated in Ulundi Town which functions as the administrative centre for Zululand and the Northern KwaZulu-Natal Region

Table 3-4: Employment Levels per Local Municipality

Indicator	eDumbe	uPhongola	AbaQulusi	Nongoma	Ulundi	Zululand
Employment	10 679	11 756	38 473	14 087	19 723	**94 717**
Unemployment	4 770	7 910	11 938	10 012	11 848	**46 477**
Economically Active Population	60 184	95 896	165 020	136 603	138 977	**596 680**
Labour Force Participation	25.70%	20.50%	30.50%	17.60%	22.70%	**23.70%**
Unemployment Rate	29.90%	26.40%	25.90%	38.50%	38.30%	**31.20%**

Source: StatsSA, 2016

AbaQulusi has the largest number of unemployed people in Zululand, with 11 938. However, the municipality has the smallest unemployment rate at 25.9% with uPhongolo second at 26.4%. Nongoma (38.5%) and Ulundi (38.3%) have the highest unemployment rate, higher than the district average (31.2%).

All the local municipalities have the labour force participation rate that is at below 50%. AbaQulusi has the highest labour force participation rate of 30.5% which is indicative of a higher level of job search activity than in the other municipalities while Nongoma has the lowest labour force participation rate of 17.6%. This points to a labour market in crisis in Nongoma and requires concerted job creation efforts in the municipality.

Unemployment in Zululand is unsustainably high and is having the negatively impact of discouraging people from spending the time and money to actively search for jobs.

3.3 POPULATION GROWTH SCENARIOS

Population and economic growth rates are used to determine future developmental requirements within the ZDM. This determines the required increase or decrease in water services. Non-domestic consumer unit growth, particularly commercial, industrial and agricultural growth, also gives an indication of the expected increase in water demand and associated wastewater flow discharges. Factors that affect population growth rate include:

- ✓ Immigration due to displaced farm labour, land restitution and declining job opportunities in neighbouring provinces;
- ✓ Emigration to urban centres or outward migration from the region in search of job opportunities; and
- ✓ The HIV/AIDS epidemic that is predicted to seriously affect economically active persons (18-45 years). Full-blown AIDS sufferers who are unable to continue working may return home to the rural areas. This may be an internal urban/rural shift, or migration from urban areas outside the DM. With the prevalence of HIV/AIDS, especially in KZN, it is important to ensure adequate water services provision in the rural areas.

The current consumer profile of the district reflects an updated household count which was done by ZDM from aerial photography taken in 2016 by National Geo-spatial Information (NGI). A total of 182 585 households and 1 057 farmhouses were captured, bringing the total dwellings in ZDM to 183 642.

The ZDM WSDP 2020/2021 Review reports an annual average household growth of 2.1% from 2013 - 2016. There seems to be some migration from the rural areas to the various urban centres in the district as well as where infrastructure is provided.

Growth trends per local municipality can be summarised as follows:

- ✓ **AbaQulusi**
  High growth in the surrounding eMondlo town areas as well as in Nkongolwane. There is a substantial growth in the Kwa Shoba & Tinta's Drift areas, with a high decrease in rural households surrounding Vryheid town.
- ✓ **eDumbe**
  Strong growth in eDumbe, Frischgewaagd & Bilanyoni.
- ✓ **uPhongolo**
  High growth in Ncotshane as well as settlements all along the N2 going west towards Belgrade.
- ✓ **Nongoma**
  Positive growth along the Nongoma/Hlabisa road, with an overall slight negative growth in most of the rural areas.
- ✓ **Ulundi**
  Positive growth surrounding Ulundi town areas, with an overall slight negative growth in most of the rural areas between Ulundi and Nongoma.

eDumbe and uPhongolo show the highest urban growth. Rural growth is negative in Ulundi and Nongoma, with a slight positive growth in AbaQulusi, eDumbe and uPhongolo.

3.4 Main Development Nodes

The importance of development nodes reflects an area's economic development potential and the range of service that should be provided.

The following **primary** nodes have been identified in the District:

- ✓ **Pongola** - the economy of Pongola is based on large scale commercial production of Sugarcane. The uPhongolo natural features further allow for eco-tourism opportunities in the highly sensitive areas adjacent the Pongolapoort Dam, and the areas between the R69 and the N2.
- ✓ **Ulundi** – Ulundi, as the current seat of the Zululand District Municipality, and the former seat of KZN, has a strong public service-oriented economy. This allows for other supporting commercial and residential activities to be present within the Municipality.
- ✓ **Vryheid** – In comparison to Pongola and Ulundi, Vryheid has a much larger commercial and services sector, although the economy is also dependant on agriculture, and mining.

These nodes are mainly centres which should provide service to the sub-regional economy and community needs. These centres were identified as Third Order Development nodes within the Provincial Spatial Economic Development Strategy.

The following **secondary** order nodes have been identified:

- ✓ Paulpietersburg; and
- ✓ Nongoma.

These nodal areas do not provide services or economic advantages significant on Provincial Level but fulfil very important service delivery functions within the local economies of the municipalities and are the only areas providing commercial choice to the residents of the respective municipalities.

In total 14 tertiary order nodes have been identified throughout the district (see Table 3-5). The functions of these nodes consist of basic government service delivery to the surrounding communities with very limited commercial opportunities. The services sector within these areas is basically non-existent.

Table 3-5: Developmental Nodes

Local Municipality	Primary Development Nodes	Secondary Development Nodes	Tertiary Development Nodes
AbaQulusi Local Municipality	Vryheid		eMondlo Hlobane Louwsburg
Ulundi Local Municipality	Ulundi		Babanango Ceza Mpungamhlophe Nqulwane
uPhongolo Local Municipality	Pongola		Belgrade Godlwayo
Nongoma Local Municipality		Nongoma	Kwaphenyane Maphophoma Mahashini Ngqongwane
eDumbe Local Municipality		Paulpietersburg	Bilanyoni / Mangosothu

Source: (IDP Draft Review, 2019/2020)

4. WATER REQUIREMENTS

This section provides an overview of the water requirements as calculated using the demand model developed for the purpose of this study. A summary is provided firstly for the District and then for each of the Local Municipalities. The total number of households (HH) as obtained from the 2011 Census and the number of households below RDP standards are also provided. (Households below RDP standards include all households having water supply – any form – further than 200m from the household).

4.1 WATER SUPPLY SERVICE LEVEL

Service levels currently differ across the ZDM, predominantly based on a rural/urban split. In general urban areas have water services equal to or higher than, and many rural areas have either no water services or these services do not meet, the compulsory national standards determined by the Minister of Water Affairs and Forestry in terms of Section 9(1)(a) of the Water Services Act, 1997 (Table 4a).

ZDM has adopted a Free Basic Water Services policy as follows:

- ✓ All households will receive six (6) kilolitres of potable water free of charge for domestic use;
- ✓ Industrial, commercial and institutional consumers do not qualify for free basic services; and
- ✓ All water supplied from communal standpipes and rudimentary systems will be free.

Table 4-1 illustrates the levels of service offered through the Free Basic Water Policy.

Table 4-1: Free Basic Water Policy

Level of Water Service	Definition	Free Basic Water Policy
(DW1) Full Pressure conventional house connection	Direct unrestricted full pressure (24m) connection to the reticulation system, metered and billed	Stepped block tariff (with first block at zero charge free to all households)
(DW2) Yard Tank (RDP Standard)	Restricted (to 200ℓ per day) individual erf connection with tank in yard	All water at no charge
(DW3) Communal street tap (RDP Standard)	Unrestricted full pressure standpipe not further than 200m form dwellings (shared by a few consumers)	All water at no charge
(DW4) Rudimentary System	Formalised supply: * borehole equipped with hand pump * protected spring * communal standpipe further than 200m from dwellings	All water at no charge

Source: ZDM Draft WSDP 2020/2021 Review

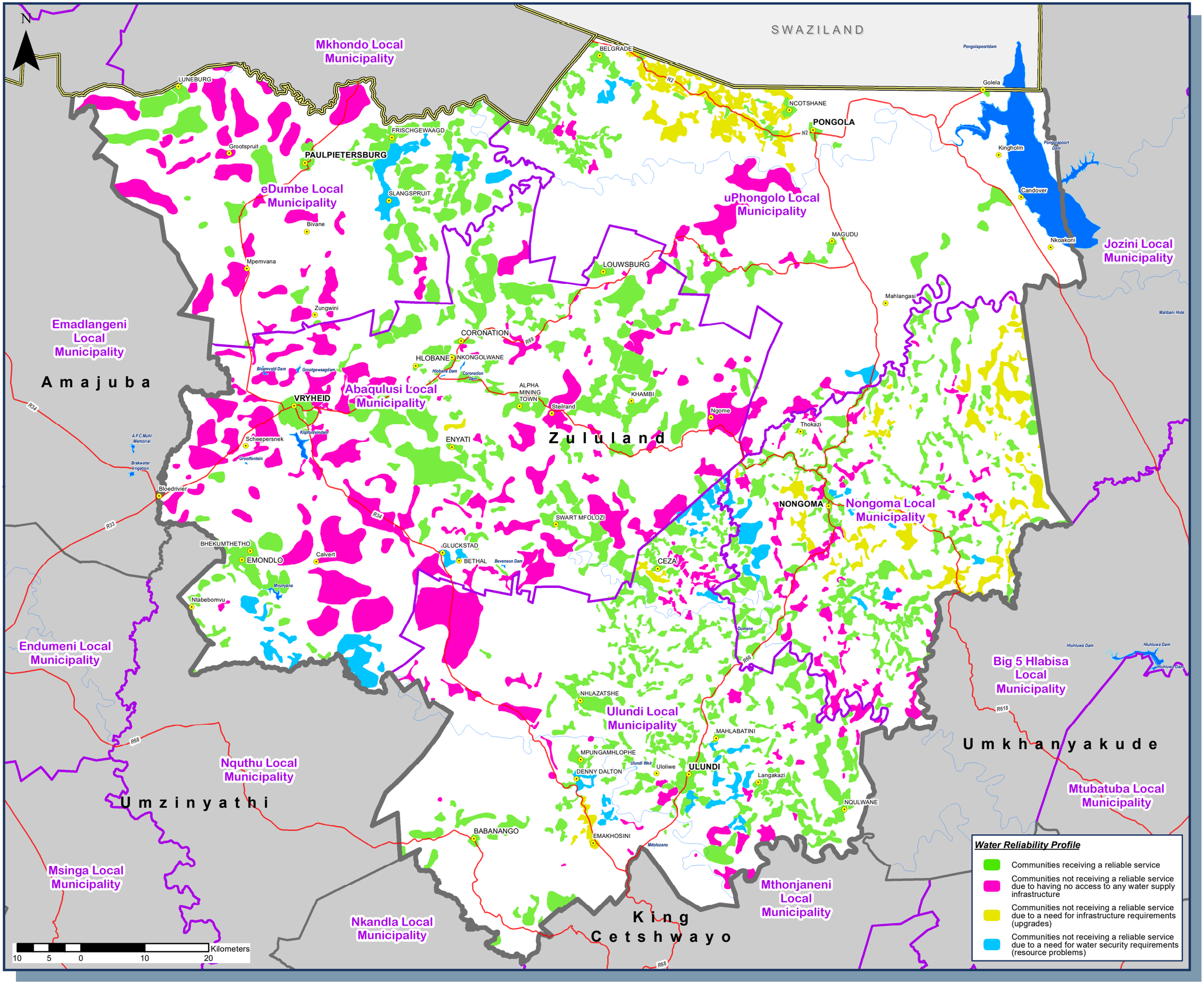
The ZDM Draft WSDP 2020/2021 Review reports that the current water backlog for the District is as follows:

Table 4-2: Water Backlogs within Zululand District Municipality

Local Municipality	Total Nr of Households	Water Backlog	% Backlog	% of Total Backlog
AbaQulusi	47 119	10 996	23.34%	25.75%
eDumbe	17 641	3 501	19.85%	8.20%
Nongoma	44 376	19 995	45.06%	46.81%
Ulundi	44 987	5 801	12.89%	13.58%
uPhongolo	29 519	2 418	8.19%	5.66%
Total	**183 642**	**42 711**	**23.26%**	**100.00%**

Source: ZDM Draft WSDP 2020/2021 Review

Nongoma has the highest backlog with 45% of the households not having access to water. uPhongolo and Ulundi LMs have the lowest percentage backlog – 8% & 12% respectively. The water services levels are illustrated in Figure 4-1.



Legend

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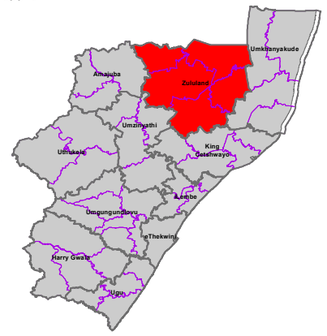

CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Reliability Profile

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 4.1

Water Reliability Profile

- Communities receiving a reliable service
- Communities not receiving a reliable service due to having no access to any water supply infrastructure
- Communities not receiving a reliable service due to a need for infrastructure requirements (upgrades)
- Communities not receiving a reliable service due to a need for water security requirements (resource problems)

4.2 WATER LOSSES AND DEMAND MANAGEMENT

The ZDM has initiated a reporting system whereby all Water Services Providers (WSPs) in the district have to provide certain prescribe operational information to the municipality on a monthly basis. Included in the information is water abstraction volumes, treatment volumes, consumer metered and billed volumes and effluent volumes at the sewage plants. This information will be used to compile a more comprehensive and accurate water balance for the district.

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 roll-out of new infrastructure to communities without services is of highest priority and leaves the ZDM with very little capital for upgrading of existing services. Promoting more efficient usage of water can therefore have a significant impact in relieving this pressure with relatively low capital input.

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:
    - o School and public educational and awareness programmes aimed at promoting effective usage of water (brochures, advertising, newsletters, demonstrations, exhibits, informative, billing, etc);
    - o Water services tariff that promotes efficient water usage; and
    - o Any other “win-win” initiatives that could influence consumers positively.
- ✓ Specific targeted projects which include:
    - o Repair plumbing leaks inside properties; and
    - o 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 2020/2021 WSDP Review also notes that to date the WDMS has largely been driven at project level by the Service Providers and at a political level by councilors. However, the plan is to implement WDMS interventions in alignment with the NRW programme rollout.

4.2.1 ZDM Non-Revenue Programme (NRW)

The quantum of water available for use within the District is both stressed and limited therefore the only way of ensuring an adequate and sustainable supply in the long terms is to manage wasteful practices. In this regard the ZDM has recognised the need and embarked on a plan of action to redress non-revenue water (NRW). This programme is intended to quantify the usage of water within the district by way of a water

balance, compare this with the design norms and standards set by the ZDM and to identify specific interventions to manage the demand within acceptable limits and to reduce water losses.

The Non-Revenue Water (NRW) programme, which has been adopted by Council, will be implemented progressively throughout the District with the initial focus primarily on the Nkonjeni RWWSS/Ulundi and Frischgewaagd areas. This approach will enable the ZDM to refine the programme before rolling it out in all other areas.

The information gathered from the NRW programme will be incorporated into MANZI, be aligned with the ZDM WSP reporting system and used to develop a water balance for individual schemes and eventually a water balance for the entire District as required by the WSDP.

The NRW programme will assist in aligning O&M interventions where most needed and thereby improve the efficiency of scarce resources.

The following specific interventions have already been launched in the target areas to address water losses through:

- ✓ Pressure management;
- ✓ Leak repair programmes;
- ✓ Meter repair & replacement programmes;
- ✓ Internal plumbing leaks; and
- ✓ Consumer end-use demand management initiatives.

4.3 WATER BALANCE

The WSA prepares monthly water balances, in the IWA format, on a local municipality level, for submission to the DWS.

The water balance for the WSA is presented in Table 4-3 for the month of December 2018.

Table 4-3: Zululand Water Balance, December 2018

Total System Input Volume 1 548 882 m3/month 51.63Mℓ/d	Authorised Consumption 1 313 814 m3/month Percentage of SIV = 84.8% 43.79Mℓ/d	Billed Authorised Consumption 228 427 m3/month Percentage of SIV = 14.7% 7.61Mℓ/d	Billed Metered Consumption-Domestic 152 874 m3/month Percentage of SIV = 9.9%	Revenue Water 228 427 m3/month Percentage of SIV = 14.7% 7.61Mℓ/d
			Billed Metered Consumption-Commercial 75 553 m3/month Percentage of SIV = 4.9%	
			Export Volume - m3/month Percentage of SIV = 0.0%	
			Billed Unmetered Consumption - m3/month Percentage of SIV = 0.0%	
		Unbilled Authorised Consumption 1 085 387 m^3/month Percentage of SIV = 70.1% 36.17Mℓ/d	Unbilled Metered Consumption 231 136 m3/month Percentage of SIV = 14.9%	Non-Revenue Water 1 320 455 m3/month Percentage of SIV = 85.3% 44.01Mℓ/d
			Unbilled Unmetered Consumption 854 252 m3/month Percentage of SIV = 55.2%	
	Water Losses 235 068 m^3/month Percentage of SIV = 15.2% 7.83Mℓ/d	Apparent Losses - m^3/month Percentage of SIV = 0.0% Mℓ/d	Unauthorised Consumption - m3/month Percentage of SIV = 0.0%	
			Metering Inaccuracies - m3/month Percentage of SIV = 0.0%	
		Real Losses 235 068 m^3/month Percentage of SIV = 15% 7.83Mℓ/d	Mains and Distribution Leaks - m3/month Percentage of SIV = 0.0%	
			Reservoir Overflows - m3/month Percentage of SIV = 0.0%	
			Service Connection Leaks - m3/month Percentage of SIV = 0.0%	

Source: KZN IWA Water Balances, 2018

The ZDM has initiated a reporting system whereby all Water Services Providers (WSPs) in the district have to provide certain prescribe operational information to the municipality on a monthly basis. Included in the information is water abstraction volumes, treatment volumes, consumer metered and billed volumes and effluent volumes at the sewage plants. This information will be used to compile a more comprehensive and accurate water balance for the district.

Unfortunately, there is currently insufficient information related to internal losses and inflows into the sewage plants to complete a comprehensive water balance. However, an attempt was made to produce a first order water balance with figures from data that was available at the time, as indicated in Table 4-4 overleaf:

Table 4-4: First Order Water Balance for ZDM

Description	% Losses	Mℓ/day	Mℓ/year
Estimated bulk water abstracted		77.99	28 446.0
Estimated bulk water purchased from others		-	-
Estimated bulk water treated		**77.99**	**28 446.0**
Estimated losses during treatment	10%	7.80	2 844.6
Estimated physical water losses during distribution	15%	11.69	4 266.9
Estimated volume of water supplied to consumers	**75%**	**58.50**	**21 334.5**
Estimated influent at wastewater plants	60%	27.9	10 184
Estimated losses during treatment	10%	4.7	1 697
Estimated effluent discharged to source		14.0	5 092
Balance (discharge - abstraction)		**-48.1**	**-17 538**

Source: ZDM WSDP 2019/2020 Review

4.4 Water Demand Model

The Water Demand Model as described within Section 1.5 was applied to the Zululand District Municipality and the population growth estimates utilising Census' Community Survey 2016 as base were used to determine the project population until 2050 of which the detail is provided within the paragraphs hereafter.

4.4.1 Water Demand for Zululand District Municipality

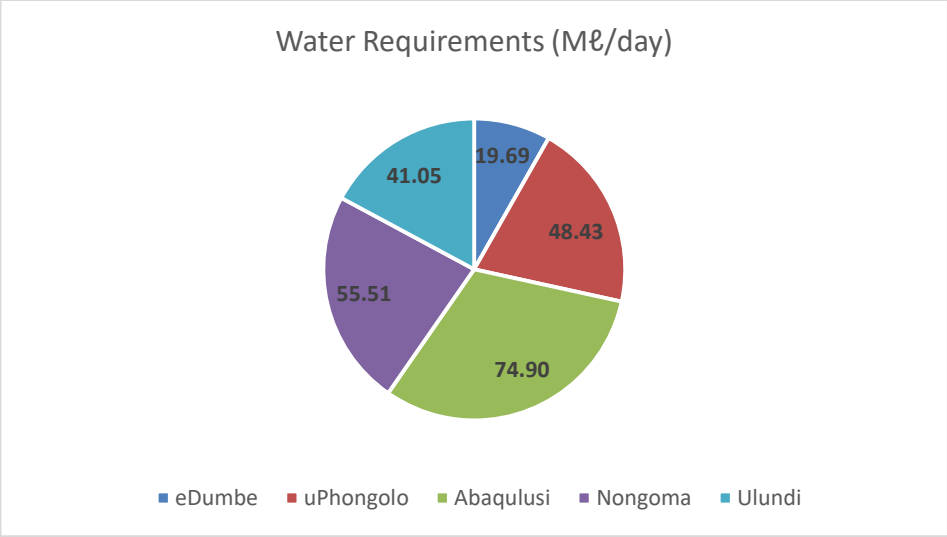
The water requirements (Mℓ/day) for the ZDM are presented per Local Municipality within Table 4-5. These water requirements were calculated for consumers having formal water supply schemes and for consumers not yet supplied from a formal water supply scheme. Section 1.5 in this report explains the approach for the calculations to determine the theoretical water requirements and adjusted for water losses. The ZDM would require by the year 2050, 239.58Mℓ/day.

Table 4-5: Water Requirements (Mℓ/day), per Local Municipality

Local Municipality	Population 2020	Water Requirements (Mℓ/day)						
		2020	2025	2030	2035	2040	2045	2050
eDumbe	87 583	15.82	16.32	16.86	17.50	18.19	18.92	19.69
uPhongolo	203 344	38.65	39.95	41.33	42.96	44.69	46.51	48.43
Abaqulusi	250 579	60.48	62.38	64.41	66.84	69.40	72.08	74.90
Nongoma	240 294	44.09	45.59	47.19	49.11	51.13	53.26	55.51
Ulundi	173 650	32.80	33.88	35.03	36.41	37.87	39.42	41.05
Total	**955 450**	**191.84**	**198.12**	**204.82**	**212.83**	**221.28**	**230.18**	**239.58**

Figure 4-2 below indicates that AbaQulusi LM's 2050 demand will be the highest with 74.9Mℓ/day followed by 55.5Mℓ/day by the Nongoma LM.

Figure 4-2: 2050 Water Demand in M Mℓ/day per LM



4.4.2 Demand per Regional Water Scheme

The water requirements for ZDM are presented in this section per existing Water Supply Scheme (WSS) area and potential future Water Supply Intervention Area (WSIA) area for the entire DM, thus covering all consumers in the municipality. Table 4-6 represents the water requirements in Mℓ/day.

The Hlahlindlela, Usuthu and Nkonjeni has the highest water demand of 23%, 20% and 17% respectively. These WSS/WSIA are also the biggest supply areas within ZDM and would be serving close to 50% of the ZDM population.

Table 4-6: Water Demand per WSS/WSIA in Mℓ per day

Water Supply Scheme / WSIA		Population 2020	Water Requirements (Mℓ/day)						
			2020	2025	2030	2035	2040	2045	2050
ZUL001	Coronation	54 589	11.11	11.49	11.89	12.37	12.87	13.40	13.96
ZUL002	Hlahlindlela	178 926	44.41	45.79	47.27	49.04	50.91	52.86	54.92
ZUL003	Khambi	30 018	5.42	5.61	5.80	6.03	6.28	6.54	6.81
ZUL004	Mandhlakazi	97 503	17.32	17.91	18.55	19.31	20.12	20.97	21.87
ZUL005	Mkuze	11 533	2.24	2.33	2.42	2.52	2.62	2.73	2.84
ZUL006	Nkonjeni	160 952	33.66	34.74	35.89	37.27	38.73	40.26	41.88
ZUL007	Simdlangentsha Central	32 567	5.56	5.74	5.94	6.17	6.41	6.67	6.95
ZUL008	Simdlangentsha East	96 300	18.24	18.84	19.48	20.24	21.05	21.90	22.80
ZUL009	Simdlangentsha West	87 583	15.82	16.32	16.86	17.50	18.19	18.92	19.69
ZUL010	Usuthu	205 479	38.05	39.34	40.72	42.37	44.10	45.94	47.87
	Total	**955 450**	**191.84**	**198.12**	**204.82**	**212.83**	**221.28**	**230.18**	**239.58**

5. EXISTING WATER SUPPLY INFRASTRUCTURE

This section provides an overview of the available water resources as well as the current surface water supplied schemes and the larger groundwater schemes (not for individual consumption).

Previously it was reported that ZDM combined their original 37 water schemes into 10 regional water supply schemes. The ZDM Draft WSDP 2020/2021 Review states that originally there were 10 back to back Regional Water Supply Schemes (RWSS) however, Coronation RWSS is currently under review to rather implement stand-alone schemes.

Table 5-1: Regional Water Supply Schemes within ZDM

Scheme Name	Status Quo
Coronation	Masterplan under review to implement stand-alone schemes instead of regional scheme
Khambi	Completed
Hlahlindlela	On hold due to water shortages
Mandhlakazi	In progress
Mkuze	Completed
Nkonjeni	In progress
Simdlangentsha East	Upgrades to cater for increased water demands
Simdlangentsha Central	In progress
Simdlangentsha West	In progress
Usuthu	In progress

Source: ZDM Draft WSDP 2020/2021 Review

The ZDM Draft WSDP 2020/2021 Review states that due to time and budget constraints with implementation of costly bulk infrastructure, ZDM has initiated an intervention to alleviate the severe water shortage in areas where a sustainable local source can be developed. These water sources will supply several settlements in the surrounding area and will become part of the Regional Scheme infrastructure in future. Implementation will be done according to the ZDM Prioritisation Model for water services within each Regional Scheme.

For remote communities where no bulk services are feasible or possible (cannot be served by the Regional Scheme or Intermediate Schemes), a rudimentary water level of service is implemented in the form of boreholes with handpumps, or spring protections. In some areas a small reticulation scheme with RDP level of services will be constructed where possible.

5.1 WATER RESOURCE AVAILABILITY

5.1.1 Surface Water

The ZDM falls within the Pongola-Mtamvuna Water Management Area (WMA), one of nine WMAs that divides the large catchment areas of South Africa. The Pongola Mtamvuna WMA covers the whole of the KZN

province, except a small part in the south, that falls within the Mzimvubu Tsitsikamma WMA. ZDM comprises of the following tertiary catchments: W21, W22, W31, W41, W42, and W44.

The total available water and requirements as at year 2000, based on a 98% assurance of supply within these sub-areas, is summarised in Table 5-2. 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 Rossouw2[1], 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).

Table 5-2: ZDM Water balance for the year 2000 (Million m³/a). (ZDM 2020/2021 WSDP Review)

			Mfolozi	Mkuze	Pongolo	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 (25ℓ/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.

According to the ZDM 2019/2020 WSDP Review, the ZDM requires at least 2 108Mℓ per month or 25 295Mℓ per year to supply the population of approximately 805 055 people with basic water services. This does not

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

account for commercial or industrial requirements. However, the ZDM population has grown to 931 935 people and would therefore require a greater amount of water to supply basic water services.

The following major rivers run through ZDM and are sources for bulk water supply schemes:

- ✓ White Mfolozi River in the south of the District and 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 Supply Scheme supplying areas in the Nongoma Local Municipality; and
- ✓ Phongolo River in the north that supplies communities residing in the Phongolo Local Municipality.

5.1.1.1 White Mfolozi Catchment (Hlandlindlela & Nkonjeni Regional Water Supply Schemes)

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. The dam was constructed to supply water to the town of Vryheid but can also be used to increase the water supply to Ulundi if necessary. The challenge in this catchment is not that there is not enough water but there is a lack of storage (dams) which results in low firm yields and water shortages occur during drought events. Unfortunately, the deficit in the lower reaches of the catchment limits further upstream use as this flow is needed downstream. The only way to remove the flow limitation is to construct more dams. The shortages that are reported in Ulundi are mostly due to operational problems.

A reconnaissance level water resource catchment study for the White Mfolozi River was undertaken in 2009/2010. The yield analysis indicates that there is insufficient water to currently meet the requirements of eMondlo LM at 98% assurance and by 2030 there will be significant shortfalls in the water availability to meet the requirements of all the main towns, especially if the Reserve are released from the main dams. One of the study recommendations was that the Water Resources Planning Model (WRPM) be used to determine the scheduling requirements for new infrastructure and to recommend operating rules for the system.

The 2020/2021 WSDP Review reports that ZDM undertook a Water Resource Modelling of the Upper White Mfolozi River System during 2011/2012. The model indicated that the yield from the Mvunyane Dam is insufficient to meet the water requirements at the desired levels of assurance and should be augmented soon to avoid the risk of restrictions occurring. Operating rules for Mvunyane Dam should be implemented to protect higher assurance users. The model also indicated that if a high growth scenario is anticipated, the yield from the Klipfontein Dam will be sufficient to meet the water requirements of Vryheid, Ulundi and eMondlo

only until 2021. After 2021 the existing water resources infrastructure of the White Mfolozi will need augmentation to meet the projected water requirements.

The following recommendations are proposed by the Planning Model:

- ✓ Take immediate action to augment the water supply to eMondlo;
- ✓ Start the necessary pre-feasibility and /or feasibility studies to be prepared for the next Water Resource Augmentation project;
- ✓ Implement the proposed operating rules for Mvunyane, Bloemveld and Grootgewacht Dams;
- ✓ Decide on a restriction strategy for eMondlo. Implement restrictions to eMondlo based on the short-term yield curves and the water requirement projections;
- ✓ Continue to track the actual water usage in the system and update the water demand projections regularly;
- ✓ Monitor all dam levels daily, including the rainfall and evaporation.
- ✓ Monitor water abstractions and return flows daily.
- ✓ Rerun the WRPM every year in May with the updated system storage information and the updated water projections to revise the projected implementation date for the next water resource augmentation project;
- ✓ Review the recommendations made in the First Order Reconciliation strategies done during Small Town Studies, particular attention should be paid to Water Conservation and Demand Management Strategies in the ZDM supply areas;
- ✓ Review the option of raising Klipfontein dam as proposed in the First Order Reconciliation strategies with other water resource development alternatives to improve the system yield; and
- ✓ The raising of Klipfontein Dam is likely to be expensive due to the potential impact on the road and railway line.

5.1.1.2 Black Mfolozi Catchment (Usuthu Regional Water Supply Scheme)

The ZDM 2020/2021 WSDP Review reports that ZDM investigated the available water resources in the upper Black Mfolozi River during 2011. The purpose of the investigation was two-fold:

- ✓ An assessment was undertaken to determine the available water resources of the upper Black Mfolozi River which involved quantifying the divertable flows at the existing weir on the river near Nongoma upstream of the KwaNkweme River confluence. This represents the situation prior to construction of the off-channel storage dam on the KwaNkweme River. Analyses were performed for 18.6Mℓ/day (2025 demand) and 25Mℓ/day (2035 demand).
- ✓ Detailed yield analyses were undertaken to determine the water resources capability of a proposed system on the upper Black Mfolozi River, which consists of a new off-channel storage dam on the KwaNkweme River. Water for this off-channel storage dam will be supplied by diverting available flows from the existing weir on the Black Mfolozi River. The performance of the system was evaluated for a variety of possible configurations including a range of dam (storage) sizes, flow diversion capacities and downstream environmental flow requirements (EFR's).

Based on the results of the water resource assessment it is concluded that:

> The construction of the proposed off-channel storage dam on the KwaNkweme River, a run-of-river scheme on the upper Black Mfolozi River could supply a target abstraction of 18.6Mℓ/day (or 6.8 million m³/a, the projected water requirement for the proposed scheme in 2025) with an annual risk of failure of 64% (recurrence interval of 1:1.6 years). This risk is well above accepted levels for schemes of this increase the supply capability (assurance of supply) of the system.

A storage capacity of 7.9 million m³ (30% of the maximum capacity) is adequate to meet the target abstraction of 6.8 million m³/a. This, however, requires a large diversion works capacity of 0.6m³/s. For a larger dam of 10.6 million m³ (40% of the maximum capacity) diversion works with a capacity of only 0.4m³/s would be adequate to meet the target abstraction.

The construction of an off-channel dam on the KwaNkweme River is recommended.

5.1.1.3 Pongola Catchment (Mandhlakazi, Mkuze and Simdlangentsha Regional Water Supply Schemes)

The largest water user in the Pongola River catchment is irrigation. Most of the irrigation takes place upstream of the Pongolapoort Dam close to Pongola town. The Bivane Dam was built on the Bivane River by the Impala Water User Association. The dam substantially increased the supply to irrigators, the town of Pongola and the surrounding communities.

The water resources of the Pongola River System are dominated by the Pongolapoort Dam. The historic firm yield is estimated at 530 million m³/a which is substantially less than the original estimates of approximately 900 million m³/a.

The Pongola Catchment is currently under-utilised and the only catchment area not under stress. This catchment area supplies the Mandhlakazi Regional Water Supply Scheme from Senekal Boerdery via the Pongolapoort Dam (Jozini Dam).

Due to the high cost involved for the construction of an off-storage facility for the Usuthu Regional Scheme, the augmentation of the Mandhlakazi and Usuthu Regional Water Supply Schemes is currently investigated. The following items should be considered:

- ✓ Alternative sites for the off-channel storage facility should be investigated;
- ✓ The possibility to reduce the capacity of the off-channel storage dam on the KwaNkweme River should be investigated. The associated risk should be considered.
- ✓ The Operational cost should also be considered (including levies payable to Mr Senekal);
- ✓ ZDM will have to assess their agreement with Mr Senekal and negotiate upgrading and extensions of the existing agreement if necessary, for the Usuthu supply;
- ✓ Additional and future DWA water allocations and licences from Pongolapoort Dam (Jozini Dam);
- ✓ The existing abstraction works at Pongolapoort Dam (Jozini Dam) needs to be investigated.

5.1.2 Groundwater

Groundwater is a potential water source where the quality and quantity are controlled by the geology of the area. The Zululand district is underlain predominantly by Karoo Sequence basalts, shales, siltstones, and conglomerates that have been intruded by dolerite dykes, sills and plugs of Jurassic age (i.e. post Karoo).

The overall quality of groundwater in the ZDM is good in the northern parts, with the water quality in eDumbe, uPhongolo and AbaQulusi LMs falling within Class 0 and 1 (Kempster Classification). In the southern parts the water quality is generally poor however, with most boreholes falling in Class 3. It is important to note that most of the Traditional Authority areas are situated within these areas of poorer groundwater quality. The decline of groundwater quality from west to east can be attributed to the following:

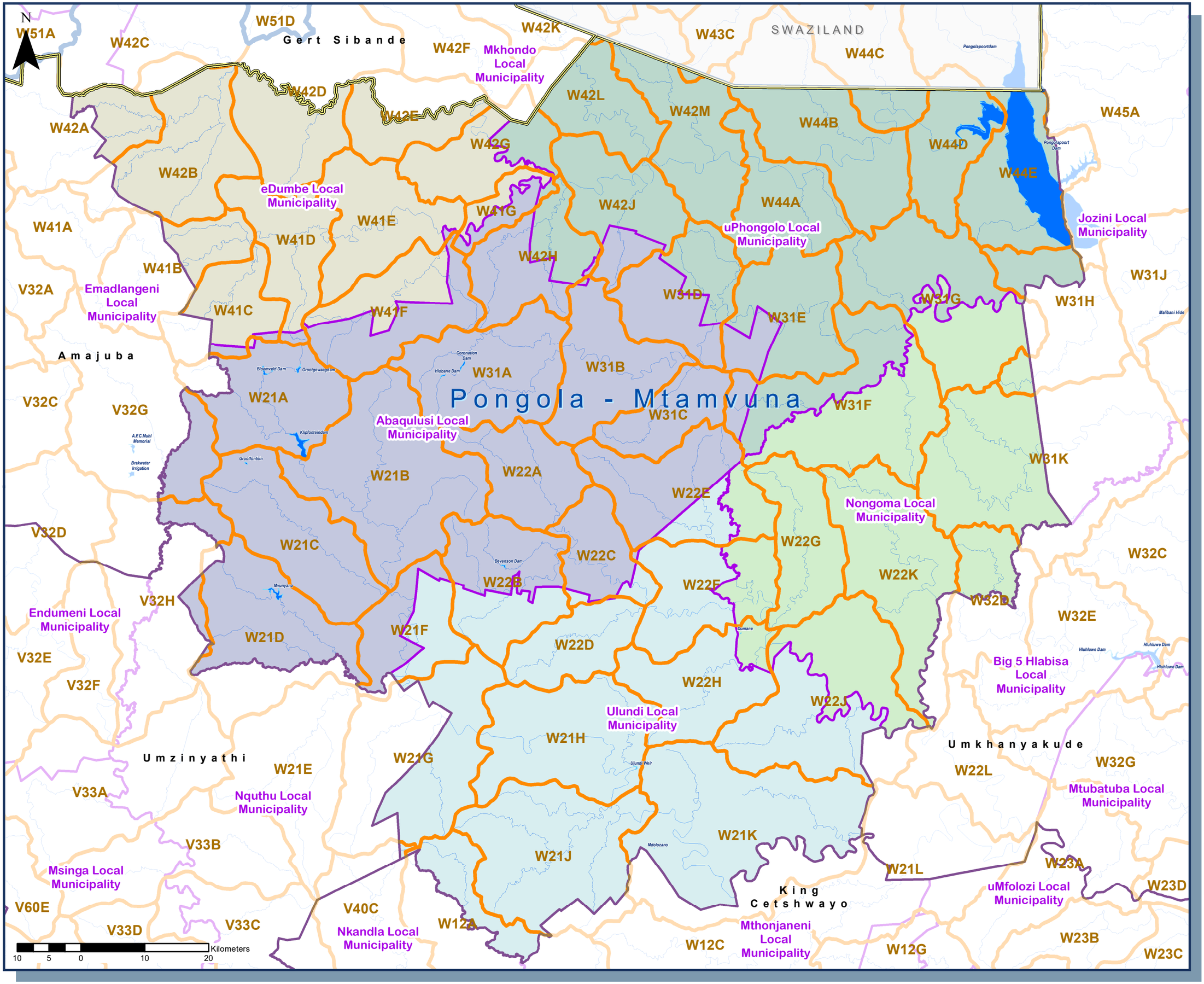
- ✓ Declining rainfall from west to east; and
- ✓ Concentration of dissolved solids from through flow below the Dwyka Formation and coal seems in the Vryheid Formation in the central and eastern regions of the catchments.

The sedimentary rocks that underlie the ZDM represent a secondary of fractured rock aquifer with negligible primary porosity or permeability. Groundwater storage and movement is therefore mainly confined to fractures and joints that occur within the rock mass and is therefore structurally controlled.

The groundwater development potential within each of the quaternary catchments is adequate to meet the basic water demand of rural communities either through:

- ✓ Stand-alone basic levels of water supply by boreholes equipped with hand pumps; or
- ✓ Limited reticulation schemes through production boreholes that target structural features offering high groundwater development potential.

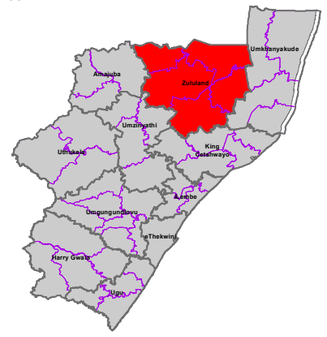
Groundwater quality monitoring is only occasionally monitored in the District.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Water Management Area
- Quaternary Boundaries & Numbers (W22F)

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

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Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Water Resources

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

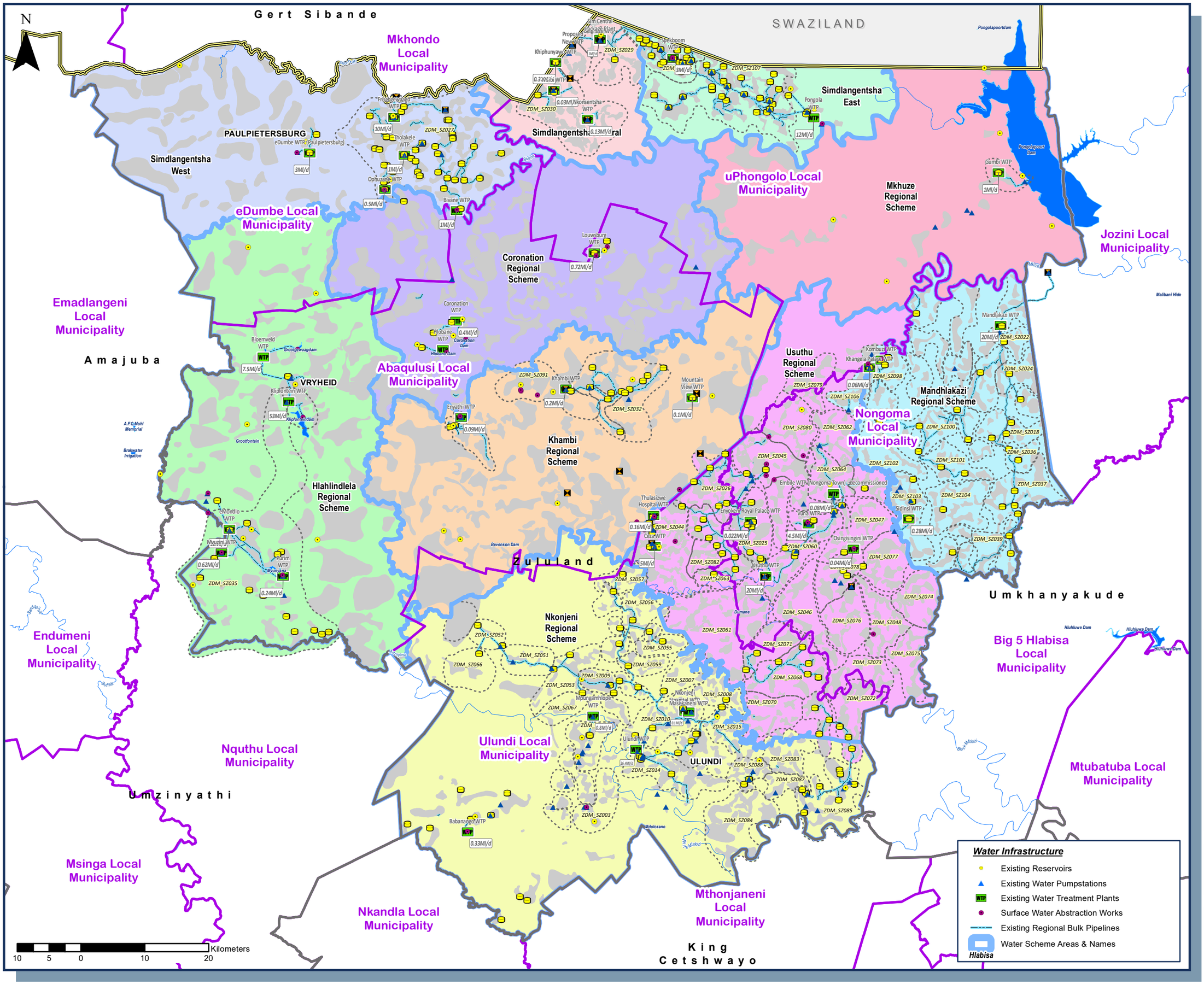
DC26: Figure 5.1

5.2 WATER SUPPLY SCHEMES

The ten (10) regional schemes covering ZDM schemes and are as follows:

- ✓ Coronation (AbaQulusi LM);
- ✓ Khambi (AbaQulusi LM);
- ✓ Hlahlindlela (AbaQulusi LM);
- ✓ Mandhlakhazi (Nongoma LM);
- ✓ Usuthu (Nongoma LM);
- ✓ Mkuze (uPhongolo LM);
- ✓ Nkonjeni (Ulundi LM);
- ✓ Simdlangentsha West (eDumbe LM);
- ✓ Simdlangentsha Central (uPhongolo LM); and
- ✓ Simdlangentsha East (uPhongolo LM).

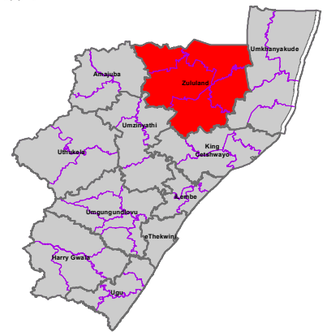
The water supply scheme areas and existing infrastructure for ZDM are illustrated in Figure 5-2.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- NONGOMA — Major Towns
- ZDM_SZ022 — Sub-Supply Zones

LOCALITY:



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Component

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 5.2

5.3.1 Hlahlindlela Regional Water Supply Scheme:

The Hlahlindlela RWSS supplies water to communities within the AbaQulusi LM and is well-served with existing stand-alone schemes. The ZDM Draft WSDP 2020/2021 Review reports that the Hlahlindlela RWSS is currently on hold due to water shortages. Communities are supplied through the following two water schemes:

- ✓ Vryheid Town Water Scheme; and
- ✓ eMondlo Water Scheme.

5.3.1.1 Vryheid Town Water Scheme

- ✓ The Vryheid Town WS supplies water to the town of Vryheid from two water treatment plants namely the Klipfontein WTP and Bloemveld WTP.
- ✓ The Klipfontein WTP receives raw water from the Klipfontein Dam situated on the White Mfolozi River and supplies water to Vryheid town. The capacity of the WTP is 53Mℓ/day. Raw water is pumped from Klipfontein Dam via ø800mm and ø450mm rising mains to the water treatment plant. Once treated, potable water is delivered to the command reservoir via a ø 350mm rising main.
- ✓ The Bloemveld WTP receives raw water from the Bloemveld and Grootgewaagd Dams situated on the aMagoda River and supplies water to Vryheid town. The WTP has a capacity of 7.5 Mℓ/day. Potable water is pumped from the treatment plant to a command reservoir via a ø475mm rising main.

The available combined storage in Vryheid is 15.5Mℓ.

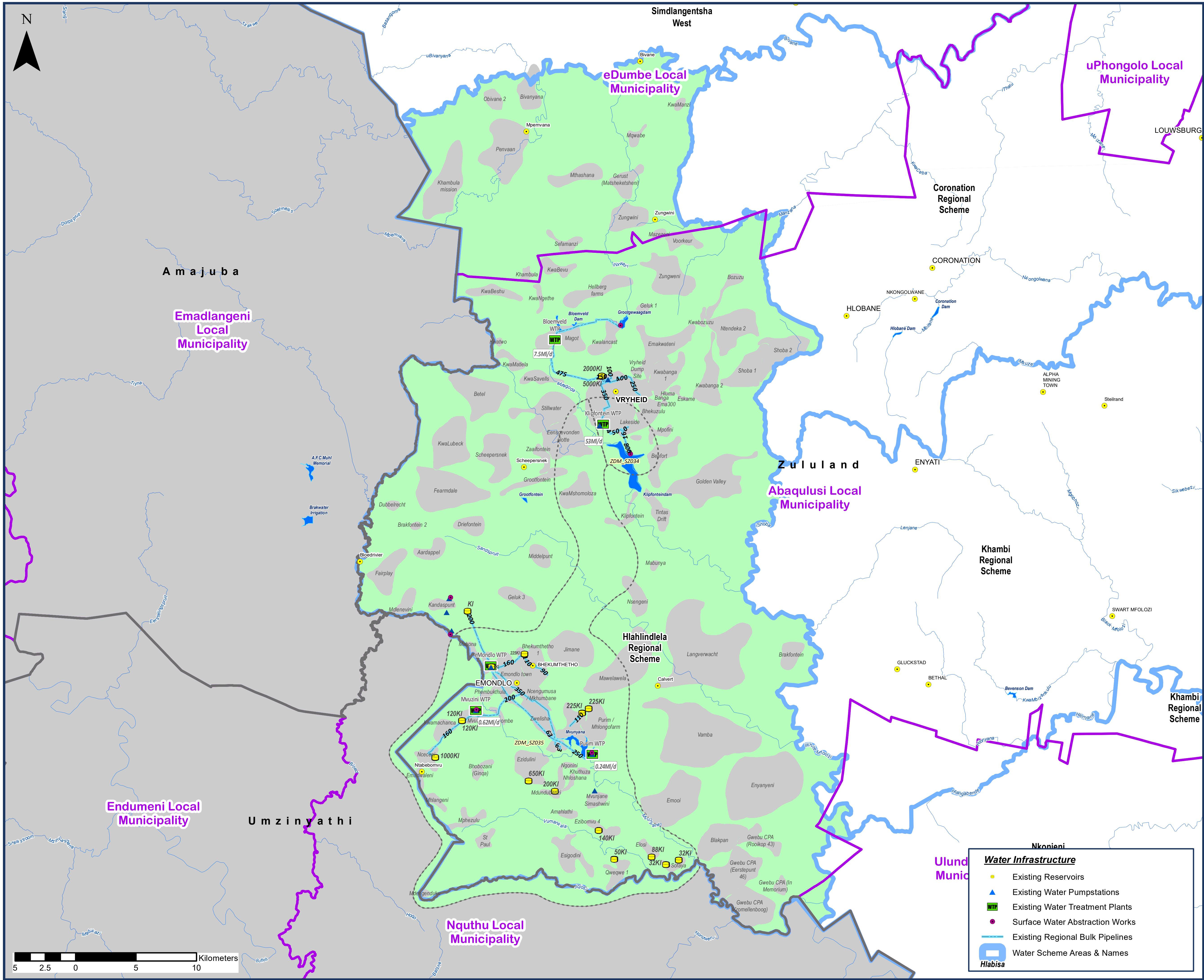
5.3.1.2 eMondlo Water Scheme

The Emondlo WS supplies water to Mondlo Township from two water treatment plants namely the Mondlo WTP and Mvuzini WTP. The main source of water supply is the Mvunyana Dam as well as direct abstraction from the Mvunyana River.

- ✓ The eMondlo WTP receives raw water from the Mvunyana Dam located on the Mvunyana River and supplies water to the eMondlo (Hlahlindlela) Township. The capacity of the WTP has been refurbished and upgraded to supply 12Mℓ/day but the demand has grown to 16Mℓ/day. Raw water is pumped to the eMondlo WTP via a ø 200mm rising main which can only supply 12Mℓ/day. These concerns will be addressed with the bulk services implementation through the Hlahlindlela Regional Scheme.
- ✓ The capacity of the Mvuzini WTP 0.62Mℓ/day.

The available combined storage is 15Mℓ.

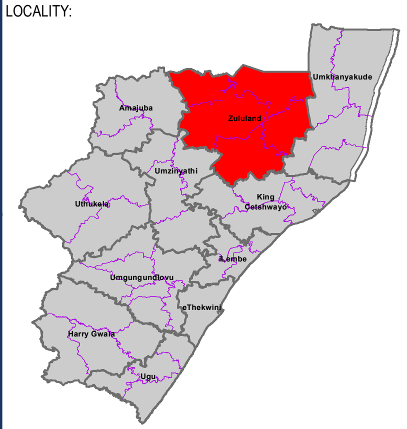
The funding available to implement the Hlahlindlela Regional water supply is not adequate, but ZDM is reviewing the annual budget allocation for this scheme to fast-track the implementation of bulk services.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns
- Sub-Supply Zones

LOCALITY:



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Hlahlindlela
Zululand District Municipality

DATE COMPLETED:
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MAP NO.:
DC26: Figure 5.3

5.3.2 Khambi Regional Water Supply Scheme

The Khambi Tribal Authority area is well-served with several small stand-alone schemes. (Esihlengeni, Kwamakweshe, Ngenetsheni, Cibilili and Ntumbane Community Water Supply schemes). Not all of these schemes however have had a sustainable water source. The integration of all the stand-alone schemes to this bulk service is completed.

The long-term planning was to supply water from the Coronation Dam to the Khambi area, but an in-depth study by ZDM concluded that the Coronation Dam will not be a sustainable solution for the long-term additional demand, and the cost per capita would be too high. ZDM is currently equipping sustainable local sources closer to Khambi area, which will result in a substantial saving in bulk infrastructure.

The Khambi Regional RWSS supplies water to communities located in the AbaQulusi LM and is made up of the following three schemes:

- ✓ Khambi Water Scheme;
- ✓ Enyathi Water Scheme; and
- ✓ Mountain View Water Scheme.

5.3.2.1 Khambi Water Scheme

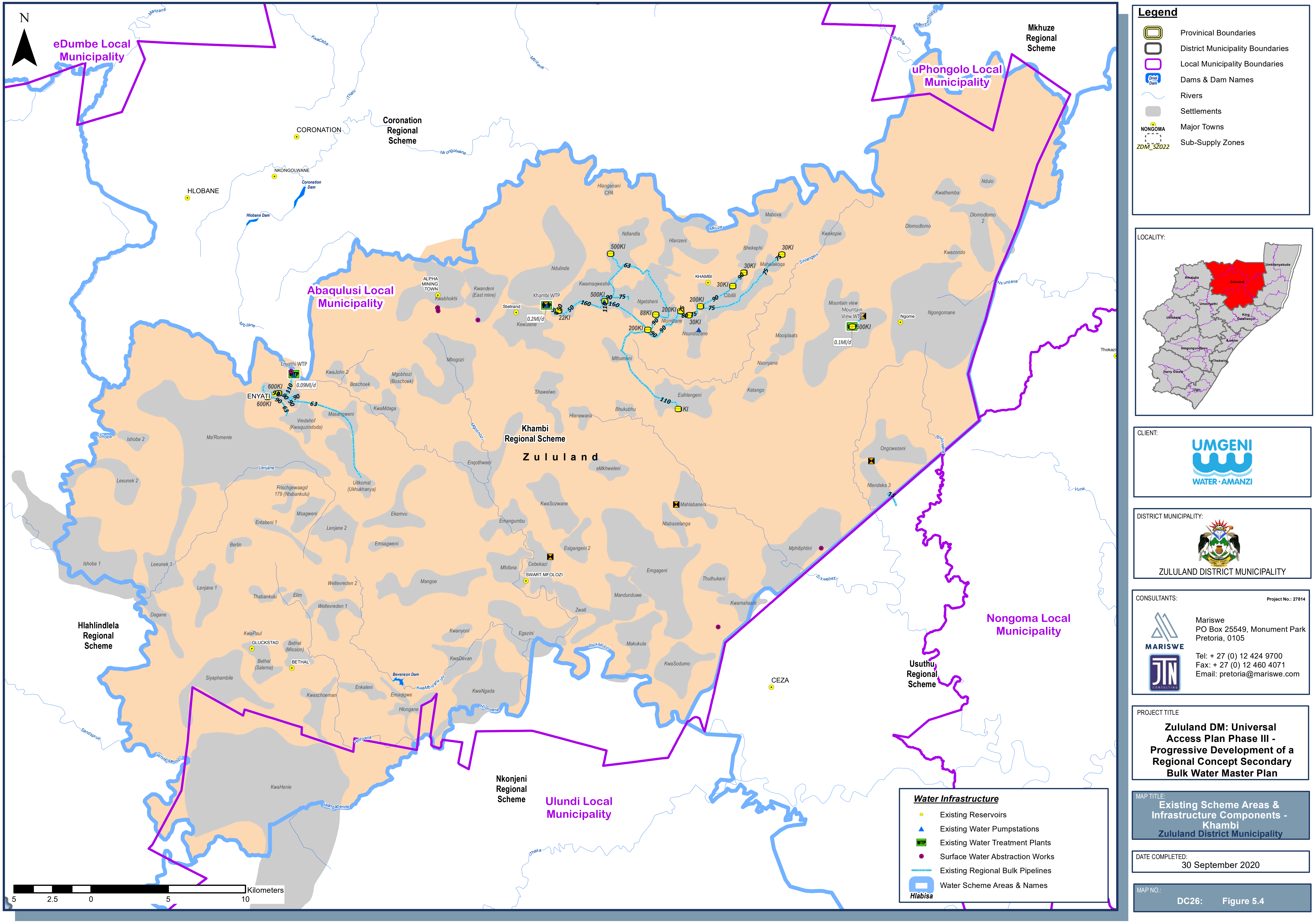
The Khambi WS supplies water to the Ngenetsheni community. Raw water is obtained through river abstraction on a tributary of the Mkuze River. Potable water is supplied to the Khambi WTP via a ø 100mm pipeline. The capacity of the treatment plant is 0.2Mℓ/day.

5.3.2.2 Enyathi Water Scheme

The Enyathi WS supplies water to the localised communities of Enyathi and Bloemendal. Raw water is abstracted from a weir on the Black Mfolozi River to the Enyahti WTP via a ø 200mm rising main. Potable water is supplied from the Enyathi WTP. Clear water is pumped from the WTP to a command reservoir via a 16mm diameter rising main. The capacity of the treatment plant is 0.09 Mℓ/day.

5.3.2.3 Mountain View Water Scheme

The Mountain View WS supplies water to the Salvation community. Raw water is obtained from a spring located on top of the mountain and pumped to the Mountain View WTP that has a capacity of 0.1Mℓ/day.



eDumbe Local Municipality
uPhongolo Local Municipality
Mkhuze Regional Scheme
Coronation Regional Scheme
CORONATION
NKONGOLWANE
HLOBANE
Abaqulusi Local Municipality
Khambi Regional Scheme
Zululand
Hlahlindlela Regional Scheme
Nkonjeni Regional Scheme
Ulundi Local Municipality
Nongoma Local Municipality
Usuthu Regional Scheme
CEZA
ENYATI
Enyathi WTP
Khambi WTP
KHAMBI
SWART MFOLOZI
GLUCKSTAD
BETHAL
NGOME
Kilometers
5 2.5 0 5 10
Legend
Provincial Boundaries
District Municipality Boundaries
Local Municipality Boundaries
Dams & Dam Names
Rivers
Settlements
Major Towns
Sub-Supply Zones
LOCALITY:
Water Infrastructure
Existing Reservoirs
Existing Water Pumpstations
Existing Water Treatment Plants
Surface Water Abstraction Works
Existing Regional Bulk Pipelines
Water Scheme Areas & Names
CLIENT:
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PROJECT TITLE
Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan
MAP TITLE:
Existing Scheme Areas & Infrastructure Components - Khambi
Zululand District Municipality
DATE COMPLETED:
30 September 2020
MAP NO.:
DC26: Figure 5.4

5.3.3 Coronation Regional Water Supply Scheme

The Coronation Regional Scheme consists of a few small and isolated towns and a number of scattered and very isolated rural settlements within formalised farm areas.

The original planned regional scheme is currently under revision. The Coronation Dam is not sustainable to supply Coronation Regional Scheme with additional water, and bulk services to the rural scattered settlements of Coronation area will be too costly to supply from a bulk infrastructure network. A revised Master Plan is currently in progress whereby stand-alone schemes from local sustainable sources will be developed to cover as many settlements as possible (ZDM Draft WSDP 2020/2021 Review). Once the stand-alone schemes have been developed, the Coronation RWSS will therefore fall away.

Currently, the communities within the AbaQulusi and Phongolo LMs are supplied by the following four water schemes:

- ✓ Louwsburg Water Scheme;
- ✓ Coronation Water Scheme;
- ✓ Hlobane Water Scheme; and
- ✓ Boreholes and Springs.

5.3.3.1 Louwsburg Water Scheme

The Louwsburg Water Scheme supplies water to Louwsburg town. The Louwsburg WTP receives raw water via a ø 100mm pumping main from a dam located on the edge of the town. The capacity of the WTP is 0.72Mℓ/day. Clear water is pumped from the treatment plant to a command reservoir via a ø 110mm rising main. The capacity of the command reservoirs is 0.6 Mℓ.

The town of Louwsburg within the Coronation regional scheme area have a water resource challenge that will not be easy to solve. The existing dam has a limited catchment and groundwater is difficult to find due to the locality of the town. Any possible solutions will be very costly and there is insufficient funding at this stage to address the issue. The town is also in need of waterborne sewage, but the water problems receives a higher priority at present.

5.3.3.2 Coronation Water Scheme

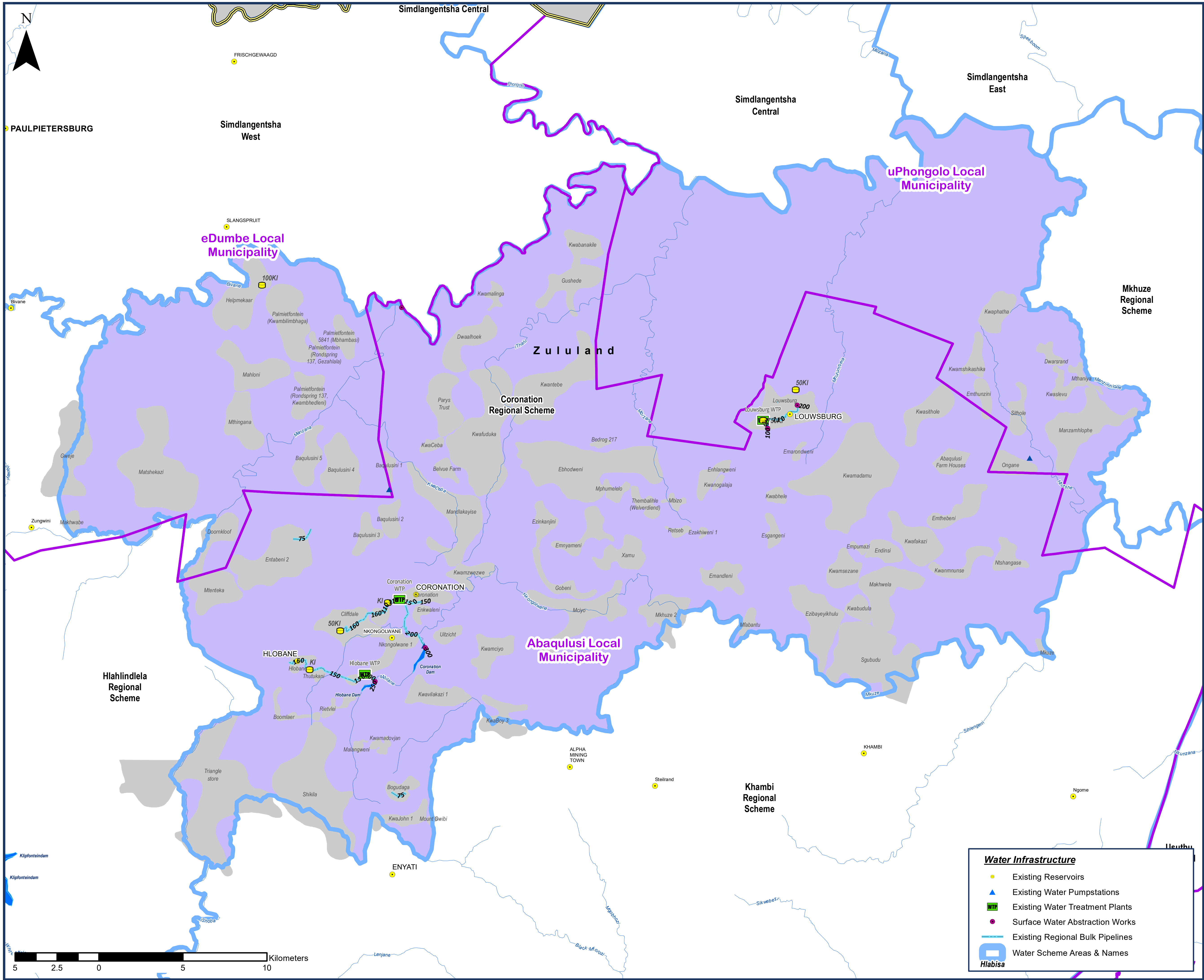
The Coronation Water Scheme supplies water to the coal mining town of Coronation and surrounding villages of Kengolanga, Shongololo and Thukuzele. The Coronation WTP receives raw water from the Coronation dam located on Mbilane River via a ø 200mm pumping main. The capacity of the WTP is 0.4Mℓ/day. Clear water is pumped from the treatment plant to a command reservoir via a ø 110mm rising main. The capacity of the reservoir is approximately 0.4Mℓ.

5.3.3.3 Hlobane Water Scheme

The Hlobane Water Scheme supplies water to the communities of Hlobane and Vaalbank from the Hlobane WTP. Raw water is sourced from Hlobane Dam located upstream of Coronation Dam on the Mbilane River to the Hlobane WTP via a ø200mm pumping main. The capacity of the Hlobane WTP 2.0Mℓ/day. Clear water is pumped from the treatment plant to a command reservoir via a ø 150mm rising main. The capacity of the command reservoir is approximately 0.4Mℓ.

5.3.3.4 Borehole Supply

Communities located to the south and west of Louwsburg town are mainly farming communities with pockets of localised rural communities. ZDM supplies water to these communities from localised sources such as boreholes and springs.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns
- Sub-Supply Zones

LOCALITY:

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DISTRICT MUNICIPALITY: ZULULAND DISTRICT MUNICIPALITY

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Coronation
Zululand District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: DC26: Figure 5.5

5.4.1 Simdlangenthsa West Regional Water Supply Scheme:

Simdhlangentsha West Regional Scheme supplies water to mainly rural communities to the east of Paulpietersburg town located in the eDumbe LM and is made up of the following two water schemes and boreholes:

- ✓ Simdlangentsha West Water Scheme;
- ✓ Paulpietersburg Town Water Scheme; and
- ✓ Borehole supply.

5.4.1.1 Simdlangenthsa West Water Scheme

The Simdlangentsha West WS supplies water to the town of Frischgewaagd and surrounding communities up to the Bivane River on the south. Water is supplied from the following water treatment plants namely the Frischgewaagd WTP, Tholakela WTP and Bivane WTP.

- ✓ The Frischgewaagd WTP receives raw water from the Phongolo River. The capacity of the treatment plant has been upgraded to 10 Mℓ/day. The current capacity of the rising main line from the existing weir in the Pongola River to the WTP is 2Mℓ/day
- ✓ The Tholakela WTP receives raw water from a tributary of the Phongolo River. The capacity of the treatment plant is 1.0Mℓ/day.
- ✓ The Bivane WTP (capacity of 1.0Mℓ/day) is owned and operated by the Impala Water User Association. Raw water is obtained from the Bivane Dam to supply the communities in the surrounding area. The storage capacity of the dam is 115.2 million m^3.

The WSDP reports that a new rising main line from the Pongola weir to Frischgewaagd will be constructed. The Frischgewaagd Water Treatment Plant will be relocated to the Pongola River Weir, and will provide treated water to Ezimbomvu, Tholakela, Mangosuthu and Opuzane. In the future Frischgewaagd will be restricted to 200 litres per day, with the option to register and pay for a higher level of service.

5.4.2 Paulpietersburg Town Water Scheme

The Paulpietersburg Town WS supplies water to the town of Paulpietersburg (also known as Dumbe Town). Raw water is obtained from Dumbe Dam located on the Egoda River and pumped to the Paulpietersburg WTP. The capacity of the treatment plant is 3Mℓ/day. The total storage capacity of the scheme is 5Mℓ.

N

SWAZILAND

Gert Sibande

Dr Pixley Ka Isaka Seme Local Municipality

Mkhondo Local Municipality

Simdlangentsha West

Simdlangentsha Central

uPhongolo Local Municipality

eDumbe Local Municipality

Zululand

Emadlangeni Local Municipality

Amajuba

Hlahlindlela Regional Scheme

Abaqulusi Local Municipality

Coronation Regional Scheme

LUNEBURG

PAULPIETERSBURG

Grootspruit

eDumbe WTP (Paulpietersburg)

3Ml/d

Frischgewaagd WTP

10Ml/d

Tholakele WTP

1Ml/d

SLANGSPRUIT

Ophuzane WTP

0.5Ml/d

Bivane

Bivane WTP

1Ml/d

Mpemvana

Zungwini

CORONATION

NKONGOLWANE

HLOBANE

Bloemveld Dam

eMagoda

Grootgewaagdam

Hlobane Dam

Coronation Dam

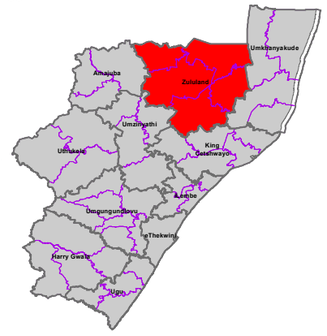
Kilometers

2.5 1.25 0 2.5 5

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns (NONGOMA)
- Supply Zones (ZDM_SZ022)

LOCALITY:



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Simdlangentsha West
Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 5.6

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Surface Water Abstraction Works
- Existing Weir
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names (Hlabisa)

5.5.1 Mandlakazi Regional Water Supply Scheme

The Mandhlakazi RWSS supplies water to communities located on the eastern side of the Nongoma LM. The Mandhlakazi Regional Scheme represents the second largest supply area in the district and also the second biggest portion of the total backlogs of the municipality. There are no towns in the supply area and the communities are sparsely scattered and vast distances apart. The provision of water services to all communities are therefore extremely expensive and will take a long time to conclude.

Water supply problems in the neighbouring Hlabisa area has resulted in a change of priorities and the construction of a bulk supply pipeline to supply the eastern side of Mandhlakazi and eventually reach the Hlabisa communities.

The RWSS is made up of two water schemes, namely:

- ✓ Mandlakazi Water Scheme; and
- ✓ Sidinsi Water Scheme.

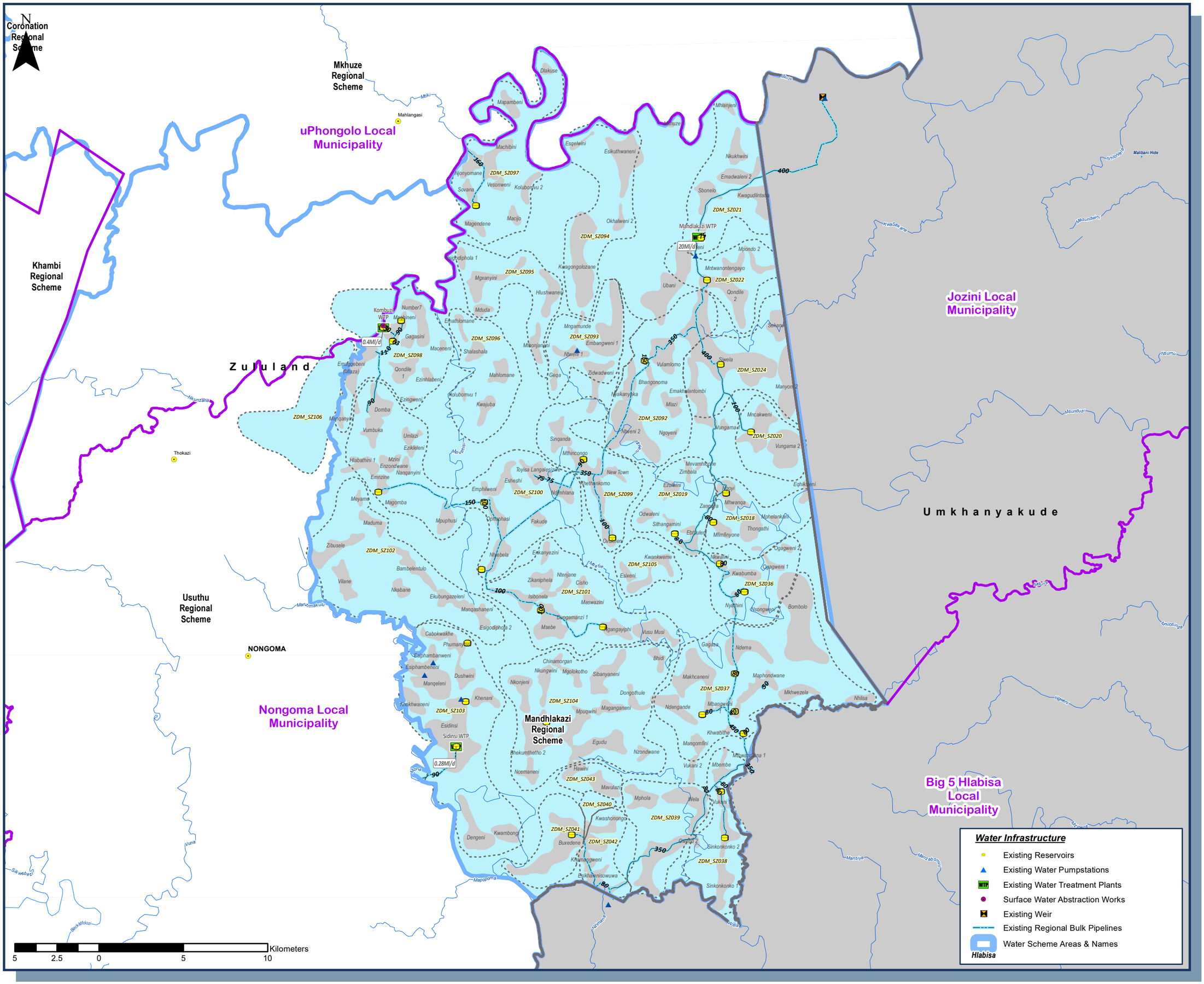
5.5.1.1 Mandlakazi Water Scheme

Raw water is being purchased from the Charl Senekal Trust in terms of a memorandum of agreement for treatment at Mandhlakazi WTP. Raw water is obtained from the weir upstream of Blackie Dam and pumped via a ø 350mm ductile iron rising main to the Mandhlakazi WTP which is located in Madulaleni community. ZDM does not have an abstraction facility at Pongolopoort Dam but an abstraction license for the Mandhlakazi Scheme has been submitted to DWS.

The Mandhlakazi WTP was upgraded to 20Mℓ/day but is only operating at 10 Mℓ/day as the Charl Senekal Trust can only supply 10 Mℓ/day. From the WTP, clear water is pumped in two stages via a ø 350mm rising main to a command reservoir. The two pump stations are fitted with pumps for lower water demands of 36 ℓ/s (1 Mℓ/day).

5.5.1.2 Sidinsi Water Scheme

Raw water is abstracted from the Mona River through two rudimentary installations to a booster installation. The booster installation has 3 X 10 000 litre jojo tanks that act as reservoirs where water is pumped to the WTP via a ø 90mm uPVC pipe. The Sidinsi (KwaMpanza) WTP has a capacity of 0.28Mℓ/day and is located in the south of the scheme area. The storage reservoirs consist of three (3) concrete reservoirs each with a capacity of approximately 120m³ (0.12Mℓ).



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:
Existing Scheme Areas & Infrastructure Components - Mandhlakazi
Zululand District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC26: Figure 5.7

5.5.2 Usuthu Regional Water Supply Scheme

The Usuthu Regional Scheme is the largest water supply scheme in the district and supplies almost the entire Nongoma LM and also represents the biggest portion of the total backlogs. The eastern part of the Nongoma LM is supplied from the Mandhlakazi RWSS.

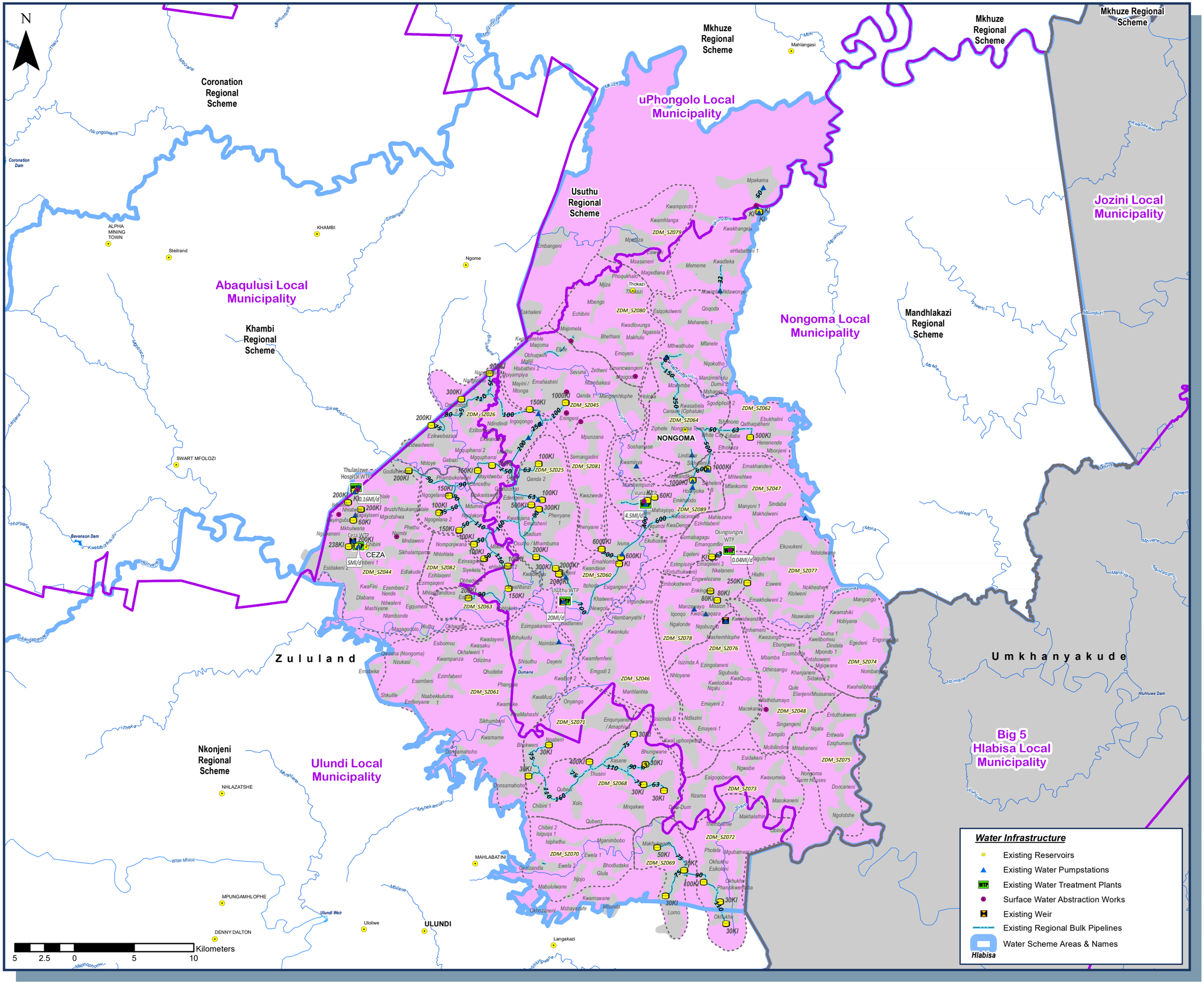
The scheme required the development of a new water source from the Black Mfolozi river and expensive bulk infrastructure to be rolled out over vast distances to scattered rural communities.

The area is served by five water treatment plants namely, Vuna WTP, Usuthu WTP, Ceza WTP, Thulasizwe WTP, and Osingisingini WTP. Embile WTP was recently decommissioned.

- ✓ The Vuna WTP receives raw water from the Vukwana Dam situated on the Vuna River, a tributary of the Black Mfolozi River. The capacity of the WTP is 4.5Mℓ/day and potable water is pumped from the WTP via a ø 400mm pumping main to a command reservoir. The WTP supplies water to the Nongoma town. The bulk storage capacity is 12Mℓ. A new terminal reservoir of 7Mℓ is still to be constructed next to the existing reservoirs that will provide the northern parts of the Usuthu Regional Scheme.
- ✓ The Ceza WTP obtains water from the weir located on the Vungu River, a tributary of the Black Mfolozi River. The surrounding communities in the area are also supplied from groundwater. The capacity of the treatment plant is 3Mℓ/day and potable water is pumped from the WTP via a ø 90mm pumping main to a command reservoir. The storage bulk storage capacity is 1.5Mℓ.
- ✓ The Usuthu WTP gets water from the Black Mfolozi River through river abstraction. The capacity of the WTP is upgraded to 20Mℓ/day and potable water is pumped from the treatment plant via a ø 90mm pumping main to two reservoirs in Nongoma town (3Mℓ and 4Mℓ).
- ✓ The Thulasizwe WTP is located north of the Ceza community. Raw water is received from the Sikwebezi River from where it is pumped to the WTP. Potable water is pumped from WTP via a ø 50mm pumping main to a command reservoir. The capacity of the WTP is 0.16Mℓ/day. The bulk storage capacity is 7Mℓ.
- ✓ The Osingisingini WTP supplies communities south of the town. Raw water is obtained from the Nhlekisa River where it is pumped to the WTP. The capacity of the WTP is 0.04Mℓ/day.

The existing rudimentary supply programme, whereby local groundwater sources are developed within 800m walking distance from households, was hampered in Usuthu area due to difficulty in finding reliable and good quality water sources close to communities. ZDM has initiated intermediate, stand-alone water schemes to address the delay in providing reticulation to communities. These intermediate schemes are developed from production boreholes where available and are designed in such a way that they can easily be integrated into the bulk services network in future (ZDM Draft WSDP 2020/2021 Review).

The sustainability of the main water source of Nongoma town is under severe strain and no longer sustainable during drought periods. The installation of a bulk pipeline from the Black Mfolozi river to Nongoma is currently in progress to address this issue. The internal bulks for Nongoma town will also be upgraded to augment the existing water supply.



Legend

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- Local Municipality Boundaries
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- Major Towns (NONGOMA)
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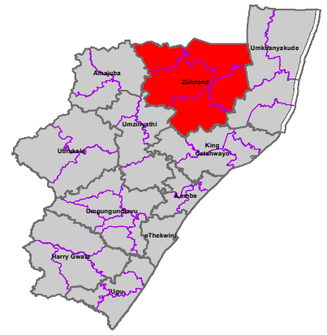
LOCALITY:



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PROJECT TITLE

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MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Usuthu
Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 5.8

Water Infrastructure

- Existing Reservoirs
- Existing Water Pumpstations
- Existing Water Treatment Plants
- Surface Water Abstraction Works
- Existing Weir
- Existing Regional Bulk Pipelines
- Water Scheme Areas & Names (Hlabisa)

5.6.1 Nkonjeni Regional Water Supply Scheme

The Nkonjeni RWSS supplies water to communities located in the Ulundi LM and is made up of three water schemes namely:

- ✓ Greater Ulundi Water Scheme;
- ✓ Babanango Water Scheme; and
- ✓ Mpungamhlophe Water Scheme.

5.6.1.1 Greater Ulundi Water Scheme

The Greater Ulundi Water Scheme supplies water to the Ulundi town and surrounding communities. Water is sourced from the Ulundi Weir situated on the White Mfolozi River. Water is released from the Klipfontein Dam near Vryheid, 71km away and meanders for 144km along the river to the weir. The Klipfontein Dam supply both domestic water to Vryheid and Ulundi as well as irrigation water for the farmers downstream of the dam. The surrounding communities are also supplied from groundwater.

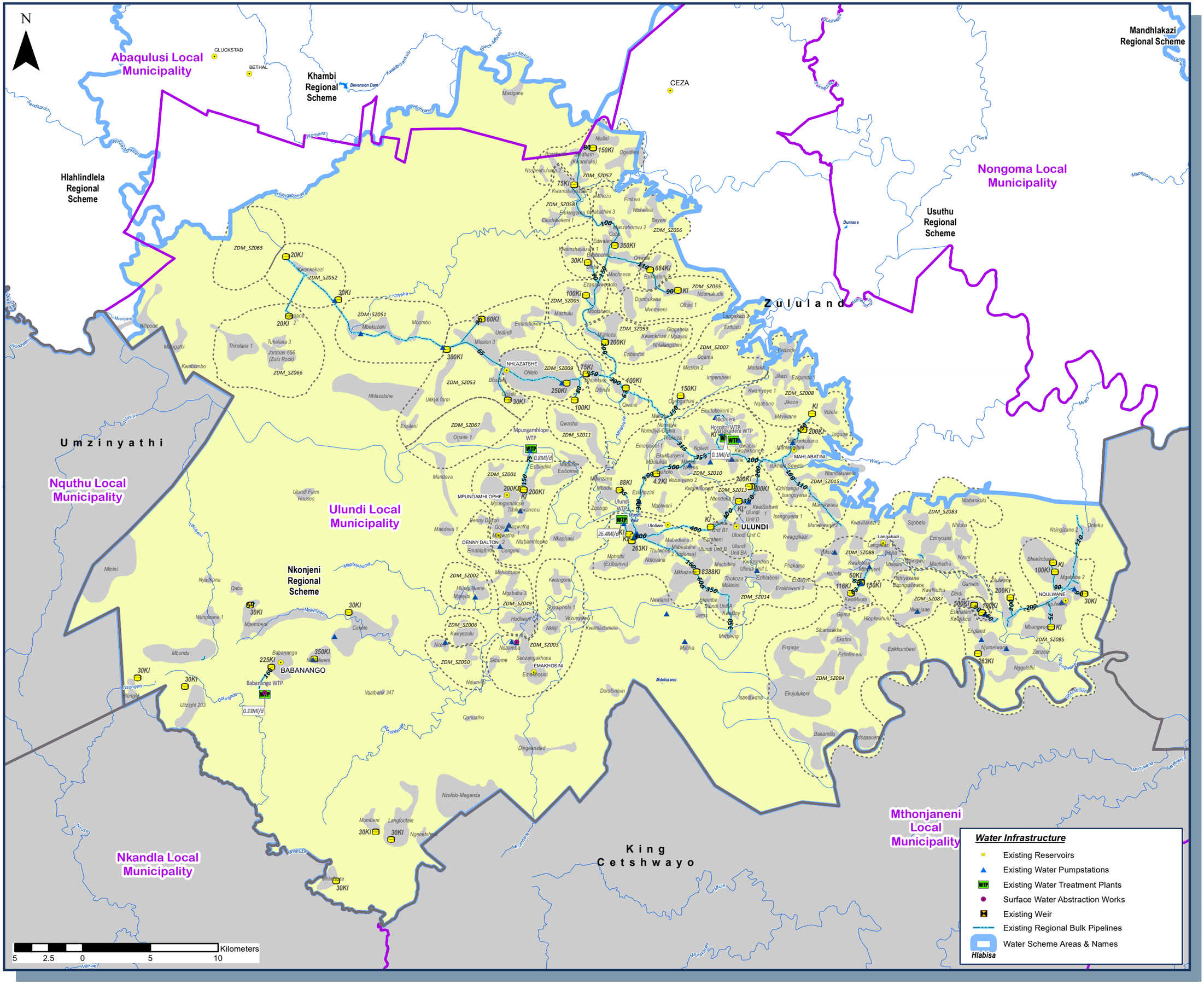
Clear water is pumped from the Ulundi WTP to a command reservoir via a ø 500mm rising main. The capacity of the WTP is 26.4Mℓ/day. The capacity of the storage reservoirs is 27Mℓ.

5.6.1.2 Babanango Water Scheme

The Babanango WTP receives raw water from the weir situated on the Gologodo River, a tributary of the Mhlatuze River. The capacity of the WTP is 0.33Mℓ/day. Clear water is pumped from the treatment plant to a command reservoir via a ø 160mm rising main. The capacity of the storage reservoirs is 0.65Mℓ.

5.6.1.3 Mpungamhlophe Water Scheme

The Mpungamhlophe WTP is situated 17km upstream of the White Mfolozi River along the river course. The capacity of the WTP is 0.8 Mℓ/day. Clear water is pumped from the treatment plant to a command reservoir via a ø150mm rising main. The capacity of the storage reservoirs is 0.65 ℓ.



Legend

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- Dams & Dam Names
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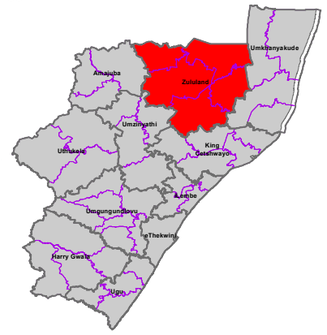
- Sub-Supply Zones (ZDM_SZ022)

LOCALITY:



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Nkonjeni
Zululand District Municipality

DATE COMPLETED:
30 September 2020

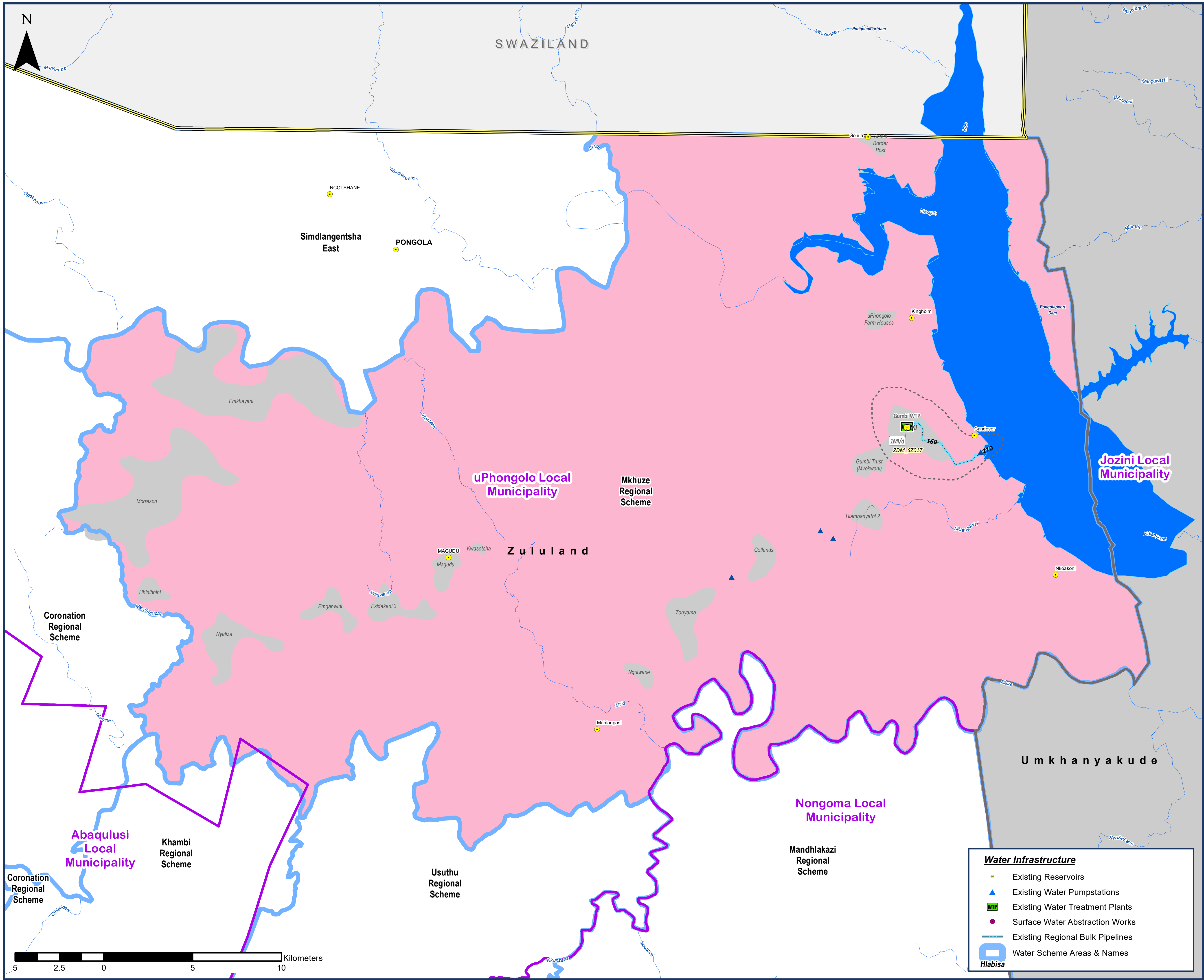
MAP NO.:
DC26: Figure 5.9

5.7.1 Mkuze Regional Water Supply Scheme

The Mkuze Regional Water Supply Scheme supplies water to communities on the eastern end of the uPhongolo LM next to the Phongolo Dam west of the N2. The area covered by the scheme is vast stretching to the west to included portions of Ithala Game Reserve. The Mkuze Regional Scheme area comprises of mostly formal farm areas and a small number of sparsely scattered rural communities. The construction of a single regional scheme to supply the entire footprint is not feasible, but rather individual schemes from local sources (ZDM WSDP 2020/2021 Review). Groundwater sources in the area are also of poor quality and insufficient yield to sustain large scale development.

Raw water is pumped from the Phongolo Dam to the Gumbi WTP via a ø 160mm pumping main. An existing land reform project at the Gumbi settlement has resulted in a dramatic influx of families that settled without any water or sanitation infrastructure being in place. This resulted in the construction of an emergency supply from the neighbouring Pongolapoort Dam. The abstraction point at the dam is however not ideal and in future a second abstraction point from a more ideal position should be investigated.

The capacity of the Gumbi WTP is 1Mℓ/day. Clear water is stored in a reservoir at the water treatment plant.



Legend

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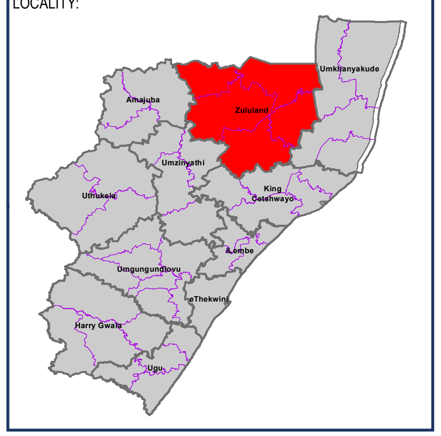
LOCALITY:



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Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Mkhuze Zululand District Municipality

DATE COMPLETED:
30 September 2020

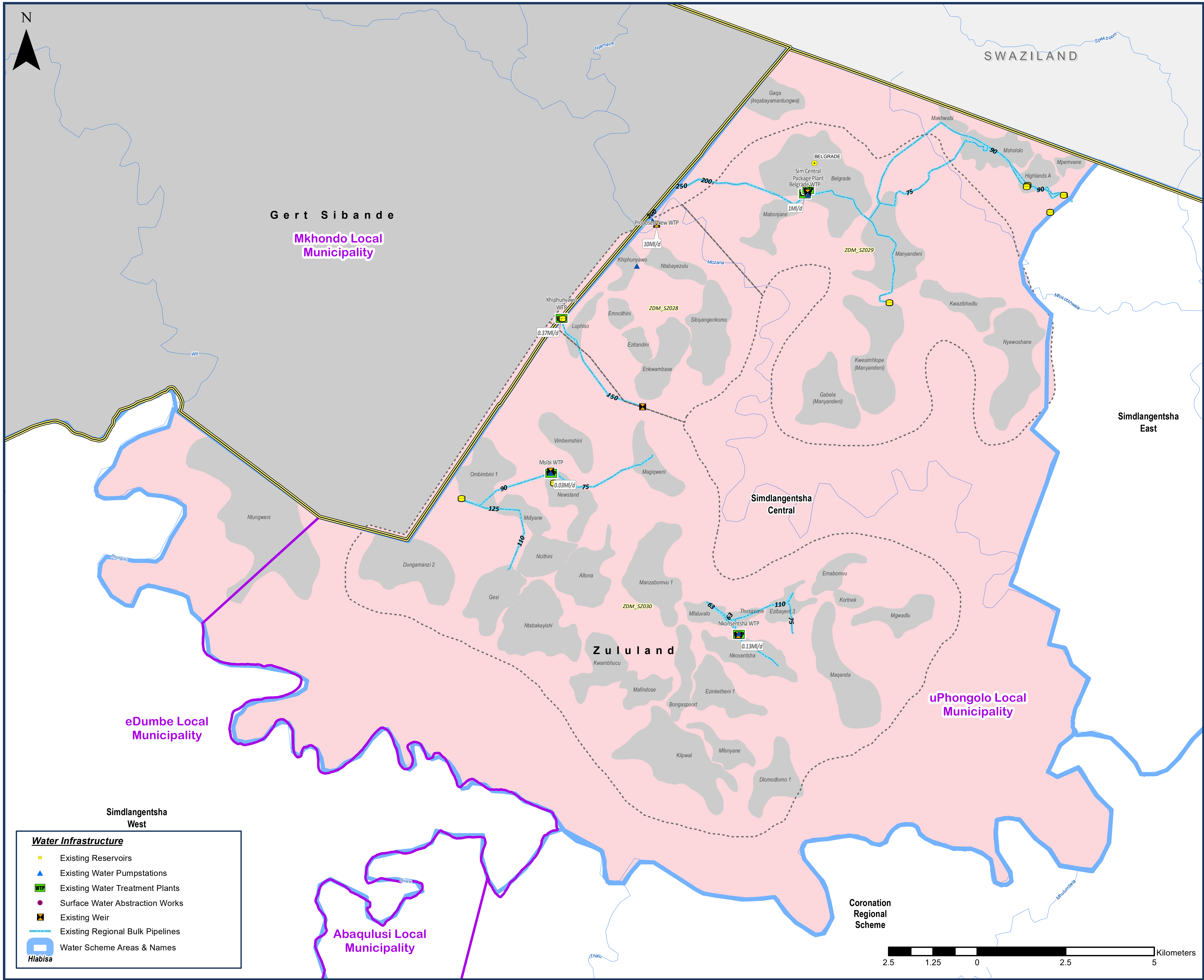
MAP NO.:
DC26: Figure 5.10

5.7.2 Simdlangentsha Central Regional Water Scheme

The Simdlangentsha Central (Belgrade) RWSS is supplied from two sources namely a weir in the Mozana River and a small dam in the tributary of Mozana River near the Belgrade WTP. A new Sim Central Package Plant was built for Regional Scheme next to the Belgrade Package Plant. Both Package Plants supply treated water to the township and surrounding communities. Although the area is generally well-served, all schemes are old, and the regional scheme planning will include infills to provide water to additional households.

Raw water is pumped from the abstraction works at the weir on the Mozana River through a pumping main via a 250mm diameter iron pipeline to the Belgrade WTP and located in the rural town. The capacity of the Belgrade Package Plant is 1.0 Mℓ/day, and the new Sim Central Package Plant is 4Mℓ/day. Although the total capacity is 5Mℓ/day, only 4Mℓ/day is available for Simdlangentsha Central. The existing Sim Central Package Plant (4Mℓ/day) is running at full capacity and cannot supply the remaining regional supply area as it also supplies the northern section of Simdlangentsha East. Simdlangentsha East does not receive adequate water all the way from the Pongola abstraction works.

Clear water is pumped from the WTP and Package Plant via a ø 250mm pipeline to a 2.5 Mℓ command reservoir. There are three other small package water treatment plants that serve localised communities. These plants are namely Khiphunyawo WTP, Nkosentsha WTP and Msibi WTP. They are currently producing 0.37Mℓ/day, 0.13Mℓ/day and 0.03Mℓ/day, respectively.



N
Gert Sibande
Mkhondo Local Municipality
SWAZILAND
Simdlangentsha East
Simdlangentsha Central
Simdlangentsha West
Zululand
eDumbe Local Municipality
uPhongolo Local Municipality
Abaqulusi Local Municipality
Coronation Regional Scheme
ZDM_SZ028
ZDM_SZ029
ZDM_SZ030
Belgrade WTP
Sim Central Package Plant
Proposed New WTP
Khiphunyawo WTP
Msibi WTP
Nkosentsha WTP
1Ml/d
10Ml/d
0.37Ml/d
0.03Ml/d
0.13Ml/d
Water Infrastructure
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Existing Regional Bulk Pipelines
Water Scheme Areas & Names
Hlabisa
2.5 1.25 0 2.5 5 Kilometers

Legend

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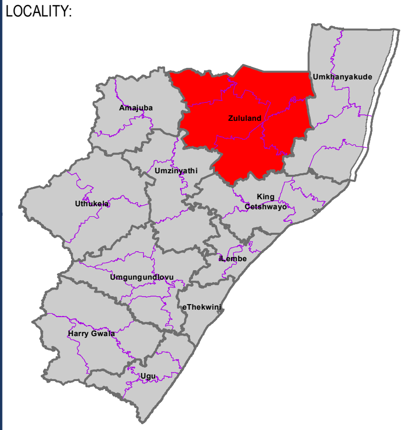

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Simdlangentsha Central Zululand District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC26: Figure 5.11

5.7.3 Simdlangentsha East Regional Water Scheme

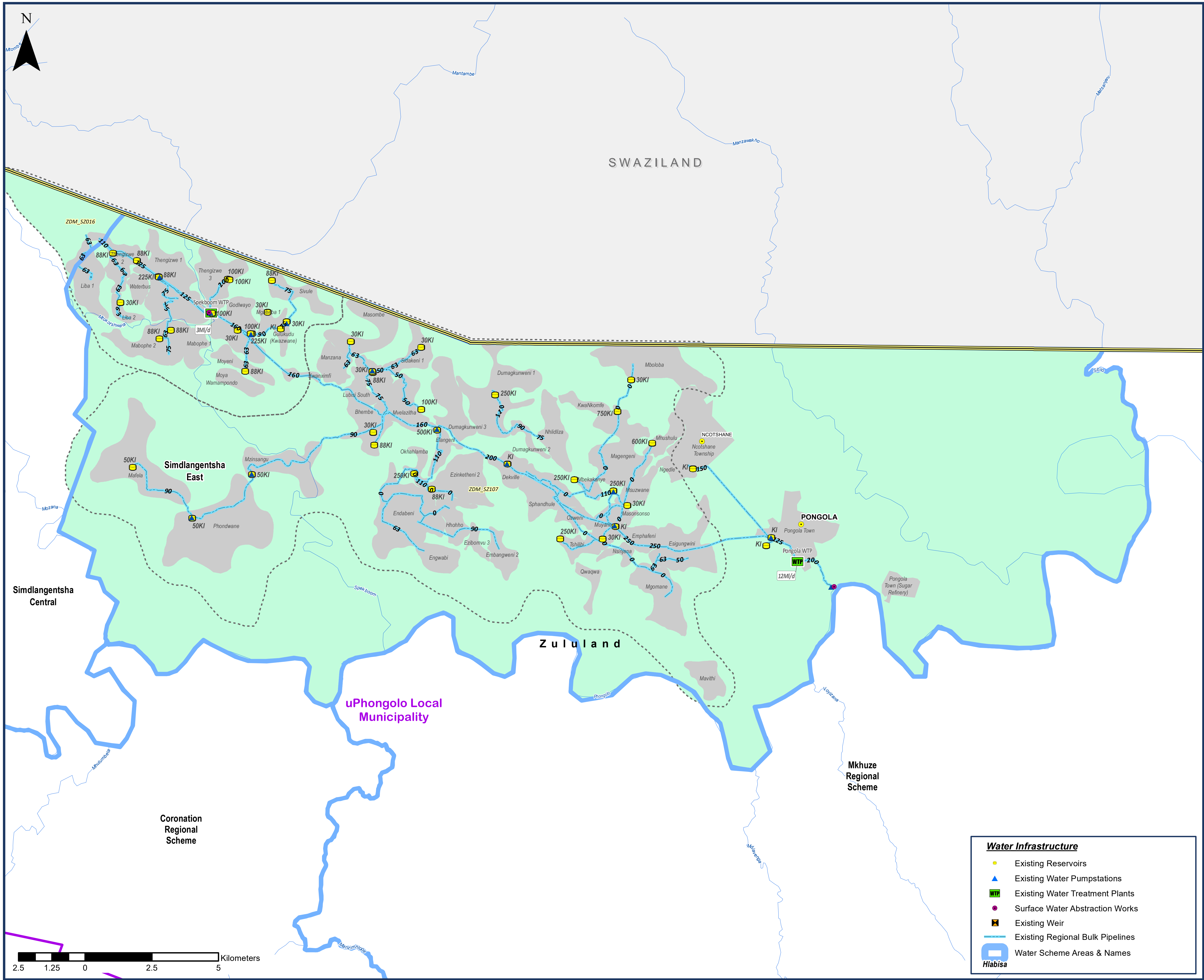
The Simdlangentsha East Regional Scheme is a well-served area. The Simdlangethsa East RWSS supplies water to the town of Phongolo as well as a vast rural area which stretches from the border with Swaziland in the north, the communities of Manyandeni and Highlands to the east and the Pongola River to the south and Spekboom to the west.

Raw water is abstracted from irrigation channels next to the Pongola River and is gravitated via a 300mm diameter pumping main into the Phongola WTP. The capacity of the Phongola WTP is 12Mℓ/day. Treated water is pumped via ø 300mm cast iron and ø 355mm PVC pipelines to command reservoirs. The capacity of the existing reservoirs is 9.5Mℓ.

The Spekboom WTP is a Wataka package plant with a capacity of 1.28Mℓ/day and receives raw water from direct abstraction from the Spekboom River. The Spekboom WTP is to be upgraded to 3Mℓ/day.

The irrigation channels are managed by DWS and the supply is mostly reliable except when the channels are closed for maintenance. ZDM pays DWS a raw water charge for water abstracted from the channels.

Water supply in the rural areas is under severe pressure with frequent interruptions to the supply. The bulk infrastructure needs to be upgraded as a result of population growth since the inception of the scheme. Excessive water usage and high water losses due to illegal and unmetered connections are contributing to the pressure of supplying water in the rural areas. Apart from the above problems the bulk infrastructure is also in need of upgrade as a result of population growth since the inception of the scheme. The upgrading of the existing bulk infrastructure for the southern part of the scheme is in progress.



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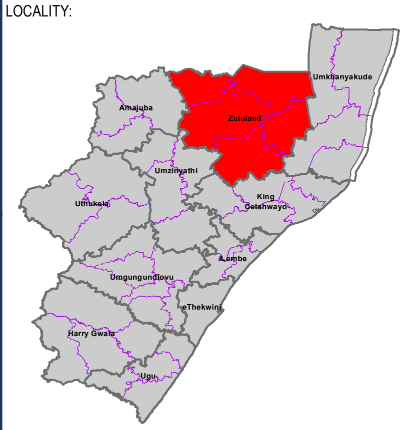

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UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Scheme Areas & Infrastructure Components - Simdlangentsha East Zululand District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC26: Figure 5.12

6. EXISTING SANITATION BULK INFRASTRUCTURE

6.1 SANITATION SERVICE LEVEL

ZDM provides sanitation in the rural areas in the form of dry-pit VIP toilets. Implementation is done according to the ZDM Prioritisation Model for rural sanitation services.

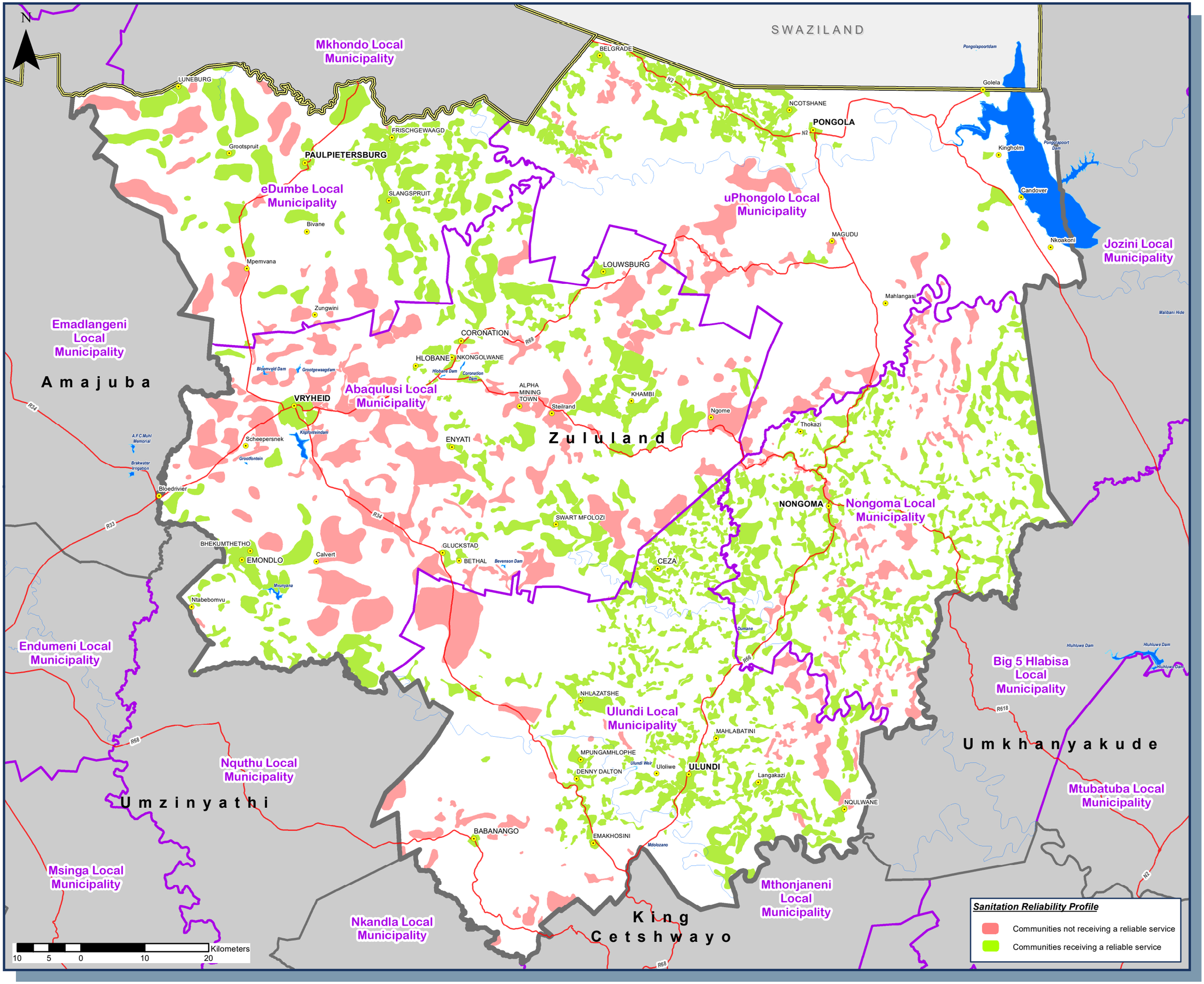
A Rural Sanitation Replacement Programme has also been initiated in 2013 to replace the old Archloo-, Block- and Zink-type VIPs. This programme's implementation will be included in the next 5-year review of the WSDP (ZDM Draft WSDP 2020/2021 Review).

The current sanitation backlog is at 16.66% as illustrated in the ZDM WSDP 2020/2021 and in Table 6-1 below. However, settlements are continuously expanding, and household growth will maintain an increase in the future. New settlements data were received in February 2020 and shows a sanitation backlog of **13%**.

Table 6-1: Sanitation Backlogs within Zululand District Municipality

Sanitation	Total Households	Backlogs	% Backlogs in LM
AbaQulusi	47 119	8 098	17.19%
eDumbe	17 641	1 288	7.30%
Nongoma	44 376	10 755	24.24%
Ulundi	44 987	3 222	7.16%
uPhongolo	29 519	7 223	24.47%
Total	**183 642**	**30 586**	**16.66%**

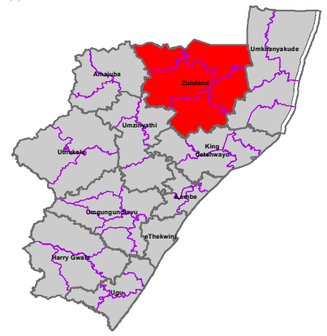
Source: ZDM Draft WSDP 2020/2021 Review



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- National Roads
- Main Roads
- Dams & Dam Names
- Rivers
- Settlements
- NONGOMA — Major Towns

LOCALITY:



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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Sanitation Reliability Profile

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 6.1

The ZDM has adopted the following free basic sanitation policy:

Table 6-2: Free Basic Sanitation Policy

Level of Water Service	Definition	Free Basic Sanitation Policy
Waterborne sewage	Unrestricted connection to municipal sewerage system	Included in free basic water allocation
Septic tank or similar facility	On-site disposal (self-treatment)	No charge
Conservancy tank	Localised sewage temporary storage facility	No charge to selected households in specific areas as determined by the municipality, aligned to free basic water policy for service level DW4
Ventilated Improved Pit (VIP)	Dry pit with sufficient capacity on-site disposal based on set standards	No charge

Source: ZDM WSDP 2020/2021 Review

Table 6-3 below indicates the number of urban and rural consumers having access to sanitation according to the level of service ZDM provides.

Table 6-3: Residential Consumers: Access to Sanitation

	None or Inadequate (Excl. Infills/Replacements)	VIP	Septic tank	Waterborne	TOTALS
		RDP	RDP	>RDP	
AbaQulusi LM	0	0	1035	14 965	16 000
eDumbe LM	0	2981	498	1 979	5 458
Nongoma LM	0	283	0	349	632
Ulundi LM	0	635	0	5 277	5 912
uPhongolo LM	0	698	0	3 311	4 009
Total (urban)	**-**	**4 597**	**1 533**	**25 881**	**32 011**
AbaQulusi LM	8 098	22 597	424	0	31 119
eDumbe LM	1 288	10 629	266	0	12 183
Nongoma LM	9 854	33 890	0	0	43 744
Ulundi LM	2 123	36 900	52	0	39 075
uPhongolo LM	7 223	17 951	336	0	25 510
Total (rural)	**28 586**	**121 967**	**1 078**	**0**	**151 631**
Total (households)	**28 586**	**126 564**	**2 611**	**25 881**	**183 642**

Source: ZDM Draft WSDP 2020/2021 Review

6.2 EXISTING SANITATION BULK INFRASTRUCTURE

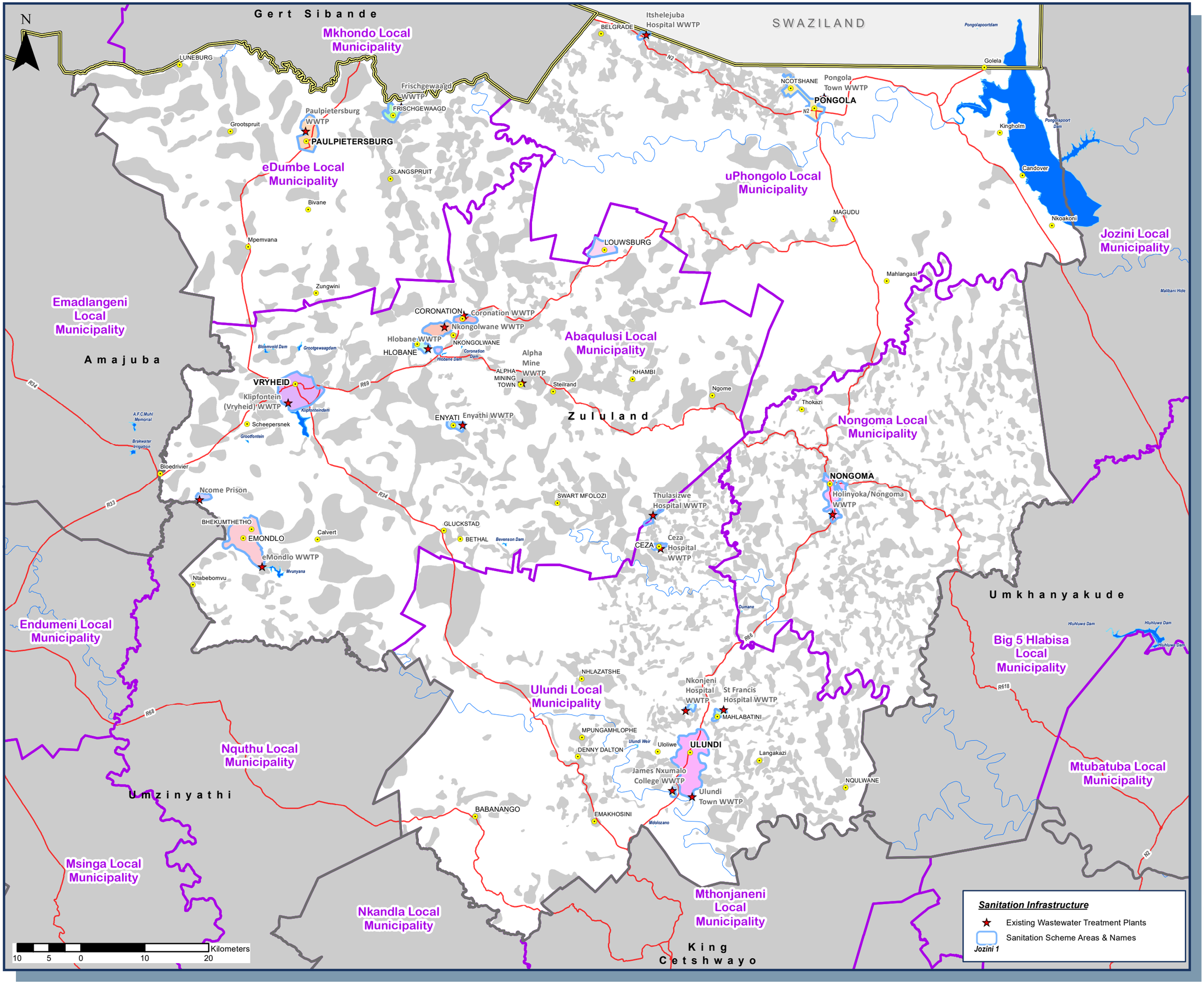
Planning is required in the urban areas to confirm the suitability of the bulk infrastructure, especially with regards to increased pressures on the infrastructure due to an increasing urbanisation trend that has been occurring and also to allow for future growth in population.

ZDM is currently updating its assessments on al wastewater treatment plants. Eighteen wastewater treatment plants were assessed and are listed in Table 6-4 below and is illustrated in.

Table 6-4: List of Wastewater Treatment Plants

Local Municipality	WWTP Name	Capacity Mℓ/day
AbaQulusi Local Municipality	Alpha Mine WWTP	0
	Coronation WWTP	1
	eMondlo WWTP	4
	Enyathi WWTP	0
	Hlobane WWTP	3
	Klipfontein (Vryheid) WWTP	9
	Nkongolwane WWTP	0.25
	Thulasizwe Hospital WWTP	0.03
eDumbe Local Municipality	Frischgewaagd WWTP	0.08
	Paulpietersburg WWTP	0.45
Nongoma Local Municipality	Holinyoka/Nongoma WWTP	3
Ulundi Local Municipality	Ceza Hospital WWTP	0.14
	James Nxumalo College WWTP	0.08
	Nkonjeni Hospital WWTP	0.12
	St Francis Hospital WWTP	0.12
	Ulundi Town WWTP	3
uPhongolo Local Municipality	Itshelejuba Hospital WWTP	0.11
	Pongola Town WWTP	3.6

Source: DWS Reference Framework, February 2020



Legend

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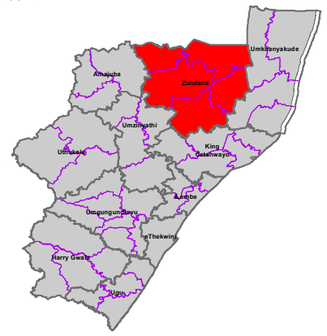

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Existing Sanitation Infrastructure

Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

DC26: Figure 6.2

7. BULK WATER SUPPLY PROJECTS CURRENTLY IN PLANNING

The existing funding grants for the municipal capital projects and operating subsidies for water services are mainly funded by the Municipal Infrastructure Grant (MIG) followed by the Regional Bulk Infrastructure Grant (RBIG) and the Water Services infrastructure Grant (WSIG). The main objective of MIG is to assist WSAs by providing grant funding in removing the backlog concerning basic municipal services to poor households. RBIG focusses on the infrastructure required to connect or augment the water resource on a macro[2] or sub regional [3] scale (over vast distances [4]), with internal bulk and reticulation systems or any bulk supply infrastructure that may have a significant impact on water resources in terms of quantity and quality. The bulk infrastructure that would have a "significant impact on water resources" includes:

- ✓ Any bulk scheme that is designed for maximum demand of 5Mℓ/day or more;
- ✓ Any wastewater treatment plant that discharges into a freshwater resource system; and
- ✓ Any water treatment plant that is designed for a maximum demand of more than 2Mℓ/day.

For the purpose of this study, the existing regional bulk projects were considered and evaluated to identify potential gaps within the existing project footprints to the extent that a total "wall-to-wall" bulk water services needs perspective is visualised and realised. This must be done in the context to improve access to basic services but at the same time support economic growth and development and ensure sustainable services.

This Chapter provides a brief overview of existing and planned bulk water infrastructure projects sourced from the ZDM 2019/2020 WSDP Review. The ZDM has the following implementation programmes in place in terms of water provision.

- ✓ Regional Water Supply Schemes;
- ✓ Intermediate Stand-alone Schemes; and
- ✓ Rudimentary Water Supply Schemes.

7.1 REGIONAL BULK WATER PROJECTS IN PLANNING

The ZDM mainly receives their funding from MIG and WSIG. Only two regional bulk infrastructure projects receive funding from RBIG.

The funding streams for infrastructure development over the next three years are tabled in Table 7-1.

[2] "Macro" is defined as infrastructure serving extensive areas across multi-municipal boundaries

[3] "Sub-regional" is defined as large regional bulk infrastructure serving numerous communities over a large area normally within a specific district or local municipal area

[4] Over "vast distances" is considered as any distances greater than 5km

Table 7-1: Grant Funding Streams

Grant Funding Programme	2019/2020 (R '000)	2020/2021 (R '000)	2021/2022 (R '000)	Total Funding over Next 3 Financial Years (R'000)
Municipal Infrastructure Grant (MIG)	R225 574	R238 887	R258 040	**R722 501**
Water Services Infrastructure Grant (WSIG)	R100 000	R105 500	R110 000	**R315 500**
Regional Bulk Infrastructure Grant (RBIG)	R163 774	R133 774	R200 000	**R497 548**
Total: Zululand District Municipality	**R489 348**	**R478 161**	**R568 040**	**R1 535 549**

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

Table 7-2 indicates the RBIG funding allocated for the next three financial years to two bulk projects within ZDM.

Table 7-2: RBIG Funding in terms of DORA for ZDM

Project Code	Local Municipality	Project Name	2019/2020(R '000)	2020/2021(R '000)	2021/2022(R '000)
KNR001	Nongoma Local Municipality	Nongoma Bulk Water Scheme	R73 774	R33 774	R0
KNR002	uPhongolo and Nongoma Local Municipalities	Mandhlakazi Bulk Water Supply	R90 000	R100 000	R200 000
Total Zululand District Municipality			**R163 774**	**R133 774**	**R200 000**

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

The funding allocations as presented in DORA, is presented in Table 7-3 below.

Table 7-3: Three-Year Medium-Term Expenditure Framework (MTEF) per Local Municipality in ZDM

LM Name	Municipal Infrastructure Grant (MIG)			Water Services Infrastructure Grant (WSIG)		
	2019/2020(R '000)	2020/2021(R '000)	2021/2022(R '000)	2019/2020(R '000)	2020/2021(R '000)	2021/2022(R '000)
Zululand District Municipality	R225 574	R238 887	R258 040	R100 000	R105 500	R110 000

Source: Division of Revenue Bill Schedule (DORA), 2019/2020

The following tables provide an overview of projects ZDM is planning for the regional schemes per financial year.

Table 7-4: Roll-Out of Regional Water Infrastructure Projects for the Hlahlindlela RWSS

Regional Scheme	Financial Year	Description	Cost
Hlahlindlela	On Hold	Bulks, secondary bulk, storage, pump stations, bulk supply connections	R206 796 339

Source: ZDM WSDP 2019/2020 Review

The projects for Hlahlindlela Regional Scheme are on hold due to water shortages.

Table 7-5: Roll-Out of Regional Water Infrastructure Projects for the Mandhlakazi RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Mandhlakazi	2019/2020	Bulks	Bulks to Zones and bulk upgrades	R268 000 000
	2020/2021	Bulks	Bulks to Zones and bulk upgrades (10ML to 20ML)	R16 000 000
	>2022	Bulk upgrades	Bulks to Zones	R138 000 000
	2024	Bulk upgrades	Bulk upgrades (20ML to 30ML)	R25 000 000
Total				**R447 000 000**

Source: ZDM WSDP 2019/2020 Review

Table 7-6: Roll-Out of Regional Water Infrastructure Projects for the Nkonjeni RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Nkonjeni	2021/2022	Bulks	Gravity mains	R17 132 452
	>2022	Bulks, storage, pump stations	New reservoirs & pump stations, gravity mains	R134 549 360
Total				**R151 681 812**

Source: ZDM WSDP 2019/2020 Review

Table 7-7: Roll-Out of Regional Water Infrastructure Projects for the Simdlangentsha Central RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Simdlangentsha Central	2019/2020	Storage	New bulk regional reservoirs	R9 236 918
	2021/2022	Storage, bulks	Regional bulk pipelines and raw water reservoir	R6 716 493
	>2022	Storage, bulks, break pressure tanks	Regional bulk pipelines, new bulk reservoirs and break pressure tank	R7 987 794
Total				**R23 941 205**

Source: ZDM WSDP 2019/2020 Review

Table 7-8: Roll-Out of Regional Water Infrastructure Projects for the Simdlangentsha East RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Simdlangentsha East	2019/2020	Bulks, storage	Upgrade of rising main and pipelines and new reservoirs for reticulation	R12 665 254
	2021/2022	Storage, bulks	New reservoirs for reticulation and upgrade of rising main and pipelines	R8 926 617
Total				**R21 591 870**

Source: ZDM WSDP 2019/2020 Review

Table 7-9: Roll-Out of Regional Water Infrastructure Projects for the Simdlangentsha West RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Simdlangentsha West	2019/2020	Bulks, pump stations	Upgrade pump station and new rising main to bulk reservoirs	R6 109 678
	2020/2021	Bulks	Upgrade of rising main and pipelines and new reservoirs for reticulation	R13 327 036
	>2022	Bulks, storage, pump stations, bulk supply connections	New regional reservoirs, new regional bulk pipelines and bulk supply connections	R94 538 028
Total				**R113 974 742**

Source: ZDM WSDP 2019/2020 Review

Table 7-10: Roll-Out of Regional Water Infrastructure Projects for the Usuthu RWSS

Regional Scheme	Financial Year	Infrastructure Type	Description	Cost
Usuthu	>2022	Storage, secondary bulks, bulks, break pressure tanks, source/abstraction, upgrade of WTPs	Bulk gravity mains to reservoirs, secondary bulks, new reservoirs and pump stations, off-storage dam	**R582 779 350**

Source: ZDM WSDP 2019/2020 Review

8. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

A gap analysis has been undertaken for the water schemes in the ZDM. The gap analysis has taken into account current planning interventions by the WSA. In this regard, the entire ZDM has been demarcated into regional water schemes in line with short and long term plans by the WSA. Ten (10) regional schemes have been identified and are as follows:

- ✓ ZUL001: Coronation;
- ✓ ZUL002: Hlahlindlela;
- ✓ ZUL003: Khambi;
- ✓ ZUL004: Mandhlakazi;
- ✓ ZUL005: Mkuze;
- ✓ ZUL006: Nkonjeni;
- ✓ ZUL007: Simdlangentsha Central;
- ✓ ZUL008: Simdlangentsha East;
- ✓ ZUL009: Simdlangentsha West;
- ✓ ZUL010: Usuthu.

The gap analysis for the ten (10) regional schemes is discussed under this section.

8.1 ZUL001: CORONATION SCHEME

UAP Phase II recommended the upgrade of the Coronation WTPs, construction of a ø 200mm X 0.9km long clear water rising pipeline from Coronation WTW to the existing command reservoir site, the construction of 4Mℓ storage reservoir and the raw and clear water conveyance to the value of approximately R65.6 million. UAP Phase II also suggested the upgrade of Louwsburg WTP, bulk raw and clear water conveyance and the raising of the Louwsburg Dam wall to the value of R67.3. However, the original planned regional scheme is currently under revision. The Coronation Dam is not sustainable to supply the Regional Scheme with additional water, and bulk services to the rural scattered settlements of Coronation area will be too costly to supply from a bulk infrastructure network. A revised Master Plan is currently in progress whereby stand-alone schemes from local sustainable sources will be developed to cover as many settlements as possible. Once the stand-alone schemes have been developed, the Coronation RWSS will therefore fall away.

No projects are currently planned as the Coronation scheme is under revision and the scheme has water source challenges.

In evaluating whether the existing infrastructure would meet the demand for 2050, the current water source is insufficient. UAP Phase III proposes that once a new source has been identified, the water treatment plant would need to be upgraded and the bulk distribution and storage be increased.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. The comparison is provided in Table 8-1..

Table 8-1: Coronation Gap Analysis

Coronation	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	0.4	2.6
Storage Capacity (Mℓ)	0.8	8.6
Bulk Conveyance (Mℓ/day)	10.83	14.22

8.2 ZUL002: HLAHLINDLELA SCHEME

UAP Phase II recommended the raising of the Klipfontein Dam wall (in two phases), additional bulk storage and bulk clear water conveyance from the Klipfontein WTP to eMondlo to the value of R646.3 million. However, all bulk supply and bulk supply connections, storage and pump station projects currently planned for the Hlahlindlela Scheme has been put on hold due to water shortages.

The current water source is insufficient and for the existing infrastructure to meet the demand for 2050, which totals to approximately 55Mℓ/day, UAP Phase III proposes that the storage and bulk distribution be increased once an adequate water source has been identified.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. The comparison is provided in Table 8-2 below.

Table 8-2: Hlahlindlela Gap Analysis

Hlahlindlela	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	73.12	-
Storage Capacity (Mℓ)	18.5	35.35
Bulk Conveyance (Mℓ/day)	31.7	40

8.3 ZUL003: KHAMBI SCHEME

The Khambi Regional RWSS supplies water to communities located in the AbaQulusi LM and is made up of the Khambi Water Scheme; Enyathi Water Scheme; and the Mountain View Water Scheme. Raw water is obtained through river abstraction.

The integration of all the stand-alone schemes to the bulk regional scheme has been completed although the scheme does not have a sustainable water source. It was planned that the Khambi scheme will be supplied by the Coronation Dam, but the dam is not a sustainable solution for the long-term additional demand.

UPA Phase II indicated that the existing infrastructure is adequate, however, to meet the 2050 demand (6.81Mℓ/day), UAP Phase III proposes that storage needs to be increased to 5.9Mℓ and the water treatment plants need to be upgraded. The current storage capacity is approximately 3.6Mℓ.

The existing infrastructure capacity is compared with the projected 2050 demand. The comparison is provided in Table 8-3 below.

Table 8-3: Khambi Gap Analysis

Khambi	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	0.39	2.9
Storage Capacity (Mℓ)	3.6	5.9
Bulk Conveyance (Mℓ/day)	5.92	8.34

8.4 ZUL004: MANDHLAKAZI SCHEME

Raw water is being purchased from the Charl Senekal Trust in terms of a memorandum of agreement (to supply 10Mℓ/day) for treatment at Mandhlakazi WTP. Due to increased water demand, the current supply is from the Senekal Dam is not sustainable.

Water supply problems in the neighbouring Hlabisa area has resulted in a change of priorities and the construction of a bulk supply pipeline to supply the eastern side of Mandhlakazi and eventually reach the Hlabisa communities.

UPA Phase II indicated that the existing and planned infrastructure is adequate for this scheme. However, it is proposed under UAP Phase III, with the projected 2050 demand being 21.87Mℓ/day, that the Mandhlakazi WTP be upgraded to 35Mℓ/day to also provide for the Hlabisa communities in uMkhanyakude District Municipality. The Sidinsi WTP would also need to be upgraded together with increased storage. UAP Phase III also recommends that a new abstraction works, pump station and rising main from the Pongolapoort Dam to the existing Mandlakazi WTP be constructed to increase the water supply for Mandhlakazi Scheme and Hlabisa Scheme in uMkhanyakude as the supply from Charl Senekal Trust is not sustainable.

MIG projects have been identified for bulk upgrades from 2019/2020 financial year to the 2022 financial year to the value of approximately R450 million. A RBIG project for the Mandhlakazi Bulk Water Supply has been earmarked for an amount of R390 million over the next three years. The latter should be considered when planning the bulk infrastructure requirements.

The existing infrastructure capacity is compared with the projected 2050 demand. The comparison is provided in Table 8-4 below.

Table 8-4: Mandhlakazi Gap Analysis

Mandhlakazi	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	20.28	35.4
Storage Capacity (Mℓ)	28.1	56.3
Bulk Conveyance (Mℓ/day)	226	279

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the water treatment plants, bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.5 ZUL005: Mkuze Scheme

The Mkuze Regional Scheme area comprises of mostly formal farm areas and a small number of sparsely scattered rural communities. Groundwater sources in the area are also of poor quality and insufficient yield to sustain large scale development.

UAP Phase II did not recommend any infrastructure upgrades or extensions.

Currently no MIG projects have been planned to support this scheme although UAP Phase III proposes that a future abstraction point at the Pongolapoort Dam be investigated as the current abstraction point that was constructed for an emergency supply is not ideal. The capacity of the Gumbi WTP is sufficient but the storage would need to increase. The 2050 demand for Mkuze is projected at 2.84Mℓ/day.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. The comparison is provided in Table 8-5 below.

Table 8-5: Mkuze Gap Analysis

Mkuze	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	1	-
Storage Capacity (Mℓ)	0	0.84
Bulk Conveyance (Mℓ/day)	0.84	1.18

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.6 ZUL006: Nkonjeni Scheme

The Nkonjeni regional scheme has well-developed and sustainable water source. Water is sourced from the Ulundi Weir situated on the White Mfolozi River. Water is released from the Klipfontein Dam near Vryheid. The Klipfontein Dam supply both domestic water to Vryheid and Ulundi as well as irrigation water for the farmers downstream of the dam. The surrounding communities are also supplied from groundwater.

Clear water is pumped from the Ulundi WTP to a command reservoir via a ø 500mm rising main. The capacity of the WTP is currently 26.4 Mℓ/day and would need to be upgraded to 32Mℓ/day.

UAP Phase II recommended the following interventions to the value of R648.9 million:

- ✓ Upgrade the Ulundi WTP by an additional 3Mℓ/day;
- ✓ Construction of a ø 450mm X 220m long rising main from the White Mfolozi river Weir to Ulundi WTP;
- ✓ Construction of a ø 550mm X 1.75km long bulk clear water rising main from Ulundi WTP to the command reservoir;
- ✓ 100km of bulk primary and secondary pipelines to be constructed;
- ✓ Upgrade Babanango WTP by 1Mℓ/day and the construction of 1Mℓ bulk storage in Babanango;
- ✓ Upgrade Mpungamhlophe WTP by an additional 3Mℓ/day;
- ✓ Construction of a ø 200mm X 100m long rising main from the White Mfolozi River to Mpungamhlophe WTP;
- ✓ Construction of ø 200mm bulk clear water rising main from Mpungamhlophe WTP to the command reservoir at the top of the hill; and
- ✓ Construction of a 4Mℓ storage reservoir in Mpungamhlophe.

The proposal under UAP Phase III is very similar to what was proposed in UAP Phase II. UAP Phase III proposes that the Ulundi WTP be upgraded to 32Mℓ/day and the Babanango WTP to 0.5Mℓ. The existing bulk storage (command reservoirs) be upgraded at Babanango WTP, Ulundi WTP and Mpungamhlope WTP and the existing primary bulk pipelines from the WTPs be upgraded as well. It is also recommended that approximately 100km additional primary, secondary and tertiary pipelines be constructed.

Two (2) MIG projects have been identified to construct new reservoirs, pump stations and bulk gravity mains to the value of R151 million.

The treatment plant, bulk distribution and storage need to be increased when compared with the projected 2050 demand of 41.88 Mℓ/day. The comparison is provided in Table 8-6 below.

Table 8-6: Nkonjeni Gap Analysis

Nkonjeni	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	27.53	32.5
Storage Capacity (Mℓ)	22	89
Bulk Conveyance (Mℓ/day)	134.75	175.72

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.7 ZUL007: SIMDLANGENTSHA CENTRAL

Although the area is generally well-served, all schemes are old, and the regional scheme planning will include infills to provide water to additional households. The existing Sim Central Package Plant (4Mℓ/day) is running at full capacity and cannot supply the remaining regional supply area as it also supplies the northern section

of Simdlangentsha East. Simdlangentsha East does not receive adequate water all the way from the Pongola abstraction works.

UAP Phase II recommended the following interventions to a value of R118 million:

- ✓ Upgrade of Belgrade WTP to 6Mℓ/day;
- ✓ Construction of ø 100mm X 0.1km raw water rising main from the weir to the Belgrade WTP;
- ✓ Construction of ø 200mm X 9.2km clear water rising main from the Belgrade WTP to the command reservoir at Khiphunyawo WTP for areas previously supplied from Nkosentsha WTP, Khiphunyawo WTP and Msibi WTP; and
- ✓ Construction of storage reservoirs with a combined capacity of 2Mℓ.

However, UAP Phase III proposes the construction of a new water treatment plant (10Mℓ/day) at the existing weir on the Mozana River as the Sim Central Package Plant is running at full capacity. It also recommends the construction of approximately 67km secondary and tertiary pipelines as well as to increase the bulk storage with 14.6Mℓ.

MIG projects have been identified to construct new bulk regional reservoirs and regional bulk pipelines to the value of approximately R24 million.

A new WTP is required and the bulk distribution and storage need to be increased when compared with the projected 2050 demand of 6.95Mℓ/day. This comparison is provided in Table 8-7 below.

Table 8-7: Simdlangentsha Central Gap Analysis

Simdlangenthsa Central	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	1.5	11.5
Storage Capacity (Mℓ)	0.85	16.6
Bulk Conveyance (Mℓ/day)	67.73	87.6

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the treatment plants, bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.8 ZUL008: SIMDLANGENTSHA EAST

The Simdlangethsa East RWSS supplies water to the town of Phongolo as well as a vast rural area which stretches 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.

UAP Phase II recommended the upgrade of the Phongola WTP to 15Mℓ/day, upgrade of bulk storage reservoirs by an additional 10Mℓ and the construction of ø 300mm X 12km long raw water rising main from the Phongola River to the Phongola WTP to the value of R162.8 million.

However, UAP Phase III found the WTP capacities as sufficient and that the bulk distribution and storage need to be increased to meet the projected 2050 demand of 22.80Mℓ/day.

MIG projects have been identified to construct new reservoirs, pipelines, and upgrade of the existing rising main to the value of R21.5 million.

The existing and planned infrastructure capacity is compared with the projected 2050 demand. This comparison is provided in Table 8-8 below.

Table 8-8: Simdlangentsha East Gap Analysis

Simdlangentsha East	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	15	-
Storage Capacity (Mℓ)	5.8	31.5
Bulk Conveyance (Mℓ/day)	72.85	93.2

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.9 ZUL009: Simdlangentsha West

The Simdlangentsha West WS supplies water to the town of Frischgewaagd and surrounding communities up to the Bivane River on the south. ZDM plans to construct a new rising main line from the Pongola weir to Frischgewaagd with the Frischgewaagd WTP being relocated to the Pongola River Weir.

UAP Phase II recommended the upgrade of the eDumbe (Paulpietersburg) WTP and raising the Dumbe Dam wall to the value of R95 million. However, under UAP Phase III it is recommended that the bulk distribution be increased by approximately 68km (secondary = 38km and tertiary = 27km). Bulk storage is to be increased by an additional 32Mℓ.

MIG projects have been identified to upgrade pipelines, pump stations and constructing new reservoirs and bulk supply connection to the value of R114 million over the next three financial years.

The WTP capacity is sufficient but the bulk distribution and storage need to be increased when compared with the projected 2050 demand of 19.69Mℓ/day. This comparison is provided in Table 8-9 below.

Table 8-9: Simdlagenthsa West Gap Analysis

Simdlangenthsa West	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	15	-
Storage Capacity (Mℓ)	14	34
Bulk Conveyance (Mℓ/day)	62.85	80.7

Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

8.10 ZUL010: USUTHU SCHEME

The Usuthu Regional Scheme is the largest water supply scheme in the district and supplies almost the entire Nongoma LM. The scheme requires the development of a new water source from the Black Mfolozi river and bulk infrastructure to be rolled out over vast distances to scattered rural communities.

UAP Phase II recommended the construction of a new dam on the Sikwebezi River and a new WTP to the value of R1.268 billion. However, UAP Phase III proposes that the bulk distribution be increased by approximately 283km (secondary = 128km and tertiary = 155km). Bulk storage is to be increased by an additional 42Mℓ with the Usuthu WTP and Vuna WTP to be upgraded to 35Mℓ/day and 6Mℓ/day, respectively. UAP Phase III also recommends the construction of an off-channel storage dam (earthfill dam) on the KwaNkweme River.

Projects are funded through MIG to the value of R582 million and is earmarked for the 2022 financial year. A RBIG project Nongoma Bulk Water Supply has been earmarked for an amount of R110 million over the next two financial years. The latter should be considered when planning the bulk infrastructure requirements.

The treatment plant, bulk distribution and storage need to be increased when compared with the projected 2050 demand of 47.87Mℓ/day. The comparison is provided in Table 8-10 below.

Table 8-10: Usuthu Gap Analysis

Usuthu	Current Capacity	Proposed Capacities
Water Treatment Plants (Mℓ/day)	29.78	46.28
Storage Capacity (Mℓ)	28	116
Bulk Conveyance (Mℓ/day)	339.4	427.26

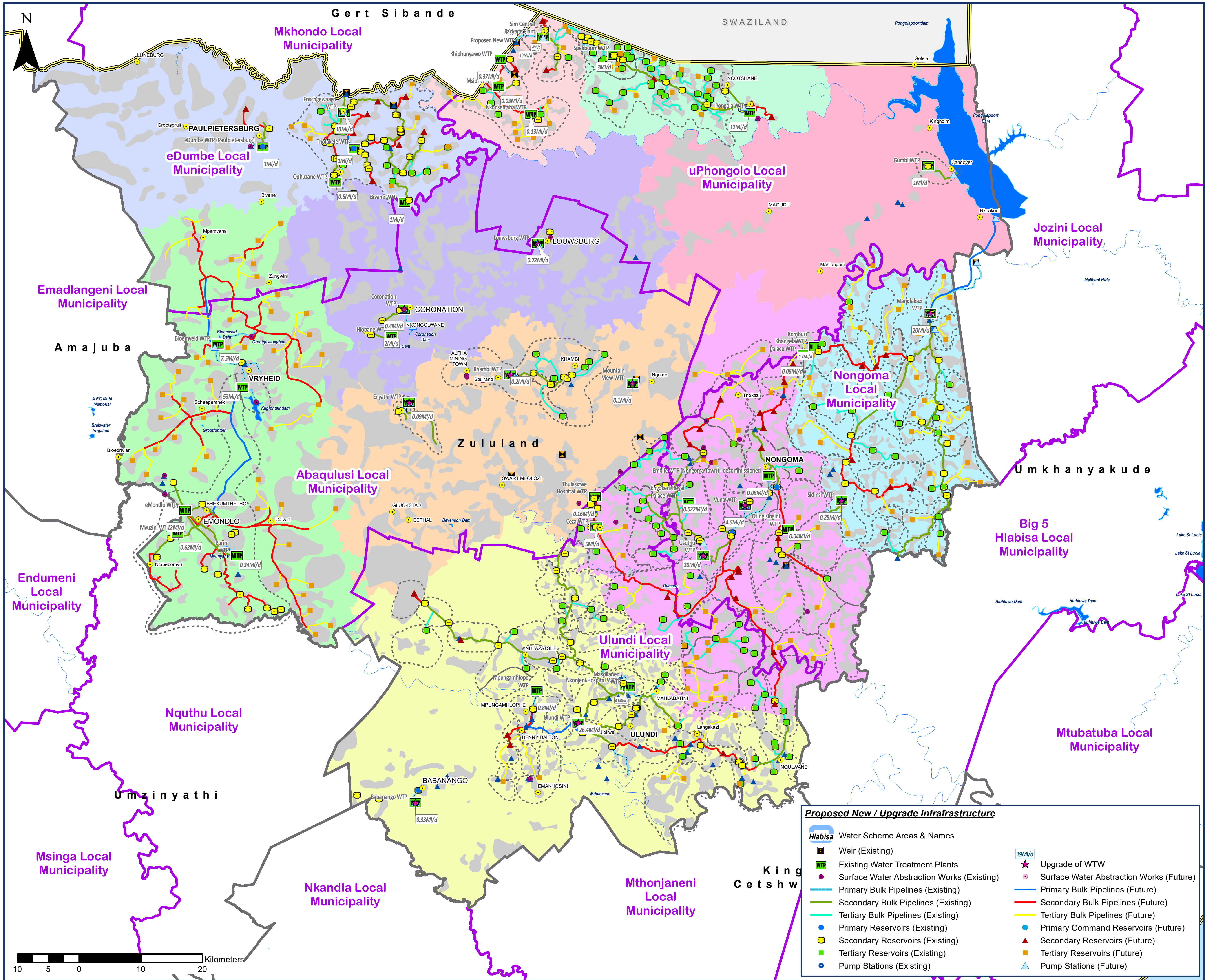
Based on the capacities of existing infrastructure, there are gaps within the water supply requirements for the projected 2050 demand and the capacity of the treatment plants, bulk pipelines and secondary and tertiary reservoirs would need to be increased to meet the demand of 2050.

9. PROPOSED BULK WATER SUPPLY INTERVENTIONS

9.1 PROPOSED WALL-TO-WALL WATER SUPPLY INTERVENTION AREAS

This section details the water supply reconciliation options for bulk water services within the Zululand DM – considering existing use and future supplies and water sources, per scheme area. It must be noted that the Water Supply Intervention Areas (WSIAs) were demarcated based on all the existing planning initiatives that are currently underway within the WSA. However, the demand model that was proposed to be used within this project will be used to determine the proposed bulk infrastructure requirements and would be sized accordingly to meet the demand of 2050.

The details of the each WSIA split between existing upgrade and future additional requirements are provided per WSIA within the paragraphs hereafter and illustrated for the entire WSA within Figure 9-1 and per proposed WSIA.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements
- Major Towns
- ZDM Supply Zones

LOCALITY:

CLIENT: UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY: ZULULAND DISTRICT MUNICIPALITY

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions

Zululand District Municipality

DATE COMPLETED: 30 September 2020

MAP NO.: DC26: Figure 9.1

9.2 ZUL001: CORONATION SCHEME

9.2.1 Demand Model Intervention

9.2.1.1 Water Demand

The water demand for the Coronation WSIA was determined for 2020 and 2050 and included within Table 9-1. It consists of a few small and isolated towns and several scattered and very isolated rural settlements of which only Louwsburg is a formal urban town. Coronation Scheme is expected to have a demand of 14Mℓ/day in 2050.

Table 9-1: Population and Water Demand 2020 and 2050 for the Coronation WSIA

Population	**Population 2020**	**Population 2050**
	54 589	65 942
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	11.11	13.96

9.2.1.2 Water Resource Consideration

ZDM is currently reviewing the original planned regional scheme as the Coronation Dam is not sustainable to supply the Coronation Scheme with additional water and the bulk services to the rural scattered settlements will be too costly. Therefore, stand-alone schemes from local sustainable sources will be developed to cover as many settlements as possible. The town of Louwsburg also has a water resource challenge as the dam on the edge of Louwsburg town has a limited catchment and groundwater is difficult to find due to the locality of the town.

The Coronation WTP and Louwsburg WTP needs to be upgraded to 2.5Mℓ/day and 1Mℓ/day respectively.

9.2.2 Water Supply Infrastructure

9.2.2.1 Bulk Conveyance

- ✓ The existing Louwsburg WTP needs to be upgraded to 1Mℓ/day;
- ✓ Upgrade the existing primary ø 100mm pumping main (500m) from the dam to Louwsburg WTP to ø 160mm;
- ✓ The current secondary bulk from the WTP runs east (±4km) and then in a northernly direction to a reservoir just outside Louwsburg and needs to be upgraded to ø 140mm bulk pipeline;
- ✓ The ø 200mm rising main from the Coronation Dam to the Coronation WTP is sufficient (3.8km);
- ✓ Upgrade the existing Coronation WTP to 2.5Mℓ/day;
- ✓ The existing secondary rising main from the WTP to an existing reservoir in Cliffdale needs to be upgraded to ø 200mm bulk pipeline (4.2km);
- ✓ Upgrade the existing primary ø 200mm rising main from the Hlobane Dam to the Hlobane WTP (800m) to ø 250mm; and
- ✓ Upgrade the existing secondary rising main (2.9km) from the WTP to Hlobane (ø 160mm).

9.2.2.2 Storage

- ✓ Current storage capacity totals approximately 1.5Mℓ and would be upgraded to approximately 8Mℓ; and

The primary command reservoir at Louwsburg to be upgraded to 1.9Mℓ secondary reservoir to 1.73Mℓ. The reservoir at the Coronation WTP to be upgraded to 4.3Mℓ.

9.2.2.3 Water Pump Stations

- ✓ The existing Louwsburg and Coronation pumping capacities would need to be increased to 9kW and 34kW; and
- ✓ Two (2) new pump stations (7kW & 13kW) at the Hlobane Dam and Coronation WTP are also required.

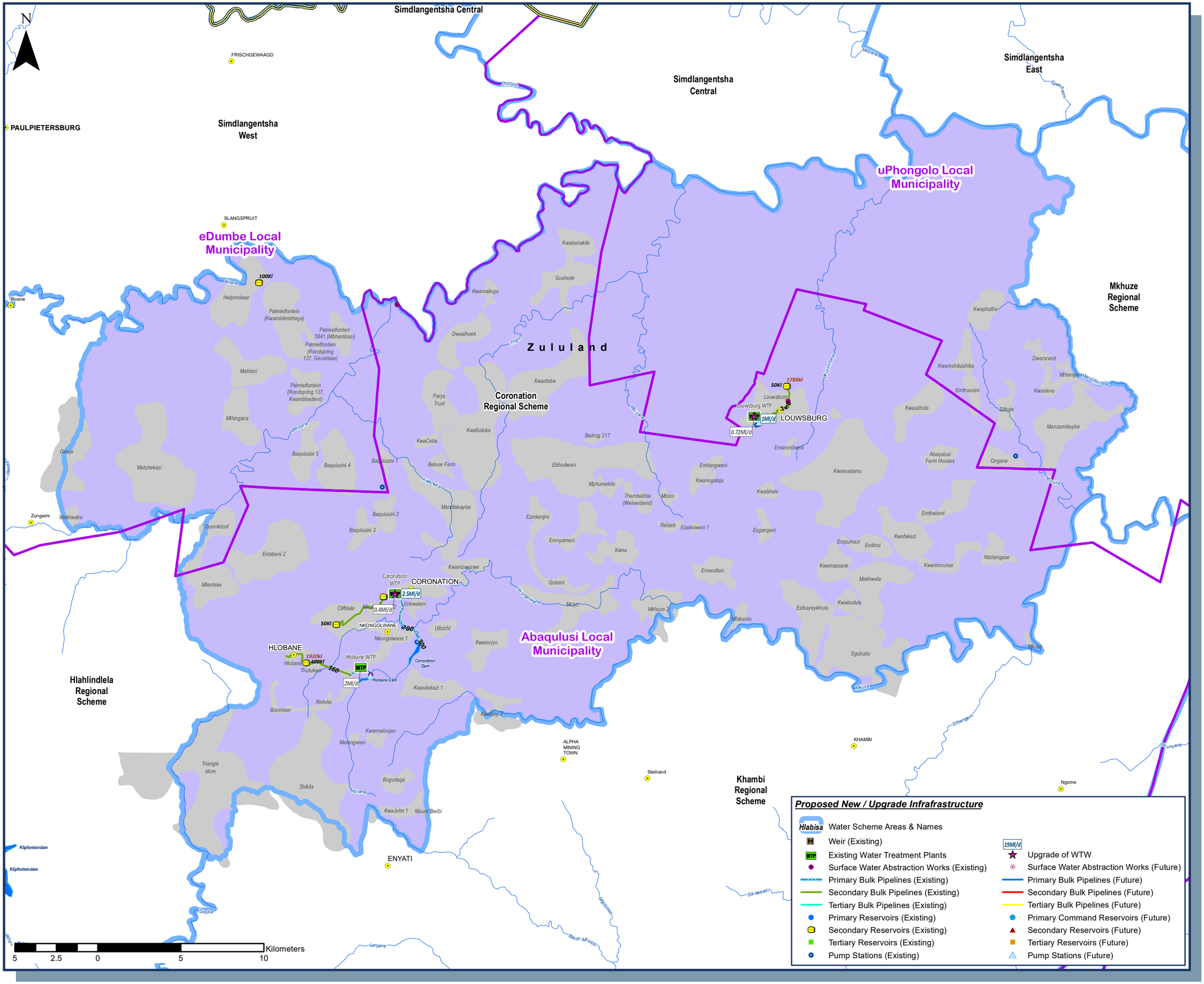
9.2.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Coronation WSIA and is illustrated within Figure 9-2 overleaf followed by the schematic layout of the WSIA within Figure 9-3.

It is proposed to initiate a detailed water resource study to address both potential surface water and groundwater augmentation options. Once a sustainable water resource has been identified, can the following infrastructure interventions be commissioned:

- ✓ To meet the 2050 demand, the existing Coronation WTP needs to be upgraded to 2.5Mℓ/day and the Louwsburg WTP to 1Mℓ/day;
- ✓ Upgrade existing primary bulk pipelines ranging from ø 160mm to ø 250mm (6km) and secondary pipelines ranging from ø 140mm to ø 200mm;
- ✓ The existing primary storage capacity need to increase to 1.9Mℓ and the secondary storage capacity would need to increase from 800kℓ to approximately 6Mℓ;
- ✓ Increase pumping capacities of the existing Louwsburg and Coronation pump stations (9kW & 34kW);
- ✓ Add two (2) new pump stations - One (1) at Hlobane Dam and one at Coronation WTP (7kW & 13kW);
- ✓ Groundwater studies are required in order to supply approximately 6 000 households through stand-alones schemes that are not currently served; and
- ✓ Conduct hydrology studies to determine the yield of the dams.

Design details of all the infrastructure components are provided within Annexure B.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
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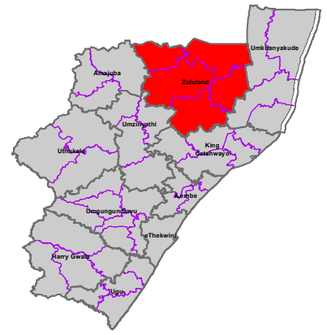
LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL001: Coronation
Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

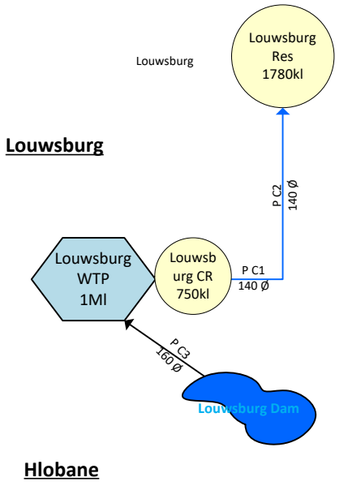
DC26: Figure 9.2

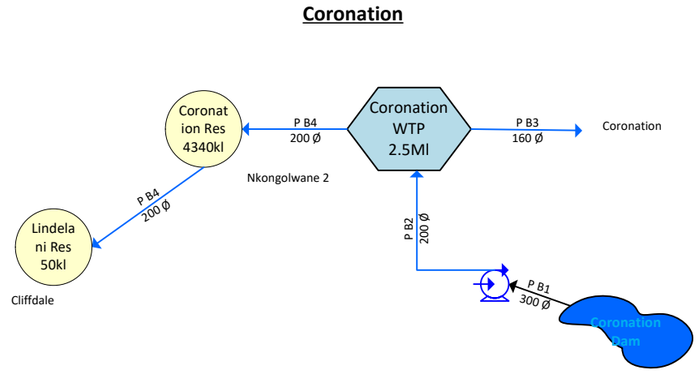
Proposed New / Upgrade Infrafrastructure

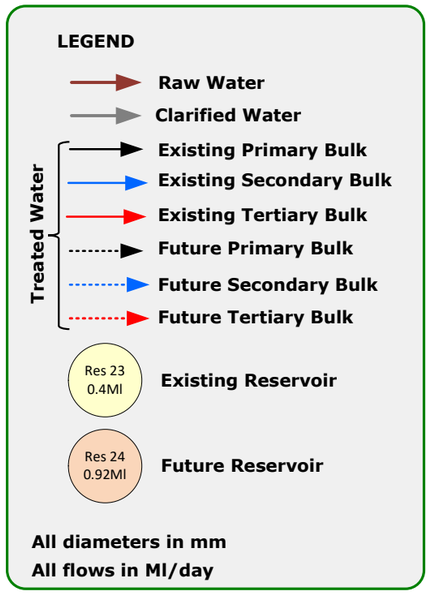
- Hlabisa — Water Scheme Areas & Names
- Weir (Existing)
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

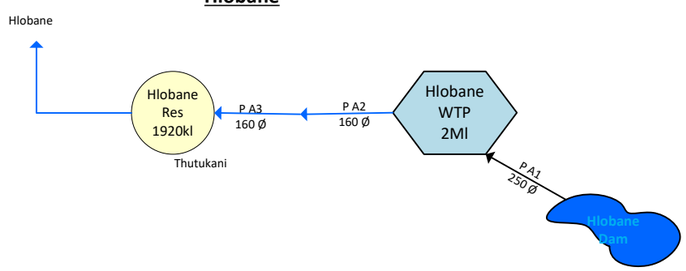
Figure 9.3

ZUL001: WSIA: Coronation









9.2.4 Financial Requirements

The bulk cost requirement for UK001: Coronation WSIA is tabled within Table 9-2 below.

Table 9-2: ZUL001: Coronation Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R22 526 500	R2 252 650	R24 779 150
Secondary	R44 320 000	R4 432 000	R48 752 000
Tertiary	R0	R0	R0
Total	**R66 846 500**	**R6 684 650**	**R73 531 150**

The total bulk cost requirement for the Coronation Scheme is R 73.5 million (excl VAT). The scheme development cost per household is approximately R 5 686. Due to the regional scheme being reviewed as it is too costly to provide bulk services to the rural scattered settlements of Coronation area, the regional scheme will fall away once all stand-alone schemes have been developed. Due to the size of the project, it will take close to 42 years to complete.

9.3 ZUL002: HLAHLINDLELA SCHEME

9.3.1 Demand Model Intervention

9.3.1.1 Water Demand

The water demand for the Hlahlindlela WSIA was determined for 2020 and 2050 and included within Table 9-3. It includes approximately 112 communities with Vryheid and eMondlo being formal urban towns and with the rest of the communities being mostly rural scattered communities very low densities. Hlahlindlela Scheme is expected to have a demand of nearly 55Mℓ/day in 2050.

Table 9-3: Population and Water Demand 2020 and 2050 for the Hlahlindlela WSIA

Population	**Population 2020**	**Population 2050**
	178 926	216 136
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	44.41	54.92

9.3.1.2 Water Resource Consideration

The White Mfolozi is the Hlahlindlela Scheme's current source of water and is the main water source for domestic purposes. However, there are water use entitlements for irrigation agriculture downstream of the Klipfontein Dam. The total registered irrigation water use downstream of Klipfontein Dam is 10.04 million m^3/a

at a lower assurance of supply compared to the domestic sector. It is known that the registered irrigation water is currently not being used by irrigation agriculture.[5]

The total bulk potable water production for 2011 for the White Mfolozi River catchment was 47.5 Mℓ/day (Update of the Water Reconciliation Strategy of the White Mfolozi River System in Zululand District Municipality for the period 2012 to 2040). This figure includes the water requirements for Vryheid, Emondlo, Babanango and Nkonjeni supply areas. Currently the Hlahlindlela scheme is experiencing water shortages and is the reason for projects being put on hold.

The Klipfontein Dam is situated on the Mfolozi River and supplies Vryheid town. The Grootgewaagd and Bloemveld Dams are situated on the aMagoda River and supplies water to Vryheid town. The Mondlo Township's main source of water is the Mvunyana Dam as well as direct abstraction from the Mvunyana River. Water is also released from the Klipfontein Dam to supply the Nkonjeni Regional Scheme (Ulundi). A water resource study will be necessary to identify potential surface water and groundwater augmentation options.

9.3.2 Water Supply Infrastructure

9.3.2.1 Bulk Conveyance

- ✓ From the Bloemveld WTP a primary ø 315mm bulk pipeline would need to extend in a northerly direction (±11km) to primary Command Reservoir (CR1);
- ✓ From CR 1, a secondary bulk pipeline ranging from ø 63mm to ø 110mm will extend further north towards Obivane 2 community. Tertiary pipelines (approximately 11km in total) will branch off the secondary pipeline towards the communities of Obivane 2, Bivanyana, Penvaan and Khambula Mission. The tertiary pipelines will range between ø 50mm and ø 75mm;
- ✓ From CR 1 another secondary bulk pipeline needs to extend (approximately 49km) south east ranging between ø 63mm and ø 250mm. Tertiary pipelines will branch off towards the communities of Helberg Farms, Zunweni, Voorkeur, Bozuzu, Ntendeka 2, Shoba 1 & 2, Kwabanga 2, Golden Valley and Tint as Drift. The tertiary pipelines will range between ø 50mm and ø 125mm and amount to ±33km;
- ✓ 5km from the primary CR1, tertiary pipelines (ranging between ø 50mm and ø 110mm) will extend (23km) in a northernly direction to serve the communities of Zungwini, Mthashana, Mqwabe and KwaManzi;
- ✓ From Klipfontein WTP, a primary bulk pipeline needs to extend (±6km) to a second command reservoir (CR2) at KwaMshomoloza; From CR2, secondary pipelines need to extend to the west and will range between ø 63 and ø 160mm for approximately 16km from where tertiary pipelines will branch off towards the communities of Driefontein, Fairplay, Mdlenevini, Fearmdale, Scheepersneck, KwaLubeck, Betel, Stillwater, Zaaifontein, Middelpunt and Geluk 3. The tertiary pipelines will range between ø 50mm and ø 63mm and total approximately 35km;
- ✓ The primary bulk pipeline will extend further south from CR2 to another command reservoir (CR3);

[5] Update of the Water Reconciliation Strategy of the White Mfolozi River System in Zululand District Municipality for the period 2012 to 2040

- ✓ Existing secondary pipelines extends from eMondlo WTP and feed Emondlo town, Phumbuthula, Enhlahelni, Zwelisha and Purim. Secondary pipelines range between ø 63mm and ø 315mm and amount to ±50km;
- ✓ From Mvuzini WTP an existing secondary pipeline extends to Nceceni from where an additional secondary pipeline (14km) is required to serve Emadwaleni, Mhlangeni, Mphezulu and Bhobozani. The secondary pipeline will range between ø 63mm and ø 160mm;
- ✓ From the existing secondary pipeline at the Purim WTW, additional secondary pipelines (ranging from ø 90mm to ø 200mm) will be required to extend (approximately 26km) further south to serve the Ezidulini, Nhloshana, Amahlathi, Ezibomvu 4, Esigodini, Qweqwe 1, Elosi and Sofaya communities; and
- ✓ From the CR3, future primary bulk pipeline, additional secondary pipelines (ø 63mm to ø 160mm) will extend eastwards (16km) from where it will extend further towards the south (19km) upto Gwebu CPA community. The secondary pipelines will range from ø 90mm to ø 140mm. Tertiary bulk pipelines ranging from ø 50mm to ø 90mm, will branch off (34km) to serve Nsengeni, Mawelawela, Langverwacht, Vamba, Brakfontein, Emooi, Enyanyeni, Brakpan, and Gwebu CPA communities.

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 380km. An additional 193km secondary (ranging between ø 50mm and ø 350mm) and 150km tertiary bulk pipelines (ranging between ø 50mm and ø 125mm) would be necessary to supply the whole of the Hlahlindlela WSIA.

9.3.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 10Mℓ and needs to be upgraded to 17Mℓ;
- ✓ Four (4) primary command reservoirs are required with capacities to vary between 2.2Mℓ and 5Mℓ; and
- ✓ Eight (8) secondary reservoirs with capacities between 30kℓ and 2Mℓ and 48 tertiary reservoirs with capacities between 30kℓ and 1.6Mℓ will be required.

The storage capacity would need to be increased with an additional 35.2Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme.

9.3.2.3 Water Pump Stations

- ✓ Install new pump station at Bloevmveld WTP (202kW).

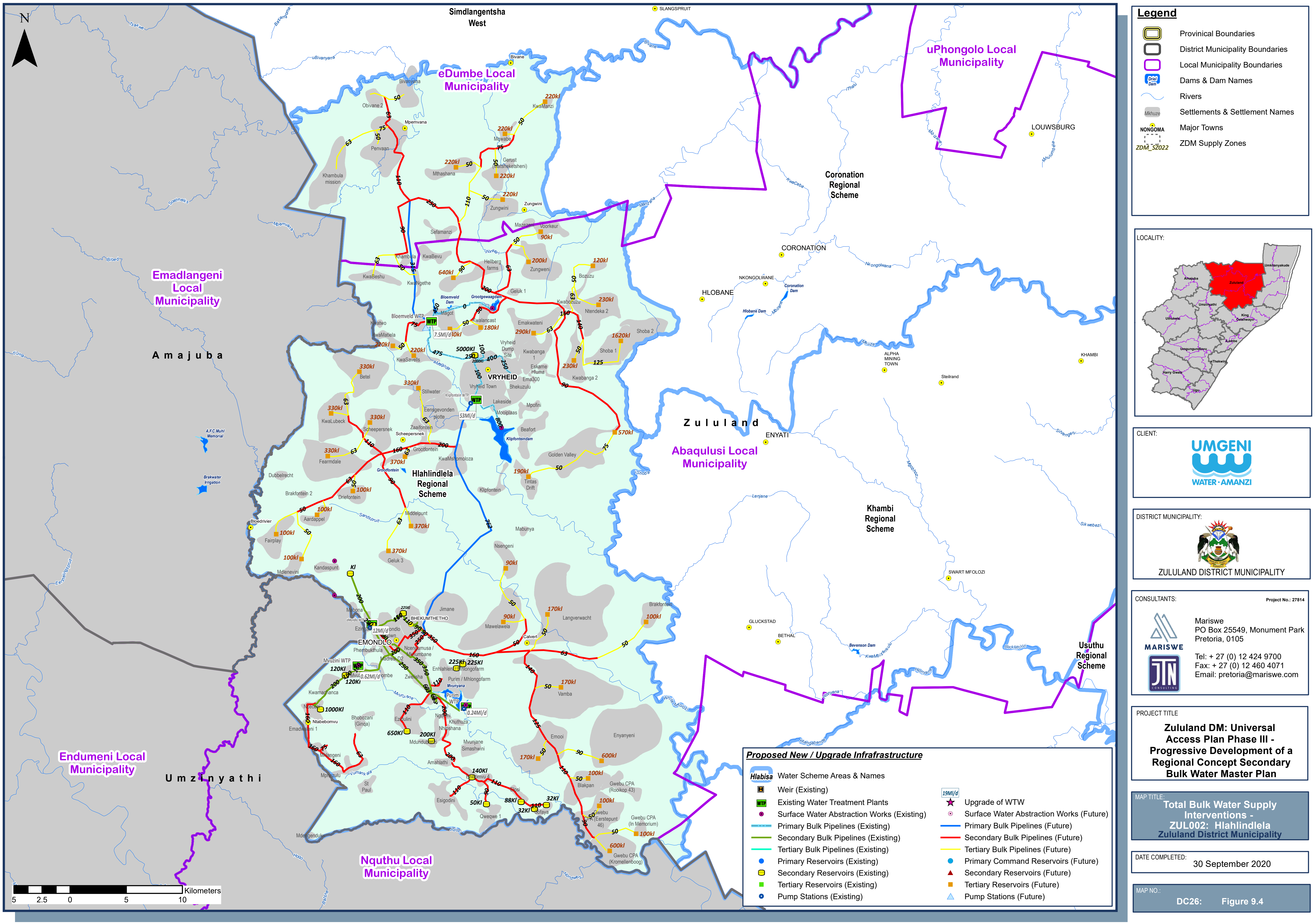
9.3.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Hlahlindlela WSIA and is illustrated within Figure 9-4 overleaf followed by the schematic layout of the WSIA within Figure 9-5.

It is proposed to initiate a detailed water resource study to address both potential surface water and groundwater augmentation options. Once a sustainable water resource has been identified, can the following infrastructure interventions be commissioned:

- ✓ Add primary bulk pipelines ranging from ø 315mm to ø 762mm (36km) and secondary pipelines (193km) ranging from ø 50mm to ø 350mm as well as tertiary pipelines (150km) ranging between ø 50mm and ø 125mm;
- ✓ The existing secondary storage capacity amounts to 960kℓ would need to increase to 5.5Mℓ and tertiary storage capacity amounts to 450kℓ and is required to increase to 12.9Mℓ;
- ✓ Additional primary storage capacity of 17Mℓ would be required; and
- ✓ New pump station at Bloemveld WTP (202kW).

Design details of all the infrastructure components are provided within Annexure B.



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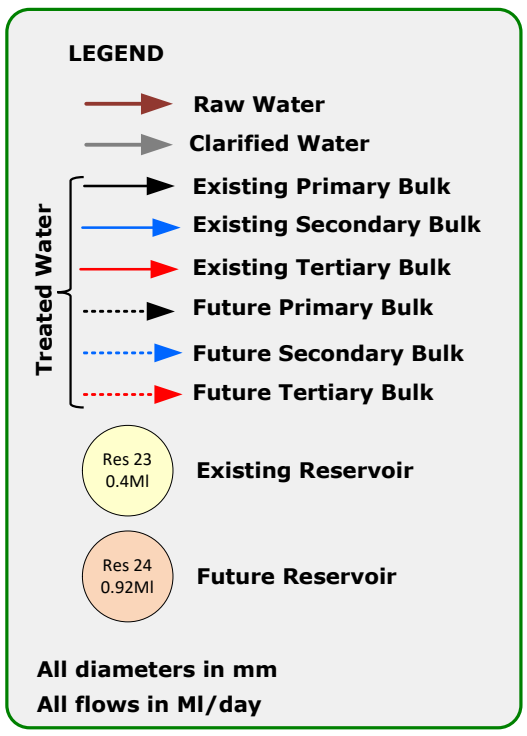
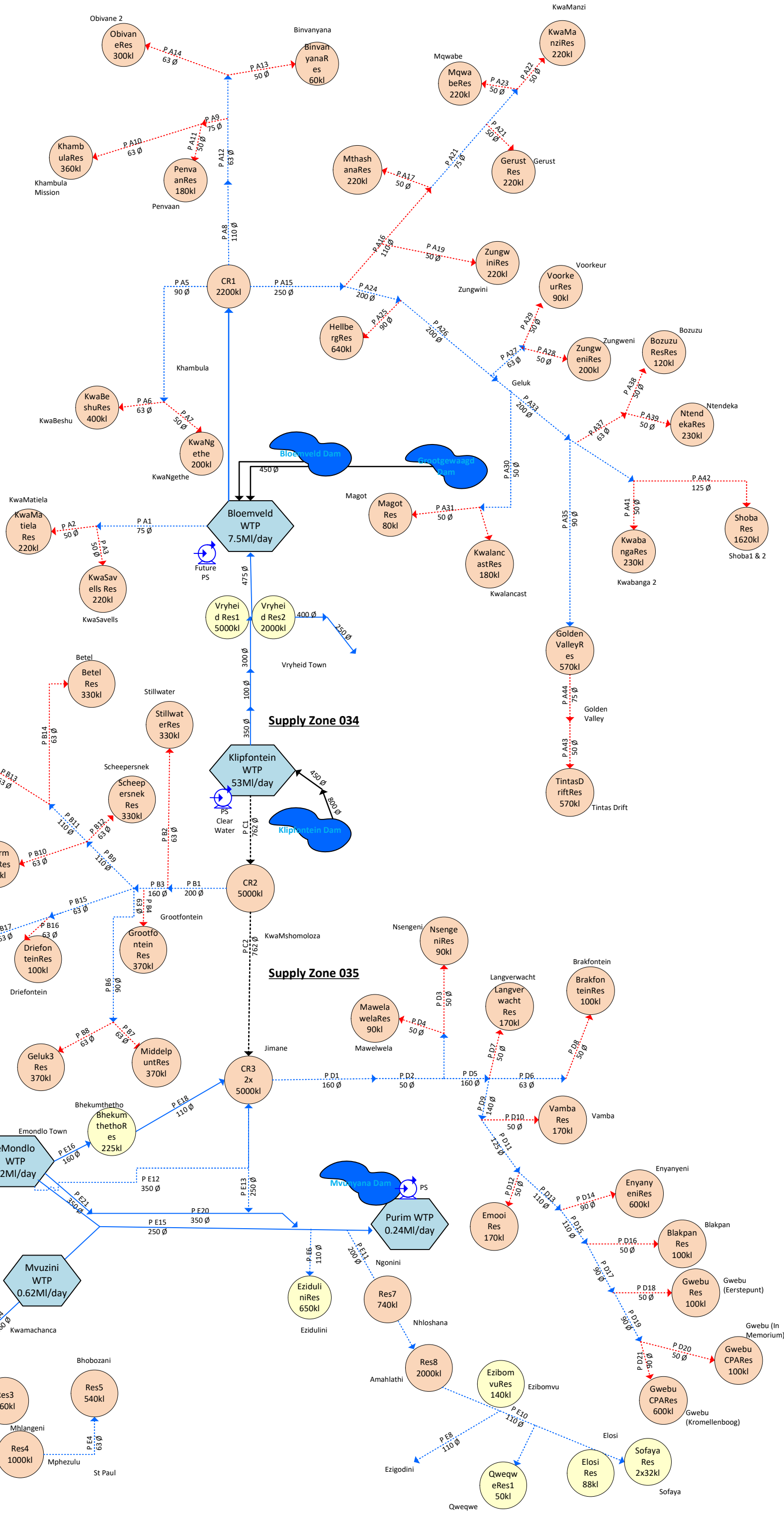
PROJECT TITLE
Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan
MAP TITLE:
Total Bulk Water Supply Interventions - ZUL002: Hlahlindlela
Zululand District Municipality
DATE COMPLETED:
30 September 2020
MAP NO.:
DC26: Figure 9.4
Proposed New / Upgrade Infrastructure
Water Scheme Areas & Names
Weir (Existing)
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Pump Stations (Existing)
Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
Pump Stations (Future)
Simdlangentsha West
eDumbe Local Municipality
uPhongolo Local Municipality
Emadlangeni Local Municipality
Amajuba
Coronation Regional Scheme
Hlahlindlela Regional Scheme
Zululand
Abaqulusi Local Municipality
Khambi Regional Scheme
Usuthu Regional Scheme
Endumeni Local Municipality
Umzinyathi
Nquthu Local Municipality
VRYHEID
EMONDLO
LOUWSBURG
CORONATION
HLOBANE
ENYATI
Kilometers

Figure 9.5

ZUL002 WSIA: Hlahlindlela





9.3.4 *Financial Requirements*

The bulk cost requirement for ZUL002: Hlahlindlela WSIA is tabled within Table 9-4 below.

Table 9-4: ZUL002 Hlahlindlela Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R476 091 000	R47 609 100	R523 700 100
Secondary	R131 385 000	R13 138 500	R144 523 500
Tertiary	R116 170 000	R11 617 000	R127 787 000
Total	**R723 646 000**	**R72 364 600**	**R796 010 600**

The total bulk cost requirement for the Hlahlindlela Scheme is R 796 million (excl VAT). The scheme development cost per household is approximately R 18 782. Due to the size of the project, it will take close to 42 years to complete.

9.4 ZUL003: KHAMBI SCHEME

9.4.1 Demand Model Intervention

9.4.1.1 Water Demand

The water demand for the Khambi WSIA was determined for 2020 and 2050 and included within Table 9-5. It includes approximately 91 communities with Enyathi and Mountain View the only urban towns and with the rest of the communities being mostly rural scattered communities very low densities. Khambi Scheme is expected to have a demand of 6.8Mℓ in 2050.

Table 9-5: Population and Water Demand 2020 and 2050 for the Khambi WSIA

Population	**Population 2020**	**Population 2050**
	30 018	36 260
Demand	**Demand 2020 (Mℓday)**	**Demand 2050 (Mℓ/day)**
	5.42	6.81

9.4.1.2 Water Resource Consideration

The Khambi Scheme is well-served with several stand-alone schemes and the integration of the stand-alone schemes to the bulk service is complete. The long-term planning was to supply water from the Coronation Dam to the Khambi area, but the Coronation Dam will not be a sustainable solution for the long-term additional demand, and the cost per capita would be too high.

A water resource study will be necessary to identify potential surface water and groundwater augmentation options.

9.4.2 Water Supply Infrastructure

9.4.2.1 Bulk Conveyance

- ✓ The existing Enyathi WTP in Supply Zone 033 needs to be upgraded from 0.09Mℓ/day to 0.3Mℓ/day;
- ✓ An existing ø 110mm bulk pipeline extends from the Enyathi WTP to a reservoir in Enyathi town from where a ø 63mm secondary pipeline (8.5km) runs south towards the Uitkomst community;
- ✓ Also, from the reservoir in Enyathi town, a pipeline extends (1.3km) to the west to another existing 600kℓ reservoir from where an existing ø 63mm pipeline extends (2km) south to Vredehof;
- ✓ The existing Khambi WTP in Supply Zone 091 needs to be upgraded from 0.2Mℓ/day to 2.1Mℓ/day;
- ✓ The existing primary bulk pipeline from the Khambi WTP to the command reservoir needs to be upgraded to ø 250mm;
- ✓ An existing ø 160mm secondary extends (7km) from the command reservoir past Kwamaqweshe Res 1 to Res 2;
- ✓ From Kwamaqweshe Res 1, a ø 63mm tertiary pipeline extends northwards to the Ndlandla community;

- ✓ Also, from Kwamaqweshe Res 2, another secondary ø 110mm pipeline runs north east towards Ntumbane where two tertiary pipelines (ø 90mm & ø 75mm) extend further north east towards Bhekephi (3km) and Mahalakoqa (6.7km);
- ✓ From Res 2, an existing ø 63mm tertiary pipeline extends (9.5km) south towards Esihlengeni; and
- ✓ The existing Mountain View WTP in Supply Zone 032 needs to be upgraded from 0.1Mℓ/day to 0.5Mℓ/day.

9.4.2.2 Storage

- ✓ All the existing tertiary reservoirs need to be upgraded to between 200kℓl and 500kℓ per reservoir. Current storage capacity totals 4.3Mℓ and would need to be upgraded to approximately 6.3Mℓ;
- ✓ Upgrade the existing primary reservoir at Mountain View to 800kℓ; and
- ✓ Upgrade the command reservoir A1 to 500kℓ.

9.4.2.3 Water Pump Stations

- ✓ The pump station at the Enyathi WTP needs to be upgraded to 8kW;
- ✓ A new pump station (6kW) from the command reservoir to Enyahti Res 1 to be installed;
- ✓ The pump station at the Khambi WTP to be upgraded to 47kW; and
- ✓ A new pump station (23kW) at the command reservoir close to the Khambi WTP to be installed.

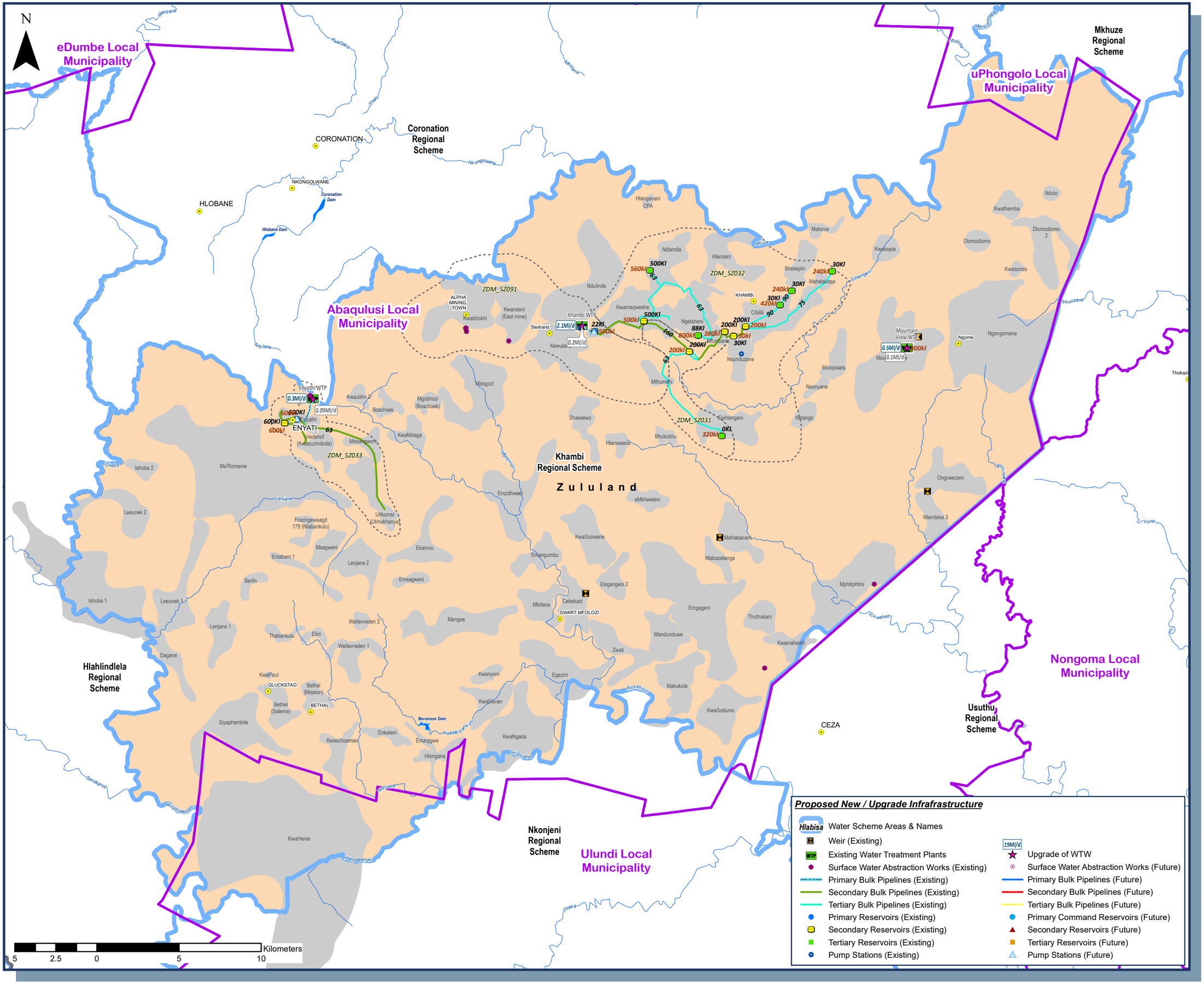
9.4.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Khambi WSIA and is illustrated within Figure 9-6 overleaf followed by the schematic layout of the WSIA within Figure 9-7.

It is proposed to initiate a detailed water resource study to address both potential surface water and groundwater augmentation options. Once a sustainable water resource has been identified, can the following infrastructure interventions be commissioned:

- ✓ To meet the 2050 demand, the existing Enyahti, Khambi and Mountain View WTPs need to be upgraded to 0.3Mℓ/day, 2.1Mℓ/day and 0.5Mℓ/day, respectively;
- ✓ Upgrade the existing Khambi WTP primary bulk pipeline to ø 250mm;
- ✓ Increase the existing tertiary storage capacity (678kℓ) to 2.4Mℓ;
- ✓ Upgrade two (2) existing primary reservoirs (1.2Mℓ) to 1.9Mℓ;
- ✓ Upgrade two (2) existing pump stations at the Enyathi and Khambi WTPs (8kW & 47kW);
- ✓ Add two (2) new pump stations at the two command reservoirs (6kW & 23kW); and
- ✓ Conduct groundwater as well as hydrology studies to determine the yield of the rivers and spring.

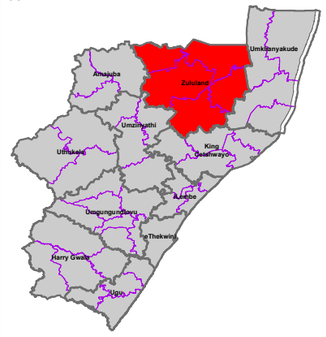
Design details of all the infrastructure components are provided within Annexure B.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL003: Khambi
Zululand District Municipality

DATE COMPLETED:
30 September 2020

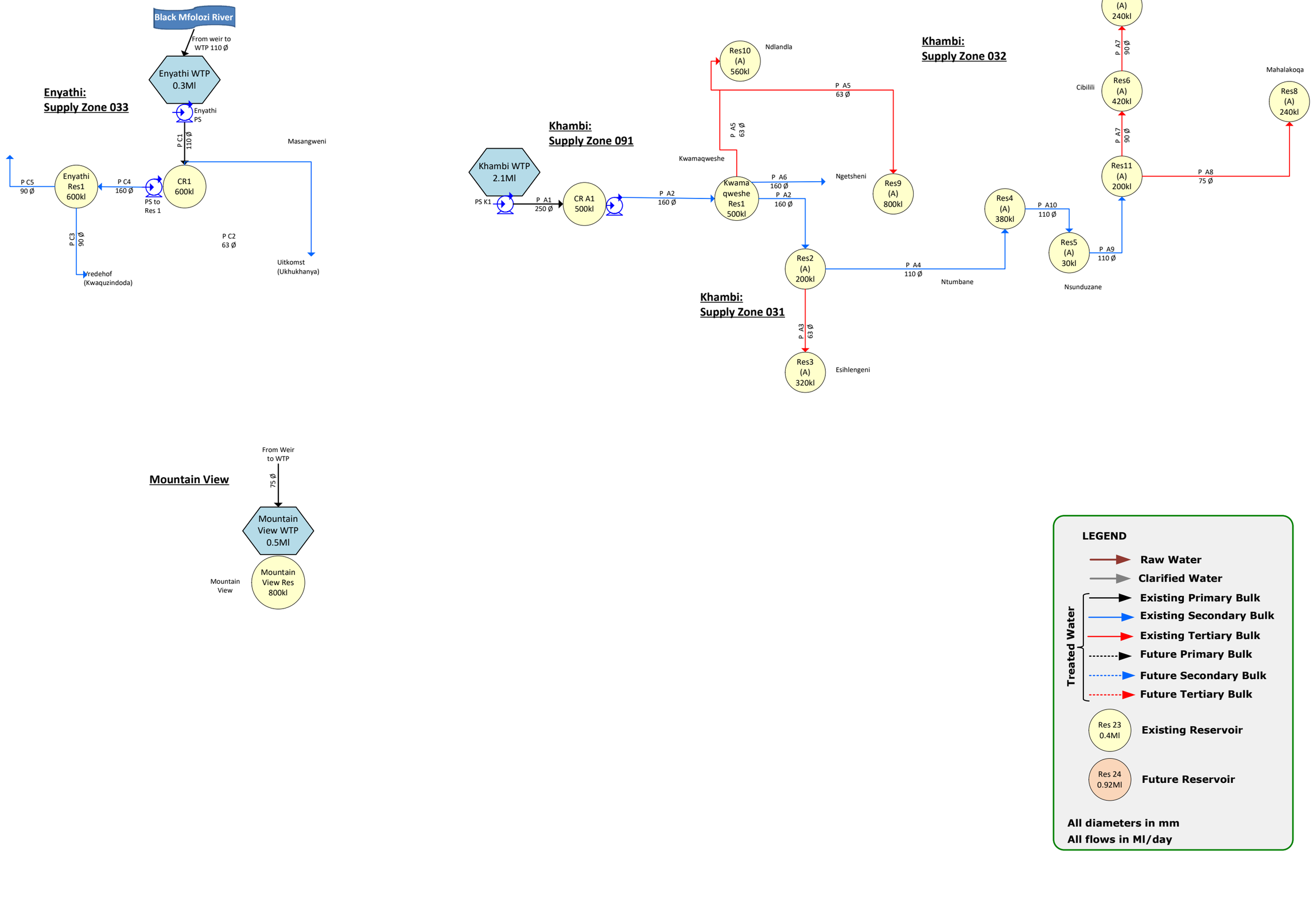
MAP NO.:
DC26: Figure 9.6

Proposed New / Upgrade Infrafrastructure

- Hlabisa — Water Scheme Areas & Names
- Weir (Existing)
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9.7

ZUL003 WSIA: Khambi



9.4.4 *Financial Requirements*

The bulk cost requirement for ZUL003: Khambi WSIA is tabled within Table 9-6.

Table 9-6: ZUL003: Khambi Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R53 491 000	R5 349 100	R58 840 100
Secondary	R9 618 000	R961 800	R10 579 800
Tertiary	R18 892 000	R1 889 200	R20 781 200
Total	**R76 001 000**	**R8 200 000**	**R90 201 100**

The total bulk cost requirement for the Khambi Scheme is R 90.2 million (excl VAT). The scheme development cost per household is approximately R 12 686. Due to the size of the project, it will take close to 42 years to complete.

9.5 ZUL004: MANDHLAKAZI SCHEME

9.5.1 Demand Model Intervention

9.5.1.1 Water Demand

The water demand for the Mandhlakazi WSIA was determined for 2020 and 2050 and included within Table 9-7. The Mandhlakazi Scheme is the second largest supply area. It includes approximately 175 communities with no formal urban towns. The rural communities are sparsely scattered and vast distances apart. Mandhlakazi Scheme is expected to have a demand of nearly 22Mℓ in 2050.

Table 9-7: Population and Water Demand 2020 and 2050 for the Mandhlakazi WSIA

Population	**Population 2020**	**Population 2050**
	97 503	117 780
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	17.32	21.87

9.5.1.2 Water Resource Consideration

Raw water is purchased from the Charl Senekal Trust in terms of a memorandum of agreement. The raw water is obtained from the weir upstream of the Blackie Dam. The raw water is treated at the Mandhlakazi WTP (20Mℓ/day) but the WTP is only operating at 10Mℓ/day as the Senekal Trust can only supply 10Mℓ/day. ZDM has applied with DWS for an abstraction license at Pongolopoort Dam. The Mkuze River is also a water source for the Mandhlakazi Regional Scheme. Due to increased water demand, the current supply from the Charl Senekal Trust (Senekal Dam) is not sustainable.

The Mandhlakazi WTP needs to be upgraded to 35Mℓ/day as the WTP also needs to supply to the Hlabisa Scheme in uMkhanyakude. The Sidinsi WTP (0.28Mℓ/day) located in the south of the scheme receives raw water abstracted from the Mona River, needs to be upgraded to 0.4Mℓ/day. The Kombuzi WTP (0.4Mℓ/day) located in the Maqhineni community, abstracts raw water from the Nkunzana River.

9.5.2 Water Supply Infrastructure

9.5.2.1 Bulk Conveyance

- ✓ From the weir upstream from Pongolapoort Dam (Jozini Dam), raw water is pumped via a ø 400mm rising main (14.5km) to the Mandlakazi WTP and needs to be upgraded to ø 660mm;
- ✓ As the water supply from the Charl Senekal Trust is not sustainable it is proposed that a ø 660mm rising main (21km) from the Pongolapoort Dam is constructed to increase the supply to the Scheme;
- ✓ From Mandlakazi WTP the existing secondary pipeline (ø 400mm) extends south for approximately 3km to an existing command reservoir (CR1). Tertiary bulk pipelines (ø 63mm) runs from the CR1 to Mpondo 2, Qondile 2 (Supply Zone 022) in the east and Ubani in the west and totals approximately 9km. Tertiary

pipelines (ø 63mm) also extend from Mandlakazi WTP in a northernly direction to Nkukhwini (6.8km) and Kwagudlintaba (5.5km) communities;

- ✓ From the CR1, the existing secondary pipeline needs to be upgraded to ø 630mm and extends (3km) south into Supply Zone 092. The pipeline forks into two (2) secondary pipelines – one (ø 560mm) running west towards Vulamlomo community to an existing 1.5Mℓ reservoir and extends even further south west through Supply Zones 092, 099 & 100 (14km, and ranging from ø 400mm and ø 450mm) where it will join with a future secondary pipeline at Nhlebela community. Existing tertiary pipelines branch off to serve the communities of Mazi, Khethankomo, Ovukneni, Ophaphasi and Emnzine. The other leg of the secondary pipeline (ø 450mm) extends (3km) south to an existing reservoir at Siwela community in Supply Zone 024. This secondary pipeline extends (6km) even further south to an existing reservoir at Ngoyi community in Supply Zone 018;
- ✓ From Ngoyi the secondary pipeline (ø 450mm) runs south past Ebthuleni to a reservoir at Nkwalini community (8km) in Supply Zone 036. Tertiary pipelines branch off (approximately 22km) to the east and the west of this secondary pipeline ranging from ø 63mm to ø 125mm;
- ✓ From Nkwalini the secondary pipeline (ø 450mm) extends (±30km) through Supply Zone 036, 037, 038 and 039. The pipeline ranges between ø 350mm and ø 450mm;
- ✓ At Mthwandlana 2, ø 63mm tertiary pipelines to Maphondwane, Bambolo and Mkhwezela to the east (10km) and to Ndengande and Makhcaneni in the west;
- ✓ An existing ø 80mm tertiary pipeline extends (3km) from Mbembe into Supply Zone 038 from where it will be required to run further south to Sinkonkonko 1 (3.6km, ø 63mm);
- ✓ From Kombuzi WTP, a secondary bulk pipeline will be required to extend (21km) in an easternly direction towards the reservoir at Vulamlomo ranging between ø 250mm and ø 315mm and join with the existing secondary bulk pipelines (ø 560mm & ø 450mm). A tertiary bulk pipeine will be required to extend (22km) in a northernly direction through Supply Zone 095 to Supply Zone 097 ranging between ø 75mm and ø 125mm. This pipeline will serve the communities of Mthonjaneni, Mgxanyini, Mgendene Sovana, Machibini and Mapambeni. 3km further east from this tertiary pipeline, a tertiary pipeline will extend (15km) further north to serve Mngamunde, Kwagongolozane, Okhalweni 2 and Esikuthwaneni;
- ✓ Existing tertiary pipelines (ranging from ø 75mm to ø 200mm) extend (6km) also from Kombuzi WTP south through Supply Zone 098 to Supply Zone 100 from where additonal tertiary pipelines will be required to serve the communities of Domba, Vumbuka and Mzini Enzondwane;
- ✓ From the Nhlebela community an additional secondary bulk pipeline (21km) will be required to run further south through Supply Zone 102, 103 and into Supply Zone 104. The pipeline will range from ø 100mm to ø 355mm. Three tertiary pipelines (ø 110 & ø 140mm) will need to branch off to serve Zibusele (11km), Sibanyaneni (1km) and Mavulazi (3km). An existing tertiary pipeline branches off towards the east to serve Msebe and Ngagayiphi (ø 110 & ø 140mm);
- ✓ The Sidinsi WTP needs to be upgraded to 0.4Mℓ/day. The WTP is served via an existing secondary bulk pipeline (3.4km) that needs to be upgraded from ø 90mm to ø 110mm. From the Esidensi community a tertiary pipeline (ø 90mm) will be required to extend (5km) further south to the Dengeni community;

- ✓ Install new abstraction works and pump station (842kW) at Pongolapoort Dam as Senekal Trust is not sustainable. A ø 660mm primary bulk pipeline to extend from the dam to the existing Mandhlakazi WTP (±22km).

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 183km. An additional 43km secondary (ranging between ø 63mm and ø 560mm) and 139km tertiary bulk pipelines (ranging between ø 63mm and ø 315mm) would be necessary to supply the whole of the Mandhlakazi WSIA.

9.5.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 17.6Mℓ and needs to be upgraded to 32Mℓ;
- ✓ The two (2) primary command reservoirs (CR1 & CR2)) needs to be upgraded to 12.7Mℓ and 475kℓ respectively;
- ✓ Existing secondary storage reservoirs need to be upgraded to 10Mℓ with eight (8) additional secondary reservoirs required with capacities between 160kℓ and 2.2Mℓ; and
- ✓ Existing tertiary reservoirs need to be upgraded to 9.2Mℓ with 34 additional tertiary reservoirs required with capacities between 170kℓ and 2.1Mℓ.

The storage capacity would need to be increased with an additional 29Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme.

9.5.2.3 Water Pump Stations

- ✓ The existing pump station at the Jozini Dam's pumping capacity will need to be increased to 842kW; and
- ✓ Four (4) new pump stations are required – one booster pump station at Mandhlakazi WTP (786kW), pump station at Mono River to Sidinsi WTP (11kW), a booster pump station to CR1 (816kW) and a new pump station at Pongolapoort Dam (842kW).

9.5.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Mandhlakazi WSIA and is illustrated within Figure 9-8 overleaf followed by the schematic layout of the WSIA within Figure 9-9.

It is proposed to initiate a detailed hydrology study to determine the yield of the rivers and Pongolapoort Dam. Once the yields have been determined and it is found to be sufficient, can the following infrastructure interventions be commissioned:

- ✓ Upgrade the existing ø 400mm rising main (14.5km) to the Mandlakazi WTP to ø 660mm;
- ✓ Upgrade approximately 80km secondary pipelines and 46km tertiary pipelines;
- ✓ Upgrade the existing Mandlakazi WTP to 35Mℓ/day and the Sidinsi WTP to 0.4Mℓ/day;

- ✓ Add secondary bulk pipelines ranging from ø 63mm to ø 560mm (43km) and tertiary pipelines (139km) ranging between ø 63mm and ø 315mm;
- ✓ Increase the existing primary storage capacity (11Mℓ) to 13.2Mℓ and the existing secondary storage capacity (4.6Mℓ) to 9.5Mℓ. The existing tertiary storage (2Mℓ) need to increase to 9.2Mℓ;
- ✓ Additional secondary storage of 7.4Mℓ and approximately 20Mℓ of tertiary storage would be required;
- ✓ Increase pumping capacity of the existing pump station at Blackie Dam (842kW);
- ✓ Add three (3) new pump stations at the Sidinsi and Mandhlakazi WTPs (11kW & 786kW) and a booster pump station at CR1 816kW); and
- ✓ A new abstraction works, pump station (842kW) and rising main (21km and ø 660mm) from the Pongolapoort Dam to the existing Mandlhakazi WTP to increase the water supply for Mandhlakazi Scheme as the supply from Charl Senekal Trust is not sustainable.

Design details of all the infrastructure components are provided within Annexure B.

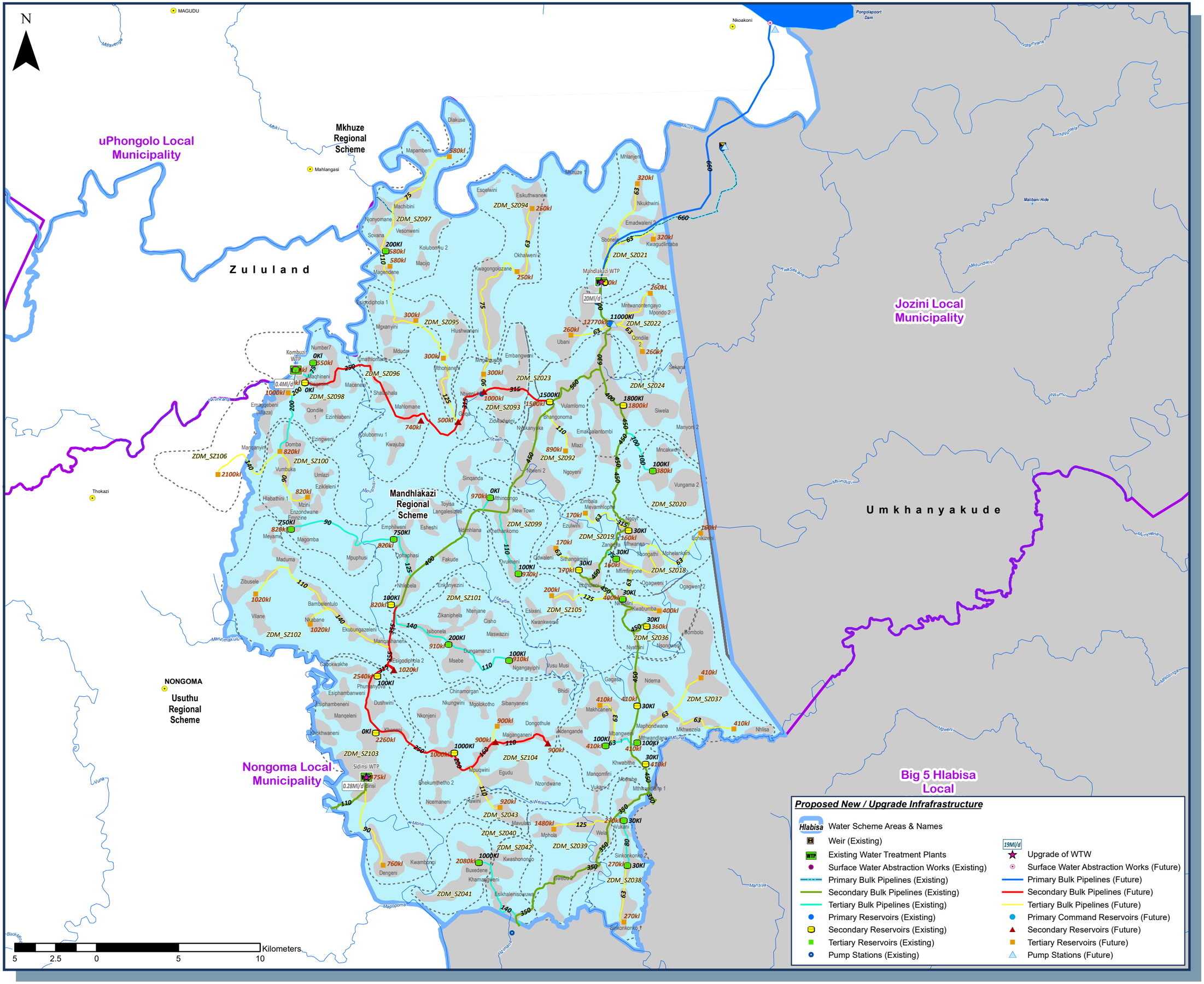
9.5.4 Financial Requirements

The bulk cost requirement for ZUL004: Mandhlakazi WSIA is tabled within Table 9-8 below.

Table 9-8: ZUL003: Mandhlakazi Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R660 543 000	R66 054 300	R726 597 300
Secondary	R537 999 000	R53 799 900	R591 798 900
Tertiary	R201 642 000	R20 164 200	R221 806 200
Total	**R1 400 184 000**	**R140 018 400**	**R1 540 202 400**

The total bulk cost requirement for the Mandhlakazi Scheme is R 1.54 billion (excl VAT). The scheme development cost per household is approximately R66 692. Due to the size of the project, it will take close to 42 years to complete.



Legend

- Provinical Boundaries
- District Municipality Boundaries
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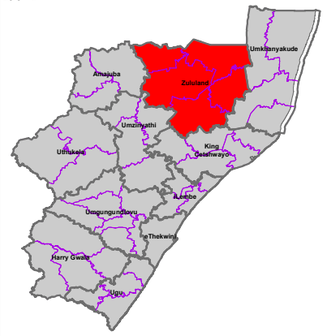
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL004: Mandhlakazi Zululand District Municipality

DATE COMPLETED:

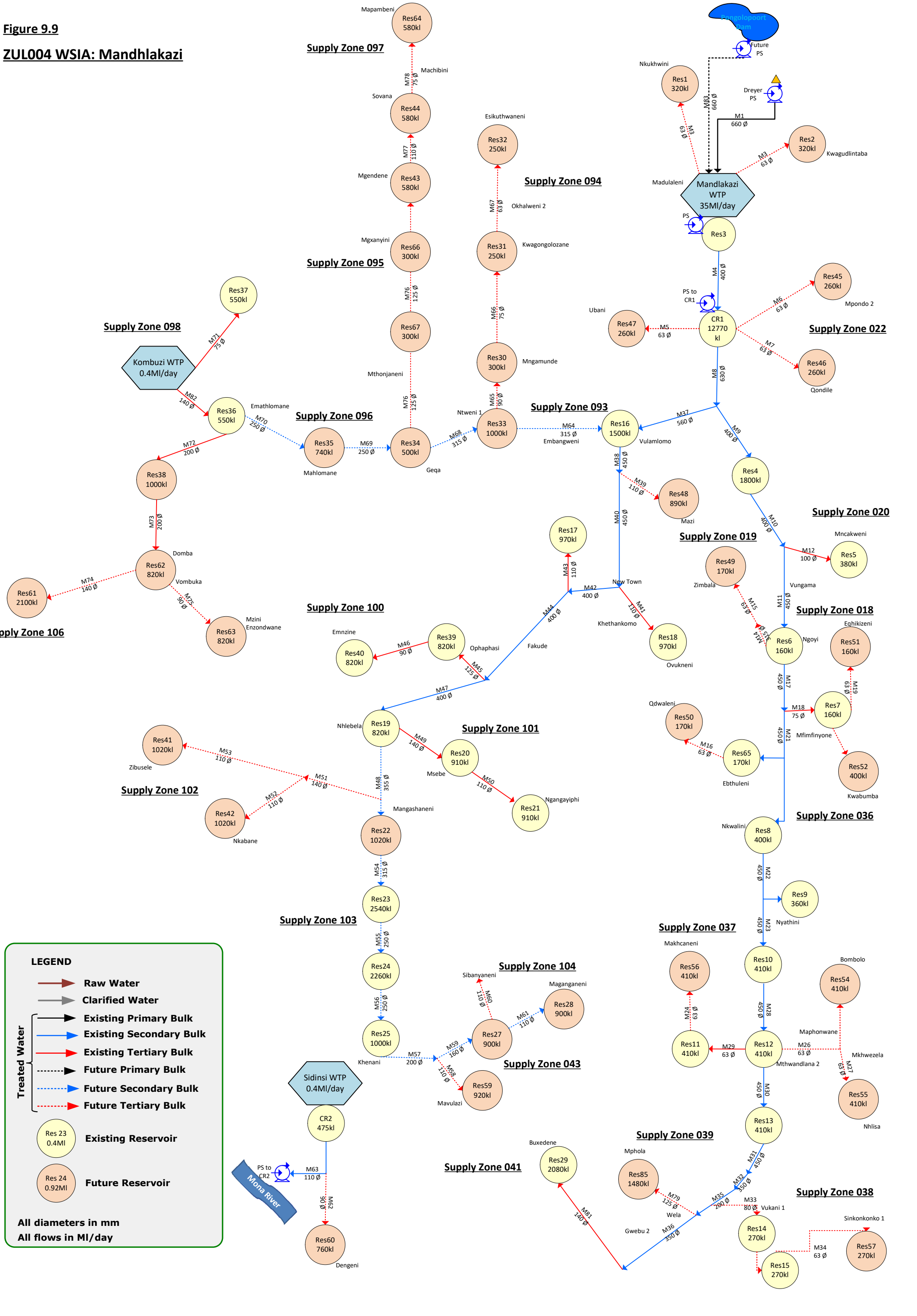
30 September 2020

MAP NO.:

DC26: Figure 9.8

Figure 9.9

ZUL004 WSIA: Mandhlakazi



9.6 ZUL005: MKUZE SCHEME

9.6.1 Demand Model Intervention

9.6.1.1 Water Demand

The water demand for the Mkuze WSIA was determined for 2020 and 2050 and included within Table 9-9. The area covered by the scheme is vast stretching to the west to include portions of the Ithala Game Reserve. It includes approximately 15 communities with mostly formal farm areas and a small number of sparsely scattered rural communities. Mkuze Scheme is expected to have a demand of approximately 3Mℓ in 2050.

Table 9-9: Population and Water Demand 2020 and 2050 for the Mkuze WSIA

Population	**Population 2020**	**Population 2050**
	11 533	13 931
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	2.24	2.84

9.6.1.2 Water Resource Consideration

Raw water is pumped from Pongolopoort Dam to the Gumbi WTP (1Mℓ/day) via a ø 160mm pumping main. It is recommended that a second abstraction point at Pongolopoort Dam be investigated as the current emergency supply abstraction point is not in an ideal position. ZDM indicated that a single regional scheme is not feasible and individual schemes from local sources will be required to serve the scattered communities.

A water resource study will be necessary to identify potential surface water and groundwater augmentation options.

9.6.2 Water Supply Infrastructure

9.6.2.1 Bulk Conveyance

- ✓ The existing pumping main (ø 160mm and 0.6km long) from Pongolopoort Dam and runs (6km) further to the Gumbi WTP, does not need any upgrades or extentions.

9.6.2.2 Storage

- ✓ The existing storage reservoir does not need to be upgraded.

9.6.3 Proposed Interventions

The interventions is recommended in order to adequately supply the Mkuze WSIA and is illustrated within Figure 9-10 overleaf followed by the schematic layout of the WSIA within Figure 9-11.

- ✓ Investigate the option of a second abstraction point at Pongolopoort Dam as the current emergency water supply abstraction point is not in an ideal position;
- ✓ Perform a yield analysis of the rivers and Pongolopoort Dam to determine addtitional water sources; and
- ✓ Groundwater studies are required in order to supply approximately 1 300 households through stand-alones schemes / individual schemes that are not currently served;
- ✓ Conduct hygrology studies to determine the yield of the rivers and Pongolapoort Dam.

Design details of all the infrastructure components are provided within Annexure B.

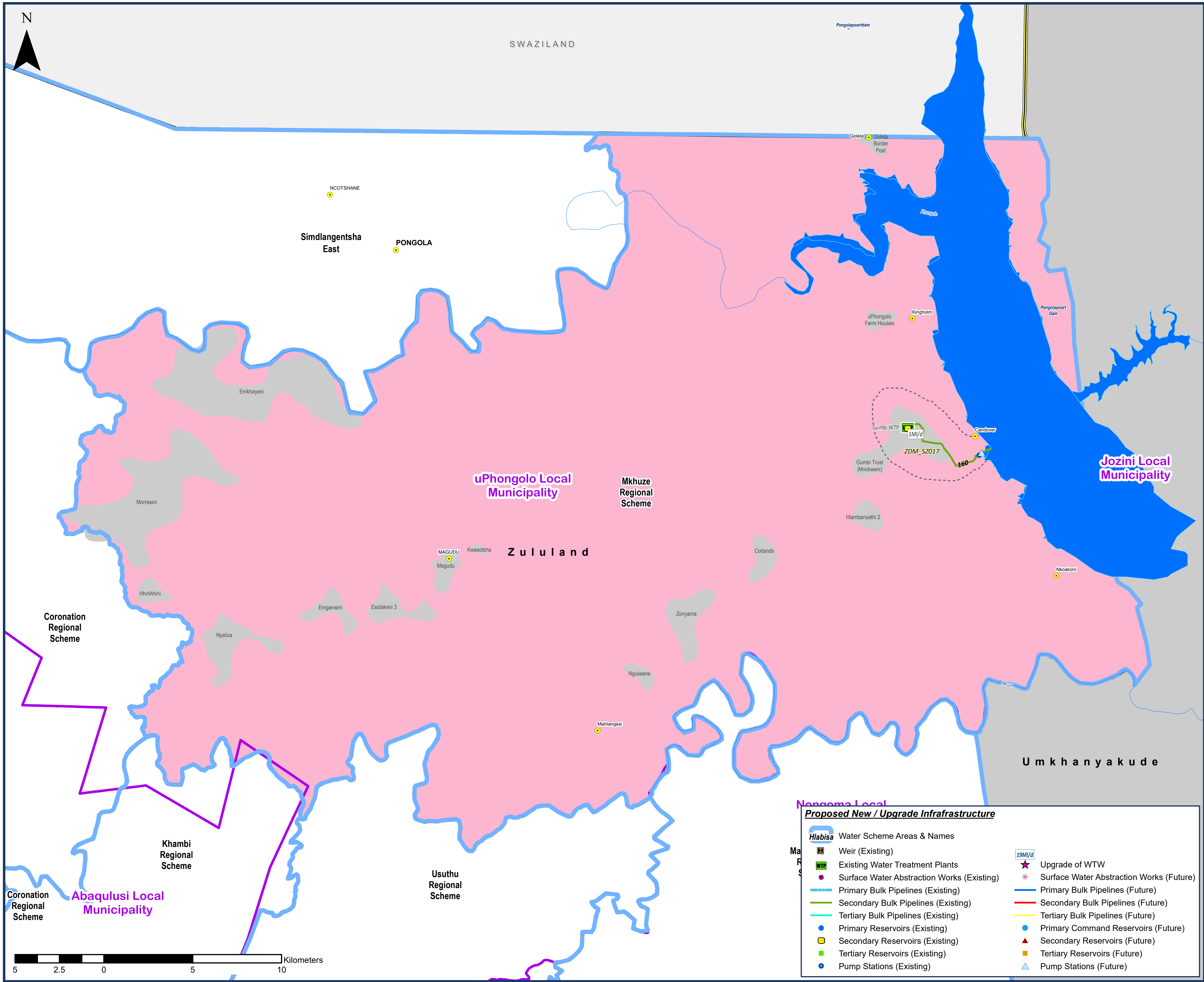
9.6.4 Financial Requirements

The bulk cost requirement for ZUL005: Mkuze WSIA is tabled within Table 9-10 below.

Table 9-10: ZUL005: Mkuze Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R15 000 000.00	R1 500 000	R16 500 000
Secondary	R9 323 000.00	R932 300	R10 255 300
Tertiary	R0	R0	R0
Total	**R24 323 000**	**R1 832 300**	**R26 755 300**

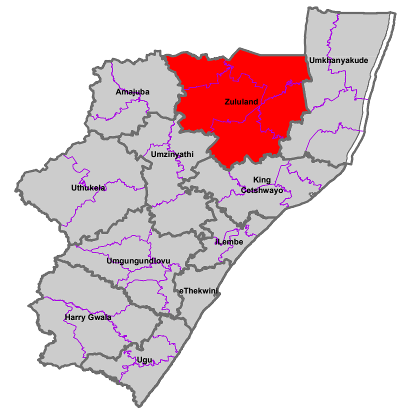
The total bulk cost requirement for the Mkuze Scheme is R 26.7 million (excl VAT). The scheme development cost per household is approximately R 9 794.


N
SWAZILAND
Pongolapoortdam
Golela
Golela Border Post
NCOTSHANE
Simdlangentsha East
PONGOLA
Phongolo
Kingholm
uPhongolo Farm Houses
Pongolapoort Dam
Emkhayeni
Morreson
Gumbi WTP
1Ml/d
ZDM_SZ017
160
Candover
Gumbi Trust (Mvokweni)
Jozini Local Municipality
uPhongolo Local Municipality
Mkhuze Regional Scheme
Hlambanyathi 2
MAGUDU
Magudu
Kwasotsha
Zululand
Cotlands
Nkoakoni
Hhinihhini
Emganwini
Esidakeni 3
Zonyama
Coronation Regional Scheme
Nyaliza
Ngulwane
Mkuze
Mahlangasi
Umkhanyakude
Nongoma Local
Khambi Regional Scheme
Usuthu Regional Scheme
Coronation Regional Scheme
Abaqulusi Local Municipality
5 2.5 0 5 10 Kilometers
Proposed New / Upgrade Infrafrastructure
Hlabisa Water Scheme Areas & Names
Weir (Existing)
WTP Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Pump Stations (Existing)
19Ml/d Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
Pump Stations (Future)

Legend

Provinical Boundaries
District Municipality Boundaries
Local Municipality Boundaries
Dams & Dam Names
Rivers
Settlements & Settlement Names
Major Towns
ZDM Supply Zones

LOCALITY:



CLIENT:

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL005: Mkhuze
Zululand District Municipality

DATE COMPLETED:
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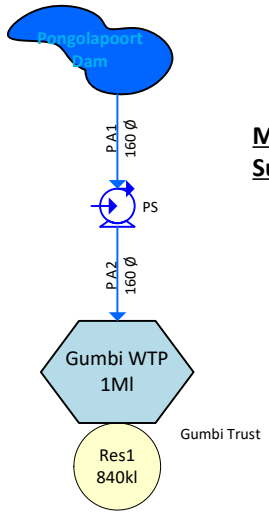
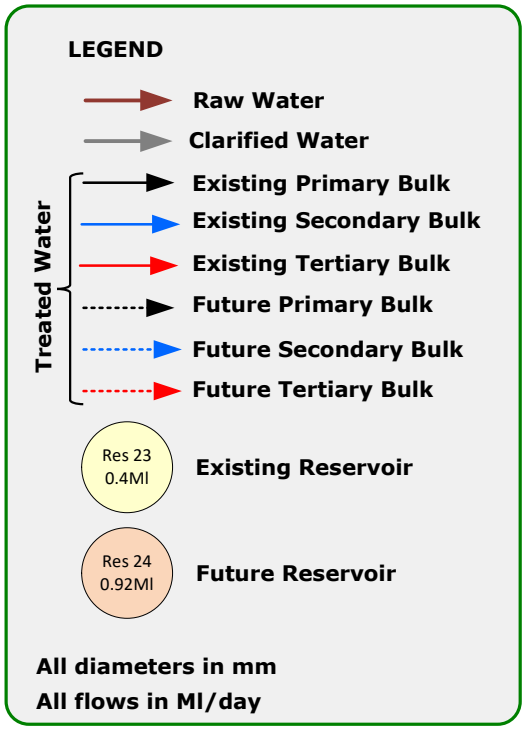
MAP NO.:
DC26: Figure 9.10

Figure 9.11

ZUL005 WSIA: Mkhuze



Mkhuze:
Supply Zone 017



9.7 ZUL006: NKONJENI SCHEME

9.7.1 Demand Model Intervention

9.7.1.1 Water Demand

The water demand for the Nkonjeni WSIA was determined for 2020 and 2050 and included within Table 9-11. It includes approximately 175 communities with no formal urban towns. The rural communities are sparsely scattered and vast distances apart. Nkonjeni Scheme is expected to have a demand of nearly 42Mℓ in 2050.

Table 9-11: Population and Water Demand 2020 and 2050 for the Nkonjeni WSIA

Population	**Population 2020**	**Population 2050**
	160 952	194 424
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	33.66	41.88

9.7.1.2 Water Resource Consideration

At present the White Mfolozi catchment, at a 1:50 year level of assurance, is estimated at 51 million m³/a. The total current requirement is in the order of 98 million m³/a. The catchment is therefore severely stressed from a resource point of view. The Klipfontein Dam is the most significant water resource and is situated in the upper reaches of the White Mfolozi River. The Klipfontein Dam can be used to increase the supply to Ulundi. The challenge in the White Mfolozi catchment is not that there is not enough water but there is a lack of dams which results in low firm yields and water shortages that occur during drought periods. A water resource study will be necessary to identify potential surface water augmentation options and possible dam developments.

The Ulundi and Babanango WTPs need to be upgraded to 32Mℓ/day and 0.5Mℓ/day, respectively.

9.7.2 Water Supply Infrastructure

9.7.2.1 Bulk Conveyance

- ✓ Clear water is pumped from the Ulundi WTP via an existing ø 500mm rising main to a command reservoir. The WTP needs to be upgraded to 32Mℓ/day and the rising main to ø 813mm;
- ✓ From the command reservoir (CR1), an existing secondary pipeline extends (5.5km) to the Mkhazane community in Supply Zone 014 and needs to be upgraded to ø 400mm from where an existing ø 600mm and ø 350mm pipeline extends further to Matheng. From Mkhazane an additional ø 315 mm secondary pipeline will be needed running (±28km) to the east through Supply Zone 014 towards Supply Zone 087 and into Supply Zone 086 to Zilulwane community. From Zilulwane an existing ø 125mm secondary bulk pipeline extends (10.5km) further north east to Onteku. Existing tertiary pipelines (ranging between ø 75mm and ø 110m) branch off to Mbangweni, Mgababa 2 and Bhekimbazo. An additional ø 110mm tertiary pipeline (approximately 4km) will be required to serve Njomelwane. At Mthonjaneni community,

tertiary pipelines (ranging from ø 110mm to ø 160mm) are needed to branch off south towards Supply Zone 084 to feed the communities of KwaMvula, Gijima, Enguqe and Ekatini. The tertiary pipelines total approximately 8.5km. Additional ø 125mm & ø 315mm tertiary pipelines will be required to run (±10km) in a north easterly direction into Supply Zone 083 to serve Sqobelo and Ntabankulu. A ø 140mm tertiary pipeline will be needed to serve Supply Zone 088 (1.3km);

- ✓ Another existing ø 355mm secondary pipeline from CR1 extends east towards Supply Zone 013 to serve Ulundi Unit B1. The secondary pipe (ø 315mm) extends further to Ntendeka, Ulundi Unit D, Esthenilezitombi and Vukuza (14.5km) and is joined by the existing primary pipeline extending from the Nkonjeni Hospital WTP and Masokaneni WTP;
- ✓ An existing ø 400mm secondary pipeline extends from CR1 north to Mbudle. 1.2km from the CR1 a ø 355mm existing secondary extends (5km) in a northernly direction into Supply Zone 010 to the Cisholo community. From Cisholo the pipeline (ø 315mm) further extends to Mbeka (3.55km) where it joins with an existing ø 250mm secondary pipeline. The existing ø 250mm secondary pipeline extends to the east and joins the existing primary pipeline (ø 50mm) that comes from the Nkonjeni Hospital WTP and Masokaneni WTP (6km). An existing ø 250mm extends (3km) from the primary and secondary pipeline join north east through Supply Zone 015 to Mahlabathini. From Mahlabathini an existing ø 140mm tertiary pipeline extends (1.3km) north into Supply Zone 008 to Vutela;
- ✓ From Mbeka, an existing ø 315mm secondary bulk pipeline extends (±4km) in a north westernly direction to Qwane Vuka in Supply Zone 012. At Manaba community, an existing ø 75mm tertiary pipeline runs north to Osengathini in Supply Zone 007;
- ✓ From Qwane Vuka an existing ø 200mm secondary bulk pipeline extends (4km) in a northernly direction to Mahleza (Supply Zone 059) from where it extends further north to Supply Zone 005 to Mbotsheni (3.5km). Here an existing ø 75mm tertiary pipeline branch off to the left to Mashulu in Supply Zone 005. From Mbotsheni an the existing ø 160mm secondary pipeline runs still in a northernly direction to Cobe in Supply Zone 056 (±5km). Two existing tertiary pipelines ranging between ø 75mm and ø 110mm branch off on either side of the secondary pipeline. One tertiary pipeline branch off to the left to Dlebe (±1.7km) in Supply Zone 004 and the other branch off to the right to Kwayaka in Supply Zone 054 and further to Ndumakude in Supply Zone 055 (±7km);
- ✓ From Cobe, the existing ø 125mm secondary bulk pipeline extends even further north to Kwamshayazafe 3 (7.5km) in Supply Zone 058 and ends at Njoline community in Supply Zone 057. The ø 90mm secondary pipeline to Njoline is approximately 4km;
- ✓ Also from Qwane Vuka, another existing ø 200mm secondary bulk pipeline extends in a north westernly direction to Ohlelo (2km) in Supply Zon 009. From here the ø 140mm secondary pipeline extends further (9km) through Supply Zone 053 to Supply Zone 051. The ø 125mm existing secondary pipeline passes through Supply Zone 51 (Mbombo & Mbekuzeni communities) to Supply Zone 052. From Supply Zone 52 the ø 90mm pipeline extends to Kwankakazi (3km). An existing ø 63mm tertiary brances off at Kwankakazi to Tukelana 2 in Supply Zone 066 (±4km). Two existing ø 50mm tertiary pipeplines branch off on either side of the secondary pipeline. One towards Undindi community (3km) north of the secondary pipeline and the other to the south of the secondary pipeline in Supply Zone 053 (2.5km);

- ✓ From Mpungamhlope WTP (0.8Mℓ/day) an existing ø 160mm primary bulk pipeline extends south towards an existing command reservoir (CR2). A ø 315 mm primary bulk pipeline is needed from CR2 to extend to the east to CR1 at Ulundi WTP (±15km). An additional ø 250mm secondary bulk pipeline is also needed to extend south from CR2 to Goje (3km). From here the ø 200mm secondary pipeline will be required to extend further (3km) south to Emahlathini and further to Hlungulwane Supply Zone 002 (2km). A ø 75mm tertiary pipeline will extend from the secondary bulk pipeline further south through Supply Zone 002, 006 and into 050 at Kweyezulu. From Emahlathini another ø 160mm tertiary bulk pipeline is needed (10km) to serve Mehlomane, Mgababa 3, Hodlweni in Supply Zone 49 and it will end in Supply Zone 003;
- ✓ The existing Babanango WTP needs to be upgraded to 0.5Mℓ/day. An existing ø 110mm primary bulk pipeline from the WTP extends to an existing command reservoir (CR3).

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 98km. An additional 15km primary bulk pipeline (ø 315mm), 40km secondary (ranging between ø 63mm and ø 315mm) and 44km tertiary bulk pipelines (ranging between ø 75mm and ø 315mm) would be necessary to supply the whole of the Nkonjeni WSIA.

9.7.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 16Mℓ and needs to be upgraded to 79Mℓ;
- ✓ The three (3) primary command reservoirs (CR1, CR2 & CR3) need to be upgraded to 19.27Mℓ, 2.35Mℓ and 920kℓ respectively;
- ✓ 24 Existing secondary storage reservoirs need to be upgraded to 42Mℓ with six (8) additional secondary reservoirs required with capacities between 360kℓ and 1.5Mℓ; and
- ✓ 20 Existing tertiary reservoirs need to be upgraded to 14.5Mℓ with 10 additional tertiary reservoirs required with capacities between 330kℓ and 2.4Mℓ.

The storage capacity would need to be increased with an additional 78Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme.

9.7.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Nkonjeni WSIA and is illustrated within Figure 9-12 overleaf followed by the schematic layout of the WSIA within Figure 9-13Figure 9-9.

- ✓ Upgrade the existing ø 500mm rising main from the WTP to the command reservoir to ø 813mm as well as 15km primary bulk pipelines ranging from ø 50mm to ø 150mm;
- ✓ Upgrade 118km existing secondary pipelines ranging between ø 90mm and ø 400mm;
- ✓ Upgrade 40.5km existing tertiary pipelines ranging from ø 50mm and ø 250mm;
- ✓ Upgrade the existing Ulundi WTP to 32Mℓ/day and the Babanango WTP to 0.5Mℓ/day;

- ✓ Add an additional 15km primary bulk pipeline (ø 315mm), secondary bulk pipelines ranging from ø 63mm to ø 315mm (40km) and tertiary pipelines (44km) ranging between ø 75mm and ø 315mm;
- ✓ Increase the existing primary storage capacity (425kℓ) to 22.5Mℓ;
- ✓ Increase the existing secondary storage capacity (11.3Mℓ) to 42Mℓ. The existing tertiary storage (4Mℓ) need to be increased to 14.5Mℓ;
- ✓ Additional secondary storage of 4.8Mℓ would be required as well as and additional 10Mℓ of tertiary storage; and
- ✓ Conduct a water resource study to identify potential surface water augmentation options and possible dam developments.

Design details of all the infrastructure components for are provided within Annexure B.

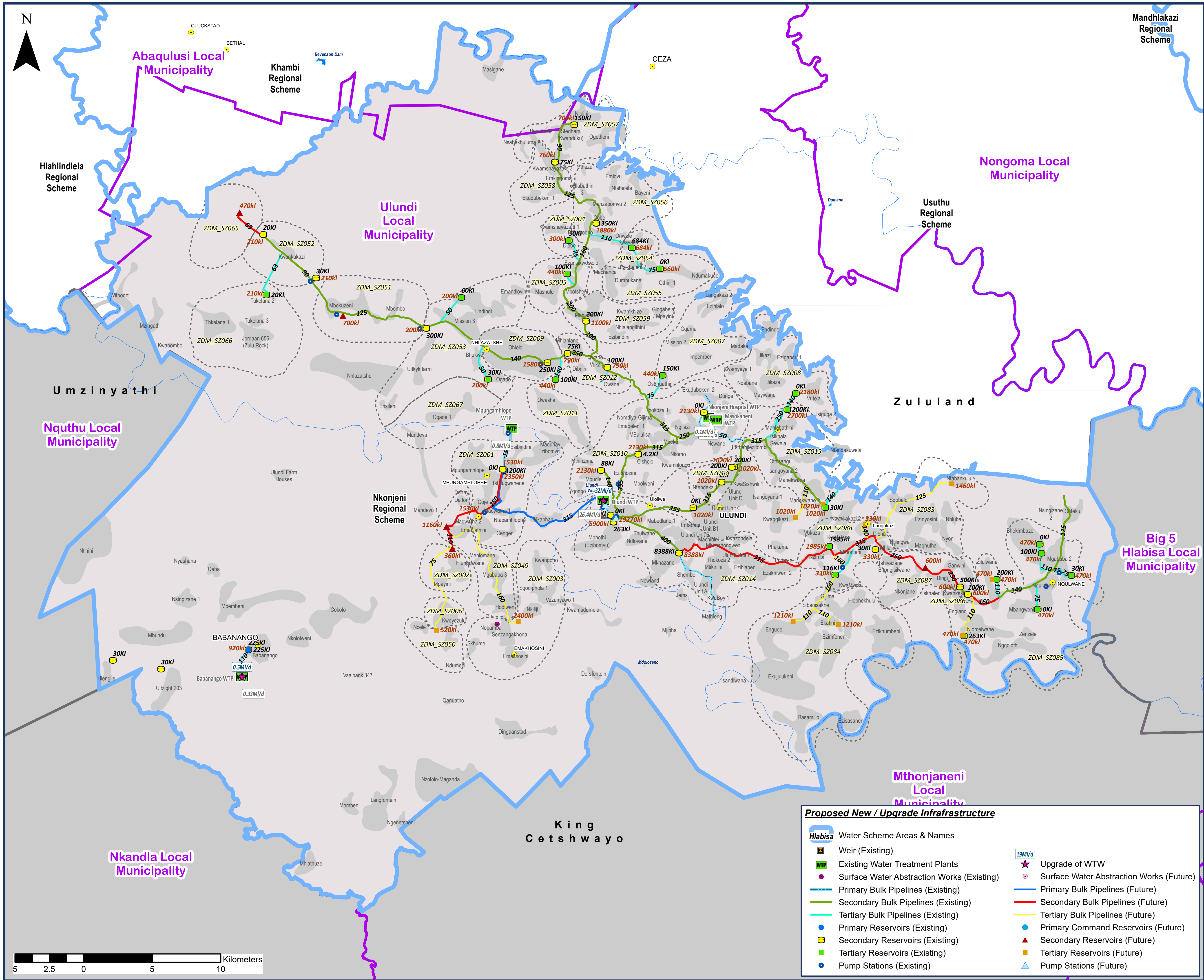
9.7.4 Financial Requirements

The bulk cost requirement for ZUL006: Nkonjeni WSIA is tabled within below.

Table 9-12: ZUL006: Nkonjeni Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R231 256 670	R23 125 667	R254 382 337
Secondary	R436 551 000	R43 655 100	R480 206 100
Tertiary	R153 106 000	R15 310 600	R168 416 600
Total	**R820 913 670**	**R77 337 167**	**R903 005 037**

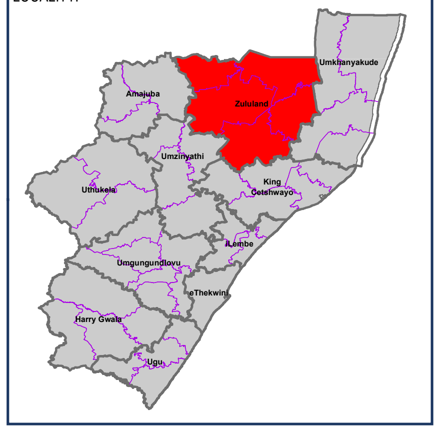
The total bulk cost requirement for the Nkonjeni Scheme is R 903 million (excl VAT). The scheme development cost per household is approximately R 23 687.



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL006: Nkonjeni Zululand District Municipality

DATE COMPLETED:

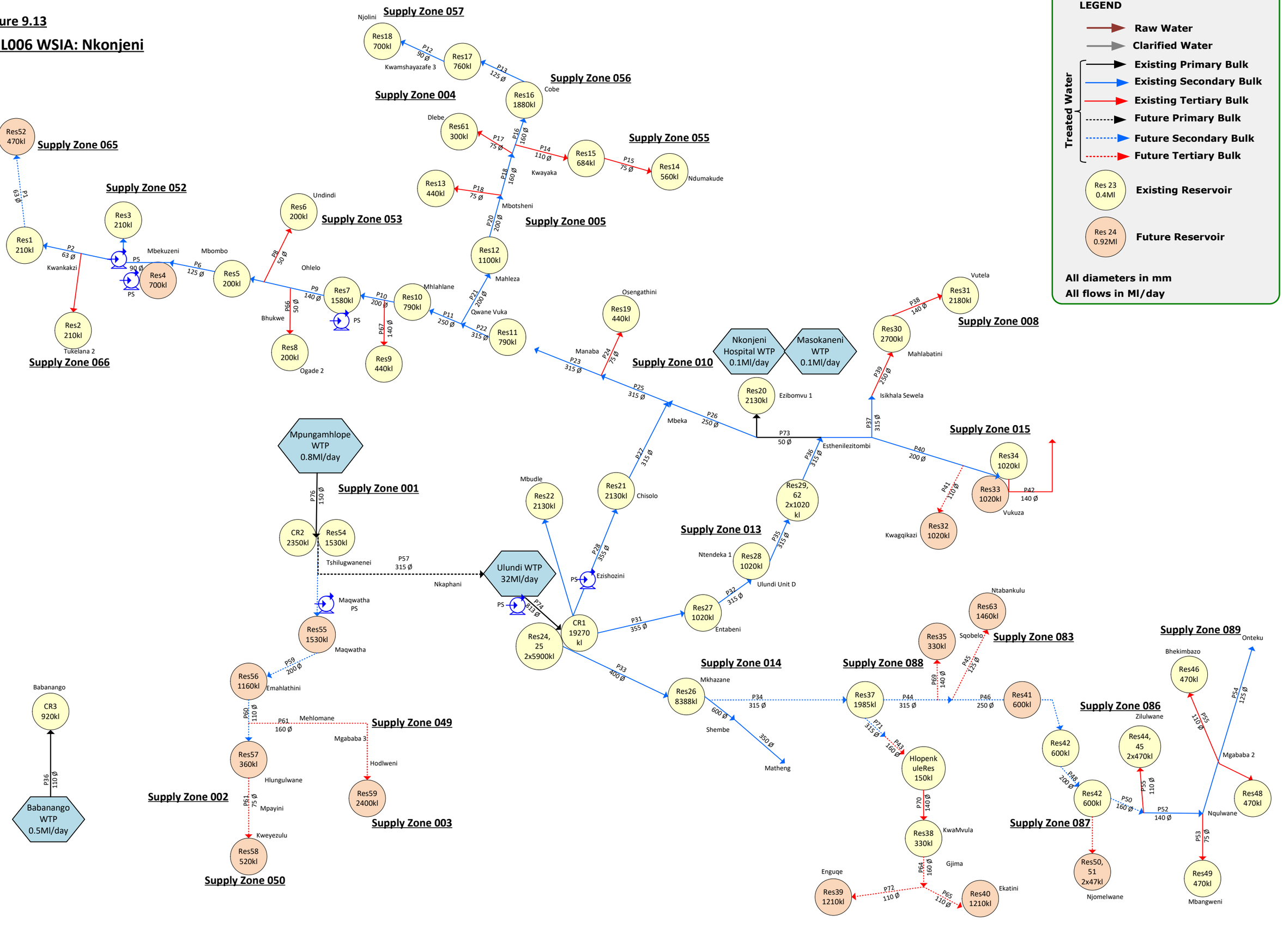
30 September 2020

MAP NO.:

DC26: Figure 9.12

Figure 9.13

ZUL006 WSIA: Nkonjeni



9.8 ZUL007: SIMDLANGENTSHA CENTRAL SCHEME

9.8.1 Demand Model Intervention

9.8.1.1 Water Demand

The water demand for the Simdlangentsha Central WSIA was determined for 2020 and 2050 and included within Table 9-13. It includes 46 communities with Belgrade being the only formal urban town. The rural communities are scattered across the area with very low densities. Simdlangentsha Central Scheme is expected to have a demand of approximately 7Mℓ in 2050.

Table 9-13: Population and Water Demand 2020 and 2050 for the Simdlangentsha Central WSIA

Population	**Population 2020**	**Population 2050**
	32 567	39 340
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	5.56	6.95

9.8.1.2 Water Resource Consideration

The Simdlangentsha Central Scheme is supplied from two sources namely a weir in the Mozana River and a small dam near the Sim Central Package Plant (4Mℓ/day). The Sim Central Package Plant is currently running at full capacity. Raw water is pumped from the weir in the Mozana River to the Sim Central Package Plant from where clear water is pumped to a command reservoir. Three small package treatment plants also serve localised communities, namely Khiphunyawo WTP (0.37Mℓ/day), Msibi WTP (0.03Mℓ/day) and Nkonsenthsa WTP (0.13Mℓ/day).

It is proposed to construct a new WTP (10Mℓ/day) at the existing weir at the Mozana River.

9.8.2 Water Supply Infrastructure

9.8.2.1 Bulk Conveyance

- ✓ The existing primary bulk pipeline that pumps raw water to the Sim Central Package Plant needs to be upgraded to ø 450mm (5.7km);
- ✓ The existing secondary bulk pipeline from the plant also needs to be upgraded to ø 315mm and it extends to Kwesimphlope (Manyandeni) community. An additional ø 90mm secondary bulk pipeline will be required to extend (1.7km) a bit further to Gabela in Supply Zone 029. From where the two ø 450mm and ø 315mm secondary bulk pipelines join, another ø 200mm secondary bulk pipeline is need to extend to the north towards the Gaqa community;
- ✓ Existing tertiary bulk pipelines branch off the ø 315 mm secondary bulk pipeline to the east ranging from ø 110mm and ø 160mm past Makhwabi, Mshololo and Highlands A communities (±12km);
- ✓ Additional tertiary bulk pipelines (ranging between ø 63mm and ø 75mm) are required to extend (6km) from the existing ø 315mm secondary bulk pipeline towards Mabonjane, Manyandeni and Kwazibhedlu;

- ✓ Raw water is abstracted from a weir for Khiphunyawo WTP via a ø 150mm primary bulk pipeline. From the WTP, additional secondary bulk pipelines (ø 90mm & ø 160mm) are needed to extend to the east to serve Luphiso Emncithini, Ezitandini and Enkwambase communities in Supply Zone 028 (± 2.5km). Also from the WTP, another secondary bulk pipeline will be needed to serve communities in Supply Zone 030. The secondary bulk pipeline willl range from ø 75mm to ø 250mm (17km) and extend past Ombimbini 1, Ncithinin, Altona, Mfaluvalo and end at Ezibayeni. A ø 90m,m tertiary pipeline is needed to branch off to the secondary bulk pipeline to serve Vimbemshini (1km). From Ezibayeni, additional ø 63mm tertiary pipelines will extend to the north to Emabomvu and to the south to Maqanda (±5km). A few tertiary pipelines that branch off the secondary bulk pipeline will be needed. At Altona a ø 110mm tertiary pipeline need to branch off to the south to serve Ntabakayishi. A ø 90mm tertiary bulk pipeline will be needed to serve Manzabomvu 1 (2km) and tertiary bulk pipelines (ranging from ø 63mm to ø 140mm) will be required to branch off from Manzabomvu in a southernly direction to serve Bongaspoort, Mafindose, KLipwal, Mfenyane and Dlomodlomo 1 (±10km);
- ✓ From Nkonsentsha WTP an existing ø 75mm secondary bulk pipeline extends towards Nkosentsha and Mfaluvalo communities; and
- ✓ From the Msibi WTP, an existing ø 63mm secondary pipeline extends (3km) to the east to Newstand and Magiqweni communities and to the west to Ombimbini 1 (2.8km). From the existing reservoir in existing in Ombimbini 1, an existing ø 125mm tertiary bulk pipeline extends further to the south west (2.9km) from where an additional ø 90 mm tertiary pipeline will be required to serve Gesi, Dungamanzi 2 and Ntungweni communities to the west (±9km).

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 67km. An additional 28km secondary (ranging between ø 75mm and ø 250mm) and 39km tertiary bulk pipelines (ranging between ø 63mm and ø 140mm) would be necessary to supply the Simdlangentsha Central WSIA.

9.8.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 2Mℓ and needs to be upgraded to 7.2Mℓ;
- ✓ Five (5) existing secondary storage reservoirs need to be upgraded to 4.4Mℓ with three (3) additional secondary reservoirs required with capacities between 160kℓ and 1.26Mℓ; and
- ✓ Five (5) existing tertiary reservoirs need to be upgraded to 2.7Mℓ with 13 additional tertiary reservoirs required with capacities between 180kℓ and 1.1Mℓ.

The storage capacity would need to be increased with an additional 14.6Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme.

9.8.3 *Proposed Interventions*

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Simdlangentsha Central WSIA and is illustrated within Figure 9-12 overleaf followed by the schematic layout of the WSIA within Figure 9-13Figure 9-9.

Ininiate hydrology studies to determine the yield of the rivers and spring from where the following infrastructure components could be commissioned:

- ✓ Construction of a new WTP (10Mℓ/day) at the existing weir at Mozana River;
- ✓ Upgrade 9km existing primary bulk pipeline ranging from ø 150mm to ø 450mm;
- ✓ Upgrade existing secondary pipelines (16km) ranging between ø 75mm and ø 450mm;
- ✓ Upgrade 18km existing tertiary pipelines (18km) ranging from ø 50mm to ø 160mm;
- ✓ Add secondary bulk pipelines ranging from ø 75mm to ø 250mm (29km) and tertiary pipelines (39km) ranging between ø 63mm and ø 140mm;
- ✓ Increase existing storage capacities with 5.27Mℓ. Existing secondary storage (1.7Mℓ) to be increased to 4.45Mℓ and existing tertiary storage (220kℓ) to 2.76Mℓ;
- ✓ Additional secondary storage capacity of approximately 2.28Mℓ would be required. The total tertiary storage that will be needed amounts to approximately 7.1Mℓ;and
- ✓ Hydrology studies are required to determine the yield of the rivers.

Design details of all the infrastructure components are provided within Annexure B.

9.8.4 *Financial Requirements*

The bulk cost requirement for ZUL007: Simdlangentsha Central WSIA is tabled within Table 9-14 below.

Table 9-14: ZUL007: Simdlangentsha Central Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R171 297 000	R17 129 700	R188 426 700
Secondary	R84 436 000	R8 443 600	R92 879 600
Tertiary	R75 901 000	R7 590 100	R83 491 100
Total	**R331 634 000**	**R33 163 400**	**R364 797 400**

The total bulk cost requirement for the Simdlangentsha Central Scheme is R 364.7 million (excl VAT). The scheme development cost per household is approximately R 47 291. Due to the size of the project, it will take close to 42 years to complete.

N

Gert Sibande

SWAZILAND

Simdlangentsha West

Simdlangentsha Central

Zululand

Simdlangentsha East

Coronation Regional Scheme

Gaqa (Inqabayamantungwa)
1260kl
140
1430Kl
2000kl
BELGRADE Sim Central Package Plant
Belgrade
Belgrade WTP
4Ml/d
1Ml/d
200
0
450
Mabonjane
440kl
75
Proposed New WTP
10Ml/d
Khiphunyawo
Ntabayezulu
Mzana
Khiphunyawo WTP
0.37Ml/d
Luphiso
Emncithini
225Kl
1320kl
160
ZDM_SZ028
Sibiyangenkomo
Ezitandini
Enkwambase
90
400kl
140
150
620kl
Vimbemshini
0Kl
320kl
Msibi WTP
0.03Ml/d
Magiqweni
Newstand
63
Ombimbini 1
160
125
120Kl
120kl
50
Mdiyane
700kl
Ntungweni
90
Dungamanzi 2
740kl
40Kl
Gesi
Ncithini
Altona
620kl
Manzabomvu 1
110
Ntabakayishi
30Kl
960kl
200
ZDM_SZ030
Kwambhucu
480kl
75
Mafindose
140
Ezinketheni 1
Bongaspoort
110
600kl
Klipwal
160kl
50
63
Mfenyane
260kl
Dlomodlomo 1
Mfaluvalo
110
Thusazane
250
Nkonsentsha WTP
0.13Ml/d
Nkosentsha
30Kl
500kl
Eskebheni 3
55
0Kl
560kl
180kl
Emabomvu
63
Kortnek
75
Mgwadlu
440kl
Maqanda
1100kl
Makhwabi
160
1100kl
Msololo
Mpemvane
160
110
88Kl
2500kl
Highlands A
30Kl
30Kl
ZDM_SZ029
420kl
Manyandeni
63
315
310kl
30Kl
380kl
30Kl
Kwazibhedlu
Nyawoshane
620kl
90
Gabela (Manyandeni)
Kwesimhlope (Manyandeni)
315
Mzinyathi
Mtoti dzi hwela
Spekboom
Mantambe
Thukela
Mhlumati

Proposed New / Upgrade Infrafrastructure

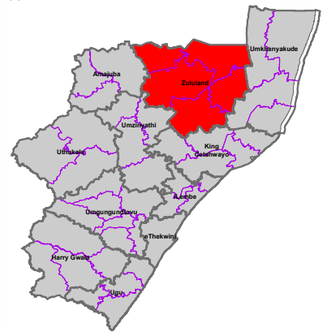
- Hlabisa — Water Scheme Areas & Names
- Weir (Existing)
- WTP — Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- 19Ml/d — Upgrade of WTW
- WTP — Water Treatment Plants (Future)
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

2.5 1.25 0 2.5 5 Kilometers

Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Mkhuze — Settlements & Settlement Names
- NONGOMA — Major Towns
- ZDM_SZ2022 — ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

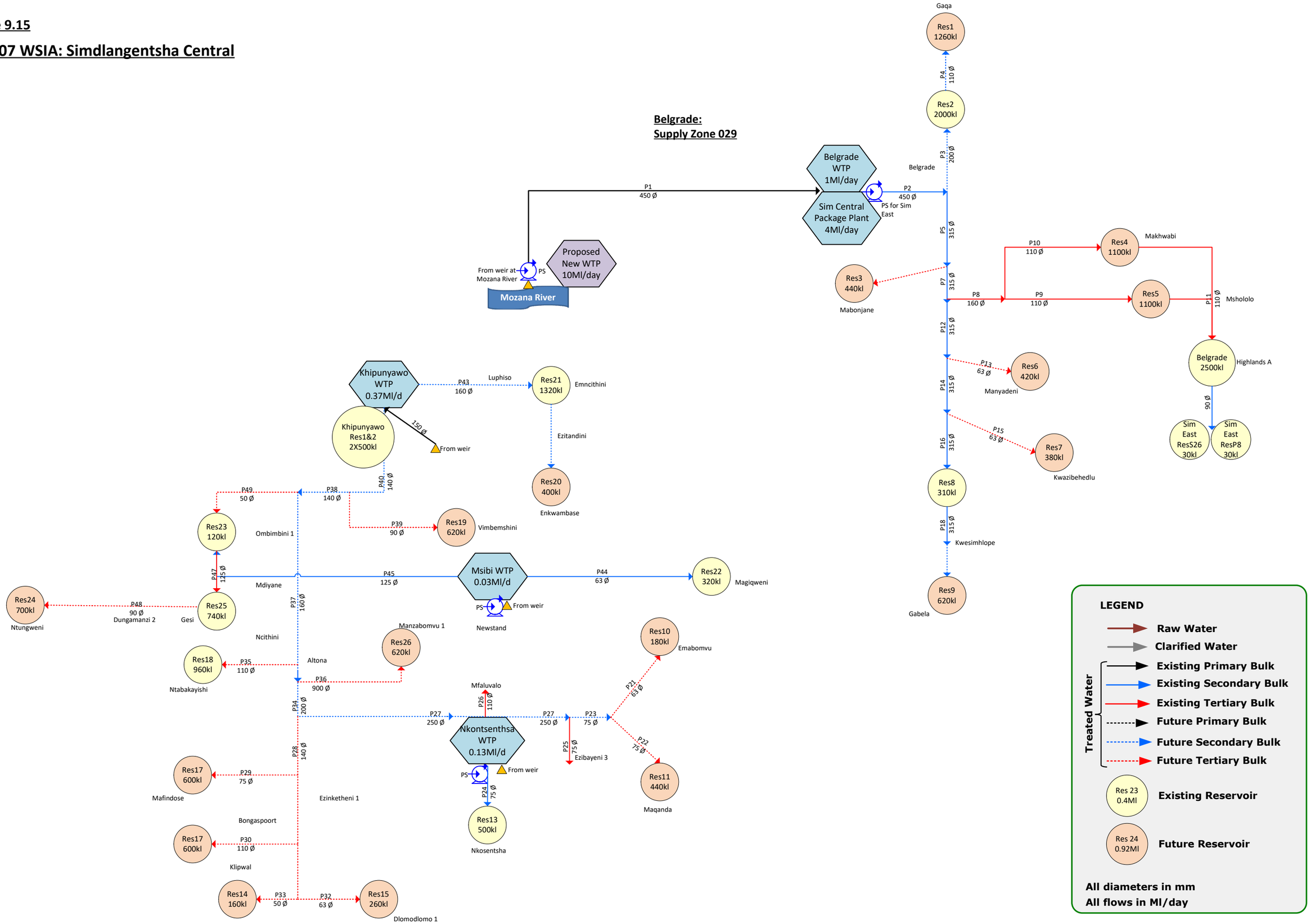
Total Bulk Water Supply Interventions - ZUL007: Simdlangentsha Central
Zululand District Municipality

DATE COMPLETED:
30 September 2020

MAP NO.:
DC26: Figure 9.14

Figure 9.15

ZUL007 WSIA: Simdlangentsha Central



9.9 ZUL008: SIMDLANGENTSHA EAST SCHEME

9.9.1 Demand Model Intervention

9.9.1.1 Water Demand

The water demand for the Simdlangentsha East WSIA was determined for 2020 and 2050 and included within Table 9-15. It includes 60 communities with Pongola Town and Ncotshane Township as being the only formal urban towns. The rural communities are scattered across the area with very low densities. Simdlangentsha East Scheme is expected to have a demand of approximately 23Mℓ in 2050.

Table 9-15: Population and Water Demand 2020 and 2050 for the Simdlangentsha East WSIA

Population	**Population 2020**	**Population 2050**
	96 300	116 327
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	18.24	22.80

9.9.1.2 Water Resource Consideration

Raw water is abstracted from irrigation channels next to the Phongolo River and gravitates to the Pongola WTP (12Mℓ/day). The irrigation channels are managed by DWS with ZDM paying DWS a raw water charge for water abstracted from the channels. Water supply to the rural areas are under pressure due to increase in population, excessive water usage and high water losses due to illegal and unmetered connections.

9.9.2 Water Supply Infrastructure

9.9.2.1 Bulk Conveyance

- ✓ Raw water is abstracted via an existing ø 200mm primary bulk pipeline to the Pongola WTP. The existing primary bulk pipeline from the WTP to the command reservoir (CR1) needs to be upgraded to ø 630mm (1.9km);
- ✓ The existing secondary bulk pipeline running from the command reservoir all the way west towards the Spekboom WTP needs to be upgraded. From the command reservoir the existing secondary bulk pipeline needs to be upgraded to ø 500mm and it extends to a reservoir at Masonsonso community in Supply Zone 017. From Masonsono to Dekville, the secondary pipeline needs to be upgraded to ø 460mm and from Dekville to Elangeni to ø 400mm. From Elangeni to Mvelazitha the pipeline needs to be upgraded to ø 630mm and from Mvelazitha to Godlwayo to ø 250mm. From Godlwayo to Spekboom WTP the pipeline needs to be upgraded to ø 140mm;
- ✓ The existing secondary bulk pipeline from CR1 to Ncotshane Township also requires an upgrade to ø 150mm;
- ✓ From Masonsono existing tertiary bulk pipelines extends (ranging from ø 50mm to ø 200mm) on either side of the existing secondary pipeline totalling approximately 23km. These pipelines serve the communities of Mboloba, Mhushulu, Msuzwane, Mgomane, Nsinjana and Tshilibi. Additional tertiary bulk

pipelines ranging from ø 50mm to ø 75mm are also required to serve KwaNkomfe, Magengeni, Qwaqwa and Esigungwini (±6km);

- ✓ From Elangeni existing tertiary bulk pipelines (ranging from ø 75mm to ø 160mm) branch off to the south of the existing secondary bulk pipeline to feed Okhahlamba, Endabeni, Engwabi, Hhohho, Ezimbomvu 3 and Embangweni 2 totalling approximately 16km. An additional ø 125mm tertiary pipeline is required to extend northwards from Elangeni to Dumagkunweni 1;
- ✓ From Mvelazitha existing tertiary bulk pipelines (ranging from ø 75mm to ø 110mm) branch off to the south of the existing secondary bulk pipeline to feed Bhembe, Mzinsangu and Mafela (8km). Additional ø 50mm tertiary pipelines are needed to serve Phondwane and part of Mzinsangu (4.5km);
- ✓ From Mvelazitha to the north, existing tertiary bulk pipelines (ranging between ø 50mm and ø 200mm) extends from the existing secondary bulk pipeline towards Thandukukhama, Lubisi South, Lubisi North, Sdakeni 1 and Manzana and Masombe (12km). An additional ø 400mm tertiary pipeline is required to serve Masombe (±2km);
- ✓ From Spekboom WTP the existing (ø 125mm) secondary pipeline extends further to end at Thengizwe 2 from where existing tertiary bulk pipelines (ranging between ø 75mm and ø 125mm) branch off at either side of the secondary pipeline towards Mabophe 2, Liba 2, Liba 1, Thengizwe 3, Sivule and Mgababa 1. Additional ø 75mm tertiary bulk pipelines are required and will branch off to the south of the existing tertiary pipelines to feed Moya Wamampondo, Moyeni and Mabophe 1.

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 33km. An additional 7.5km secondary (ø 75mm ø 110mm) and 25km tertiary bulk pipelines (ranging between ø 50mm and ø 400mm) would be necessary to supply the Simdlangentsha East WSIA.

9.9.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 5Mℓ and needs to be upgraded to 25.5Mℓ;
- ✓ 11 Existing secondary storage reservoirs need to be upgraded to 11Mℓ with three (3) additional secondary reservoirs required with capacities 400kℓ, 620kℓ and 1.26Mℓ and totalling 2.3Mℓ; and
- ✓ 29 existing tertiary reservoirs need to be upgraded to 14Mℓ with 13 additional tertiary reservoirs required with capacities between 140kℓ and 520kℓ, totalling 4Mℓ.

The storage capacity would need to be increased with an additional 27Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme. A total storage capacity of 32Mℓ is required.

9.9.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Simdlangentsha East WSIA and is illustrated within Figure 9-16 overleaf followed by the schematic layout of the WSIA within Figure 9-17Figure 9-9.

Ininiate hydrology studies to determine the yield of the rivers from where the following infrastrcucture components could be commissioned:

- ✓ Upgrade the existing primary bulk pipelines (3.4km) to ø 200mm and ø 630mm;
- ✓ Upgrade 33.6km existing secondary pipelines ranging between ø 75mm and 630mm;
- ✓ Upgrade 91km existing tertiary pipeline ranging between ø 50mm and ø 250mm;
- ✓ Add secondary bulk pipelines ranging from ø 75mm to ø 250mm (7.5km) and tertiary pipelines (39km) ranging between ø 63mm and ø 140mm;
- ✓ Increase the existing secondary storage capacity (1.25Mℓ) to 10.85Mℓ and the existing tertiary storage (3.8Mℓ) to 14.47Mℓ);
- ✓ Additional secondary storage capacity of approximately 2.28Mℓ would be required. The total tertiary storage that will be needed amounts to approximately 7.1Mℓ; and
- ✓ Hydrology studies are required to determine the yield of the rivers.

Design details of all the infrastructure components are provided within Annexure B.

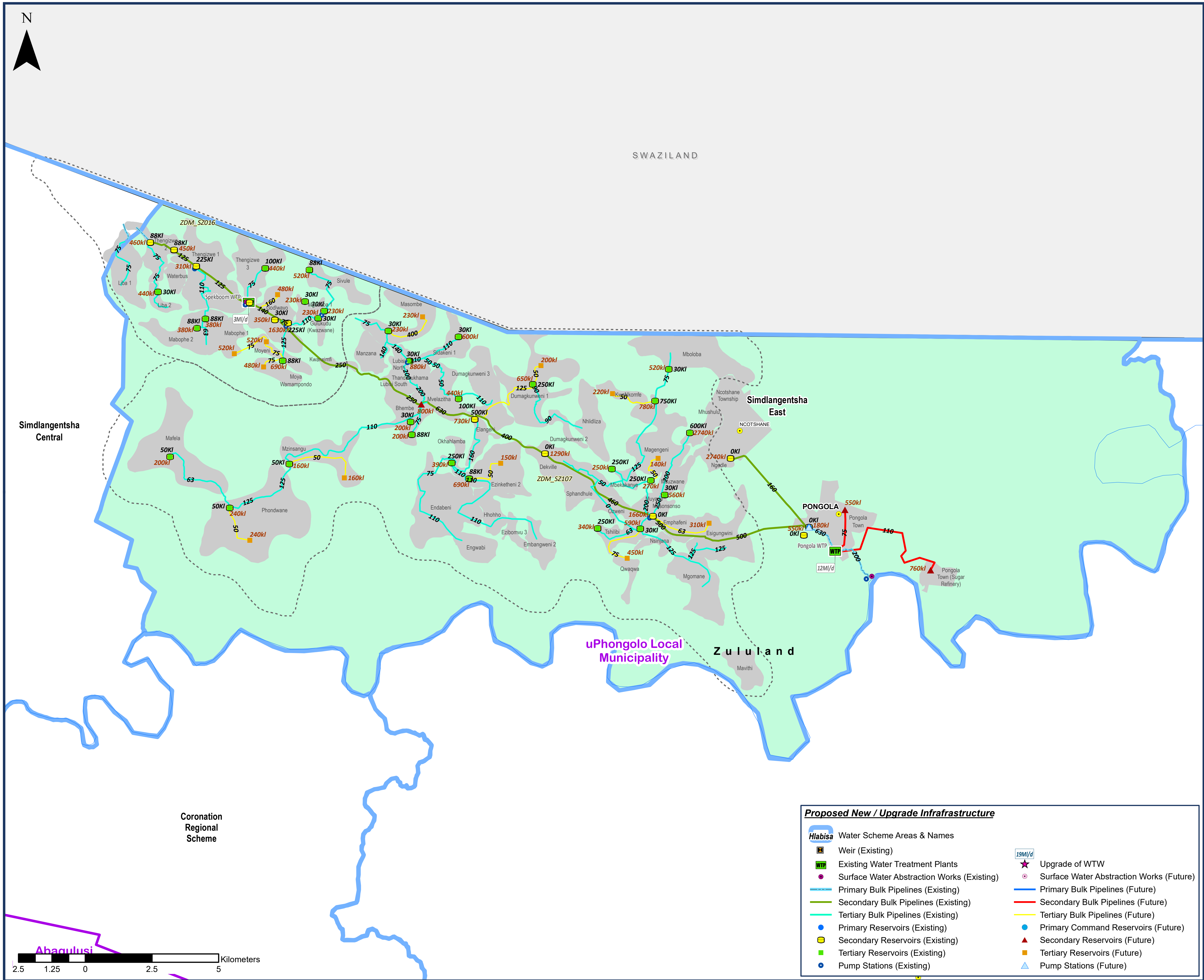
9.9.4 Financial Requirements

The bulk cost requirement for ZUL008: Simdlangentsha East WSIA is tabled within Table 9-16 below.

Table 9-16: ZUL008: Simdlangentsha East Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R37 780 000	R3 778 000	R41 558 000
Secondary	R181 496 000	R18 149 600	R199 645 600
Tertiary	R149 741 000	R14 974 100	R164 715 100
Total	**R369 017 000**	**R36 901 700**	**R405 918 700**

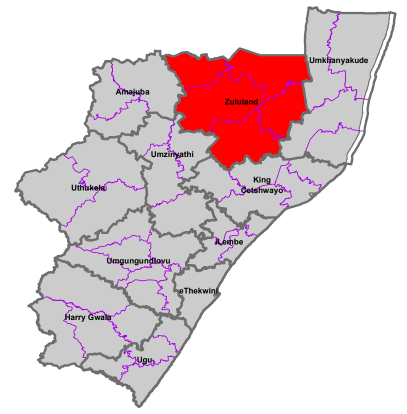
The total bulk cost requirement for the Simdlangentsha East Scheme is R 405.9 million (excl VAT). The scheme development cost per household is approximately R 17 796. Due to the size of the project, it will take close to 42 years to complete.


N
SWAZILAND
ZDM_SZ016
ZDM_SZ107
Simdlangentsha Central
Simdlangentsha East
uPhongolo Local Municipality
Zululand
Coronation Regional Scheme
Abaqulusi
PONGOLA
NCOTSHANE
Pongola WTP
12Ml/d
3Ml/d
Spekboom WTP
Pongola Town
Pongola Town (Sugar Refinery)
Thengizwe 1
Thengizwe 2
Thengizwe 3
Waterbus
Liba 1
Liba 2
Mabophe 1
Mabophe 2
Moyeni
Moya
Wamampondo
Kwanyumfi
Sivule
Masombe
Manzana
Sidakeni 1
Lubisi North
Lubisi South
Thandukukhama
Dumagkunweni 1
Dumagkunweni 2
Dumagkunweni 3
Mvelazitha
Bhembe
Elangeni
Okhahlamba
Mafela
Mzinsangu
Phondwane
Endabeni
Hhohho
Ezibomvu 3
Embangweni 2
Engwabi
Ezinketheni 2
Dekville
Sphandhule
Nhlidliza
Kwankomfe
Mboloba
Ncotshane Township
Mhushulu
Magengeni
Ngedle
Mbekakanye
Ozweni
Tshilibi
Emphafeni
Esigungwini
Nairijana
Qwaqwa
Mgomane
Mavithi
Kilometers
2.5 1.25 0 2.5 5
Proposed New / Upgrade Infrastructure
Hlabisa Water Scheme Areas & Names
Weir (Existing)
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Pump Stations (Existing)
19Ml/d Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
Pump Stations (Future)

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

ZULULAND DISTRICT MUNICIPALITY

CONSULTANTS: Project No.: 27814

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL008: Simdlangentsha East Zululand District Municipality

DATE COMPLETED:

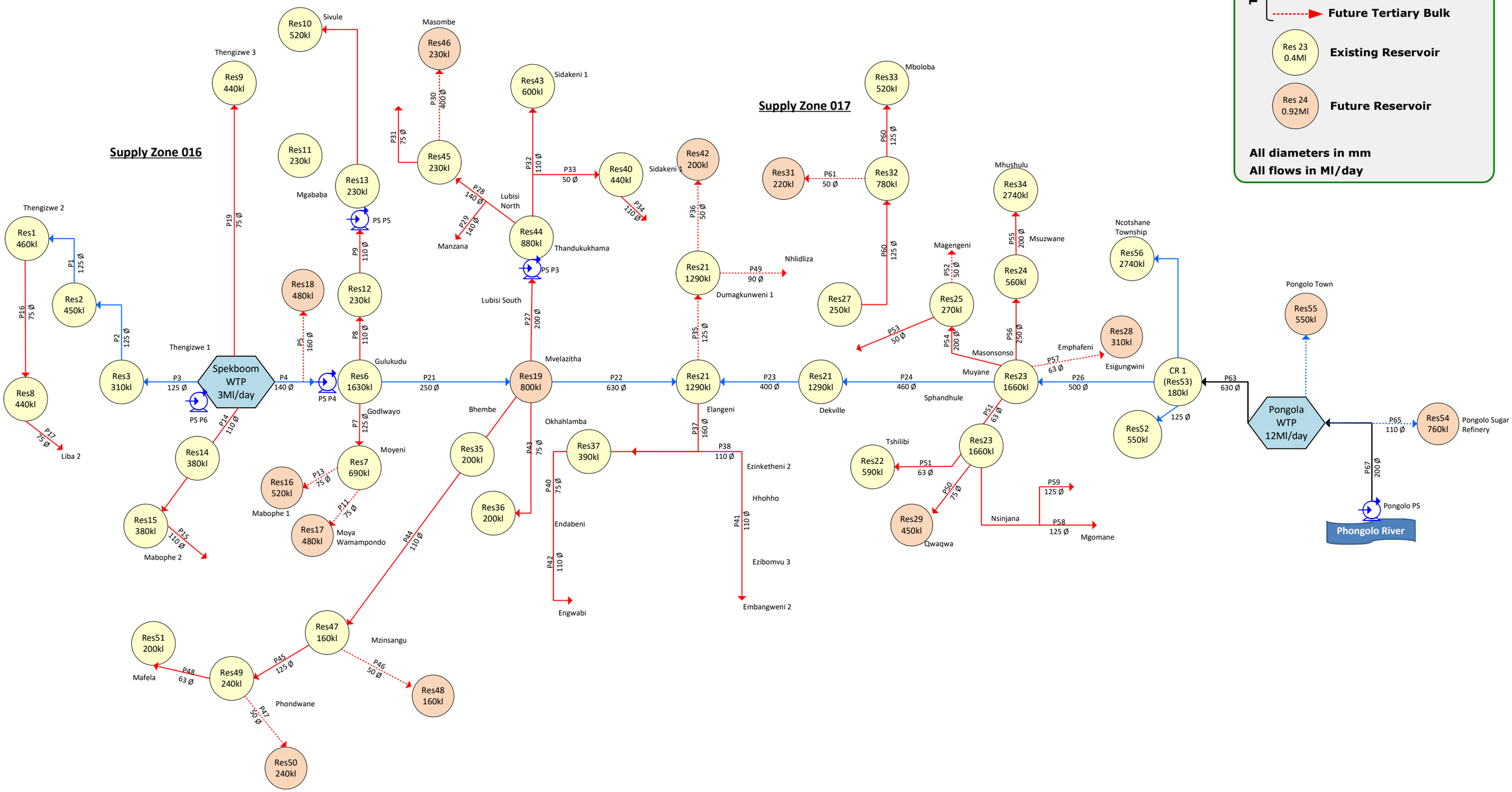
30 September 2020

MAP NO.:

DC26: Figure 9.16

Figure 9.17

ZUL008 WSIA: Simdlangentsha East



9.10.1 Demand Model Intervention

9.10.1.1 Water Demand

The water demand for the Simdlangentsha West SIA was determined for 2020 and 2050 and included within Table 9-17. It includes 75 communities with a Paulpietersburg, Frischgewaagd and Edumbe Township urban formal towns. The rural communities are scattered across the area with very low densities. Simdlangentsha West Scheme is expected to have a demand of approximately 20Mℓ in 2050.

Table 9-17: Population and Water Demand 2020 and 2050 for the Simdlangentsha West WSIA

Population	**Population 2020**	**Population 2050**
	87 583	105 798
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	15.82	19.69

9.10.1.2 Water Resource Consideration

The Simdlangentsha West Scheme receives raw water from the Phongolo River, Dumbe Dam and the Bivane Dam. The Frischgewaagd WTP (10Mℓ/day) and Tholakela WTP (1Mℓ/day) receive raw water from the Phongolo River while the Bivane WTP (1Mℓ/day) is owned and operated by the Impala Water User Association with water being obtained from the Bivane Dam. The Bivane Dam was built by on the Bivane River by the Impala Water User Association. The Paulpietersburg WTP (3Mℓ/day) obtains raw water from the Dumbe Dam located on the Egoda River and supplies water to the town of Paulpietersburg. The current water source for the scheme is sufficient.

9.10.2 Water Supply Infrastructure

9.10.2.1 Bulk Conveyance

- ✓ The existing primary bulk pipeline from the Dumbe Dam to the Paulpietersburg WTP needs to be upgraded to ø 200mm. An existing secondary bulk pipeline extends from the WTP through Paulpietersburg to Edumbe Township and needs to be upgraded to ø 200mm. An additional ø 75mm secondary bulk pipeline from Edumbe Township is required to serve the Titane community;
- ✓ The existing secondary bulk pipeline from the Pongola Weir to the Frischgewaagd WTP and command reservoir (CR1) needs to be upgraded to ø 500mm. The secondary bulk pipeline extends further south (3.7km) from the WTP to secondary reservoir at Mapayphini and needs to be upgraded to ø 315mm;
- ✓ From Mapayphini and additional ø 160mm secondary bulk pipeline is required to join with the existing ø 125mm secondary bulk pipeline extending from the Ophuzane WTP. The existing secondary bulk pipeline extending in a northernly direction from the Ophuzane WTP are required to be upgraded to ø 110mm and ø 125mm. 1.3km from the WTP an existing ø 63mm tertiary bulk pipeline extends to the right to serve Ophuzane;

- ✓ Also from Mapayphini additional tertiary bulk pipelines ranging between ø 50mm and ø 63mm need to extend to the west to serve Amberg and Mthethwa Trust communities;
- ✓ Existing tertiary bulk pipelines ranging between ø 50mm and ø 250mm extends to the north to serve Ngwanya and Mangosuthu;
- ✓ From the weir at Enkembeni C an existing secondary bulk pipeline extends westwards towards the Frischgewaagd WTP and needs to be upgraded to ø 315mm. From the weir, in a northernly direction, an additional ø 50mm secondary bulk pipeline is required (3.6km) to serve Enkembeni A from where a ø 50mm tertiary bulk pipeline is required to serve Ntengwana further north (3km). Another existing secondary bulk pipeline running south from the weir to Balmoral needs to be upgraded to ø 315mm. At Balmoral a tertiary bulk pipeline is required to extend to the north to serve Bilayini (±4km). From Balmoral an existing ø 63mm secondary bulk pipeline extends to end at Mathunzini community (4km);
- ✓ A ø 125mm secondary bulk pipeline is required to extend to the east from Frischgewaagd WTP towards Embizeni and KwaMpunzi to end at Mdwadlaza where it will join with a future ø 75mm primary bulk pipeline that will extend from the Tholakele WTP. An existing ø 125mm secondary bulk pipeline extends to the east from the Tholakele WTP to join with a future ø 75mm secondary bulk pipeline that will join with the existing secondary bulk pipeline coming from Balmoral;
- ✓ From the Tholakele WTP an existing ø 90mm secondary bulk pipeline extends further south towards Ko Dlomo (1.8km) with a future ø 50mm secondary bulk pipeline to join to serve Pivaanspoort (2km);
- ✓ From Bivane WTP an existing secondary pipeline extends to Obivane 1;
- ✓ Also from Balmoral, an additional ø 200mm secondary bulk pipeline extends south (4km) parallel to the existing ø 63mm secondary bulk pipeline towards Mpundu where it joins with an existing secondary bulk pipeline that needs to be upgraded to ø 160mm and is approximately 4.2km long. From Khuzeni the secondary pipeline extends to the north again and needs to be upgraded ranging from ø 50mm to ø 110mm to serve Mhlosane, Emakholweni and Emuklbeni. At Mhlosane an existing ø 90mm tertiary bulk pipeline extends to the east to serve Gedlase and Gwebu 1 (4.6km). From Gwebu 1 an additional ø 50mm tertiary bulk pipeline is required to serve Nyosi (3km).

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 68km. An additional 38km secondary (ranging between ø 50mm and ø 200mm) and 27km tertiary bulk pipelines (ranging between ø 50mm and ø 200mm) would be necessary to supply the Simdlangentsha Central WSIA.

9.10.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 12.5Mℓ and needs to be upgraded to 38.5Mℓ;
- ✓ 27 Existing secondary storage reservoirs need to be upgraded to 21Mℓ with nine (9) additional secondary reservoirs required with capacities between 70kℓ and 1.2Mℓ; and
- ✓ 12 Existing tertiary reservoirs need to be upgraded to 9.7Mℓ with eight (8) additional tertiary reservoirs required with capacities between 40kℓ and 150kℓ.

The storage capacity would need to be increased with an additional 32Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme. A total storage capacity of 45Mℓ is required.

9.10.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Simdlangentsha West WSIA and is illustrated within Figure 9-18 overleaf followed by the schematic layout of the WSIA within Figure 9-19Figure 9-9.

- ✓ Upgrade the existing primary bulk pipeline from the Dumbe Dam to the Paulpietersburg WTP to ø 200mm;
- ✓ Upgrade existing secondary bulk pipelines (64km) ranging between ø 50mm and ø 500mm;
- ✓ Add secondary bulk pipelines ranging from ø 50mm and ø 200mm (38km) and tertiary pipelines (27km) ranging between ø 50mm and ø 200mm;
- ✓ Increase existing primary storage capacity (5.2Mℓ) to 7.8Mℓ and the existing secondary storage (1.6Mℓ) to 14.7Mℓ. The existing tertiary storage capacity (5.6Mℓ) would need to increase to 9.7Mℓ;
- ✓ Additional secondary storage capacity of approximately 5.3Mℓ would be required. The total tertiary storage that will be needed amounts to approximately 790kℓ.

Design details of all the infrastructure components for ZUL009: Simdlangentsha West WSIA are provided within Annexure B.

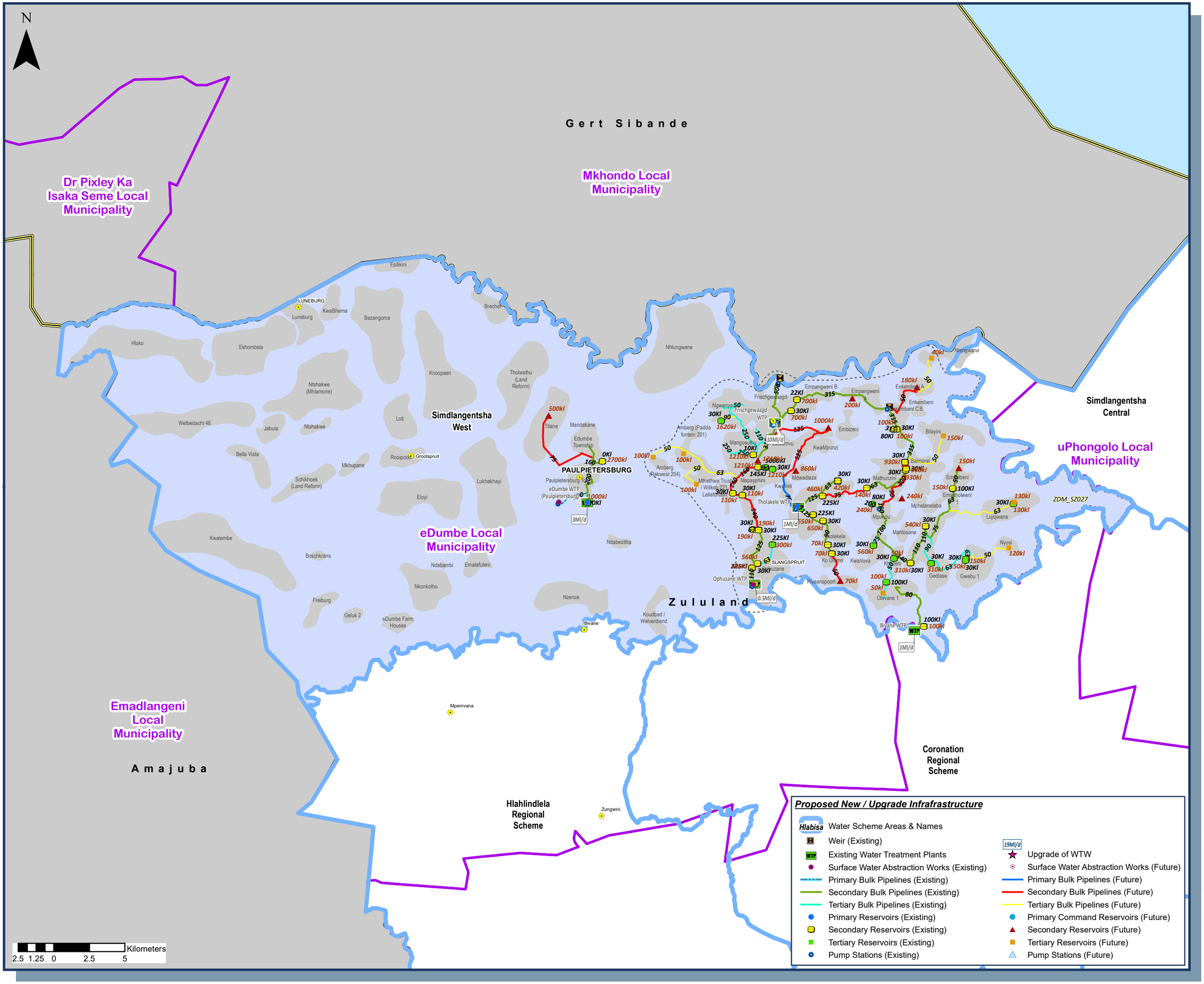
9.10.4 Financial Requirements

The bulk cost requirement for ZUL009: Simdlangentsha West WSIA is tabled within below.

Table 9-18: ZUL009: Simdlangentsha West Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R50 358 000	R5 035 800	R55 393 800
Secondary	R215 990 000	R21 599 000	R237 589 000
Tertiary	R47 080 000	R4 708 000	R51 788 000
Total	**R313 428 000**	**R31 342 800**	**R344 770 800**

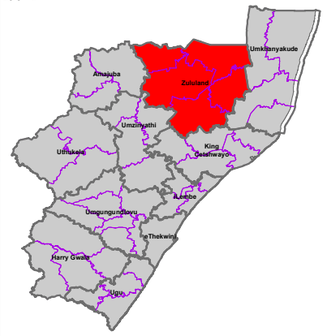
The total bulk cost requirement for the Simdlangentsha West Scheme is R 344.7 million (excl VAT). The scheme development cost per household is approximately R 16 619. Due to the size of the project, it will take close to 42 years to complete.



Legend

- Provinical Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Dams & Dam Names
- Rivers
- Settlements & Settlement Names
- Major Towns
- ZDM Supply Zones

LOCALITY:



CLIENT:

UMGENI WATER · AMANZI

DISTRICT MUNICIPALITY:

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PROJECT TITLE

Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan

MAP TITLE:

Total Bulk Water Supply Interventions - ZUL009: Simdlangentsha West
Zululand District Municipality

DATE COMPLETED:

30 September 2020

MAP NO.:

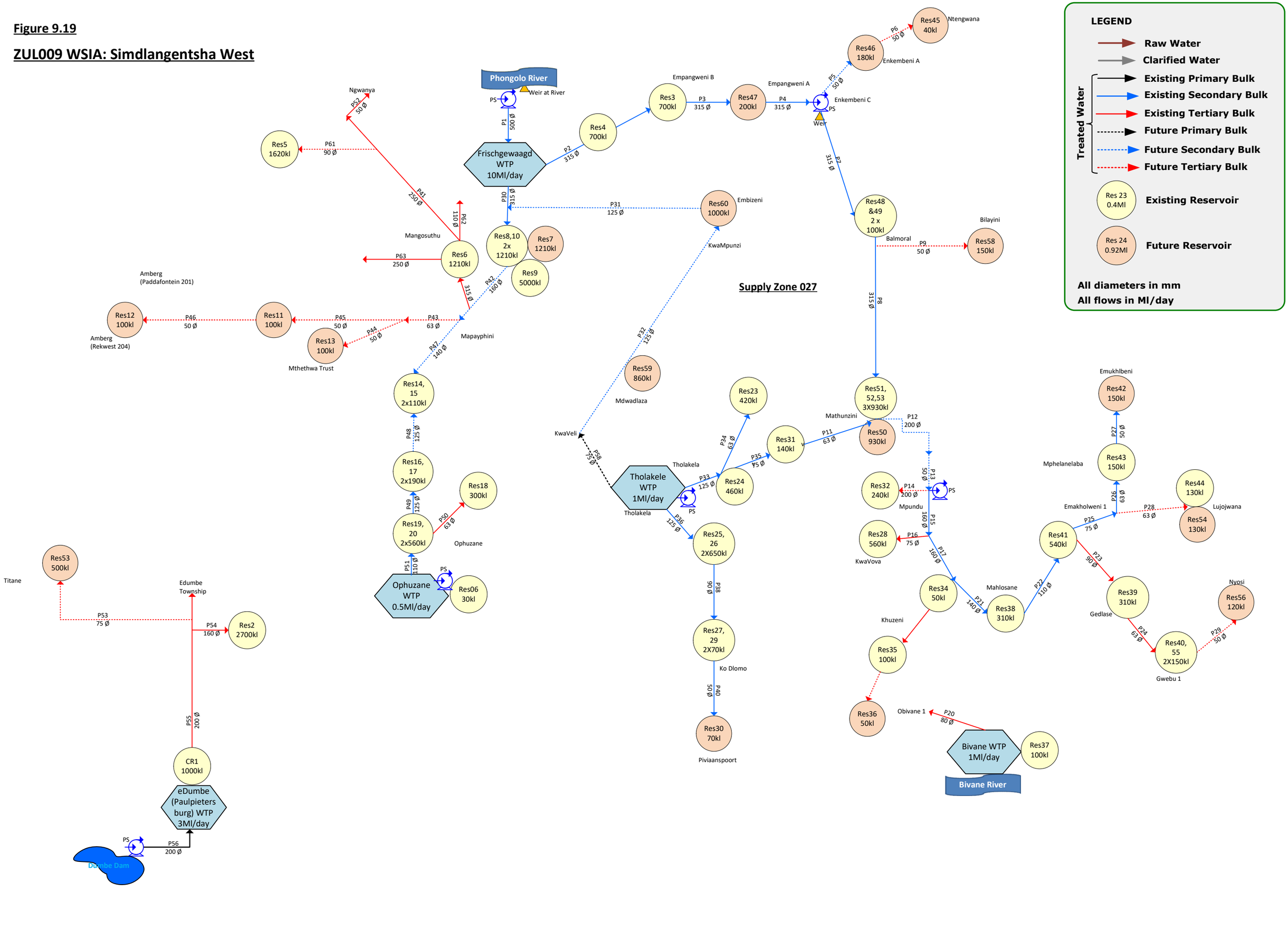
DC26: Figure 9.18

Proposed New / Upgrade Infrafrastructure

- Water Scheme Areas & Names
- Weir (Existing)
- Existing Water Treatment Plants
- Surface Water Abstraction Works (Existing)
- Primary Bulk Pipelines (Existing)
- Secondary Bulk Pipelines (Existing)
- Tertiary Bulk Pipelines (Existing)
- Primary Reservoirs (Existing)
- Secondary Reservoirs (Existing)
- Tertiary Reservoirs (Existing)
- Pump Stations (Existing)
- Upgrade of WTW
- Surface Water Abstraction Works (Future)
- Primary Bulk Pipelines (Future)
- Secondary Bulk Pipelines (Future)
- Tertiary Bulk Pipelines (Future)
- Primary Command Reservoirs (Future)
- Secondary Reservoirs (Future)
- Tertiary Reservoirs (Future)
- Pump Stations (Future)

Figure 9.19

ZUL009 WSIA: Simdlangentsha West



9.11.1 Demand Model Intervention

9.11.1.1 Water Demand

The water demand for the Usuthu WSIA was determined for 2020 and 2050 and included within Table 9-19. Usuthu Scheme is the largest water supply scheme. It includes approximately 354 communities with Nongoma Town and White City the only formal urban towns. The rural communities are scattered and vast distances apart. Usuthu Scheme is expected to have a demand of nearly 48Mℓ in 2050.

Table 9-19: Population and Water Demand 2020 and 2050 for the Usuthu WSIA

Population	**Population 2020**	**Population 2050**
	205 479	248 211
Demand	**Demand 2020 (Mℓ/day)**	**Demand 2050 (Mℓ/day)**
	38.05	47.87

9.11.1.2 Water Resource Consideration

The Black Mfolozi River is the main water source for this scheme. The Vuna and Vukwana Dams are situated on the Vuna River with a small supply from the Nhlekisa River, a tributary of the Mona River which flows into the Black Mfolozi River. The Vuna Dam has limited storage capacity due to the siltation of the dam and it pumps surplus water to the Vukwana Dam during the higher rainfall months. The Vukwana Dam acts as an off-channel storage dam for the scheme. The current water resources within the region are inadequate to meet future water requirements.

ZDM has investigated the available water resources in the upper Black Mfolozi. ZDM recommends the construction of an off-channel storage dam on the KwaNkweme River, tributary of the Black Mfolozi River. Water for the off-channel storage dam will be supplied by diverting flows from the weir on the Black Mfolozi River. The dam will have a full supply height of 44.12m capacity of 5.109 X 10^6kℓ (5 106 m^3). The diversion capacity (rising main pipeline at the Black Mfolozi River to the dam) is 0.6m^3/second.

Once the water source has been augmented from the proposed off-channel storage dam, can the Usuthu WTP in Supply Zone 060 be upgraded to 35Mℓ/day as well as the existing Vuna WTP needs to be upgraded to 6Mℓ/day.

9.11.2 Water Supply Infrastructure

9.11.2.1 Bulk Conveyance

- ✓ The Usuthu WTP in Supply Zone 060 needs to be upgraded to 35Mℓ/day. The existing primary rising main from the WTP northwards to the command reservoir (CR3) needs to be upgraded from ø 250mm to ø 560mm. From here the existing secondary bulk pipeline extends northwards past Enyokeni Palace to Goqo in Supply Zone 026 (10.6km), and needs to be upgraded to ø 450mm. Existing tertiary pipelines (ranging between ø 63mm and ø 450mm) branch off to the right of the secondary bulk pipeline to serve Ematsheni and Qanda 2 (10km);
- ✓ From Goqo the existing secondary pipeline further north to Emahashini (8.4km) needs to be upgraded to ø 400m & ø 315mm. From Usuthu/Emahashini, existing tertiary bulk pipeline in Supply Zone 026, joins the ø 400mm secondary bulk pipeline from the west. The tertiary pipelines need to be upgraded and the upgrades range from between ø 90mm – ø 110mm. Also from Goqo, an existing secondary pipeline extends to the west to Silanda and needs to be upgraded to ø 250mm (6.7km). From Silanda the secondary pipeline extends to the south and ends at KwaNtanzi (10km) and needs upgrades from between ø 50mm and ø 110mm. Existing tertiary pipelines branch off to the right from the secondary pipeline to serve Godlankoma, Ngogelana 1, Ngogelana 2, Ngolakoma, Ekushumayeleni, Mtikini, eHlabathini 2, KwaNtanzi and Esizilo in Supply Zone 063;
- ✓ From Emahashini, in a northernly direction, an additional secondary bulk pipeline is required to extend further into Supply Zone 045 and 080 (±15km) ranging between ø 200mm and ø 315mm. The additional secondary pipeline will end at Mbengo from where additonal tertiary bulk pipelines are required to extend into Supply Zone 079 to serve Mjiza, Msasaneni, Embangeni, Mpalaza, Kwamhlanga and Kwampondo. The tertiary pipeline length totals to approximately 22km and range between ø 63mm and ø 125mm. An additional tertiary pipeline is also required to extend from Majomelo to the east (±6km) to serve Bethani and Emoyeni from where a ø 110mm tertiary pipeline is required to serve Mangohlope(3km);
- ✓ From the Usuthu WTP an existing ø 700mm secondary bulk pipeline extends east and then in a northernly direction towards a command reservoir (CR1 at Esigangeni 1). From CR1 the existing pipeline extends further north to join the existing ø 400mm primary bulk pipeline extending from the Vuna WTP;
- ✓ From the Vuna WTP the ø 600mm primary bulk pipeline extends further north towards Nongoma Town and a command reservoir (CR2) at Sikhleni B. Both the Usuthu and Vuna WTP supply water to Nongoma town. From CR2, an existing ø 500mm secondary bulk pipeline extends (11km, ø 315mm & ø 250mm) in a northernly direction past Nongoma Town, Canaan, Kwasabela, Mcwambe, Nhlophenkulu in Supply Zone 064 and into Supply Zone 062 to end at Mthwathube. An additional ø 200mm secondary bulk pipeline is needed from Mthwathube to extend further north past Mshanelo 1, Qoqoda, Kwadleka to end at Kwakhangela (±14.5km). A tertiary ø 63mm tertiary bulk pipeline is needed to serve Mpakama (±6km) and another to serve Mememe (3km , ø 125mm);
- ✓ From the Osingisingini WTP an existing ø 63mm tertiary bulk pipeline extends to Emangqomfini 1 (1.8km) from where it is required to join a secondary bulk pipeline. The ø 355 mm secondary bulk pipeline is required to join with CR2 at Sikhleni B in the north(8km). From Emangqomfini 1, the ø 355mm secondary bulk pipeline is required to extend to the south to Enkingeni in Supply Zone 078 from where it needs to

extend further south and end at Kwelimbomvu in Supply Zone 074 (±8km). From Enkingeni additional tertiary bulk pipelines ranging between ø 125mm and ø 250mm, are needed to serve the Hlathi, Magutshwa, Ekuvukeni, Masundwini, and Makholweni communities in Supply Zone 077 & 047 (±13km). A ø 200mm tertiary bulk pipeline extending from Kwelibomvu to Qule in Supply Zone 048 in the south;

- ✓ From CR1 at Esigangeni 1, an additional ø 450mm secondary bulk pipeline is required to extend in a southernly direction (±7km) towards Kwamfemfeni in Supply Zone 046. From Kwamfemfeni, a ø 315 secondary bulk pipeline is needed to run east and then to the south pass Emgodi 2, Manhlanhla, Isizinda B, KwaLuhonjwana, Nzama, Thembalihle (Supply Zone 073) and to end at Okhukhu Esikoleni in Supply Zopne 072 . New secondary bulk pipes to range between ø 200 and ø 315mm. At Okhukhu Esikoleni, existing tertiary bulk pipelines ranging between ø 50mm and ø 125mm joins the future secondary bulk pipeline. The existing tertiary bulk pipeline serves Makhukwane, Lomo and Phansikwentaba. At Manhlanhla an additional ø 140mm tertiary bulk pipeline is need to extend to the east of the secondary bulk pipeline to serve Ndlazini, Emayeni, Nqalu and KwaQuqu in Supply Zone 076. At Nzama an additional tertiary bulk pipeline is also needed to branch off to the east and then in a northernly direction into Supply Zone 075. The pipeline will range between ø 63mm and ø 200mm and will total approximatey 19km and will serve Esigoqobeni, Ngwabe, Kwavumela, Nongoma Farm Houses, Mhlabaneni and Nqala;
- ✓ Also from Kwamfemfeni, another additional secondary bulk pipeline (ranging between ø 200mm & ø 315mm) is required to extend further south west to KwaMahashi in Supply Zone 061. Approximately 3km from Kwamfemfeni, at the Onyango community, a ø 250mm tertiary bulk pipeline is needed to extend from the secondary pipeline in a southernly direction (7.5km) where it will join with existing tertiary bulk pipelines in Supply Zone 068. The existing tertiary bulk pipelines range between ø 50mm and ø 200mm and totals approximately 26km. These pipelines serve Bhokweni, Donsamahoho, Chibini 1, Qubeni, Xolo, Mphangeleni, Xasane, Bhunwane and Esphiva. From Chibini 1 additional tertiary bulk pipelines are required to serve Chibini 2, Isiguqa 1, Isphethu, Ewela 2, Gezizandla, Ewela 1, Mabululwane, Glula and Mganimbobo in Supply Zone 070;
- ✓ From the Thulasizwe Hospital WTP (0.16Mℓ/day) in Supply Zone 044, a new ø 140mm secondary bulk pipeline is needed and will join a new ø 200mm secondary bulk pipeline that extends towards Ceza WTP. From Ceza WTP (5Mℓ/day), an additional secondary bulk pipeline (ranging from ø 110mm to ø 300mm) is required to extend in a south easterly direction (±26km) to join the secondary bulk pipeline at KwaMahashi in Supply Zone 061. New tertiary bulk pipelines are needed and will branch off on either side of the secondary bulk pipeline to serve Ngubabeni, Nhlongo, Mndaweni, Dlabane and Egqumeni in Supply Zone 044;
- ✓ At Kwampanza in Supply Zone 061, additional ø 110mm tertiary bulk pipelines are needed to serve Qwasha, Esembeni and Emfenyane (±11km). At Dayeni, another ø 110mm tertiary bulk pipeline is required to branch off to the east and then in a northernly direction to serve Dayeni and Nsimbini.

Bulk distribution to supply the whole Regional Scheme would need to be increased by approximately 283km. An additional 128km secondary (ranging between ø 63mm and ø 450mm) and 155km tertiary bulk pipelines (ranging between ø 50mm and ø 250mm) would be necessary to supply the whole of the Usuthu WSIA.

9.11.2.2 Storage

- ✓ The existing storage reservoirs need to be upgraded. The current storage capacity totals approximately 23.2Mℓ and needs to be upgraded to 83Mℓ;
- ✓ The three (3) primary command reservoirs (CR1, CR2 & CR3) need to be upgraded to 19Mℓ, 7.7Mℓ & 6.9Mℓrespectively;
- ✓ Existing secondary storage reservoirs need to be upgraded to 21.2Mℓ with 17 additional secondary reservoirs required with capacities between 260kℓ and 2.7Mℓ; and
- ✓ Existing tertiary reservoirs need to be upgraded to 28Mℓ with 35 additional tertiary reservoirs required with capacities between 200kℓ and 3.36Mℓ.

The storage capacity would need to be increased with an additional 42Mℓ to meet the 2050 water demand and to connect it to the Regional Scheme. A total storage capacity of 125Mℓ is required.

9.11.3 Proposed Interventions

The following infrastructure upgrades and augmentation will be required in order to adequately supply the Usuthu WSIA and is illustrated within Figure 9-20 overleaf followed by the schematic layout of the WSIA within Figure 9-21.

Construction of an off-channel storage dam (earthfill dam) on the KwaNkweme River. Water for the off-channel storage dam to be supplied by diverting flows from the weir on the Black Mfolozi River. Dam will have a full supply height of 44.12 meters capacity of 5.109 X 10^6kℓ. Once the dam development is near completion, can the following infrastructure be constructed:

- ✓ Upgrade the existing Usuthu WTP to 35Mℓ/day and the Vuna WTP to 6Mℓ/day;
- ✓ Upgrade approximately 18.8km primary bulk pipelines ranging from ø 300mm to ø 600mm;
- ✓ Upgrade the existing secondary bulk pipelines ranging from ø 110mm to ø 700mm (67km);
- ✓ Upgrade 102km existing tertiary piplelines ranging from ø 50mm to ø 450mm;
- ✓ Add secondary bulk pipelines ranging from ø 63mm to ø 450mm (128km) and tertiary pipelines (155km) ranging between ø 50mm and ø 250mm; and
- ✓ Additional secondary storage capacity of approximately 16Mℓ would be required. The total tertiary storage that will be needed amounts to approximately 26Mℓ.

Design details of all the infrastructure components are provided within Annexure B.

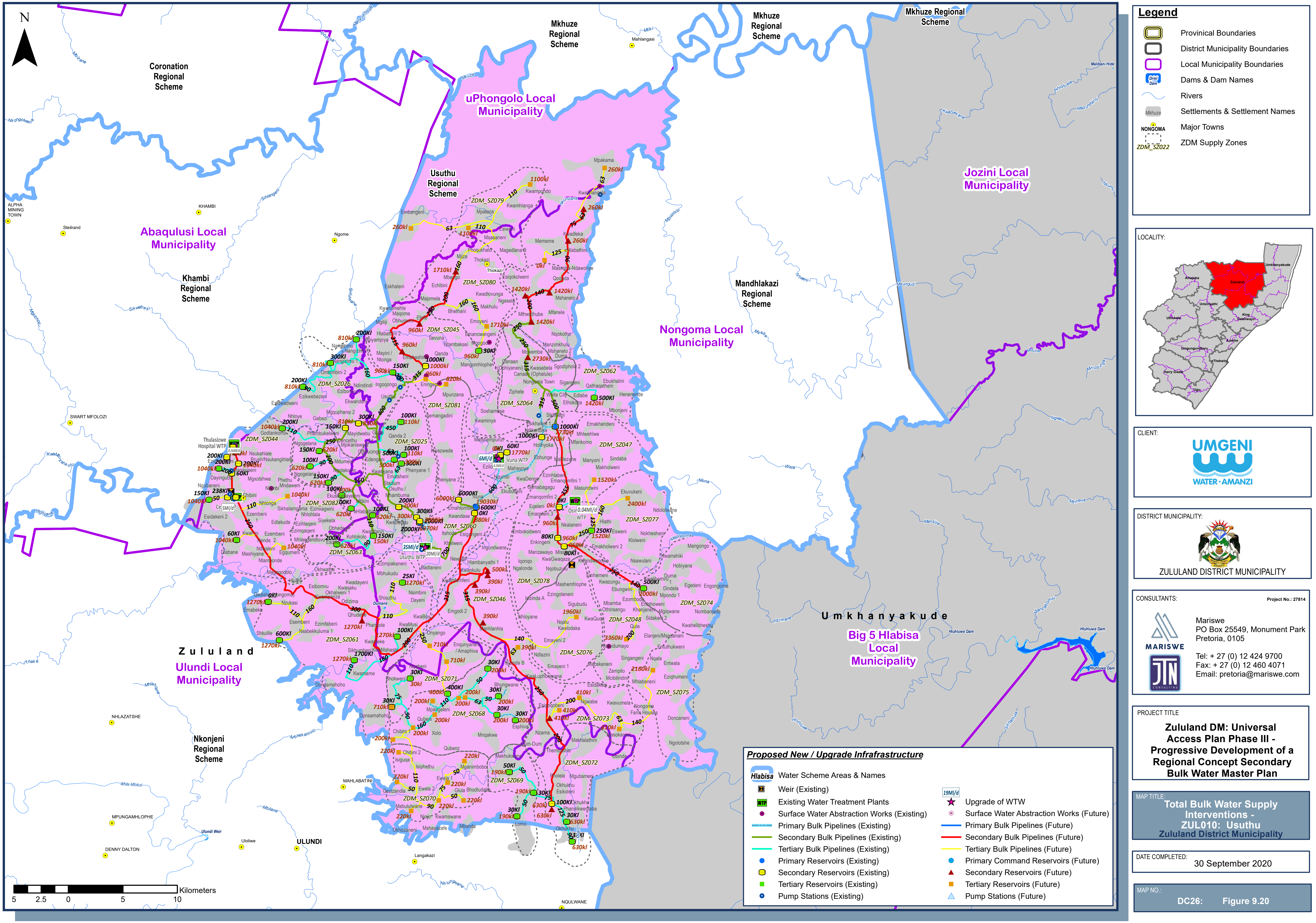
9.11.4 Financial Requirements

The bulk cost requirement for UK010: Usuthu WSIA is tabled within Table 9-20 below.

Table 9-20: UK010: Usuthu Cost Requirement

	Capital Cost	10% Contingencies	Total Cost (Excl VAT)
Primary	R1 243 820 000	R124 382 000	R1 368 202 000
Secondary	R641 922 000	R64 192 200	R706 114 200
Tertiary	R389 859 000	R38 985 900	R428 844 900
Total	**R2 275 601 000**	**R227 560 100**	**R2 503 161 100**

The total bulk cost requirement for the Usuthu Scheme is R2.5 billion (excl VAT). The scheme development cost per household is approximately R 51 432. Due to the size of the project, it will take close to 42 years to complete.



Legend
Provincial Boundaries
District Municipality Boundaries
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Dams & Dam Names
Rivers
Settlements & Settlement Names
Major Towns
ZDM Supply Zones
LOCALITY:
CLIENT:
UMGENI
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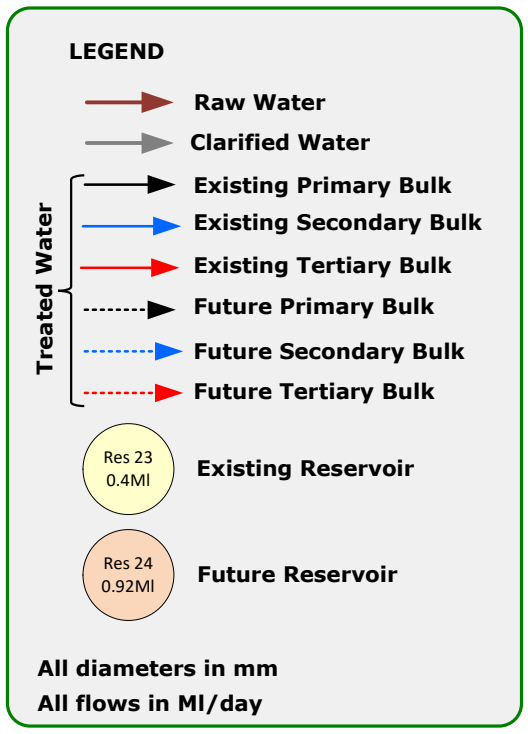
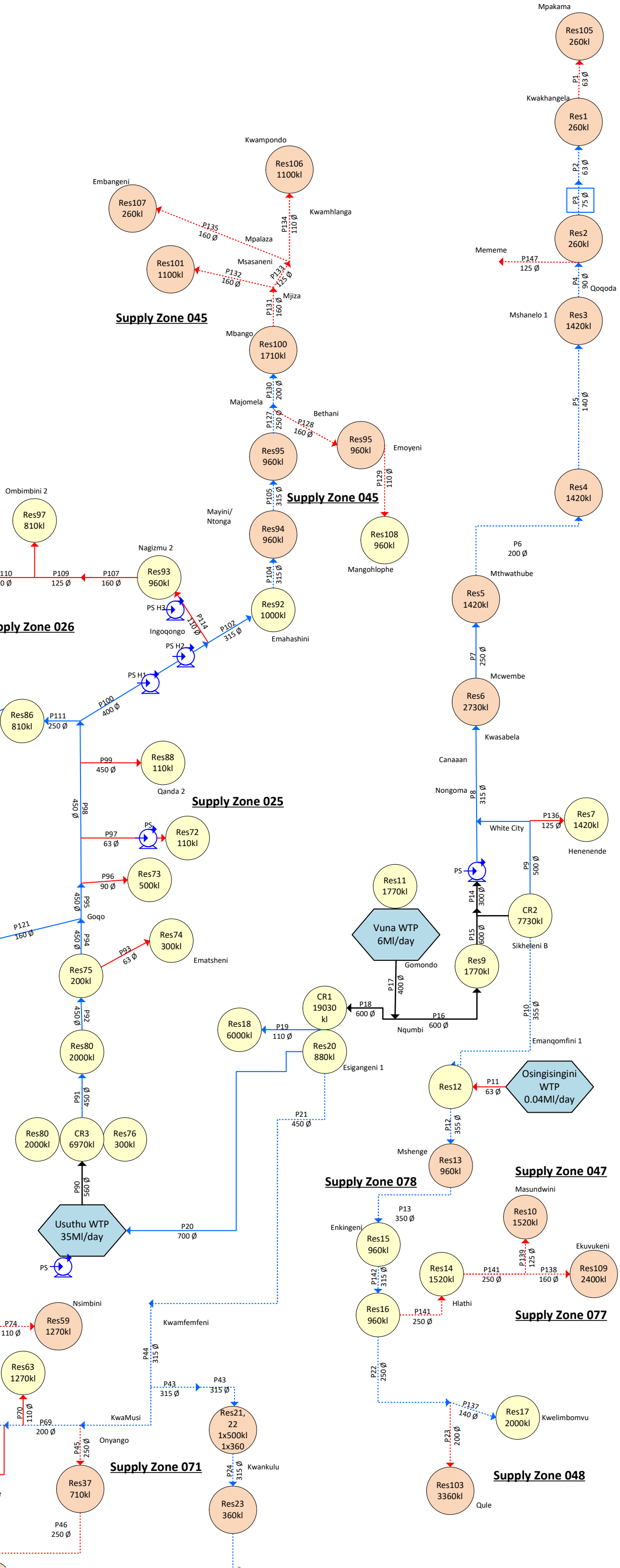
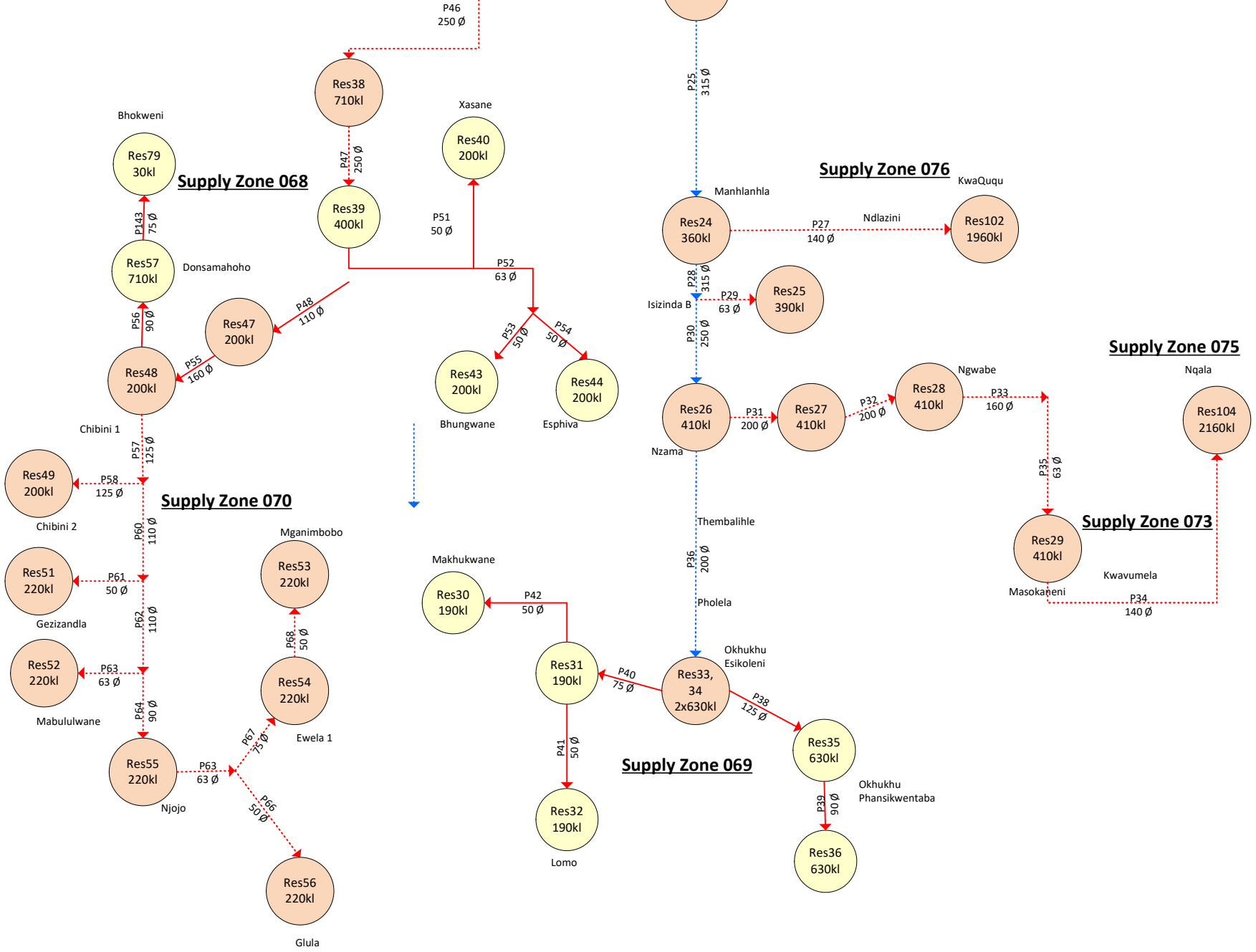
PROJECT TITLE
Zululand DM: Universal Access Plan Phase III - Progressive Development of a Regional Concept Secondary Bulk Water Master Plan
MAP TITLE:
Total Bulk Water Supply Interventions - ZUL010: Usuthu
Zululand District Municipality
DATE COMPLETED:
30 September 2020
MAP NO.:
DC26: Figure 9.20
Proposed New / Upgrade Infrastructure
Water Scheme Areas & Names
Weir (Existing)
Existing Water Treatment Plants
Surface Water Abstraction Works (Existing)
Primary Bulk Pipelines (Existing)
Secondary Bulk Pipelines (Existing)
Tertiary Bulk Pipelines (Existing)
Primary Reservoirs (Existing)
Secondary Reservoirs (Existing)
Tertiary Reservoirs (Existing)
Pump Stations (Existing)
Upgrade of WTW
Surface Water Abstraction Works (Future)
Primary Bulk Pipelines (Future)
Secondary Bulk Pipelines (Future)
Tertiary Bulk Pipelines (Future)
Primary Command Reservoirs (Future)
Secondary Reservoirs (Future)
Tertiary Reservoirs (Future)
Pump Stations (Future)
uPhongolo Local Municipality
Abaqulusi Local Municipality
Nongoma Local Municipality
Jozini Local Municipality
Big 5 Hlabisa Local Municipality
Ulundi Local Municipality
Zululand
Umkhanyakude
Coronation Regional Scheme
Mkhuze Regional Scheme
Usuthu Regional Scheme
Khambi Regional Scheme
Mandhlakazi Regional Scheme
Nkonjeni Regional Scheme
ULUNDI
Kilometers
5 2.5 0 5 10

Figure 9.21

ZUL010 WSIA: Usuthu






P46
250 Ø
Res38
710kl
P47
250 Ø
Res39
400kl
Bhokweni
Res79
30kl
Supply Zone 068
P143
75 Ø
Res57
710kl
Donsamahoho
P56
90 Ø
Res47
200kl
P48
110 Ø
P55
160 Ø
Res48
200kl
Chibini 1
P57
125 Ø
Res49
200kl
P58
125 Ø
Chibini 2
Supply Zone 070
P60
110 Ø
Res51
220kl
P61
50 Ø
Gezizandla
P62
110 Ø
Res52
220kl
P63
63 Ø
Mabululwane
P64
90 Ø
Res55
220kl
P63
63 Ø
Njojo
P67
75 Ø
Mganimbobo
Res53
220kl
P68
50 Ø
Res54
220kl
Ewela 1
P66
50 Ø
Res56
220kl
Glula
Xasane
Res40
200kl
P51
50 Ø
P52
63 Ø
P53
50 Ø
P54
50 Ø
Res43
200kl
Bhungwane
Res44
200kl
Esphiva
P25
315 Ø
Supply Zone 076
Manhlanhla
Res24
360kl
P27
140 Ø
Ndlazini
KwaQuqu
Res102
1960kl
P28
315 Ø
Isizinda B
P29
63 Ø
Res25
390kl
P30
250 Ø
Res26
410kl
Nzama
P31
200 Ø
Res27
410kl
P32
200 Ø
Res28
410kl
Ngwabe
P33
160 Ø
Supply Zone 075
Nqala
Res104
2160kl
P35
63 Ø
Supply Zone 073
Res29
410kl
Masokaneni
Kwavumela
P34
140 Ø
Thembalihle
P36
200 Ø
Pholela
Makhukwane
Res30
190kl
P42
50 Ø
Res31
190kl
P40
75 Ø
Res33,
34
2x630kl
Okhukhu
Esikoleni
P38
125 Ø
Res35
630kl
P41
50 Ø
Supply Zone 069
Res32
190kl
Lomo
P39
90 Ø
Okhukhu
Phansikwentaba
Res36
630kl

10. CONCLUSIONS

10.1 Total Water Demand per Supply Area

The total water demand per WSIA is detailed within Table 10-1 below.

Table 10-1: Total Water Demand 2050 per WSIA

WSIA No.	WSIA Name	Population 2020	Population 2050	Demand 2020	Demand 2050
ZUL001	Coronation	54 589	65 942	11.11	13.96
ZUL002	Hlahlindlela	178 926	216136	44.41	54.92
ZUL003	Khambi	30 018	36260	5.42	6.81
ZUL004	Mandhlakazi	97 503	117780	17.32	21.87
ZUL005	Mkuze	11 533	13931	2.24	2.84
ZUL006	Nkonjeni	160 952	194424	33.66	41.88
ZUL007	Simdlangentsha Central	32 567	39340	5.56	6.95
ZUL008	Simdlangentsha East	96 300	116327	18.24	22.80
ZUL009	Simdlangentsha West	87 583	105798	15.82	19.69
ZUL010	Usuthu	205 479	248211	38.05	47.87
Zululand:		**955 450**	**1 154 149**	**191.84**	**239.58**

A total of 239.58Mℓ/day is required for the entire WSA in 2050 with the Hlandlindlela WSIA, Usuthu WSIA and Nkonjeni WSIA requiring the largest portion at 23%, 20% and 17% respectively.

10.2 Total Water Resources Required vs Proposed Water Supply Interventions (WSI)

The total volume of water required is compared to the existing proposed water supply interventions are tabled within Table 10-2.

Table 10-2: Water Resources Required vs Proposed WSI

Water Supply Scheme / WSIA		Population (2050)	2050 Demand (Mℓ/day)	2050 Demand (Mm^3/a)	Existing Resources (Mm^3/a)	Proposed Additional under UAP Phase 3 (Mm^3/a)	Total (Mm^3/a)	Balance (Mm^3/a)
ZUL001	Coronation	65 942	13.96	5.10	1.14	2.01	3.15	-1.95
ZUL002	Hlahlindlela	216 136	54.92	20.04	9.89	0.00	9.89	-10.18
ZUL003	Khambi	36 260	6.81	2.49	0.14	1.06	1.20	-1.29
ZUL004	Mandhlakazi	117 780	21.87	7.98	10.95	7.45	18.40	69.60
ZUL005	Mkhuze*	13 931	2.84	1.04	499.69	0.00	499.69	498.65
ZUL006	Nkonjeni	194 424	41.88	15.29	10.05	12.15	22.20	6.92
ZUL007	Simdlangentsha Central	39 340	6.95	2.54	1.65	3.65	5.30	2.77
ZUL008	Simdlangentsha East	116 327	22.80	8.32	5.48	0.00	5.48	-2.85
ZUL009	Simdlangentsha West	105 798	19.69	7.19	6.21	0.00	6.21	-0.98
ZUL010	Usuthu	248 211	47.87	17.47	12.37	14.97	27.34	9.87

***The Pongolapoort Dam is the source for the Mkhuze Scheme and includes allocations for all other users as well and not just the allocation for the Mkhuze Scheme.**

From the table above, it is noted that most of schemes will not have adequate raw water resources to meet the 2050 demand requirements. Several water resource planning studies need to be initiated to address the current water shortages experienced within the WSA as it would result in delaying future infrastructure upgrades and extensions.

10.3 Summary of Total Bulk Water Infrastructure Requirements per WSIA

A summary of the total bulk water infrastructure requirements per proposed WSIA is provided within the tables and pages hereafter.

10.3.1 ZUL001: Coronation WSIA

Table 10-3: WSIA Summary for the ZUL001 Coronation WSIA

Coronation Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Coronation	Primary Bulk	0.4	2.5
			Louwsburg	Primary Bulk	0.72	1
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 160mm - ø 300mm	6.14km
				Secondary Bulk	ø 140mm - ø 200mm	15.9km
		Reservoirs	Command Reservoir	Primary Bulk	1	1920 Kℓ
			Command Reservoir	Secondary Bulk	3	50 - 4340 Kℓ
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations		Primary Bulk	2	9 - 34kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations		Primary Bulk	2	7 - 13kW
				Secondary Bulk	-	-

10.3.2 ZUL002: Hlahlindlela WSIA

Table 10-4: WSIA Summary for the ZUL002 Hlahlindlela WSIA

Hlahlindlela Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Klipfontein	Primary Bulk		53
			Bloemveld	Primary Bulk		7.5
			Emondlo	Primary Bulk		12
			Mvuzini	Primary Bulk		0.62
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 200mm - ø 800mm	137.6km
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Reservoirs	Command Reservoirs	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	960	960
			Supply Reservoirs	Tertiary Bulk	450	450
		Pump stations	Bloemveld PS	Primary Bulk	0.65139 M ^{3}/s	202kW
.2	**Future**	Bulk Pipelines		Primary Bulk	ø 315mm -ø 762mm	36.7km
				Secondary Bulk	ø 50mm -ø 350mm	193km
				Tertiary Bulk	ø 50mm -ø 125mm	150km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	4	2200 - 5000kℓ
			Command Reservoir	Secondary Bulk	8	30kl - 2000kℓ
			Supply Reservoirs	Tertiary Bulk	48	30kl - 1620kℓ
		Pump stations		Primary Bulk		

10.3.3 ZUL003: Khambi WSIA

Table 10-5: WSIA Summary for the ZUL003 Khambi WSIA

Khambi Regional Water Scheme						
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Khambi WTW	Primary Bulk	0.2	2.1
			Mountain View WTW	Primary Bulk	0.1	0.5
			Enyathi WTW	Primary Bulk	0.09	0.3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 110mm	2.6km
				Secondary Bulk	ø 63mm - ø 160mm	24.3km
				Tertiary Bulk	ø 50mm - ø 160mm	31.2km
		Reservoirs	Command Reservoir	Primary Bulk	2	180 -800Kℓ
			Command Reservoir	Secondary Bulk	6	30 -600Kℓ
			Supply Reservoirs	Tertiary Bulk	6	60 - 712Kℓ
		Pump stations		Primary Bulk	-	-
1.2	**Future**	Bulk Pipelines		Primary Bulk	ø 250mm	0.9km
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	-	-
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations		Primary Bulk	2	23 -47kW
				Secondary Bulk	2	6 - 8kW

10.3.4 ZUL004: Mandhlakazi WSIA

Table 10-6: WSIA Summary for the ZUL004 Mandhlakazi WSIA

Mandhlakazi Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Mandlakazi WTW	Primary Bulk	20	35
			Sidinsi WTW	Primary Bulk	0.28	0.4
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 660mm	14.55km
				Secondary Bulk	ø 63mm - ø 560mm	82km
				Tertiary Bulk	ø 63mm - 200mm	46.3km
		Reservoirs	Command Reservoir	Primary Bulk	2	475 - 12770Kℓ
			Command Reservoir	Secondary Bulk	11	170 -2540Kℓ
			Supply Reservoirs	Tertiary Bulk	15	160-280Kℓ
		Pump stations	PS at Jozini Dam to Mandhlakazi WTW	Primary Bulk	0.378333 M^3/s	842kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	ø 660mm	-
				Secondary Bulk	ø 63mm - ø 560mm	43.6km
				Tertiary Bulk	ø 63mm - ø 315mm	138.9km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	8	160 -2260Kℓ
			Supply Reservoirs	Tertiary Bulk	34	160 - 2100Kℓ
		Pump stations		Primary Bulk	4	11-842kW

10.3.5 ZUL005: Mkuze WSIA

Table 10-7: WSIA Summary for the ZUL005 Mkuze WSIA

Mkhuze Regional Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Gumbi WTW	Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk		
				Secondary Bulk	ø 100mm - ø160mm	6.91km
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	1	840
			Supply Reservoirs	Tertiary Bulk	-	-
		Pump stations	PS at Jozini Dam to WTW	Primary Bulk	0.007778 Mm^3 /s	5kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk		
			Supply Reservoirs	Tertiary Bulk		
		Pump stations		Primary Bulk		
				Secondary Bulk		

10.3.6 ZUL006: Nkonjeni WSIA

Table 10-8: WSIA Summary for the ZUL006 Nkonjeni WSIA

Nkonjeni Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW	Ulundi WTW	Primary Bulk	26.4	32
			Babanango WTW	Primary Bulk	0.33	0.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 50mm - ø 813mm	15km
				Secondary Bulk	ø 63mm - ø 400mm	118.13km
				Tertiary Bulk	ø 50mm - ø 250mm	40.55km
		Reservoirs	Command Reservoir	Primary Bulk	3	920 - 19270Kℓ
			Command Reservoir	Secondary Bulk	24	200 - 8388Kℓ
			Supply Reservoirs	Tertiary Bulk	20	200 - 1985Kℓ
		Pump stations		Primary Bulk		39 - 1009kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	ø 315mm	14.67km
				Secondary Bulk	ø 63mm - ø 315mm	39.5km
				Tertiary Bulk	ø 75mm - ø 315mm	43.8km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	6	360 - 1530Kℓ
			Supply Reservoirs	Tertiary Bulk	20	160 - 2100Kℓ
		Pump stations		Primary Bulk	0.008519 M^3/s	4 kW

10.3.8 ZUL007: Simdlangentsha Central WSIA

Table 10-9: WSIA Summary for the ZUL007 Simdlangentsha Central WSIA

Simdlangentsha Central Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 150mm - ø 450mm	9.4km
				Secondary Bulk	ø 63mm - ø 450mm	14.8km
				Tertiary Bulk	ø 50mm - ø 160mm	17.9km
		Reservoirs	Command Reservoir	Primary Bulk	0	0
			Command Reservoir	Secondary Bulk	5	310- 2000Kℓ
			Supply Reservoirs	Tertiary Bulk	5	120 - 960Kℓ
		Pump stations	PS at Belgrade WTW	Primary Bulk	0.1133056 M^3/s	116kW
1.2	**Future**	Bulk Pipelines		Primary Bulk		-
				Secondary Bulk	ø 75mm - ø 250mm	29km
				Tertiary Bulk	ø 63mm - ø 140mm	38.7km
		WTW	New WTP at weir at Mozana River	Primary Bulk	-	10
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	400 - 1260Kℓ
			Supply Reservoirs	Tertiary Bulk	13	160 - 700Kℓ
		Pump stations		Primary Bulk	-	-

10.3.10 ZUL008: Simdlangentsha East WSIA

Table 10-10: WSIA Summary for the ZUL008 Simdlangentsha East WSIA

Simdlangentsha East Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**				**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 200mm - ø 630mm	3.3km
				Secondary Bulk	ø 75mm - ø 630mm	33.6km
				Tertiary Bulk	ø 63mm -ø 200mm	91.5
		Reservoirs	Command Reservoir	Primary Bulk	1	180
			Command Reservoir	Secondary Bulk	11	310 - 2740Kℓl
			Supply Reservoirs	Tertiary Bulk	29	160 - 2740Kℓ
		Pump stations	PS at Pongola WTW to CR1	Primary Bulk	264 802 M^3/s	188 kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	ø 75mm - ø 110mm	7.6km
				Tertiary Bulk	ø 50mm - ø 400mm	25km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	3	620 - 1260Kℓ
			Supply Reservoirs	Tertiary Bulk	13	140 - 520Kℓ
		Pump stations		Primary Bulk	-	-

10.3.11 ZUL009: Simdlangentsha West

Table 10-11: WSIA Summary for the ZUL009 Simdlangentsha West WSIA

Simdlangentsha West Regional Water Scheme						
Item	**Description**					
1	**Infrastructure**				**Size / No**	**Capacity (Mℓ/d or Length or kW)**
1.1	**Existing**	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 200mm - ø 630mm	3.2km
				Secondary Bulk	ø 50mm - ø 500mm	64km
				Tertiary Bulk	ø 50mm -ø 250mm	26.16km
		Reservoirs	Command Reservoir	Primary Bulk	3	1000 - 6120Kℓ
			Command Reservoir	Secondary Bulk	27	70 - 1270Kℓ
			Supply Reservoirs	Tertiary Bulk	12	50 - 5000Kℓ
		Pump stations	PS at Frischgewaagd WTW to CR	Primary Bulk	0.181296 M^3/s	420kW
1.2	**Future**	Bulk Pipelines		Primary Bulk	ø 75mm	2.7km
				Secondary Bulk	ø 50mm - ø 200mm	38.4km
				Tertiary Bulk	ø 50mm -ø 200mm	27km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	10	70 - 1200Kℓ
			Supply Reservoirs	Tertiary Bulk	8	40 - 150Kℓ
		Pump stations		Primary Bulk	-	-

10.3.12 ZUL010: Usuthu

Table 10-12: WSIA Summary for the ZUL010 Usuthu WSIA

Usuthu Regional Water Scheme						
Item	**Description**					
4	**Infrastructure**				**Size / No**	**Capacity (Mℓ/d or Length or kW)**
4.1	**Existing**	WTW	Vuna WTW	Primary Bulk	4.5	6
			Usuthu WTW	Primary Bulk	20	35
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 50mm - ø 600mm	18.85km
				Secondary Bulk	ø 110mm - ø 700mm	67.48km
				Tertiary Bulk	ø 50mm - ø 450mm	102km
		Reservoirs	Command Reservoir	Primary Bulk	3	6970 - 19030Kℓ
			Command Reservoir	Secondary Bulk	17	300 - 6000Kℓ
			Supply Reservoirs	Tertiary Bulk	40	30 - 1520Kℓ
		Pump stations	PS at Vuna WTW	Primary Bulk	0.111111 M^3/s	291kW
			PS at Usuthu WTW	Primary Bulk	0.263492 M^3/s	1 140kW
			PS to CR3	Primary Bulk	0.209149 M^3/s	658kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	ø 63mm - ø 450mm	128km
				Tertiary Bulk	ø 50mm - ø 250mm	155km
		Dams	New off-channel storage dam on the KwaNkweme River	Primary Bulk	-	5106m^3
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs	Command Reservoir	Primary Bulk	-	-
			Command Reservoir	Secondary Bulk	17	260 - 2730Kℓ
			Supply Reservoirs	Tertiary Bulk	35	200 - 2400Kℓ
		Pump stations		Primary Bulk	-	-

10.4 Financial Requirements

The financial requirements for the provision of bulk infrastructure per WSIA based on the demand model intervention by 2050 is summarised in the table below.

Table 10-13: Financial Requirements based on Demand Model Interventions

WSIA	WSIA Name	Total Cost Requirement				
		Primary	Secondary	Tertiary	10% Contingencies	Total Cost (Excl VAT)
ZUL001	Coronation	R22 526 500	R44 320 000	R0	R6 684 650	R73 531 150
ZUL002	Hlahlindlela	R476 091 000	R131 385 000	R116 170 000	R72 364 600	R796 010 600
ZUL003	Khambi	R53 491 000	R9 618 000	R18 892 000	R8 200 000	R90 201 100
ZUL004	Mandhlakazi	R660 543 000	R537 999 000	R201 642 000	R140 018 400	R1 540 202 400
ZUL005	Mkhuze	R15 000 000	R9 323 000	R0	R2 434 300	R26 755 300
ZUL006	Nkonjeni	R231 256 670	R436 551 000	R153 106 000	R82 091 367	R903 005 036
ZUL007	Simdlangentsha Central	R171 297 000	R84 436 000	R75 901 000	R33 163 400	R364 797 400
ZUL008	Simdlangentsha East	R37 780 000	R181 496 000	R149 741 000	R36 901 700	R405 918 700
ZUL009	Simdlangentsha West	R50 358 000	R215 990 000	R47 080 000	R31 342 800	R344 770 800
ZUL010	Usuthu	R1 243 820 000	R641 922 000	R389 859 000	R227 560 100	R2 503 161 100
Total		**R2 962 163 170**	**R2 293 040 000**	**R1 152 391 000**	**R640 759 417**	**R7 048 353 587**

A total estimate of approximately R 7 billion is required to address the total bulk water supply requirement by 2050.

10.5 Funding Options

The ZDM relies mainly on grant funding programmes to fund their water supply projects. These funding programmes are mainly MIG, WSIG and RBIG. Based on all the current funding streams available to the District Municipality over the MTEF period, it will take a minimum of 42 years for the WSA 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. Umgeni Water can also be considered as a funding partner

10.6 Implementation Programme

The implementation programme will depend on the availability of funds from National Treasury as well as the capacity of the Municipality to implement projects. Although all ten (10) area interventions would be an implementation priority for the DM, it is proposed to consider the following three (3) priorities detailed within Table 10-14. It is also proposed to follow a phased approach for implementation for e.g. initiate only the upgrade to the WTP at first and then when funding permits, can the bulk conveyance and storage be extended, upgraded or constructed.

However, the order would most likely be determined by the availability of funds or intervention programmes and should be confirmed with the WSA.

Table 10-14: Proposed Implementation Order (Phased Approach)

Proposed Priorities (Phased Approach)	WSIA No and Name		Proposed Project Name	Proposed Estimated Project Value
1	ZUL007	Sim Central	New WTP (10Mℓ) at existing weir on Mozana River and bulk mains	R122 800 000
2	ZUL010	Usuthu Regional Scheme	Construction of an off-channel storage dam on the KwaNkweme River, a run-of-river scheme on the upper Black Mfolozi River. The dam will have a full supply height of 44.12 meters capacity of 5.109 X 10^6kℓ (5 106 m^3)	R800 000 000
3	ZUL004	Mandhlakazi Regional Scheme	New abstraction works, pump station and rising main from Pongolapoort Dam (Jozini Dam) to existing Mandhlakazi WTP	R302 840 000

11. RECOMMENDATIONS

11.1 RESPONSIBILITIES

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

These planning studies are in various stages of readiness to lobby for grant funding and Umgeni Water could consider as a Regional Utility to assist the ZDM to take this process further.

11.2 SELECTION OF SOLUTIONS

The ten (10) proposed water supply intervention areas (WSIAs) are the appropriate solutions for bulk water supply development within ZDM and are as follows:

- ✓ ZUL001 WSIA: Coronation;
- ✓ ZUL002 WSIA: Hlahlindlela;
- ✓ ZUL003 WSIA: Khambi;
- ✓ ZUL004 WSIA: Mandhlakazi;
- ✓ ZUL005 WSIA: Mkuze;
- ✓ ZUL006 WSIA: Nkonjeni; and
- ✓ ZUL007 WSIA: Simdlangenthsa Central
- ✓ ZUL008 WSIA: Simdlangenthsa East
- ✓ ZUL009 WSIA: Simdlangenthsa West
- ✓ ZUL010 WSIA: Usuthu.

The following three WSI are prioritised for consideration:

- ✓ Priority 1: ZUL007: Simdlangentsha Central WSIA - Construction of a new WTP (110Mℓ/day) at the existing weir on the Mozana River as well as bulk pipelines to and from the new WTP;
- ✓ Priority 2 ZUL010: Usuthu WSIA - Construction of an off-channel storage dam on the KwaNkweme River, run-of-river scheme on the upper Black Mfolozi River. Dam will have a full supply height of 44.12m capacity of 5.109 X 10^6kℓ;
- ✓ Priority 3 ZUL004: Mandhlakazi WSIA – New abstraction works, pump station and rising main from Pongolapoort Dam to existing Mandhlakazi WTP

11.3 PERTINENT SOLUTIONS

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; and
- ✓ Advisory Committees.

11.3.1 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.

11.3.2 Municipal Systems Act

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

11.3.3 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; and
- ✓ 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

ANNEXURE A – REFERENCES

Reference List

DWS (2011)	Support to the Implementation and Maintenance of Reconciliation Strategies for Towns in the Southern Region, 2016
DWS (2018)	Reference Framework Geo database, March 2018
Statistics SA	Census 2011; Community Survey 2016
Umgeni Water	UAP Phase II: Towards the Development of a Regional Bulk Water Requirements for the Zululand District Municipality, June 2015
Umgeni Water	Umgeni Water Infrastructure Master Plan, 2020
WSDP	Zululand District Municipality Water Services Development Plan, 2019/2020 & 220/2021 Review
IDP	Zululand District Municipality Final Draft Integrated Development Plan, Review 2019/2020

ANNEXURE B – DETAILED PROPOSED WSI INFRASTRUCTURE

ZUL001: Coronation Scheme

The total bulk cost requirement for the Coronation Scheme is R 73.5 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 5 686. Due to the regional scheme being reviewed as it is too costly to provide bulk services to the rural scattered settlements of Coronation area, the regional scheme will fall away once all stand-alone schemes have been developed.

Coronation Scheme Proposed Bulk Water Supply Intervention

Coronation Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Coronation Regional Scheme	ZUL001	54 589	65 942	
		Total		**54 589**	**65 942**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Coronation Regional Scheme	ZUL001	11.11	13.96	
		Total		**11.11**	**13.96**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		Hlobane			Yield of the dam is unknown	
		Coronation			Yield of the dam is unknown	
		Dam at Louwsburg			Yield of the dam is unknown	
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length)**
4.1	**Existing**	WTW	Coronation	Primary Bulk	0.4	2.5
			Hlobane	Primary Bulk	2	2
			Louwsburg	Primary Bulk	0.72	1
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 160mm - ø 300mm	6.14km
				Secondary Bulk	ø 140mm - ø 200mm	15.9km
		Reservoirs	Louwsburg Command Reservoir	Primary Bulk	0	1920
			Coronation Res	Secondary Bulk	0	4340
			Hlobane Res	Secondary Bulk	750	0
			Louwsburg Res	Secondary Bulk	50	1730
		Pump stations	Louwsburg PS	Primary Bulk		9kW
			Coronation PS	Primary Bulk	-	34kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-

				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Pump stations	Coronation PS to Reservoir	Primary Bulk		13kW
			Hlobane PS	Primary Bulk		7kW
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R22 526 500	R2 252 650	R24 779 150	
		Secondary	R44 320 000	R4 432 000	R48 752 000	
		Tertiary	R0	R0	R0	
		Total	**R66 846 500**	**R6 684 650**	**R73 531 150**	

ZUL002: Hlahlindlela Scheme

The total bulk cost requirement for the Mbonambi Scheme is R 796 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 18 782.

ZUL002: Hlahlindlela Scheme Proposed Bulk Water Supply Intervention

Hlahlindlela Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Hlahlindlela Regional Scheme	ZDM_SZ034	20 554	24 829	
			ZDM_SZ035	97 706	118 025	
			ZUL002	60 666	73 282	
		Total		**178 926**	**216 136**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Hlahlindlela Regional Scheme	ZDM_SZ034	7.56	9.28	
			ZDM_SZ035	20.49	25.42	
			ZUL002	16.35	20.22	
		Total		**44.41**	**54.92**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		Klipfontein	16.6	45.45	No irrigation in Klipfontein dam catchment	
		Mvunyana	3.96	10.84	5 mM3/a (13.7 Mℓd) irrigation downstream of Klipfontein Dam	
		Grootgewaagd	0.61	1.67		
		Bloemveld	1.07	2.93		
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length)**
4.1	**Existing**	WTW	Klipfontein	Primary Bulk		53
			Bloemveld	Primary Bulk		7.5

			Emondlo	Primary Bulk		12
			Mvuzini	Primary Bulk		0.62
		Bulk Pipelines	uPVC, Steel, HDPE, Ductile Iron	Primary Bulk	ø 200mm - ø 800mm	137.6km
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	960	960
				Tertiary Bulk	450	450
		Pump station	Bloemveld PS	Primary Bulk	0.65139 M^3/s	202kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	ø 315mm -ø 762mm	36.7km
				Secondary Bulk	ø 50mm -ø 350mm	193km
				Tertiary Bulk	ø 50mm -ø 125mm	150km
		Reservoirs	Command Reservoir 1 (CR1)	Primary Bulk		2200
			Command Reservoir 2 (CR2)	Primary Bulk		5000
			Command Reservoir 3 (CR3)	Primary Bulk		5000
			Command Reservoir 3 (CR3)	Primary Bulk		5000
			Res 2	Secondary		30
			Res 1	Secondary		350
			Res 3	Secondary		460
			Res 4	Secondary		1000
			Res 5	Secondary		540
			Res 6	Secondary		100
			Res 7	Secondary		740
			Res 8	Secondary		2000
			Obivane 2 Res	Tertiary		300
			Bivanyana Res	Tertiary		60
			Penvaan Res	Tertiary		180
			Khambula Mission Res	Tertiary		360
			KwaBeshu Res	Tertiary		400
			KwaNgethe Res	Tertiary		200
			Tintas Drift Res	Tertiary		190
			Golden Valley Res	Tertiary		570
			Emakwateni Res	Tertiary		290
			Kwabanga Res	Tertiary		230
			Shoba 1 Res	Tertiary		1620
			Ntendeka	Tertiary		230
			Bozuzu Res	Tertiary		120
			Voorkeur Res	Tertiary		90
			Zungweni Res	Tertiary		200
			Margo Res	Tertiary		80
			Kwalancast Res	Tertiary		180

			Hellberg Farms Res	Tertiary		640
			KwaManzi Res	Tertiary		220
			Mqwabe	Tertiary		220
			Zungwini Res	Tertiary		220
			Mthashana Res	Tertiary		220
			Gerust Res	Tertiary		220
			KwaMatiela Res	Tertiary		220
			KwaSavells	Tertiary		220
			Grootfontein Res	Tertiary		370
			Fearmdale Res	Tertiary		330
			Scheepersnek	Tertiary		330
			KwaLubeck	Tertiary		330
			Betel	Tertiary		330
			Stillwater	Tertiary		330
			Driefontein	Tertiary		100
			Fairplay Res	Tertiary		100
			Mdlenevini Res	Tertiary		100
			Geluk 3 Res	Tertiary		370
			Middelpunt Res	Tertiary		370
			Aardappel	Tertiary		100
			Emooi	Tertiary		170
			Enyanyeni Res	Tertiary		600
			Vamba Res	Tertiary		170
			Langverwacht Res	Tertiary		170
			Brakfontein	Tertiary		100
			Nsengeni Res	Tertiary		90
			Mawelawela Res	Tertiary		90
			Blakpan	Tertiary		100
			Gwebu Res (Eestepunt)	Tertiary		100
			Gwebu Res (In Memorium)	Tertiary		100
			Gwebu Res (Kromellenboog)	Tertiary		600
		Pump stations		Primary Bulk	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R476 091 000	R47 609 100	R523 700 100	
		Secondary	R131 385 000	R13 138 500	R144 523 500	
		Tertiary	R116 170 000	R11 617 000	R127 787 000	
		Total	**R723 646 000**	**R72 364 600**	**R796 010 600**	

ZUL003: Khambi Scheme

The total bulk cost requirement for the Khambi Scheme is R 90.2 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 12 686.

ZUL003: Khambi Scheme Proposed Bulk Water Supply Intervention

Khambi Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Khambi Regional Water Scheme	ZDM_SZ032	9 808	11 847	
			ZDM_SZ033	1 281	1 547	
			ZDM_SZ091	3 565	4 306	
			ZUL003	15 364	18 560	
		Total		**30 018**	**36 260**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Khambi Regional Water Scheme	ZDM_SZ032	1.66	2.07	
			ZDM_SZ033	0.23	0.28	
			ZDM_SZ091	0.69	0.87	
			ZUL003	2.85	3.59	
		Total		**5.42**	**6.81**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	River abstraction on a tributary of the Mkuze River			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
4.1	**Existing**	WTW	Khambi WTW	Primary Bulk	0.2	2.1
			Mountain View WTW	Primary Bulk	0.1	0.5
			Enyathi WTW	Primary Bulk	0.09	0.3
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 110mm	2.6km
				Secondary Bulk	ø 63mm - ø 160mm	24.3km
				Tertiary Bulk	ø 50mm - ø 160mm	31.2km
		Reservoirs	Command Reservoir A1	Primary Bulk	22	578
			Command Reservoir C1	Primary Bulk	600	0
			Mountain View Res	Primary Bulk	600	800
			Enyathi Res 1	Secondary Bulk	600	0
			Kwamaqweshe Res 1	Secondary Bulk	500	0
			Res 11 (A)	Secondary Bulk	200	0
			Res 2 (A)	Secondary Bulk	200	0
			Res 4 (A)	Secondary Bulk	200	180
			Res 5 (A)	Secondary Bulk	30	0
			Res 10 (A)	Tertiary Bulk	500	560
			Res 3 (A)	Tertiary Bulk	0	320
			Res 6 (A)	Tertiary Bulk	30	390
			Res 7 (A)	Tertiary Bulk	30	210
			Res 8 (A)	Tertiary Bulk	30	210

			Res 9 (A)	Tertiary Bulk	88	712
		Pump stations			-	-
					-	-
4.2	**Future**	Bulk Pipelines		Primary Bulk	250	0.9km
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Pump stations	Khambi PS at WTW	Primary Bulk	0.031481 M^3/s	47
			PS from CR to Res 2 (A)	Primary Bulk	0.017407 M^3/s	23
			Enyathi PS at WTW	Secondary Bulk	0.005185 M^3/s	8
			PS from CR to Res 1 (C)	Secondary Bulk	0.005185 M^3/s	6
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R53 491 000	R5 349 100	R58 840 100	
		Secondary	R9 618 000	R961 800	R10 579 800	
		Tertiary	R18 892 000	R1 889 200	R20 781 200	
		Total	**R82 001 000**	**R7 600 100**	**R90 201 100**	

ZUL004: Mandhlakazi Scheme

The total bulk cost requirement for the Mandhlakazi Scheme is approximately R 1.5 billion (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 66 692. Due to the size of the project, it will take close to 42 years to complete.

ZUL004: Mandhlakazi Scheme Proposed Bulk Water Supply Intervention

Mandhlakazi Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Mandhlakazi Regional Water Scheme	ZDM_SZ018	1 007	1 216	
			ZDM_SZ019	1 095	1 323	
			ZDM_SZ020	848	1 025	
			ZDM_SZ021	1 548	1 870	
			ZDM_SZ022	1 600	1 933	
			ZDM_SZ024	1 529	1 846	
			ZDM_SZ036	792	957	
			ZDM_SZ037	6 341	7 659	
			ZDM_SZ038	1 701	2 055	

			ZDM_SZ039	3 234	3 906	
			ZDM_SZ041	2 732	3 300	
			ZDM_SZ042	1 881	2 272	
			ZDM_SZ043	2 022	2 442	
			ZDM_SZ092	4 359	5 266	
			ZDM_SZ093	2 100	2 537	
			ZDM_SZ094	1 097	1 325	
			ZDM_SZ095	2 596	3 136	
			ZDM_SZ096	1 667	2 013	
			ZDM_SZ097	3 826	4 621	
			ZDM_SZ098	3 832	4 628	
			ZDM_SZ099	4 277	5 167	
			ZDM_SZ100	9 243	11 165	
			ZDM_SZ101	4 010	4 844	
			ZDM_SZ102	6 779	8 189	
			ZDM_SZ103	12 736	15 385	
			ZDM_SZ104	7 732	9 340	
			ZDM_SZ105	430	520	
			ZDM_SZ106	4 645	5 611	
			ZUL004	1 843	2 226	
		Total		**97 503**	**117 780**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Mandhlakazi Regional Water Scheme	ZDM_SZ018	0.18	0.23	
			ZDM_SZ019	0.2	0.25	
			ZDM_SZ020	0.15	0.19	
			ZDM_SZ021	0.26	0.32	
			ZDM_SZ022	0.31	0.38	
			ZDM_SZ024	0.25	0.31	
			ZDM_SZ036	0.14	0.18	
			ZDM_SZ037	1.12	1.42	
			ZDM_SZ038	0.31	0.4	
			ZDM_SZ039	0.58	0.74	
			ZDM_SZ041	0.49	0.62	
			ZDM_SZ042	0.33	0.42	
			ZDM_SZ043	0.36	0.45	
			ZDM_SZ092	0.72	0.89	
			ZDM_SZ093	0.35	0.44	
			ZDM_SZ094	0.19	0.25	
			ZDM_SZ095	0.46	0.58	
			ZDM_SZ096	0.3	0.37	
			ZDM_SZ097	0.68	0.86	
			ZDM_SZ098	0.65	0.82	
			ZDM_SZ099	0.76	0.97	

			ZDM_SZ100	1.61	2.04	
			ZDM_SZ101	0.72	0.91	
			ZDM_SZ102	1.21	1.53	
			ZDM_SZ103	2.34	2.95	
			ZDM_SZ104	1.42	1.8	
			ZDM_SZ105	0.08	0.1	
			ZDM_SZ106	0.83	1.05	
			ZUL004	0.32	0.4	
		Total		**16.96**	**21.87**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	Raw water is obtained from the weir upstream of Blackie Dam and being purchased from the Charl Senekal Trust in terms of a memorandum of agreement for treatment at Mandlakazi WTP			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
4.1	**Existing**	WTW	Mandlakazi WTW	Primary Bulk	20	35
			Sidinsi WTW	Primary Bulk	0.28	0.4
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 660mm	14.55km
				Secondary Bulk	ø 63mm - ø 560mm	82km
				Tertiary Bulk	ø 63mm - 200mm	46.3km
		Reservoirs	Command Reservoir 1 (CR1)	Primary Bulk	11000	12770
			Command Reservoir 2 (CR2)	Primary Bulk	0	475
			Res 10	Secondary Bulk	30	410
			Res 13	Secondary Bulk	30	410
			Res 16	Secondary Bulk	1500	1500
			Res 19	Secondary Bulk	100	820
			Res 23	Secondary Bulk	100	2540
			Res 25	Secondary Bulk	1000	1000
			Res 3	Secondary Bulk	0	0
			Res 36	Secondary Bulk	0	550
			Res 4	Secondary Bulk	1800	1800
			Res 65	Secondary Bulk	30	170
			Res 9	Secondary Bulk	30	360
			Res 11	Tertiary Bulk	100	410
			Res 12	Tertiary Bulk	100	410
			Res 14	Tertiary Bulk	30	270
			Res 15	Tertiary Bulk	30	270
			Res 17	Tertiary Bulk	0	970
			Res 18	Tertiary Bulk	100	970
			Res 20	Tertiary Bulk	200	910

			Res 21	Tertiary Bulk	100	910
			Res 29	Tertiary Bulk	1000	2080
			Res 37	Tertiary Bulk	0	550
			Res 44	Tertiary Bulk	200	580
			Res 5	Tertiary Bulk	100	380
			Res 68	Tertiary Bulk	0	0
			Res 7	Tertiary Bulk	30	160
			Res 8	Tertiary Bulk	30	400
		Pump stations	PS at Jozini Dam to Mandhlakazi WTW	Primary Bulk	0.378333 M^3/s	842
4.2	**Future**	Bulk Pipelines		Primary Bulk	ø 660mm	35.55km
				Secondary Bulk	ø 63mm - ø 560mm	43.6km
				Tertiary Bulk	ø 63mm - ø 315mm	138.9km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
			Res 22	Secondary Bulk	4000	1020
			Res 24	Secondary Bulk	0	2260
			Res 27	Secondary Bulk	100	900
			Res 28	Secondary Bulk	300	900
			Res 33	Secondary Bulk	1000	1000
			Res 34	Secondary Bulk	500	500
			Res 35	Secondary Bulk	300	740
			Res 6	Secondary Bulk	30	160
			Res 1	Tertiary Bulk	0	320
			Res 2	Tertiary Bulk	0	320
			Res 26	Tertiary Bulk	100	900
			Res 30	Tertiary Bulk	150	300
			Res 31	Tertiary Bulk	100	250
			Res 32	Tertiary Bulk	100	250
			Res 38	Tertiary Bulk	1000	1000
			Res 39	Tertiary Bulk	750	820
			Res 40	Tertiary Bulk	750	820
			Res 41	Tertiary Bulk	500	1020
			Res 42	Tertiary Bulk	150	1020
			Res 43	Tertiary Bulk	100	580
			Res 45	Tertiary Bulk	0	260
			Res 46	Tertiary Bulk	0	260
			Res 47	Tertiary Bulk	0	260
			Res 48	Tertiary Bulk	0	890
			Res 49	Tertiary Bulk	0	170
			Res 50	Tertiary Bulk	0	170
			Res 51	Tertiary Bulk	0	160

			Res 52	Tertiary Bulk	0	400
			Res 53	Tertiary Bulk	0	200
			REs 54	Tertiary Bulk	0	410
			Res 55	Tertiary Bulk	0	410
			Res 56	Tertiary Bulk	0	410
			Res 57	Tertiary Bulk	0	270
			Res 58	Tertiary Bulk	0	1480
			Res 59	Tertiary Bulk	0	920
			Res 60	Tertiary Bulk	0	760
			Res 61	Tertiary Bulk	0	2100
			Res 62	Tertiary Bulk	0	820
			Res 63	Tertiary Bulk	0	820
			Res 64	Tertiary Bulk	0	580
			Res 66	Tertiary Bulk	300	300
			Res 67	Tertiary Bulk	300	300
		Pump stations	PS at Mono River to Sindisi WTW	Primary Bulk	0.007037 M^3/s	11
			New PS at Ponogolopoort Dam	Primary Bulk	0.378333 M^3/s	842
			PS at WTW to Booster PS	Primary Bulk	0.378333 M^3/s	786
			PS to CR 1 (Booster)	Primary Bulk	0.378333 M^3/s	816
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R660 543 000	R66 054 300	R726 597 300	
		Secondary	R537 999 000	R53 799 900	R591 798 900	
		Tertiary	R201 642 000	R20 164 200	R221 806 200	
		Total	**R1 400 184 000**	**R140 018 400**	**R1 540 202 400**	

ZUL005: Mkhuze Scheme

The total bulk cost requirement for the Mkuze Scheme is R 26.7 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 9 194.

Mkuze Scheme Proposed Bulk Water Supply Intervention

Mkhuze Regional Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Mkhuze Regional Scheme	ZDM_SZ033	1 890	2 283	
			ZDM_SZ091	9 643	11 649	
		Total		**11 533**	**13 931**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Mkhuze Regional Scheme	ZDM_SZ033	0.33	0.41	
			ZDM_SZ091	1.91	2.42	

		Total		**2.24**	**2.84**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		Phongola Dam	500	1 369	Yield need to be confirmed	
		Gumbi WTW		1		
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length)**
4.1	**Existing**	WTW	Gumbi WTW	Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	-	-
				Secondary Bulk	ø 100mm - ø160mm	6.91km
		Reservoirs		Primary Bulk	-	-
			Res 1	Secondary Bulk	0	840
				Tertiary Bulk	-	-
		Pump stations	PS at Pongolopoort Dam to WTW	Primary Bulk	0.007778 Mm^3 /s	5kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
				Secondary Bulk	-	-
				Tertiary Bulk	-	-
		Pump stations		Primary Bulk		
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R15 000 000	R1 500 000	R16 500 000	
		Secondary	R9 323 000	R932 300	R10 255 300	
		Tertiary	R0	R0	R0	
		Total	**R24 323 000**	**R 2 432 300**	**R26 755 300**	

ZUL006: Nkonjeni Scheme

The total bulk cost requirement for the Nkonjeni Scheme is R 903 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 23 687.

Nkonjeni Scheme Proposed Bulk Water Supply Intervention

Nkonjeni Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Nkonjeni Regional Water Scheme	ZDM_SZ001	8 743	10 561	
			ZDM_SZ002	894	1 079	
			ZDM_SZ003	5 718	6 907	
			ZDM_SZ004	679	820	

			ZDM_SZ005	961	1 161
			ZDM_SZ006	1 164	1 406
			ZDM_SZ007	1 084	1 310
			ZDM_SZ008	3 901	4 712
			ZDM_SZ009	2 859	3 454
			ZDM_SZ010	14 550	17 575
			ZDM_SZ011	1 131	1 366
			ZDM_SZ012	2 214	2 674
			ZDM_SZ013	6 126	7 400
			ZDM_SZ014	32 383	39 117
			ZDM_SZ015	4 725	5 708
			ZDM_SZ049	2 665	3 219
			ZDM_SZ051	1 498	1 809
			ZDM_SZ053	1 282	1 549
			ZDM_SZ055	1 261	1 523
			ZDM_SZ056	4 102	4 955
			ZDM_SZ057	1 500	1 812
			ZDM_SZ058	1 197	1 446
			ZDM_SZ059	2 475	2 989
			ZDM_SZ065	1 823	2 202
			ZDM_SZ083	3 259	3 936
			ZDM_SZ084	5 389	6 509
			ZDM_SZ085	8 191	9 894
			ZDM_SZ087	2 784	3 363
			ZDM_SZ088	3 681	4 447
			ZUL006	32 715	39 519
		Total		**160 952**	**194 424**
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**
		Nkonjeni Regional Water Scheme	ZDM_SZ001	1.50	1.86
			ZDM_SZ002	0.14	0.18
			ZDM_SZ003	0.96	1.20
			ZDM_SZ004	0.12	0.15
			ZDM_SZ005	0.17	0.22
			ZDM_SZ006	0.21	0.26
			ZDM_SZ007	0.18	0.22
			ZDM_SZ008	0.81	1.00
			ZDM_SZ009	0.63	0.79
			ZDM_SZ010	2.73	3.40
			ZDM_SZ011	0.18	0.22
			ZDM_SZ012	0.44	0.54
			ZDM_SZ013	1.00	1.24
			ZDM_SZ014	7.14	8.85
			ZDM_SZ015	1.02	1.26

			ZDM_SZ049	0.46	0.58	
			ZDM_SZ051	0.28	0.35	
			ZDM_SZ053	0.23	0.29	
			ZDM_SZ055	0.23	0.29	
			ZDM_SZ056	0.74	0.94	
			ZDM_SZ057	0.27	0.35	
			ZDM_SZ058	0.23	0.29	
			ZDM_SZ059	0.44	0.56	
			ZDM_SZ065	0.33	0.42	
			ZDM_SZ083	0.58	0.73	
			ZDM_SZ084	0.95	1.21	
			ZDM_SZ085	1.48	1.87	
			ZDM_SZ087	0.52	0.66	
			ZDM_SZ088	0.64	0.81	
			ZUL006	9.06	11.15	
		Total		**33.66**	**41.88**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	Mfolozi River			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓd or Length or kW)**
4.1	**Existing**	WTW	Ulundi WTW	Primary Bulk	26.4	32
			Babanango WTW	Primary Bulk	0.33	0.5
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 50mm - ø 813mm	15.12km
				Secondary Bulk	ø 63mm - ø 400mm	118.13km
				Tertiary Bulk	ø 50mm - ø 250mm	40.55km
		Reservoirs	Command Reservoir (CR1)	Primary Bulk	0	19270
			Command Reservoir 2 (CR2)	Primary Bulk	200	2350
			Command Reservoir 3 (CR3)	Primary Bulk	225	920
			Res 1	Secondary Bulk	20	210
			Res 3	Secondary Bulk	30	210
			Res 5	Secondary Bulk	300	200
			Res 7	Secondary Bulk	250	1580
			Res 10	Secondary Bulk	75	790
			Res 11	Secondary Bulk	100	790
			Res 12	Secondary Bulk	200	1100
			Res 16	Secondary Bulk	350	1880
			Res 17	Secondary Bulk	75	760
			Res 18	Secondary Bulk	150	700
			Res 20	Secondary Bulk	0	2130
			Res 21	Secondary Bulk	4.2	2130
			Res 22	Secondary Bulk	88	2130
			Res 24	Secondary Bulk	0	5900
			Res 25	Secondary Bulk	263	5900

			Res 26	Secondary Bulk	8388	8388
			Res 27	Secondary Bulk	0	1020
			Res 28	Secondary Bulk	0	1020
			Res 29	Secondary Bulk	200	1020
			Res 36	Secondary Bulk	30	330
			Res 42	Secondary Bulk	500	600
			Res 43	Secondary Bulk	100	600
			Res 54	Secondary Bulk	0	1530
			Res 62	Secondary Bulk	200	1020
			Res 2	Tertiary Bulk	20	210
			Res 6	Tertiary Bulk	60	200
			Res 8	Tertiary Bulk	30	200
			Res 9	Tertiary Bulk	100	440
			Res 13	Tertiary Bulk	100	440
			Res 14	Tertiary Bulk	0	560
			Res 15	Tertiary Bulk	684	684
			Res 19	Tertiary Bulk	150	440
			Res 30	Tertiary Bulk	200	2700
			Res 31	Tertiary Bulk	0	2180
			Res 34	Tertiary Bulk	30	1020
			Res 38	Tertiary Bulk	116	330
			Res 37	Tertiary Bulk	1985	1985
			Res 45	Tertiary Bulk	200	470
			Res 46	Tertiary Bulk	0	470
			Res 47	Tertiary Bulk	100	470
			Res 48	Tertiary Bulk	30	470
			Res 49	Tertiary Bulk	0	470
			Res 50	Tertiary Bulk	263	470
			Res 61	Tertiary Bulk	30	300
		Pump stations	PS to CR1	Primary Bulk	0.570957 M^3/s	1009kW
			PS to CR2	Primary Bulk	0.069444 M^3/s	39kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	ø 315mm	14.67km
				Secondary Bulk	ø 63mm - ø 315mm	39.5km
				Tertiary Bulk	ø 75mm - ø 315mm	43.8km
		WTW		Primary Bulk	-	-
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
			Res 4	Secondary Bulk	75	700
			Res 41	Secondary Bulk	161	600
			Res 52	Secondary Bulk	0	470
			Res 55	Secondary Bulk	1741	1530
			Res 56	Secondary Bulk	2328	1160
			Res 57	Secondary Bulk	53	360
			Res 32	Tertiary Bulk	30	1020

			Res 33	Tertiary Bulk	50	1020
			Res 63	Tertiary Bulk	0	1460
			Res 39	Tertiary Bulk	97	1210
			Res 40	Tertiary Bulk	30	1210
			Res 44	Tertiary Bulk	30	470
			Res 51	Tertiary Bulk	216	470
			Res 58	Tertiary Bulk	47	520
			Res 59	Tertiary Bulk	490	2400
			Res 35	Tertiary Bulk	0	330
		Pump stations	PS at Babanango WTW to CR3	Primary Bulk	0.008519 M^3/s	4 kW
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R231 256 670	R23 125 667	R254 382 337	
		Secondary	R436 551 000	R43 655 100	R480 206 100	
		Tertiary	R153 106 000	R15 310 600	R168 416 600	
		Total	**R820 913 670**	**R82 091 367**	**R903 005 037**	

ZUL007: Simdlangentsha Central

The total bulk cost requirement for the Simdlangentsha Central is R 364.7 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 47 291.

Simdlangentsha Central Proposed Bulk Water Supply Intervention

Simdlangentsha Central Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Simdlangentsha Central Regional Water Scheme	ZDM_SZ028	4 305	5 200	
			ZDM_SZ029	9 069	10 955	
			ZDM_SZ030	15 587	18 829	
			ZUL007	3 606	4 356	
		Total		**32 567**	**39 340**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Simdlangentsha Central Regional Water Scheme	ZDM_SZ028	0.70	0.86	
			ZDM_SZ029	1.55	1.93	
			ZDM_SZ030	2.68	3.36	
			ZUL007	0.63	0.80	
		Total		**5.56**	**6.95**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	Two sources namely a weir in the Mozana River and a small dam in the tributary of Mozana River near the Sim Central Package Plant		Water source is sufficient	
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d**

						or Length or kW)
4.1	Existing	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 150mm - ø 450mm	9.4km
				Secondary Bulk	ø 63mm - ø 450mm	14.8km
				Tertiary Bulk	ø 50mm - ø 160mm	17.9km
		Reservoirs	Command Reservoir (CR1)	Primary Bulk	-	-
			Res 2	Secondary Bulk	1430	2000
			Res 8	Secondary Bulk	30	310
			Res 21	Secondary Bulk	225	1320
			Res 13	Secondary Bulk	30	500
			Res 22	Secondary Bulk	0	320
			Res 7	Tertiary Bulk	30	380
			Res 12	Tertiary Bulk	0	560
			Res 18	Tertiary Bulk	30	960
			Res 23	Tertiary Bulk	120	120
			Res 25	Tertiary Bulk	40	740
		Pump stations	PS at Belgrade WTW	Primary Bulk	0.133056 M^3/s	116kW
4.2	Future	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	ø 75mm - ø 250mm	29km
				Tertiary Bulk	ø 63mm - ø 140mm	38.7km
		WTW	New WTP at weir of Mozana River	Primary Bulk	-	10
				Secondary Bulk	-	-
		Reservoirs		Primary Bulk	-	-
			Res 1	Secondary Bulk	0	1260
			Res 9	Secondary Bulk	0	620
			Res 20	Secondary Bulk	0	400
			Res 3	Tertiary Bulk	0	440
			Res 4	Tertiary Bulk	0	1100
			Res 5	Tertiary Bulk	0	1100
			Res 6	Tertiary Bulk	0	420
			Res 10	Tertiary Bulk	180	180
			Res 11	Tertiary Bulk	0	440
			Res 14	Tertiary Bulk	160	160
			Res 15	Tertiary Bulk	0	260
			Res 17	Tertiary Bulk	0	600
			Res 16	Tertiary Bulk	0	480
			Res 19	Tertiary Bulk	0	620
			Res 24	Tertiary Bulk	0	700
			Res 26	Tertiary Bulk	0	620
		Pump stations		Primary Bulk	-	-

5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R171 297 000	R17 129 700	R188 426 700	
		Secondary	R84 436 000	R8 443 600	R92 879 600	
		Tertiary	R75 901 000	R7 590 100	R83 491 100	
		Total	**R331 634 000**	**R33 163 400**	**R364 797 400**	

ZUL008: Simdlangentsha East

The total bulk cost requirement for the Simdlangentsha East is R 405.9 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 17 796.

Simdlangentsha East Proposed Bulk Water Supply Intervention

Simdlangentsha East Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Simdlangentsha East Regional Water Scheme	ZDM_SZ016	19 588	23 662	
			ZDM_SZ107	46 331	55 966	
			ZUL008	30 381	36 699	
		Total		**96 300**	**116 327**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Simdlangentsha East Regional Water Scheme	ZDM_SZ016	3.56	4.46	
			ZDM_SZ107	8.25	10.39	
			ZUL008	6.42	7.96	
		Total		**18.24**	**22.80**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	Raw water is abstracted from irrigation channels next to the Pongola River			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
4.1	**Existing**	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 200mm - ø 630mm	3.3km
				Secondary Bulk	ø 75mm - ø 630mm	33.6km
				Tertiary Bulk	ø 63mm -ø 200mm	91.5
		Reservoirs	Command Reservoir (CR1)	Primary Bulk	0	180
			Res 1	Secondary Bulk	88	460
			Res 2	Secondary Bulk	88	450
			Res 3	Secondary Bulk	225	310
			Res 4	Secondary Bulk	100	680
			Res 5	Secondary Bulk	30	350
			Res 6	Secondary Bulk	225	1630
			Res 20	Secondary Bulk	500	730

			Res 21	Secondary Bulk	0	1290
			Res 23	Secondary Bulk	0	1660
			Res 52	Secondary Bulk	0	550
			Res 56	Secondary Bulk	0	2740
			Res 7	Tertiary Bulk	88	690
			Res 8	Tertiary Bulk	30	440
			Res 9	Tertiary Bulk	100	440
			Res 10	Tertiary Bulk	88	520
			Res 11	Tertiary Bulk	30	230
			Res 12	Tertiary Bulk	30	230
			Res 13	Tertiary Bulk	30	230
			Res 14	Tertiary Bulk	88	380
			Res 15	Tertiary Bulk	88	380
			Res 22	Tertiary Bulk	30	590
			Res 24	Tertiary Bulk	30	560
			Res 25	Tertiary Bulk	250	270
			Res 26	Tertiary Bulk	250	340
			Res 27	Tertiary Bulk	250	250
			Res 32	Tertiary Bulk	750	780
			Res 33	Tertiary Bulk	30	520
			Res 34	Tertiary Bulk	600	2740
			Res 35	Tertiary Bulk	30	200
			Res 36	Tertiary Bulk	88	200
			Res 37	Tertiary Bulk	250	390
			Res 38	Tertiary Bulk	88	690
			Res 40	Tertiary Bulk	100	440
			Res 41	Tertiary Bulk	250	650
			Res 43	Tertiary Bulk	30	600
			Res 44	Tertiary Bulk	30	880
			Res 45	Tertiary Bulk	30	230
			Res 47	Tertiary Bulk	50	160
			Res 49	Tertiary Bulk	50	240
			Res 51	Tertiary Bulk	50	200
		Pump stations	PS at Pongola WTW to CR1	Primary Bulk	264 802 M^3/s	188 kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	ø 75mm - ø 110mm	7.6km
				Tertiary Bulk	ø 50mm - ø 400mm	25km
		WTW		Primary Bulk	-	
				Secondary Bulk	-	
		Reservoirs		Primary Bulk	-	
			Res 19	Secondary Bulk	800	1260
			Res 54	Secondary Bulk	0	620
			Res 55	Secondary Bulk	0	400

			Res 16	Tertiary Bulk	0	520
			Res 18	Tertiary Bulk	0	480
			Res 17	Tertiary Bulk	0	480
			Res 28	Tertiary Bulk	0	310
			Res 29	Tertiary Bulk	0	450
			Res 30	Tertiary Bulk	0	140
			Res 31	Tertiary Bulk	0	220
			Res 39	Tertiary Bulk	0	150
			Res 42	Tertiary Bulk	0	200
			Res 46	Tertiary Bulk	0	230
			Res 48	Tertiary Bulk	0	160
			Res 50	Tertiary Bulk	0	240
			Res 57	Tertiary Bulk	0	520
		Pump stations		Primary Bulk	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R37 780 000	R3 778 000	R41 558 000	
		Secondary	R181 496 000	R18 149 600	R199 645 600	
		Tertiary	R149 741 000	R14 974 100	R164 715 100	
		Total	**R369 017 000**	**R36 901 700**	**R405 918 700**	

ZUL009: Simdlangentsha West

The total bulk cost requirement for the Simdlangentsha West is R 344.7 million (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 16 619.

Simdlangentsha West Proposed Bulk Water Supply Intervention

Simdlangentsha West Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Simdlangentsha West Regional Water Scheme	ZDM_SZ027	56 948	68 792	
			ZUL009	30 635	37 006	
		Total		**87 583**	**105 798**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
		Simdlangentsha West Regional Water Scheme	ZDM_SZ027	9.47	11.79	
			ZUL009	6.34	7.90	
		Total		**15.82**	**19.69**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		River	Raw water is abstracted from the Pongola River			

4	Infrastructure			Class	Size / No	Capacity (Mℓ/d or Length or kW)
4.1	Existing	WTW		Primary Bulk	-	-
				Primary Bulk	-	-
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 200mm - ø 630mm	3.2km
				Secondary Bulk	ø 50mm - ø 500mm	64km
				Tertiary Bulk	ø 50mm -ø 250mm	26.16km
		Reservoirs	Command Reservoir (CR1)	Primary Bulk	0	1000
			Res 22	Primary Bulk	225	750
			Command Reservoir (CR2) (Res 21)	Primary Bulk	5000	6120
			Res 2	Secondary Bulk	0	2700
			Res 3	Secondary Bulk	22	700
			Res 4	Secondary Bulk	30	700
			Res 6	Secondary Bulk	10	1210
			Res 8	Secondary Bulk	145	1210
			Res 14	Secondary Bulk	30	110
			Res 15	Secondary Bulk	30	110
			Res 16	Secondary Bulk	30	190
			Res 17	Secondary Bulk	30	190
			Res 19	Secondary Bulk	30	560
			Res 20	Secondary Bulk	225	560
			Res 23	Secondary Bulk	30	420
			Res 24	Secondary Bulk	225	460
			Res 25	Secondary Bulk	225	650
			Res 26	Secondary Bulk	30	650
			Res 27	Secondary Bulk	30	70
			Res 29	Secondary Bulk	30	70
			Res 31	Secondary Bulk	30	140
			Res 37	Secondary Bulk	100	100
			Res 38	Secondary Bulk	30	310
			Res 41	Secondary Bulk	30	540
			Res 43	Secondary Bulk	100	150
			Res 52	Secondary Bulk	30	930
			Res 51	Secondary Bulk	30	930
			Res 53	Secondary Bulk	30	930
			Res 49	Secondary Bulk	30	100
			Res 48	Secondary Bulk	80	100
			Res 5	Tertiary Bulk	30	1620
			Res 9	Tertiary Bulk	5000	5000
			Res 10	Tertiary Bulk	30	1210

			Res 18	Tertiary Bulk	225	300
			Res 28	Tertiary Bulk	30	560
			Res 32	Tertiary Bulk	80	240
			Res 34	Tertiary Bulk	30	50
			Res 35	Tertiary Bulk	100	50
			Res 39	Tertiary Bulk	30	310
			Res 40	Tertiary Bulk	30	150
			Res 55	Tertiary Bulk	30	150
			Res 44	Tertiary Bulk	30	130
		Pump stations	PS at Frischgewaagd WTW to CR	Primary Bulk	0.181296 M^3/s	420kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	ø 75mm	2.7km
				Secondary Bulk	ø 50mm - ø 200mm	38.4km
				Tertiary Bulk	ø 50mm -ø 200mm	27km
		WTW		Primary Bulk	-	
				Secondary Bulk	-	
		Reservoirs		Primary Bulk	-	
			Res 7	Secondary Bulk	200	1210
			Res 30	Secondary Bulk	0	70
			Res 33	Secondary Bulk	100	240
			Res 42	Secondary Bulk	30	150
			Res 50	Secondary Bulk	80	930
			Res 46	Secondary Bulk	0	180
			Res 47	Secondary Bulk	22	200
			Res 60	Secondary Bulk	1000	1000
			Res 59	Secondary Bulk	100	860
			Res 57	Secondary Bulk	0	500
			Res 12	Tertiary Bulk	0	100
			Res 11	Tertiary Bulk	0	100
			Res 13	Tertiary Bulk	30	100
			Res 36	Tertiary Bulk	30	50
			Res 56	Tertiary Bulk	0	120
			Res 54	Tertiary Bulk	30	130
			Res 58	Tertiary Bulk	0	150
			Res 45	Tertiary Bulk	0	40
		Pump stations		Primary Bulk	-	-
5	**Cost Requirement**		**Capital Cost**	**10% Contingencies**	**Total Cost (Excl VAT)**	
		Primary	R50 358 000	R5 035 800	R 55 393 800	
		Secondary	R215 990 000	R21 599 000	R237 589 000	
		Tertiary	R47 080 000	R4 708 000	R 51 788 000	
		Total	**R313 428 000**	**R31 342 800**	**R344 770 800**	

ZUL010: Usuthu Scheme

The total bulk cost requirement for the Usuthu Scheme is R 2.5 billion (excl VAT) and detailed within the table below. The scheme development cost per household is approximately R 51 432.

Usuthu Scheme Proposed Bulk Water Supply Intervention

Usuthu Regional Water Scheme						
Item	**Description**					
1	**Population**	**Scheme Name**	**Subscheme No**	**Population 2020**	**Population 2050**	
		Usuthu Regional Water Scheme	ZDM_SZ025	6 378	7 704	
			ZDM_SZ026	8 920	10 775	
			ZDM_SZ044	20 167	24 361	
			ZDM_SZ045	9 504	11 480	
			ZDM_SZ046	4 264	5 151	
			ZDM_SZ047	6 792	8 205	
			ZDM_SZ048	6 954	8 401	
			ZDM_SZ060	5 815	7 025	
			ZDM_SZ061	16 811	20 307	
			ZDM_SZ062	11 841	14 304	
			ZDM_SZ063	8 277	9 998	
			ZDM_SZ064	21 672	26 179	
			ZDM_SZ068	4 720	5 702	
			ZDM_SZ069	1 243	1 501	
			ZDM_SZ070	3 329	4 021	
			ZDM_SZ071	3 749	4 529	
			ZDM_SZ072	5 591	6 754	
			ZDM_SZ073	3 683	4 449	
			ZDM_SZ074	4 495	5 430	
			ZDM_SZ075	4 789	5 786	
			ZDM_SZ076	4 243	5 125	
			ZDM_SZ077	5 303	6 406	
			ZDM_SZ078	6 554	7 917	
			ZDM_SZ079	2 448	2 958	
			ZDM_SZ080	7 594	9 173	
			ZDM_SZ081	1 813	2 190	
			ZDM_SZ082	2 086	2 520	
			ZDM_SZ089	11 801	14 255	
			ZDM_SZ090	2 566	3 100	
			ZUL010	2 074	2 506	
		Total		**205 479**	**248 211**	
2	**Demand**	**Scheme Name**	**Subscheme No**	**Demand 2020**	**Demand 2050**	
			ZDM_SZ025	1.07	1.34	
			ZDM_SZ026	1.59	2.02	

			ZDM_SZ044	3.72	4.66	
			ZDM_SZ045	1.70	2.15	
			ZDM_SZ046	0.76	0.96	
			ZDM_SZ047	1.21	1.52	
			ZDM_SZ048	1.33	1.68	
			ZDM_SZ060	1.04	1.32	
			ZDM_SZ061	3.01	3.80	
			ZDM_SZ062	2.25	2.84	
			ZDM_SZ063	1.47	1.86	
			ZDM_SZ064	5.05	6.24	
			ZDM_SZ068	0.84	1.06	
			ZDM_SZ069	0.22	0.28	
			ZDM_SZ070	0.59	0.75	
			ZDM_SZ071	0.66	0.84	
			ZDM_SZ072	0.99	1.25	
			ZDM_SZ073	0.65	0.82	
			ZDM_SZ074	0.79	1.00	
			ZDM_SZ075	0.85	1.08	
			ZDM_SZ076	0.78	0.98	
			ZDM_SZ077	0.94	1.20	
			ZDM_SZ078	1.14	1.43	
			ZDM_SZ079	0.43	0.55	
			ZDM_SZ080	1.35	1.71	
			ZDM_SZ081	0.32	0.41	
			ZDM_SZ082	0.37	0.47	
			ZDM_SZ089	2.08	2.59	
			ZDM_SZ090	0.46	0.57	
			ZUL010	0.41	0.51	
		Total		**38.05**	**47.87**	
3	**Water Resource**	**Dams**	**HFY (Mm3/a)**	**HFY (Mℓ/d)**	**Comments**	
		Vukwana Dam	Vuna River			
			Vungu River			
			Black Mfolozi River			
			Sikwebezi River			
			Nhlekisa River			
4	**Infrastructure**			**Class**	**Size / No**	**Capacity (Mℓ/d or Length or kW)**
4.1	**Existing**	WTW	Vuna WTW	Primary Bulk	4.5	6
			Usuthu WTW	Primary Bulk	20	35
		Bulk Pipelines	uPVC, Steel, HDPE, AC	Primary Bulk	ø 50mm - ø 600mm	18.85km
				Secondary Bulk	ø 110mm - ø 700mm	67.48km

				Tertiary Bulk	ø 50mm - ø 450mm	102km
		Reservoirs	Command Reservoir (CR1)	Primary Bulk	600	19030
			Command Reservoir (CR3)	Primary Bulk	2000	6970
			Command Reservoir 2 (CR2)	Primary Bulk	1000	7730
			Res 68	Secondary Bulk	200	1040
			Res 10	Secondary Bulk	0	0
			Res 11	Secondary Bulk	60	1770
			Res 12	Secondary Bulk	0	0
			Res 15	Secondary Bulk	80	960
			Res 16	Secondary Bulk	80	960
			Res 18	Secondary Bulk	6000	6000
			Res 20	Secondary Bulk	0	880
			Res 33	Secondary Bulk	100	630
			Res 71	Secondary Bulk	0	1040
			Res 75	Secondary Bulk	200	200
			Res 76	Secondary Bulk	300	300
			Res 80	Secondary Bulk	2000	2000
			Res 86	Secondary Bulk	150	810
			Res 87	Secondary Bulk	300	810
			Res 9	Secondary Bulk	1000	1770
			Res 92	Secondary Bulk	1000	1000
			Res 70	Secondary Bulk	200	1040
			Res 14	Tertiary Bulk	250	1520
			Res 17	Tertiary Bulk	500	2000
			Res 62	Tertiary Bulk	1700	1270
			Res 65	Tertiary Bulk	60	1040
			Res 69	Tertiary Bulk	200	1040
			Res 74	Tertiary Bulk	300	300
			Res 108	Tertiary Bulk	30	960
			Res 111	Tertiary Bulk	200	620
			Res 113	Tertiary Bulk	100	100
			Res 114	Tertiary Bulk	150	150
			Res 30	Tertiary Bulk	50	190
			Res 31	Tertiary Bulk	30	190
			Res 35	Tertiary Bulk	30	630
			Res 36	Tertiary Bulk	30	630
			Res 39	Tertiary Bulk	400	400
			Res 40	Tertiary Bulk	30	200
			Res 43	Tertiary Bulk	30	200
			Res 44	Tertiary Bulk	30	200
			Res 45	Tertiary Bulk	30	200
			Res 59	Tertiary Bulk	25	1270
			Res 60	Tertiary Bulk	0	1270

			Res 61	Tertiary Bulk	600	1270
			Res 63	Tertiary Bulk	100	1270
			Res 67	Tertiary Bulk	150	1040
			Res 7	Tertiary Bulk	500	1420
			Res 72	Tertiary Bulk	100	110
			Res 73	Tertiary Bulk	500	500
			Res 79	Tertiary Bulk	30	30
			Res 81	Tertiary Bulk	100	620
			Res 82	Tertiary Bulk	100	620
			Res 83	Tertiary Bulk	150	620
			Res 84	Tertiary Bulk	100	620
			Res 85	Tertiary Bulk	150	620
			Res 88	Tertiary Bulk	100	110
			Res 89	Tertiary Bulk	200	1040
			Res 93	Tertiary Bulk	150	960
			Res 96	Tertiary Bulk	200	810
			Res 97	Tertiary Bulk	300	810
			Res 98	Tertiary Bulk	200	810
			Res 32	Tertiary Bulk	30	190
		Pump stations	PS at Vuna WTW	Primary Bulk	0.111111 M^3/s	291kW
			PS at Usuthu WTW	Primary Bulk	0.263492 M^3/s	1140kW
			PS to CR3	Primary Bulk	0.209149 M^3/s	658 kW
4.2	**Future**	Bulk Pipelines		Primary Bulk	-	-
				Secondary Bulk	ø 63mm - ø 450mm	128km
				Tertiary Bulk	ø 50mm - ø 250mm	155km
		Dams	New off-channel storage dam on the KwaNkweme River	Primary Bulk	-	5106m^3
		WTW		Primary Bulk	-	
				Secondary Bulk	-	
		Reservoirs		Primary Bulk	-	
			Res 26	Secondary Bulk	30	410
			Res 1	Secondary Bulk	0	260
			Res 100	Secondary Bulk	100	1710
			Res 13	Secondary Bulk	2000	960
			Res 2	Secondary Bulk	60	260
			Res 21	Secondary Bulk	500	500
			Res 22	Secondary Bulk	50	390
			Res 23	Secondary Bulk	30	390
			Res 3	Secondary Bulk	0	1420
			Res 34	Secondary Bulk	100	630
			Res 4	Secondary Bulk	0	1420
			Res 5	Secondary Bulk	0	1420
			Res 58	Secondary Bulk	1000	1270

			Res 6	Secondary Bulk	0	2730
			Res 94	Secondary Bulk	150	960
			Res 95	Secondary Bulk	300	960
			Res 24	Secondary Bulk	30	390
			Res 50	Tertiary Bulk	30	220
			Res 91	Tertiary Bulk	30	960
			Res 101	Tertiary Bulk	30	1100
			Res 102	Tertiary Bulk	0	1960
			Res 103	Tertiary Bulk	0	3360
			Res 104	Tertiary Bulk	0	2160
			Res 105	Tertiary Bulk	0	260
			Res 106	Tertiary Bulk	0	1100
			Res 107	Tertiary Bulk	0	260
			Res 109	Tertiary Bulk	0	2400
			Res 110	Tertiary Bulk	0	1520
			Res 25	Tertiary Bulk	80	390
			Res 27	Tertiary Bulk	100	410
			Res 28	Tertiary Bulk	30	410
			Res 29	Tertiary Bulk	30	410
			Res 37	Tertiary Bulk	30	710
			Res 38	Tertiary Bulk	30	710
			Res 41	Tertiary Bulk	30	200
			Res 42	Tertiary Bulk	30	200
			Res 46	Tertiary Bulk	30	200
			Res 47	Tertiary Bulk	30	200
			Res 48	Tertiary Bulk	30	200
			Res 49	Tertiary Bulk	30	200
			Res 51	Tertiary Bulk	30	220
			Res 52	Tertiary Bulk	30	220
			Res 53	Tertiary Bulk	30	220
			Res 54	Tertiary Bulk	30	220
			Res 55	Tertiary Bulk	30	220
			Res 56	Tertiary Bulk	30	220
			Res 57	Tertiary Bulk	30	710
			Res 64	Tertiary Bulk	0	1040
			Res 66	Tertiary Bulk	0	1040
			Res 78	Tertiary Bulk	0	0
			Res 90	Tertiary Bulk	100	820
			Res 99	Tertiary Bulk	100	1710
		Pump stations		Primary Bulk	-	-