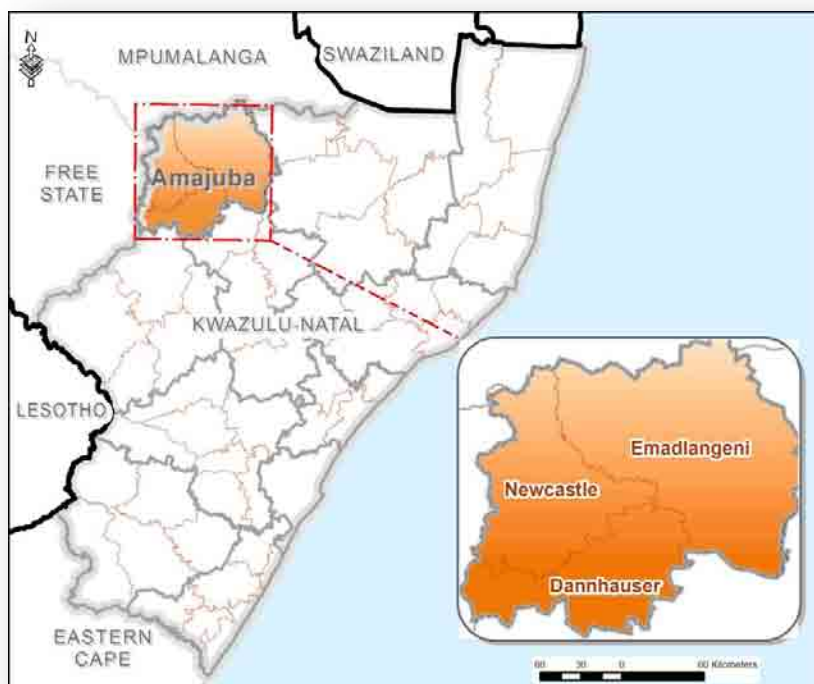


UNIVERSAL ACCESS PLAN PHASE 2 – PROGRESSIVE DEVELOPMENT OF A REGIONAL CONCEPT PLAN FOR THE AMAJUBA DISTRICT MUNICIPALITY NEWCASTLE LOCAL MUNICIPALITY

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EXECUTIVE SUMMARY

A. INTRODUCTION

Umgeni Water initiated a study in 2014 to develop Universal Access Plans (Phase 1) for bulk water supply, for all District Municipalities in the KwaZulu-Natal Province (KZN). The study culminated in a rudimentary report for each District Municipality that provides the water requirements and conceptual scheme areas and costing to provide access to bulk water supply, based on information at hand at the time.

Umgeni Water, together with the Department of Water & Sanitation (DWS) and the KZN Department of Cooperative Governance and Traditional Affairs (COGTA) sought to improve on the existing studies and initiated the follow-up study: Universal Access Plan (UAP) Phase 2 – Progressive Development of a Regional Concept Plan, again for each District Municipality in the KZN, as well as the Alfred Nzo and OR Tambo Districts in the Eastern Cape Province. Various Professional Service Providers (PSP's) were appointed to conduct the studies based on Water Services Authority (WSA) status.

The 2011 Census as well as updated Eskom Spot Building Count datasets could be applied for the improved studies. Furthermore, the DWS expressed the need to review and update their Reference Framework Geodatabase (2013) – especially the settlements and infrastructure components as part of the UAP Phase 2 study.

The objectives of the UAP Phase 2 study were to review and update the UAP Phase 1 study reports in order to improve the following:

- The Phase 1 study focused on small, localised schemes for universal access in the near future, however these proposed schemes are not necessarily sustainable;
- The proposed schemes were largely designed in isolation and took little cognisance of other water planning studies and recommendations;
- Many of the Water Services Development Plans were being updated during the course of the Phase 1 study, and need to be incorporated into UAP Phase 2;
- The study didn't go as far as Umgeni Water's extended area into the Eastern Cape Province; and
- The footprints didn't take cognisance of town planning type information that would give an indication of future demands.

The UAP Phase 2 study aimed to improve on the above and to ensure a more aligned approach between the various PSP's appointed for the different study areas.

This report is the UAP Phase 2 report for the Amajuba District Municipality (ADM) and Newcastle Local Municipality (NLM) as the two WSA's in the district, KwaZulu-Natal Province and hence forth, information reflected relates to these WSA's.

B. DEMOGRAPHICS

The Amajuba District Municipality has the lowest number of households within the KZN Province compared to the other DM's, and is the fourth smallest in geographic area (6 910km²).

For the purpose of this study, the 2011 Census was used as base as it is available for the whole of South Africa and is also used by the municipalities for their planning and reporting purposes.

The population figures were projected according to calculated growth rates provided by Umgeni Water, based in inputs from Statistics SA (growth profiles, migration and updated household surveys) as well as local knowledge of the study areas.

The demographics from the 2011 Census (sub-place level, summarised per LM) and projected to 2035, are presented in **Table B**.

Table B Demographics Summary: 2011 Census and 2035 (Projected)

Local Municipality	2011		2035	
	Population	Households	Population	Households
Dannhauser	102 127	20 328	133 333	26 613
Emadlangeni	34 450	6 240	43 106	7 912
Newcastle	363 237	84 277	479 220	111 243
TOTAL	499 627	110 503	655 659	145 768

C. WATER SERVICE LEVELS AND WATER REQUIREMENTS

The consumers in the ADM and NLM have access to water supply in various forms, ranging from no formal access (obtain water directly from natural water sources), to formal and high levels of service in the form of household connections and waterborne sanitation.

The ADM and NLM have initiated several projects to improve access to water supply – both reticulated supply and bulk water services. Services have improved, but also, many communities in the more rural areas of the ADM and NLM gain access to formal schemes through illegal connections. This affects the quantity of water available to all, as schemes were not initially designed for yard or house connections (supplied from community standpipes).

The 2011 Census service levels and water requirement projections (million m³/a and MI/d) are presented in **Table C1** and **Table C2** respectively.

Table C1 2011 Census Service Levels and Water Requirements (million m³/a), Per LM

Local Municipality	Households (2011)	HH Below RDP (2011)	Water Requirements (Million m ³ /a)				
			2015	2020	2025	2030	2035
Dannhauser	20 328	4 734	5.66	6.30	7.00	7.52	7.92
Emadlangeni LM	6 240	4 821	1.86	2.25	2.63	2.87	3.04
Newcastle LM	84 277	6 717	36.18	39.34	42.25	45.36	47.83
TOTAL (AMAJUBA)	110 503	16 272	43.70	47.89	51.88	55.75	58.79
Endumeni			6.94	7.51	8.11	8.74	9.23
Dr Pixley Ka Isaka Seme			1.25	1,13	1.47	1.51	1.56
TOTAL (Other DM's)			8.19	8.64	9.58	10.25	10.79

The Dannhauser and Emadlangeni LM's are predominantly rural in nature therefore their water requirements are also much less than those of the Newcastle LM. In addition, Newcastle LM accounts for over 76% of the households in the ADM. Some of the ADM and NLM areas are incorporated in WSS's with neighbouring municipalities of Endumeni LM (in uMzinyathi DM) and Dr Pixley Ka Isaka Seme LM in the Gert Sibande DM.

It is estimated that between 2015 and 2035, there will be a 35% increase in water requirements for the ADM.

Table C1 2011 Census Service Levels and Water Requirements (MI/d), Per LM

Local Municipality	Households (2011)	HH Below RDP (2011)	Water Requirements (MI/d)				
			2015	2020	2025	2030	2035
Dannhauser LM	20 328	4 734	15.5	17.2	19.1	20.5	21.6
Emadlangeni LM	6 240	4 821	5.1	6.1	7.2	7.8	8.3
Newcastle LM	84 277	6 717	98.8	107.5	115.4	123.9	130.7
TOTAL	110 503	16 272	119.4	130.8	141.7	152.2	160.6
Endumeni			19.0	20.5	22.1	23.9	25.2
Dr Pixley Ka Isaka Seme			3.4	3.1	4.0	4.1	4.3
TOTAL (Other DM's)			22.4	23.6	26.1	28.0	29.5

The largest growth in water volume between 2015 and 2035 is expected in the Newcastle LM followed by Dannhauser LM (by 31.9Mld and 6.1Mld respectively) whereas the largest growth in percentage water required is in still the Newcastle LM (32.3%).

The largest growth expected in the Newcastle LM is due to the developments (residential, industrial, business and commercial) already in the area, urbanisation and the increased service levels for consumers.

D. WATER CONSERVATION AND WATER DEMAND MANAGEMENT

The ADM and NLM were part of a water meter audit study completed in 2015 to establish the then state of affairs in terms of bulk water abstracted and supplied. There were few bulk water supply areas with adequate metering and recommendations were made for improving water metering in the ADM and NLM. This in turn would assist in developing an accurate water balance and therefore the development of suitable Water Conservation and Water Demand Management (WC/WDM) programmes.

Currently there are WC/WDM programmes being implemented in both the ADM and NLM including establishment and equipping of supply areas with equipment such as meters and pressure regulating devices. These programmes have not yielded conclusive trends.

Illegal water connections need to be formalised and metered – all consumers need to be metered where water is supplied in the form of yard and house connections. Night flows need to be monitored and areas experiencing high pressure need to be addressed.

Furthermore, the consumer base needs to be improved in terms of revenue recovery for water supply services. This in turn would increase the funding that can be applied to eradicate the backlog in water supply; upgrade and extend existing water supply services and maintain infrastructure components.

E. WATER RESOURCES

The ADM falls within the Pongola Mtamvuna Water Management Area (WMA), which drains towards the east coast of South Africa. The WMA border is formed just north of the ADM with the province of Mpumalanga and west of the ADM with the province of the Free State.

The most prominent surface water resources in the ADM are the Buffalo River, Ngagane River, Zaaihoek Dam and Ntshingwayo Dam. The Zaaihoek Dam is a DWS dam built in 1988 to supply the Majuba power station near Volksrust. Currently there are no domestic abstractions from this dam.

Other smaller sources exist and these are detailed with information on Full Supply Capacity (FSC) and Historic Firm Yield (HFY), provided in **Table E**.

Table E: Water Resources: FSC, HFY

Water Resource	FSC (Mm ³)	HFY (Mm ³ /a)
Mahawane Dam	2.1	Not known
Schuilhoek Dam	Not known	Not known
Balfour Dam	Not known	Not known
Buffalo River		Not available
Ngagane River		Not available
Ntshingwayo Dam	194	43 ⁺
Mfushane Dams	Not available	Not available
Dorps Dam	Not available	Not available
Nywerheids Dam	Not available	Not available
Tom Worthington Dam	2.0	1.9
Verdruk Dam	0.27	
Donald McHardy Dam	2.68	1.1
Preston Pan	0.27	
Upper & Lower Mpate Dams	0.40	0.4
Buffalo River at Tayside Weir		Not available
Ncandu Dam (Proposed)	19.15	16.87
Zaaihoek Dam	184.87	47

F. EXISTING WATER SUPPLY SCHEMES AND WATER REQUIREMENTS

Most areas in the ADM (estimated 90%) enjoy service coverage in some form of water supply – be it basic services or progressively higher levels of service up to full waterborne sanitation. The existing schemes, their current water supply and estimated water requirements, are provided in **Table F**.

From the summary table, it is clear that there are some areas that should not experience a deficit in water supplied, but there are other areas which likely experience water supply deficit or interrupted supply due to infrastructure constraints.

Table F 2011 Existing Water Supply Schemes, Water Supplied and Water Requirements¹

Water Services Area	Water Supply Scheme Area	WTW	Average Daily Consumption (MI/day)	2015 Water Requirements as per Model (MI/day)
Dannhauser	Alcockspruit & Steildrift (AMA 005 & 014)	Ngagane	8.9	10.8
	Hattingspruit (AMA 010)	Biggarsberg	0.3	0.3
	Dannhauser/Durnacol Areas (AMA 004 & AMA 008) Raw Water	Ntshingwayo Dam	3.7	3.0
Emadlangeni	Utrecht (AMA 016)	Ngagane	2.0	1.9
Newcastle LM	Newcastle area (AMA 012)	Ngagane	90.7	97.0
uMzinyathi DM	Biggarsberg to Dundee/Glencoe	Biggarsberg	12.6	19.0
TOTAL			118.2	132.0

G. PLANNED AND IMPLEMENTATION PROJECTS

The ADM and NLM have several projects for addressing water supply within its area of jurisdiction. Most are funded from the Municipal Infrastructure Grant (MIG). There is NO Regional Bulk Infrastructure Grant (RBIG) project.

The following strategic plans relating to water services exist in both ADM and NLM:

- Amajuba District Master Plan, dated 04 May 2011, by SSI (a DHV Company),
- First Order Water Services Master Plan for the Rural Areas of Emadlangeni Local Municipality, 2014, by UWP Consulting,
- uThukela Water Infrastructure Master Plan, June 2012, by Jeffares and Green

The following MIG projects (for water supply) are currently registered under the MIG programme and are at various stages of planning/implementation – refer to **Table G** overleaf.

¹ Information was not available for all scheme areas on the quantity of water supplied. Furthermore, N/A denotes this.

Table G MIG Water Supply Projects

Provincial Reference Number	National Project Number	Project Name	Reg Year	Project Status	Total Project Cost	MIG Funds
2007MIGFK252149556	MIG/KZN1206/W/08/10	Viljoenpark Bulk Services	2007	Construction	R 81 340 000	R 81 340 000
2011MIGFK252199363	MIG/KZN2154/W/10/13	Water Conservation and Demand Management Programme (NLM)	2011	Construction	R 24 618 550	R 56 013 761
2014MIGFK252222718	MIG/KZN3284	Emergency Upgrade (Ngagane WTW)	2014	Construction	R 72 846 000	R 126 101 362
2014MIGFK252226030	MIG/KZN3312	Blaauwbosch Bulk Water Project	2014	Construction	R 69 448 946	R 24 362 664
2005MIGFDC250006	MIG/KZN0209/W/05/07	Utrecht Dam	2005	Registered	R1 368 000	R 498 038
2006MIGFDC25113626	MIG/KZN0700/W/06/09	Buffalo Flats Water Supply Scheme Phase 1	2006	Construction	R 24 774 480	R 9 357 063
2007MIGFDC25153355	MIG/KZN1165/W/07/10	Buffalo Flats Water Supply Scheme Phase 2	2007	Construction	R 34 800 553	R 212 031 939
2008MIGFDC25157145	MIG/KZN1267/W/08/14	Buffalo Flats Water Supply Scheme Phase 3 (AFA)	2008	Construction	R 142 187 352	R 15 700 000
2010MIGFDC25195705	MIG/KZN2076/W/08/12	Emadlangeni Rural Water Supply Scheme Phase 1	2010	Des & Tender	R 13 380 000	R 239 235 495
2015MIGFDC25228245	MIG/KZN3617	Emadlangeni Rural Water Supply Scheme Phase 1	2015	Des & Tender	R 1 059 750	R 40 699 215
2015MIGFDC25232312	MIG/KZN3618	Buffalo Flats Water Supply Scheme Phase 3B	2015	Registered	R 68 777 282	R 3 782 830

Other projects not listed include the following:

- Ngagane BP Revision 4 – Emergency Upgrade of the Ngagane WPP.

H. BULK WATER SUPPLY INTERVENTIONS CONSIDERED

This study aims to ensure that the ADM 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 was to determine where these consumers are, their water requirements and what options can be considered to ensure universal access to water supply, up to 2035.

A number of strategies were proposed in this report, including the extension of WSS, retirement/integration of existing schemes and development of new schemes. .

The following broad interventions are proposed:

- The Ngagane WSS be redefined/extended to include the following:
 - Dannhauser LM areas served by Durnacol WTW and/or Dannhauser WTW on the premise that the two existing WTW's will be retired,
 - The Dundee/Glencoe areas in Dannhauser LM and Endumeni LM, on the premise that the Biggarsberg WTW will be retired,

- The construction of a WTW in Charlestown, as proposed by the NLM, with its raw water source as a river abstraction point downstream of the Zaaihoek Dam, be used as a supply to NLM areas currently supplied from the Greater Volksrust WSS.
- All other areas will be supplied from rudimentary stand-alone schemes as it is considered uneconomical to supply these via a reticulated conventional WSS.

The resulting schemes were the Ngagane WSS (revised) and the Greater Volksrust WSS (revised for source of supply to be on the Slang River). The Ngagane WSS will still be supplied by the current sources, i.e.:

- Ntshingwayo Dam with a registered use of 90.4 MI/day. An application has been made to DWS to increase this use to 145 MI/day,
- Buffalo River with registered use of 30MI/day. The existing infrastructure can only convey up to 25MI/day from the river to the Water treatment works,
- Ngagane River with a registered use of 30MI/day.

When the Newcastle Municipality succeeds in increasing the registered use from the Ntshingwayo Dam as a raw water source to 145MI/day, the total registered use for this system will be 205MI/day.

The Greater Volksrust will obtain its water from the Buffalo River downstream of the Zaaihoek Dam. It is anticipated that the dam will sustain a yield of up to the equivalent of the 5.3MI/day required by the WSS.

I. CONCLUSIONS AND RECOMMENDATIONS

The ADM 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.

There are an estimated 12 705 households people not having access to some form of formalised water supply infrastructure, which includes relying on tankered water supplies. Most of these people reside in the rural areas of Dannhauser LM, Emadlangeni LM and Newcastle LM.

It is estimated that the costs of provision of bulk water infrastructure for alleviating the backlogs, allowing for service level improvements is R2 362.34M broken down per LM as follows:

Local Municipality	Total (Rand, Millions)
Dannhauser	974.49
Emadlangeni	27.70
Newcastle	1 360.15
Total (Amajuba DM)	2 362.34

The main raw water source is the Ntshingwayo/Ngagane System, hence work should be phased such that the throughput of the system matches the growing demands. Based on the water requirement projections in this study, the following order of work is proposed.

- Finalising the water use license to extract 145MI/d from the Ntshingwayo Dam
- Construction of the raw water pipeline from Ntshingwayo Dam to Ngagane WTW
- Replacement of the raw water pipeline abstracting water from the Buffalo River, subject to a condition assessment
- Upgrade of the Ngagane WTW by another 60MI/day
- Construction of reservoir facilities

The proposed abstraction and WTW for Charlestown should be constructed, in collaboration with Dr Pixley ka Isaka Seme LM, provided the NLM fails to reach an agreement on joint planning with Dr Pixley ka Isaka Seme LM.

In the meantime, the WSA's should continue with the implementation of Water Conservation and Demand Management strategies.

The proposals in this report are subject to further feasibility studies, prior to detailed design and implementation.

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1. BACKGROUND AND INTRODUCTION

This report is the Bulk Water Master Plan report for the study: Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for the – Amajuba District Municipality, an appointment in the series of appointments made by Umgeni Water in February 2015.

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

1.1 BACKGROUND

This study follows the first study: Development of a Universal Access Plan (UAP) for Water Services in the Amajuba District Municipality (2014). The studies were conducted for each of the District Municipalities in the KwaZulu-Natal Province. The outcome of the 2014 UAP provided a fair amount of base information with regards to water supply in the Province. There was however a number of areas identified for improvement in order to proceed to a more detailed level of investigation.

Furthermore, the 2014 study only had access to municipal information, the 2001 Census and subsequent higher level demographic updates, the rudimentary All Towns Reconciliation Strategies (2008 – 2011), Department of Water and Sanitation (DWS) Reference Framework Geodatabase (2013 or earlier) and the 2011 Eskom Spot Building Count. A number of these datasets and studies have since been updated and the 2011 Census results became available on the lowest level of detail that can be used for planning purposes.

Since the release of the 2011 Census data in the latter half of 2013, Umgeni Water decided to review the Phase 1 UAP and furthermore extend the study area into the Eastern Cape Province.

This resulted in the Universal Access Plan Phase 2 study that commenced during 2015. The Project Execution Plan (PEP) is attached under Appendix A of this document.

1.2 PERTINENT LEGISLATION

Various Acts of Parliament make provision for existing or planned institutional structures for management of water resources and water and sanitation services. These are (and briefly discussed in this section):

- 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 relate to the management of water resources and the provision of water services by the following institutions:

- 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 (WSA) comprising District Municipalities or Local Municipalities;
- Water Boards;
- Water Service Providers (WSP);
- Provincial Government; and
- Advisory Committees.

1.2.1 NATIONAL WATER ACT

The National Water Act (Act 36 of 1998) aims to ensure that the country's water resources are protected, used, developed, conserved, managed and controlled such that:

- It can meet the basic human needs of current and future consumers;
- Promote the equitable access to water;
- Redress the discrimination of the past: racial and gender;
- Promote the efficient, sustainable and beneficial use of water in the public interest;
- Facilitate social and economic development;
- Provide for the growing demand for water use;
- Protect aquatic and associated ecosystems and their biological diversity;
- Reduce and prevent pollution and degradation of water resources;
- Meet international obligations;
- Promote dam safety;
- Manage floods and droughts; and
- In order to achieve the above, establish suitable institutions and to ensure that they have appropriate community, racial and gender representation.

It has its focus therefore on the use and protection of the water as natural resource.

1.2.2 WATER SERVICES ACT

The objectives of the Water Services Act (Act 108 of 1997) are to ensure the right of all consumers to have access to basic water supply and basic sanitation (thus encompassing the use of water for human needs – all types of sectors). Furthermore:

- To secure sufficient water and an environment not harmful to human health or well-being;
- Set national standards and norms and standards for tariffs in respect of water services;
- Ensure preparation and adoption of water services development plans by water services authorities;

- Create a regulatory framework for water services institutions and water services intermediaries;
- Make provision for the establishment and disestablishment of water boards and water services committees and their duties and powers;
- Monitoring of water services and intervention by the Minister or by the relevant Province;
- Provide for financial assistance to water services institutions;
- Ensure collection of information in a national information system and the distribution of that information;
- Warrant the accountability of water services providers; and
- Promote effective water resource management and conservation.

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. 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 Integrated Development Plan (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 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 and a critical development tool for the planning, provision and management of water services.

1.2.3 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 (national Minister responsible for local government).

1.2.4 MUNICIPAL SYSTEMS ACT

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

1.3 INTRODUCTION AND STUDY OBJECTIVES

Umgeni Water appointed UWP Consulting (Pty) Limited, in association with ZIYANDA Consulting cc , to review the Phase 1 UAP in the form of developing UAP – Phase 2, for the following areas:

- Amajuba District Municipality (ADM), in the KwaZulu-Natal province;
- Newcastle Local Municipality (NLM), in the KwaZulu-Natal province;
- uThukela District Municipality (uTDM), in the KwaZulu-Natal province;
- Alfred Nzo District Municipality (ANDM), in the Eastern Cape province; and
- O.R. Tambo District Municipality (ORTDM), in the Eastern Cape Province.

The above municipalities were all allocated Water Services Authority (WSA) status for their respective areas of jurisdiction, except for the whole of the ADM. The ADM's responsibilities as WSA exclude the area of Newcastle LM which itself is a WSA.

The UAP Phase 2 aims to review and update the UAP Phase 1 study reports in order to improve the following:

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

The deliverables of the UAP Phase 2 study are divided into two phases:

- Phase 1: Development of an Interim Regional Bulk Scheme Report; and
- Phase 2: Reconnaissance into the Proposed Regional Bulk Schemes per Water Services Authority.

Phase 1 includes the information review and development of a High Level Status Quo Assessment. (This document).

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

The UAP Phase 2 study information would be used to update the DWS Reference Framework (RF) geodatabase where possible.

This report is the UAP Phase 2 report.

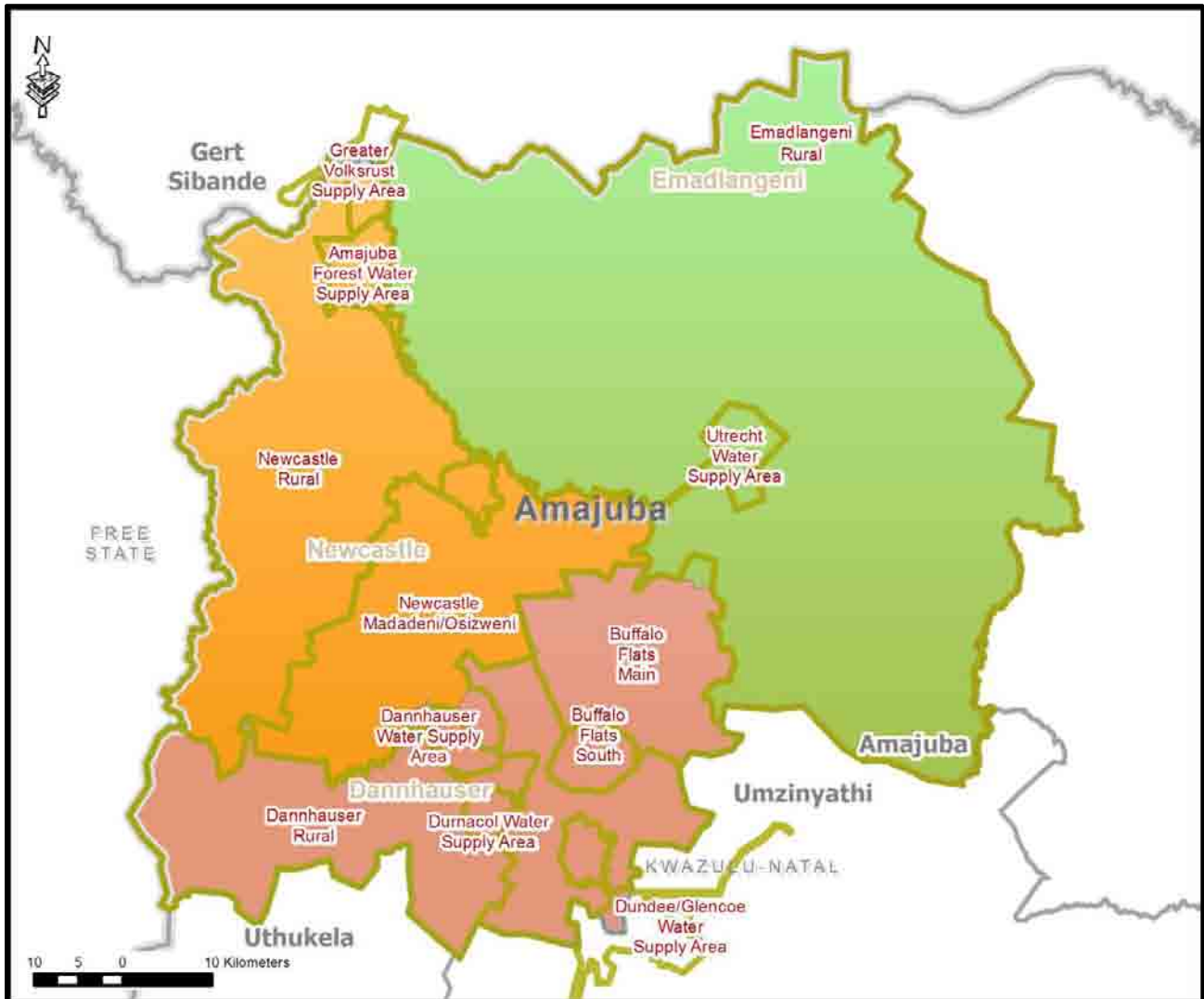
1.4 NEEDS ANALYSIS AND BULK WATER MASTER PLAN

This document is the second deliverable of the study, namely the Needs Analysis, culminating in a Bulk Master Plan. This document was prepared for the whole of the Amajuba District Municipality and therefore includes the Water Services Authorities of Amajuba DM and the Newcastle LM. The rationale for the geographic extent is that the most prominent water source – the Ntshingwayo Dam – is shared between the WSA's in the form of the following bulk water supply schemes (illustrated in **Figure 1**):

- Dannhauser WSS;
- Dundee/Glencoe WSS;
- Newcastle Madadeni / Osizweni WSS;
- Ngagane / Dannhauser / Buffalo Flats WSS; and
- Utrecht WSS.

The Utrecht WSS abstracts water from two off-channel dams from the Dorpspruit River, but has been linked to the Ngagane bulk water supply to augment water in Utrecht in times of drought. The WSS's illustrated in Figure 1 are as per DWS Framework. This map may need to be updated based on updated scheme area footprints – existing schemes.

Figure 1: Amajuba DM WSS Areas as per DWS Reference Framework



It is noted that some scheme areas are shared with neighbouring municipalities, i.e. uMzinyathi DM and Gert Sibande DM.

2. METHODOLOGY

This section describes the objectives of the study methodology followed to undertake the study: Universal Access Plan Phase 2 – Progressive Development of a Regional Concept Plan for the Amajuba District Municipality.

2.1 BACKGROUND

This study follows the first Development of a Universal Access Plan for Bulk Water Supply for Water Services Authorities in the KwaZulu-Natal (KZN) Province, completed in 2014. Umgeni Water, together with the DWS and COGTA, identified the need to further the study to improve the planning capacity of not only the benefiting Water Services Authorities (WSA's), but also for the DWS and COGTA – the supporting water services entities.

This study – Phase 2 – aimed to improve on the level of detail, taking into account current project and master planning, implementation of projects and recent updates on available water sources. Furthermore, the study again includes the whole of the KZN province, but has been extended into the Eastern Cape, including the Alfred Nzo and OR Tambo District Municipalities.

The Professional Service Provider (PSP) teams appointed for the various study areas worked closely together with Umgeni Water, DWS and COGTA to ensure an aligned study approach. This included the utilisation of the 2011 Census as base data for the calculation of water requirements between 2011 and 2035.

This study would aim to update the DWS Reference Framework geodatabase, particularly the settlement footprint, spatial distribution of levels of service and bulk water supply infrastructure. The updates are using the Phase 1 footprints as a base.

2.2 STUDY ENGAGEMENT WITH STAKEHOLDERS

This study was presented to all WSA's in the KZN Province during a WSDP workshop held by the DWS, during July 2015. The PSP's subsequently engaged each WSA individually during inception meetings to introduce the study, its objectives and detailed approach.

The first deliverable was a Status Quo report on demographics, bulk water supply, water requirements and institutional arrangements of the WSA's. The Status Quo reports were also presented to each WSA and submitted to Umgeni Water.

The Status Quo was followed by the development of a water requirements model, improvement of information available on existing and planned water supply infrastructure as well as available water sources and development of the water requirements model.

During this process, further individual engagements were held with knowledgeable individuals from each WSA, particularly water scheme managers or supervisors. It included site visits to some of the supply areas.

The result was the development of a Reconciliation Report – this report – to present the alignment of water requirements – for all areas in a WSA – with existing and planned infrastructure and available water sources in order to provide universal access to bulk water services.

The 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.

2.3 WATER REQUIREMENTS MODEL

It was agreed that all PSP teams would utilise the 2011 Census as base database for demographics and service levels to apply to the water requirements model. The water requirements were calculated for the period from 2011 to 2035, in five-year increments, starting from 2015. Umgeni Water provided the calculated demographic growth rates, per Census sub-place for the KZN province, which were incorporated into the model.

The PSP's engaged with each WSA to determine the current and planned level of service, which informed the potential development and service level growth for each settlement or town area. Furthermore, for the purpose of this study area – **Amajuba DM** – the PSP utilised an approach also used in the All Towns Reconciliation Study for the DWS Northern Planning Region. In this approach three scenarios were identified to make provision for progressively higher levels of service in areas, depending on the settlement or town type (guided by the characteristic of the settlement or town).

The water use categories applied for the various settlement or town categories are presented in **Table 2.3**. These categories were applied together with the service level scenarios and population growth rates, to determine the water requirements up to 2035.

Table 2.3 Settlement or Town Categories and Water Use

Category	Description	Household Income Per Annum	Consumption (l/c/d)
1	Very High Income; villas, large detached house, large luxury flats	>R1 228 000	410
2	Upper middle income: detached houses, large flats	153 601 – 1 228 000	295
3	Average Middle Income: 2 - 3 bedroom houses or flats with 1 or 2 WC, kitchen, and one bathroom, shower	38 401 – 153 600	228
4	Low middle Income: Small houses or flats with WC, one kitchen, one bathroom	9 601– 38 400	170
5	Low income: flatlets, bedsits with kitchen & bathroom, informal household	1 - 9600	100
6	No income & informal supplies with yard connections		100
7	Informal with no formal connection		70
8	Informal below 25 l/c/d		12

2.4 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 aimed 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 the latest existing, but also planned water supply infrastructure.

2.5 RECONCILIATION REPORT

The final deliverable of this study was a Reconciliation Report – this report – to reconcile the water requirements, with available water sources, for all areas in a WSA. This included 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 and they were 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 study or technical reports were consulted to verify information on available water sources. Information on groundwater availability and quality is however not readily available and to a sufficient level of detail.

2.6 INFORMATION SOURCES

Information used in this study was obtained from current and existing technical reports, regional studies and inputs from municipal and knowledgeable officials. It included feasibility studies (where available), master plans and studies such as the 2011 All Towns Reconciliation Strategies prepared for this area.

A number of meetings were held with the area managers and technical staff of both the ADM and the NLM, to obtain their feedback and to ensure that the latest available specifications and information is applied for the purpose of this study.

Furthermore, existing spatial and non-spatial databases were used as reference such as the 2001 and 2011 Census and the Department of Water and Sanitation (DWS) Reference Framework geodatabase.

A reference list is provided in **Annexure A**.

3. OVERVIEW OF THE 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.

3.1 GENERAL OVERVIEW

Amajuba DM is located in the north-western corner of KwaZulu-Natal and comprises three local municipalities; Newcastle, Emadlangeni and Dannhauser,

The main transportation routes linking the district to its surrounds are the N11, which provides an alternative route from Durban to Johannesburg, and the rail line, which is the main line from the Durban Harbour to Gauteng. Another road the R34 traverses the district in an east-west direction and provides a linkage from the city of Richards Bay to the interior.

The district has an area of approximately 6 910km² of which is spilt into areas of 1 855km² for Newcastle LM, 3 539km² for Emadlangeni LM and 1 516 km² for Dannhauser LM.

The notable urban settlement centres for the LM's are;

- Newcastle & Charlestown for the Newcastle LM,
- Dannhauser and Hattingspruit for Dannhauser LM,
- Utrecht for Emadlangeni LM

According to 2011 Census, the entire population of the District was 499 627 from a total of 110 503 households. According to the same statistics, 84 183 households enjoyed a water service level of service of piped water inside a yard or inside dwelling.

Since then a number of projects under implementation may have progressed and together with the growth of the DM, these statistics could be different.

3.2 INSTITUTIONAL ARRANGEMENTS FOR WATER SUPPLY

Two local authorities are designated Water Service Authorities in the District as follows:

- The Amajuba DM is the Water Services Authority (WSA) for the entire District Municipality area excluding the Newcastle LM.
- The Newcastle Municipality is the WSA for the Newcastle LM area.

The Water Services Provider functions in the entire district are provided by a number of entities, the notable ones, being:

- uThukela Water (Pty) Ltd,
- Amajuba District Municipality,
- Newcastle LM; It is noted that for the Newcastle LM area there are other institutions such as ArcelorMittal that act as WSP's for their business establishments.
- Dr Pixley ka Isaka Seme LM

The Institutional arrangements are discussed in further detail in this section based on WSS areas as depicted in **Figure 1**. It must be noted that these WSS may be redefined as part of the development of the regional concept plan for the district.

3.2.1 NEWCASTLE LOCAL MUNICIPALITY

The NLM is still in the process of establishing a staffing structure for the execution of the WSA and WSP functions. The current organogram of the Water Services function is illustrated in **Figure 2** and **Figure 3**.

Arrangements for the management of the various WSS's in the LM are further discussed.

(a) Newcastle, Madadeni and Osizweni WSS

The NLM is responsible for and manages the provision of water services for the Newcastle, Madadeni and Osizweni WSS, excluding the abstraction, all bulk raw water lines, Ngagane WTW and bulk pipelines from Ngagane WTW to some Braakfontein Reservoirs.

According to the inventory of assets, the ownership of the bulk raw water infrastructure, the Ngagane WTW, and the bulk pipelines supplying treated water from the Ngagane WTW to the Braakfontein Reservoirs are NOT vested with the NLM.

Reports by the NLM and the uThukela Water (Pty) Ltd, indicate that some staff from uThukela Water have been incorporated into the NLM to resume its functions and responsibilities as Water Services Provider for the area under NLM.

According to verbal reports (July – August 2015), the formal re-arrangement of staff, infrastructure ownership and responsibilities between the NLM, ADM and water services entity uThukela Water were resolved with respect to reticulation and sanitation. All assets for the transferred functions have been transferred to the WSA and they have included them in their asset registers.

Outstanding matters relate to the resolution of outstanding debts for raw water amounting to R80m. The WSA's are working with the entity and the shareholders have not yet resolved on the dissolution or continuation of the bulk entity in its current state. The WSA's have operated with the entity for the last two years and technical and financial constraints are being attended to within the limited funding available to

the entity. Technical support to ensure business continuity during this transitional period has been mitigated through services of Technical support consultants (Pawacons Pty Ltd with respect to NLM).

(b) Volksrust WSS

This scheme is operated and managed by the Dr Pixley ka Isaka Seme LM (WSA in the Mpumalanga Province), which is the neighbouring local municipality north of the Newcastle LM. No service level agreement exists between the NLM or uThukela Water with Dr Pixley ka Isaka Seme LM, for the bulk water supply, however Dr Pixley ka Isaka Seme LM billed uThukela Water for the bulk and retail services rendered. It is reported that recently, the bills have been reversed and forwarded to the NLM who are now responsible for payment.

Thus for this scheme the NLM is the WSA and Pixley Ka Isaka Seme LM is the WSP.

Attempts to finalise the WSA/WSP agreement or the bulk water services provider contract between the NLM and Dr Pixley ka Isaka Seme LM has now progressed considerably. A draft contract has been provided but has not yet been signed following finalisation of the bulk tariff model. It is targeted that the agreement will be signed by end of June 2016.

(c) Amajuba Forest WSS

The NLM is the official WSA for this area.

Based on interviews with both the NLM and the uThukela Water (Pty) Ltd, no one has any knowledge of the WSS. However, from the list of inventory of the NLM, there are water assets belonging to the NLM. These assets comprise a number of boreholes in the area and associated portable tanks. The 2011 Census Statistics indicate that the total number of households is less than 250.

From interviews with the NLM there is no knowledge of WSP functions being undertaken in the area. It is therefore assumed that WSP functions are undertaken by private households / institutions.

(d) ArcelorMittal Plant WSS

The area occupied by the ArcelorMittal Plant is served by a local, private WTW. This is owned, operated and maintained by ArcelorMittal. Details of the WTW have not been established.

Figure 2: Newcastle Municipality: Top Management/Executive Structure

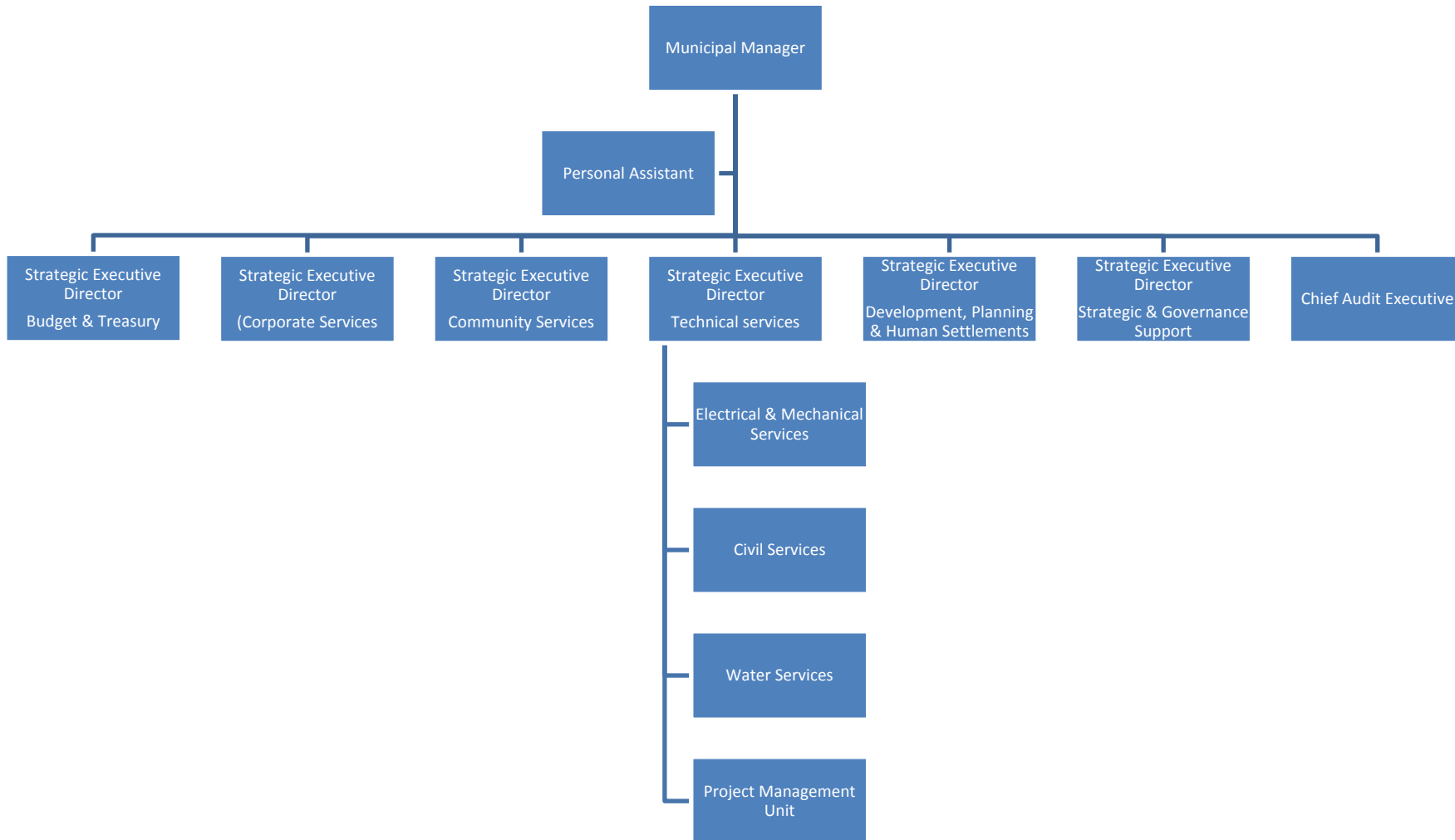
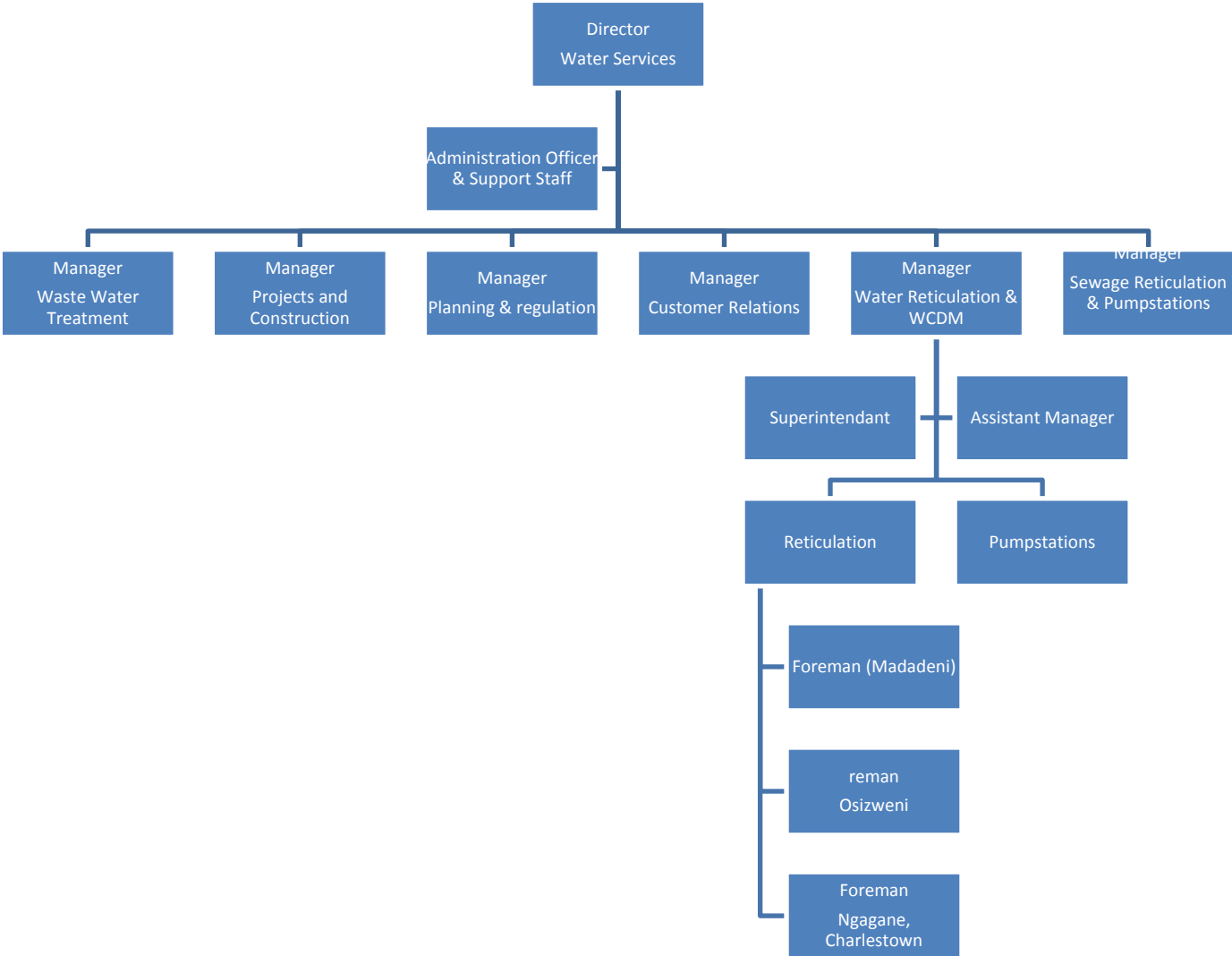


Figure 3: Newcastle LM – Water Services Organogram of O & M Staff



3.2.2 DANNHAUSER AND EMADLANGENI LOCAL MUNICIPALITIES

For Dannhauser and Emadlangeni LM's the Amajuba DM is the WSA, The organogram of the Amajuba DM is illustrated in **Figure 4** and **Figure 5**.

Varied arrangements exist with uThukela Water (Pty) Ltd for the WSP functions discussed in this section.

(a) Dannhauser – Buffalo Flats WSS

The infrastructure to this scheme comprises:

- Treated water bulk pipeline emanating from the Braakfontein Reservoirs in Newcastle to Dannhauser. This bulk infrastructure is owned, operated and maintained by uThukela Water (Pty) Ltd,
- Distribution infrastructure from the bulk pipelines to the Buffalo Flats area,
- Boreholes where conventional infrastructure has not been provided.

The ADM is the retail Water Services Provider (WSP) for this area and manages the distribution water supply infrastructure, which includes the boreholes. Bulk water infrastructure is managed by uThukela Water (Pty) Lt.

UThukela Water is still WSP for the Ngagane WTW and bulk infrastructure downstream of the WTW up to supply into the bulk reservoirs. The ADM is responsible for infrastructure from the bulk reservoirs to reticulation.

(b) Dannhauser WSS

The infrastructure serving this scheme comprises a raw water pipeline from Ntshingwayo Dam to Durnacol WTW and Dannhauser WTW. The raw water infrastructure from Ntshingwayo Dam to Durnacol is owned and operated by uThukela Water (Pty) Ltd.

The ADM is the Water Services Provider (WSP) for this area and manages the bulk and retail water supply infrastructure including the Dannhauser WTW and Durnacol WTW.

(c) Utrecht WSS

The Utrecht WSS falls within the ADM that is both the WSA and WSP for this area. The ADM manages the bulk and retail water services.

A relief pipeline (110mm diameter) has been constructed to augment supplies with additional water from the Newcastle, Madadeni and Osizweni WSS which is supplied from the Ngagane WTW.

(d) Dundee and Glencoe WSS

This WSS falls within two WSA's; Amajuba DM and uMzinyathi DM. uThukela Water is still WSP for the Biggarsberg WTW and bulk infrastructure downstream of the WTW up to supply into the bulk reservoirs. The ADM and uMzinyathi DM are responsible for infrastructure from the bulk reservoirs to reticulation in their respective areas of jurisdiction.

The retail or reticulation infrastructure is managed by the ADM for the areas falling within its area of jurisdiction namely for Hattingspruit, Springlake Colliery Mine and Bright Home.

Similarly, the uMzinyathi DM is responsible for retail or reticulation in its area of jurisdiction, namely for Dundee, Glencoe and surroundings supplied from this WSS.

Figure 4: Top Management/Executive Structure – Amajuba DM
Source IDP

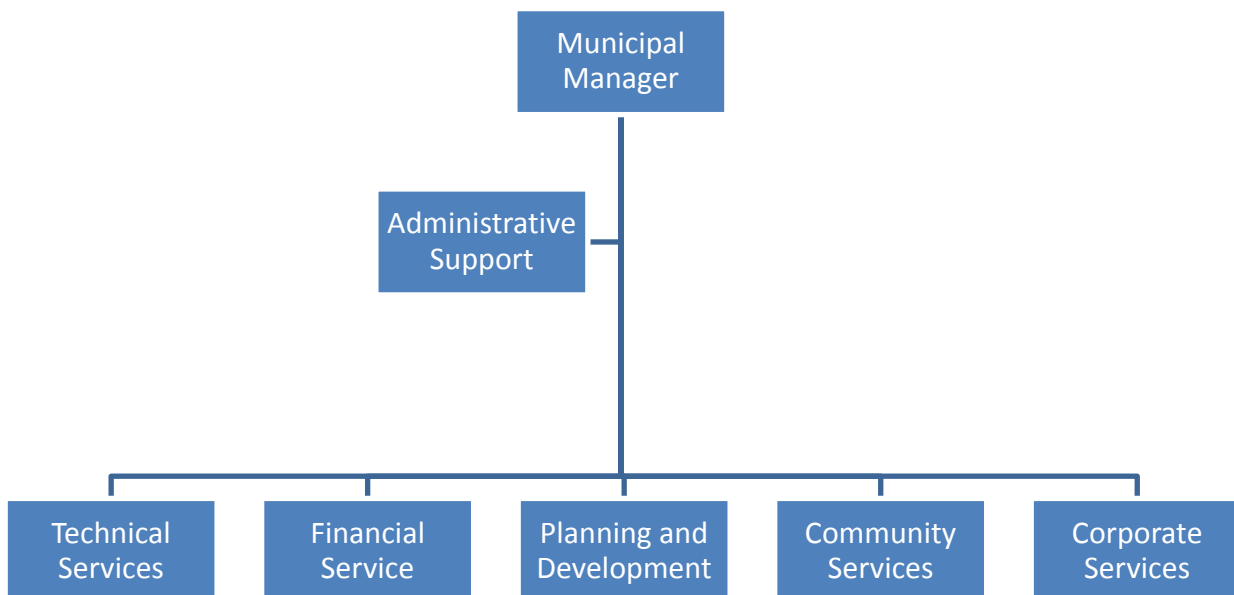
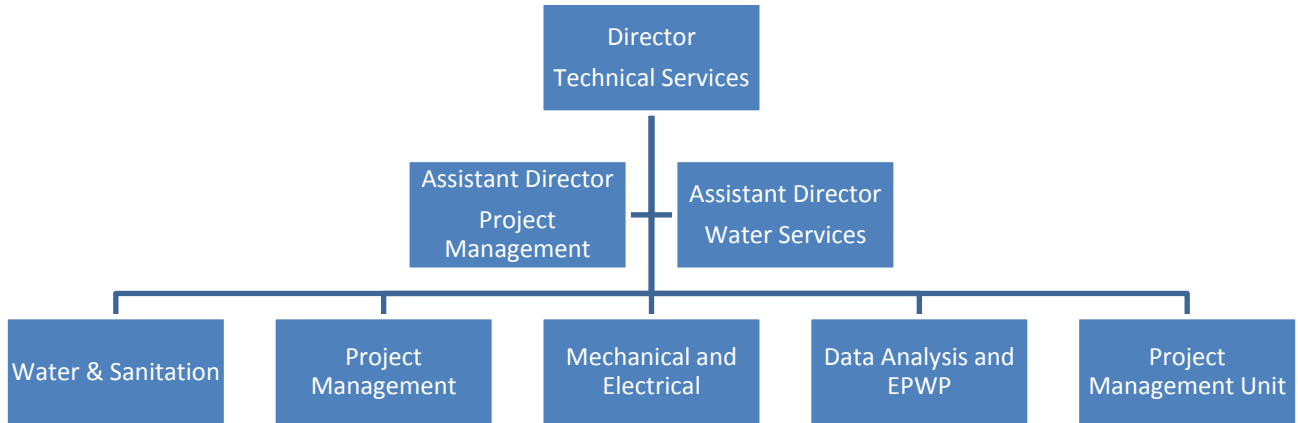


Figure 5: Organisation Structure, Technical Services Amajuba DM
Source: IDP



4. DEMOGRAPHICS

The Amajuba District Municipality has the lowest number of households within the KZN Province compared to the other DM's, and is the fourth smallest in geographic area (6 910km²).

For the purpose of this study, the 2011 Census was used as base as it is available for the whole of South Africa and is also used by the municipalities for their planning and reporting purposes.

4.1 2011 DEMOGRAPHICS

The demographics from the 2011 Census (sub-place level, summarised per LM) are presented in **Table 4.1**.

Table 4.1 Census 2011 Demographics Summary

Local Municipality	Population	Households
Dannhauser	102 127	20 328
Emadlangeni	34 450	6 240
Newcastle	363 237	84 277
TOTAL	499 627	110 503

The average number of people per household for the entire district is 4.3.

Most of the households are located in the Newcastle LM (76%) and more specifically, in the urban areas of Newcastle, Osizweni and Madadeni

The Emadlangeni and Dannhauser LM's are characterised by rural settlements (Emadlangeni is 67% rural and Dannhauser is 87% rural), either densely located or dispersed, depending on the topography of the area. The level of urbanisation (geographic settlement type: urban / traditional areas / farms) in the Emadlangeni LM is 33%, 0% and 67% respectively. The level of urbanisation (geographic settlement type: urban / traditional areas / farms) in the Dannhauser LM is 13%, 79% and 8% respectively. This already provides an indication of service level infrastructure options that can be provided (capital investment) and affordability to operate and maintain infrastructure (revenue management).

4.2 2015 – 2035 DEMOGRAPHICS AND POPULATION GROWTH

The population figures from the 2011 Census were applied as base data for the projection of the population up to 2035. Umgeni Water provided their calculated population growth projections on a sub-place level, taking into account factors such as:

- Migration;
- Updated population growth from Statistics SA; and
- Comparison with the 2011 and later Eskom Spot Building Count.

This information was applied to the water requirements model, which uses the demographics, service levels and income categories for the projected water requirements.

The projected demographics from 2011 to 2035 (summarised per LM) are presented in **Table 4.2A** and **Table 4.2B** respectively.

Table 4.2A Demographic Projections – Population

Local Municipality	2015	2020	2025	2030	2035
Dannhauser	107 338	114 935	121 297	128 393	133 333
Emadlangeni	34 386	36 830	39 019	41 437	43 106
Newcastle	380 230	407 735	431 920	459 429	479 220
TOTAL	521 854	559 500	592 235	629 259	655 659

Most people reside in the Newcastle LM which during the 2011 Census, accounting for an estimated 73% of the population living in the district.

Table 4.2B Demographic Projections – Households

Local Municipality	2015	2020	2025	2030	2035
Dannhauser	21 410	22 928	24 202	25 622	26 613
Emadlangeni	6 286	6 752	7 154	7 602	7 912
Newcastle	88 038	94 455	100 114	106 571	111 243
TOTAL	115 734	124 135	131 470	139 795	145 768

4.3 MAIN DEVELOPMENT NODES

This section highlights key elements from the Amajuba District Municipality's Spatial Development Framework SDF 2013/2014. An extract from the SDF highlights summarises the District Spatial Planning as follows:

“The current Amajuba SDF (developed during the early 2000s) provides an overview of the districts spatial development trends and patterns, and outlines strategies for spatial transformation at a district level. It adopts a service centre (service node hierarchy) approach and accordingly identifies primary, secondary and tertiary nodes. The district is predominantly rural and dominated by extensive commercial farmlands. Newcastle is the main urban centre and economic hub. Towns such as Dannhauser and Utrecht serve as secondary service centres with limited thresholds. The

N11, which runs in a north-south direction linking the KwaZulu-Natal with Mpumalanga province, serves as the primary corridor and main access route to the district while P37, P483 and P211 are identified as secondary corridors. In addition, they identify the following key areas for intervention:

- Improved access and service delivery to urban and rural areas;
- Facilitating efficient agricultural development;
- Developing the tourism potential and managing the environmental resources; and
- Developing a Hierarchy of Service Nodes.”

The economy of the Amajuba is largely dominated by the manufacturing sector, which accounts for 35% of total Gross Value Added. Other sectors of importance at a district level include the community service sector (22.2% of total Gross Value Added), financial and business services (15.2%) as well as the trade sector (8.6%).

The district has the fourth highest Gross Value Added (GVA) capital in the province. The Gross Value Added has been compared to that of the provincial economy, in order to identify the sectorial advantages of a given district, it is noted that:

- Manufacturing and Mining have a greater level of importance for the district than they do for the province
- Agriculture; Finance, Construction and Transport are relatively less important as compared to the province.

The other key sectors in terms of GVA contribution are the general government sector, wholesale and retail, finance and business services sector. GVA generated through general government services contributes 17.6% to total GVA. This sector has experienced average annual real growth of 2.6% per annum. Just over 17% of GVA can be attributed to finance (6.9%) and business services (10.2%). These have also been the fastest growing subsectors, with finance and insurance services growing at an average rate of almost 9% per annum since 2000, and business services growing at 6.2% over the same period. Wholesale and retail trade accounts for almost 14% of total GVA. Wholesale and retail trade have been growing at a modest rate of 2.63% per annum from 2000 – 2010.

The dominant economic activities are agglomerated within Newcastle Municipal Area of jurisdiction. Newcastle accounts for more than 88% of the total Gross Value Added (GVA),

4.3.1 KEY DEVELOPMENT ISSUES

The ADM's SDF lists the following as the key economic development issues:

- The primary node of development is identified as Newcastle which is to be strengthened by;
 - Provision of advanced transportation infrastructure,
 - Enhancing the growth of the Central Business District (CBD) through proper urban management,,

- Provision of bulk infrastructure for services such as water, sanitation and electricity
- The development of secondary nodes as follows:
 - Upgrading of town infrastructure for Dannhauser and Utrecht,
 - Urban renewal and regeneration of Dannhauser and Utrecht,
 - Establishing of small scale mining of coal in Dannhauser,
 - Establishment of agro-processing industry in Utrecht
- For rural service nodes, the SDF indicates the need to create/establish rural service clusters in the towns of Groenvlei, Swartkop, Kingsley and Normandien,
- The creation of rural and urban settlements coupled with provision of services and economic development.

All the above strategic projects will have an influence on the water sources available and their development and use in the region. Consideration would need to be given to adjacent catchment areas and the sharing of water for national strategic importance such as the transfer schemes for Eskom and water to the Vaal catchment (and Gauteng).

4.3.2 KEY STRATEGIC INFRASTRUCTURE PROJECTS

There are a number of key strategic infrastructure projects that will play a role in the development of the District in terms of economy, employment opportunities, infrastructure improvement, investment, environmental protection and social development. These are included in the Amajuba DM's IDP (2015/16) and the Newcastle LM's IDP 2012 to 2017 and are discussed further:

(a) Amajuba DM's IDP (2015/16)

The Amajuba DM's IDP (2015/16) lists a number of projects (in concept developments stages and under implementation). These projects include the following that may impact on the outputs of this project:

- Buffalo Flats Water Supply Scheme (Phase 2 & 3) at “construction stage”,
- Emadlangeni Rural Water Supply Scheme (Development of Water Source),
- Refurbishment of Wastewater Treatment Works in Amajuba
- Buffalo Flats Sanitation Project
- Emadlangeni Sanitation Project ,
- Buffalo Flats WCDM,
- Refurbishment of Dannhauser WTW,
- Proposed Housing Projects as follows:
 - Dannhauser;
 - NDH CBD Housing,
 - Ramaphosa Housing
 - Strybank Housing
 - Springboklaagte Housing
 - Emafusini

- Ward 2-11 Housing
- Emadlangeni;
 - Khayethu Housing,
 - Kingsley Housing
 - Hoephoep Housing
 - Ward 1. 1 - 4 Housing.

(b) Newcastle LM's IDP (2012-2017)

In its capital investment plan the Newcastle LM lists a number of infrastructure projects, a number of which are water and sanitation related. The projects that could have an impact on the outputs of this project are as follows:

- Madadeni WWTW (Upgrade)
- Bulk Services (Siyahlala)
- Ngagane WTP (Refurbishment, Raw Water Pipeline and Upgrade)
- AC Pipe Replacement (Phase 1)
- Provision of Basic Sanitation Services: Charlestown
- Provision of Basic Sanitation Services: Ingogo
- Provision of Basic Sanitation Services: Ingogo
- Viljoen Bulk – Ncandu Pump station
- JBC Sanitation to Various Wards
- Pumping Mains from Hilldrop reservoir & Gravity Main to Siyahla
- Blaauwbosch Bulk water Project
- H39 Housing Project Bulk Infrastructure
- Stafford Hill Waterborne Sewerage Scheme
- WCDM Osizweni
- WCDM – Newcastle West Bulk Meters
- Various projects administered by the “Settlements Directorate” of the Newcastle LM

Although not mentioned in list of projects, the IDP also identifies a potential water source to augment supplies to Newcastle LM as Ncandu Dam (proposed). It is noted that an unsolicited proposal for development of the Ncandu Dam exists. This proposal has not been widely accepted pending evaluation of other alternative raw water source options and the full exploitation of opportunities arising from water conservation and demand management.

5. WATER SERVICE LEVELS AND REQUIREMENTS

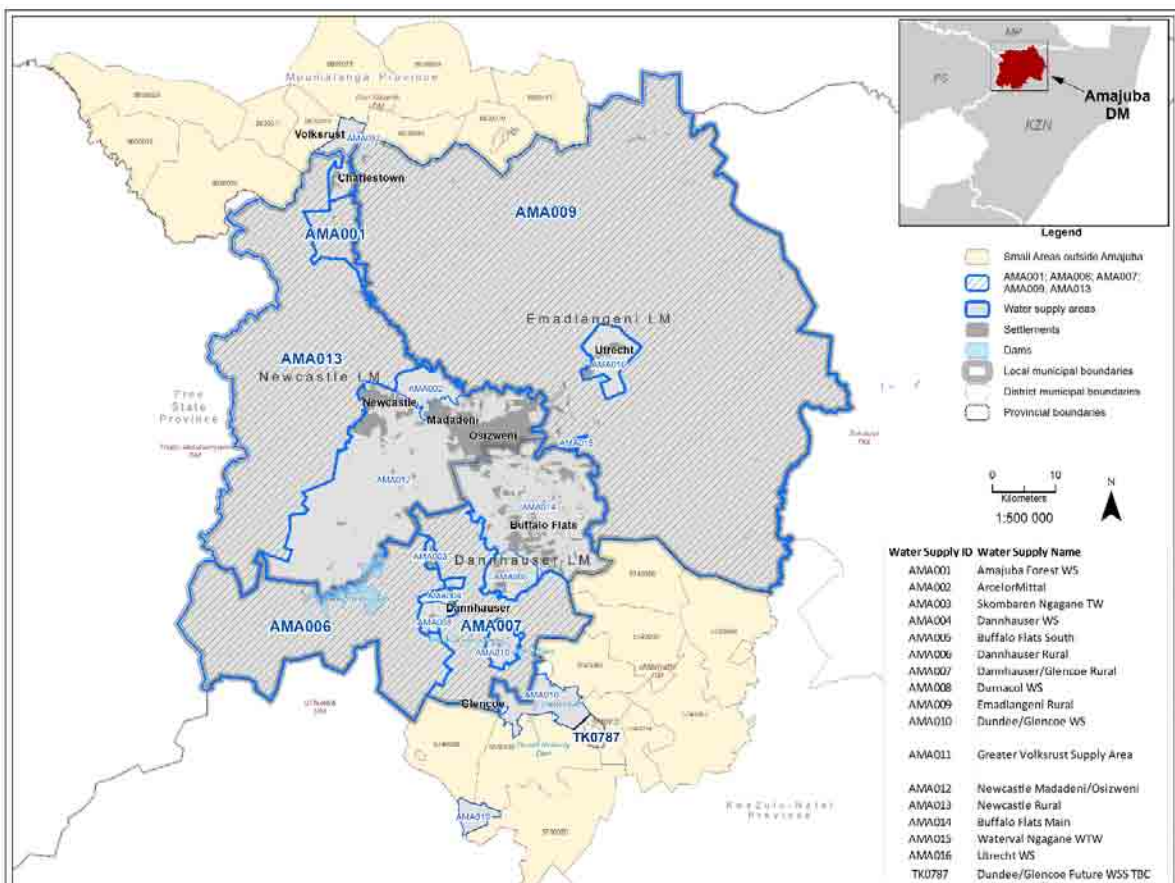
This section provides an overview of the water service levels (ADM level) and water requirements as calculated using the demand model developed for the purpose of this study. A summary of the water requirements is provided firstly for the District and then for each of the Local Municipalities and finally for a Water Supply Scheme (WSS). It is noted that for the purposes of ADM, two Water Services Authorities, exist, i.e. ADM and Newcastle Local Municipality (NLM). From a district perspective it is expected that the two WSA's would be in alignment, however this may not be the case.

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).

Note that Water Supply Scheme (WSS) boundaries do not necessarily coincide with municipal boundaries. There are supply areas that traverse more than one Local Municipality. The water requirements reported on are per LM and if a WSS is split by a LM, the water requirements are reported based on this split.

The District has been demarcated into Water Supply Schemes as illustrated in **Figure 6** below.

Figure 6: Proposed WSS for Water Requirements Analysis



Some areas outside of the Amajuba DM share water resources with both the ADM and the NLM. The affected WSS areas are AMA 010, which shares resources with areas of uMzinyathi DM, and AMA 011, which shares resources with areas in the Dr Pixley ka Isaka Seme LM in Gert Sibande DM. These areas will have to be considered when water requirements for the schemes are evaluated.

5.1 PROVISIONS IN THE IDP'S

The IDP's of both WSA's have been consulted to extract highlights of priorities to deal with service gaps:

5.1.1 AMAJUBA DM IDP (2015/16)

The IDP of the ADM indicated the following for the Emadlangeni and Dannhauser LM's under its jurisdiction:

- 18% of the total households in the area of jurisdiction of the WSA receive a level of service below RDP standard. The bulk of the backlog is identified as being in the Emadlangeni LM which is largely rural;
- 74% of the total households receive water at a basic level of service; and
- 8% receive water at a high level of service.

The ADM thus highlighted as a priority, the eradication of backlogs via the construction of formal distribution (such as pipelines) infrastructure and the implementation of a "borehole development" programme.

5.1.2 NEWCASTLE Municipality IDP (2012-2017)

The NLM IDP (2012-2017) reported on water service levels from the 2011 Census. It analysed the total number of households with a "below RDP standard" level of service as 6 479. It also identified that a significant number of backlogs are in Ward 1. The IDP also identified the adequacy of raw water sources and associated infrastructure as a major constraints. These observations will be tested in this study.

The IDP thus highlighted the following interventions as required:

- The identification of another source to augment supplies from the Ntshingwayo Dam. It proposed the development of the Ncandu Dam as the only viable intervention. It is noted, however, that the need for an alternative source and the viability of Ncandu Dam as that source still requires further investigations.

- The development of additional storage facilities to improve security of supply in the Madadeni, Osizweni, Stafford Hill, Blaauwbosch and Newcastle West areas. The volume(s) of the reservoir(s) are not quantified and will be estimated in this report.
- The implementation of a programme to reduce the level of Non-Revenue Water (NRW) citing a current level of 65%. Based on the average of 100MI/day treated at the Ngagane WTW, this would be in the order of 65MI/day and represents about R24M per month, loss of revenue. This is considered excessively high.

5.2 WATER REQUIREMENTS FOR THE AMAJUBA DM PER LM

In the Amajuba DM, the two WSA's are the Newcastle LM (responsible for the Newcastle LM area of jurisdiction) and Amajuba DM (responsible for Dannhauser and Emadlangeni LM's areas of jurisdiction).

In **Table 5.2A** and **Table 5.2B** the water requirements (in million m³/a and MI/d) for the ADM are presented, per Local Municipality. 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 Methodology Section in this report explains the approach for the calculations to determine the theoretical water requirements and adjusted for water losses. Water Requirements for areas outside the Amajuba DM (where schemes are cross border) are also included for the purposes of analyses of schemes. For those areas outside, the ADM, it is noted that the water requirements are only for parts of the supply areas that are supplied from the same schemes and not the entire LM.

Table 5.2A Water Requirements (million m³/a), Per Local Municipality

Local Municipality	Households (2011)	HH Below RDP (2011)	Water Requirements (Million m ³ /a)				
			2015	2020	2025	2030	2035
Dannhauser LM	20 328	4 734	5.66	6.30	7.00	7.52	7.92
Emadlangeni LM	6 240	4 821	1.86	2.25	2.63	2.87	3.04
Newcastle LM	84 277	6 717	36.18	39.34	42.25	45.36	47.83
TOTAL (AMAJUBA)	110 503	16 272	43.70	47.89	51.88	55.75	58.79
Endumeni			6.94	7.51	8.11	8.74	9.23
Dr Pixley Ka Isaka Seme			1.25	1,13	1.47	1.51	1.56
TOTAL (Other DM's)			8.19	8.64	9.58	10.25	10.79

The Dannhauser and Emadlangeni LM's are predominantly rural in nature therefore their water requirements are also much less than those of the Newcastle LM. In addition, Newcastle LM accounts for over 76% of the households in the ADM.

It is estimated that between 2015 and 2035, there will be a 35% increase in water requirements for the ADM.

Table 5.2B Water Requirements (MI/d), Per Local Municipality

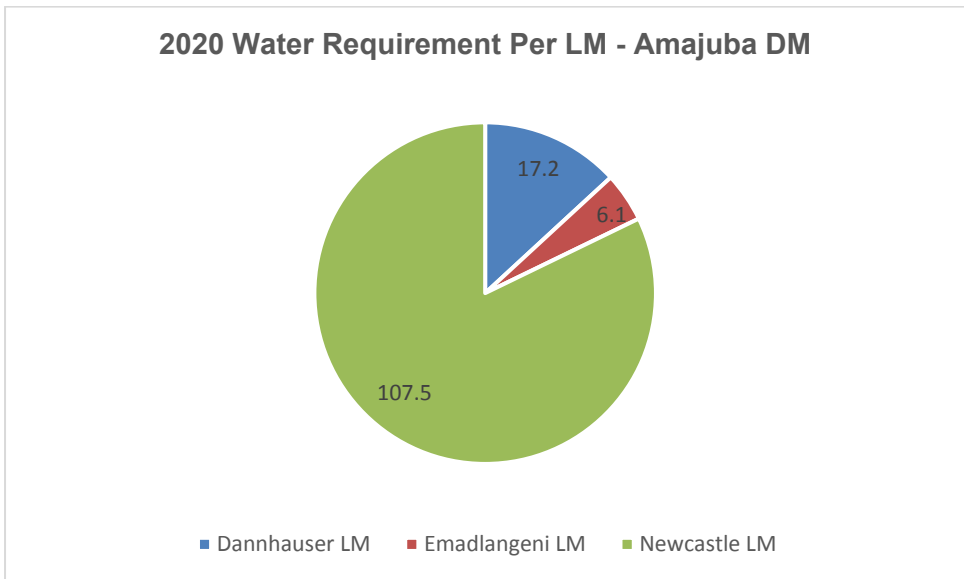
Local Municipality	Households (2011)	HH Below RDP (2011)	Water Requirements (MI/d)				
			2015	2020	2025	2030	2035
Dannhauser LM	20 328	4 734	15.5	17.2	19.1	20.5	21.6
Emadlangeni LM	6 240	4 821	5.1	6.1	7.2	7.8	8.3
Newcastle LM	84 277	6 717	98.8	107.5	115.4	123.9	130.7
TOTAL	110 503	16 272	119.4	130.8	141.7	152.2	160.6
Endumeni			19.0	20.5	22.1	23.9	25.2
Dr Pixley Ka Isaka Seme			3.4	3.1	4.0	4.1	4.3
TOTAL (Other DM's)			22.4	23.6	26.1	28.0	29.5

The largest growth in water volume between 2015 and 2035 is expected in the Newcastle LM followed by Dannhauser LM (by 31.9Mld and 6.1MI/d respectively) whereas the largest growth in percentage water required is in still the Newcastle LM (32.3%).

The largest growth expected in the Newcastle LM is due to the developments (residential, industrial, business and commercial) already in the area, urbanisation and the increased service levels for consumers.

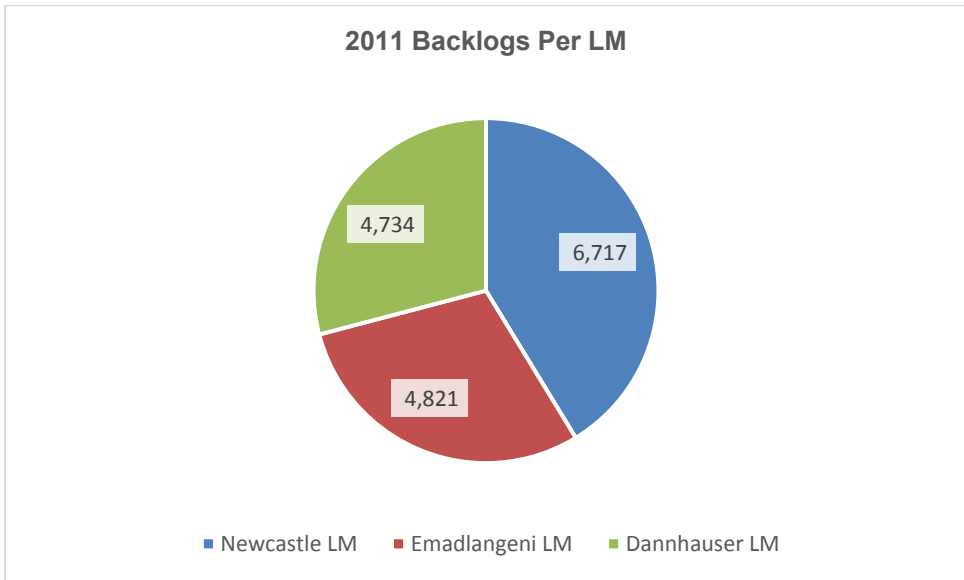
The 2020 water requirements per LM are presented in **Figure 7** in the form of a pie chart, illustrating that the Newcastle LM is the largest water consumer in the ADM, requiring 82.2% of all water.

Figure 7: ADM Water Requirements: 2020 (MI/d)



The water supply backlog of 2011 can be graphically illustrated in **Figure 8** below. There are a number of MIG projects already being implemented to eradicate the backlog and improve water supply services in the area.

Figure 8: ADM Water Supply Backlog: 2011



Backlogs are largely prevalent in the more rural areas, but in urban areas, urbanisation, establishment of informal settlements and natural growth are the main drivers in water supply and sanitation development.

5.3 DANNHAUSER LM

For the purposes of assessing water requirements, the Dannhauser LM has been divided into eight WSS areas denoted as follows:

WSS Code	Description	Source
AMA 003	Area served via a treated water pipeline from Ngagane WTW and includes Skombaren	Ngagane WTW
AMA 004	Dannhauser LM Area served by Dannhauser WTW	Dannhauser WTW via raw water pipeline from Ntshingwayo Dam
AMA 005	Dannhauser LM Area – Buffalo Flats South served by pipeline extensions from Braakfontein Reservoirs	Ngagane WTW
AMA 006	Dannhauser Rural Area south western end– no formal water schemes	No supply or Boreholes
AMA 007	Dannhauser LM /Glencoe Rural – no formal water schemes	No supply or Boreholes
AMA 008	Durnacol Area served by Durnacol WTW	Durnacol WTW via raw water pipeline from Ntshingwayo Dam
AMA 010	Dannhauser LM Area that includes Hattingspruit, Bright Home and Springlake, it being noted that Springlake is served mostly by boreholes	Biggarsberg WTW which also supplies parts of uMzinyathi DM
AMA 014	Area in Dannhauser LM served from pipeline emanating from Braakfontein Reservoirs and includes Buffalo Flats North	Ngagane WTW

Table 5.3A and Table 5.3B represent the water requirements in million m³/a and Ml/d respectively.

Table 5.3A Water Requirements (million m³/a), Per Existing and Potential WSS

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (Mm ³ /a)				
			2015	2020	2025	2030	2035
AMA 003	785	27	0.23	0.25	0.28	0.30	0.31
AMA 004	1 508	26	0.67	0.73	0.78	0.83	0.88
AMA 005	1 725	1 068	0.17	0.20	0.29	0.32	0.34
AMA 006	546	293	0.13	0.16	0.19	0.21	0.22
AMA 007	255	87	0.10	0.12	0.13	0.14	0.15
AMA 008	714	3	0.45	0.48	0.51	0.55	0.58
AMA 010**	15 186	917	0.12	0.13	0.14	0.16	0.17
AMA 014	14 755	2 461	3.77	4.21	4.68	5.01	5.27
TOTAL	35 474	4 882	5.64	6.28	7.00	7.52	7.92

** AMA 010 includes the supply areas in the uMzinyathi DM. Water requirements in the table are for the portion in Dannhauser. No. of households are for areas including those in Endumeni LM

The greatest backlogs in number of households are in AMA 014 (includes Buffalo Flats North), AMA 005 (includes Buffalo Flats South) and AMA 010 (area includes Hattingspruit, Bright Home and Springlake) totalling 4 446 households.

Theoretical water requirements (in MI/day) are as follows:

Table 5.3B Water Requirements (MI/d), Per Existing and Potential WSS

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (MI/d)				
			2015	2020	2025	2030	2035
AMA 003	785	27	0.6	0.7	0.8	0.8	0.8
AMA 004	1 508	26	1.8	2.0	2.1	2.3	2.4
AMA 005	1 725	1 068	0.5	0.5	0.8	0.9	1.0
AMA 006	546	293	0.3	0.4	0.5	0.6	0.6
AMA 007	255	87	0.3	0.3	0.3	0.4	0.4
AMA 008	714	3	1.2	1.3	1.4	1.4	1.6
AMA 010	15 186	917	0.3	0.3	0.4	0.4	0.5
AMA 014	14 755	2 461	10.3	11.5	12.8	13.7	14.4
TOTAL	35 474	4 882	15.3	17.0	19.1	20.5	21.7

In addition to the above there are additional water requirements from area in uMzinyathi DM, sharing resources with WSS AMA 010 as per following table.

Water Requirement Units	Water Requirements				
	2015	2020	2025	2030	2035
Mm ³ /a	6.94	7.51	8.11	8.74	9.22
ML/day	19.0	20.5	22.2	23.9	25.2

5.4 EMADLANGENI LM

The water requirements for the Emadlangeni LM are presented in this section, per existing Water Supply Scheme (WSS) area and potential future WSS area, therefore for all consumers in the municipality.

The Emadlangeni Municipality was split into WSS areas code-named as follows:

- AMA 016 – area in/around Utrecht served by Utrecht WTW. This area has been supplied in relief by a supply pipeline from the Ngagane WTW via Braakfontein Reservoirs,
- AMA 009 – remainder of the area in Emadlangeni LM mainly rural currently served from boreholes.

Table 5.4A and **Table 5.4B** represent the water requirements in million m³/a and MI/d respectively.

Table 5.4A Water Requirements (million m³/a), Per Existing and Potential WSS

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (Mm ³ /a)				
			2015	2020	2025	2030	2035
AMA 016	1 718	286	0.68	0.76	0.83	0.90	0.95
AMA 015			0.26	0.29	0.31	0.33	0.35
AMA 009	4 065	2 654	0.91	1.20	1.49	1.63	1.68
TOTAL	5 783	2 940	1.85	2.25	2.63	2.86	2.98

The largest backlogs in the Emadlangeni LM are in the rural areas outside of Utrecht. It is the current planning to alleviate the backlogs in these rural areas by implementing stand-alone scheme served by boreholes/springs. Projects are registered with MIG for investigation of potential sources and the development thereof.

Table 5.4B Water Requirements (MI/d), Per Existing and Potential WSS

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (MI/d)				
			2015	2020	2025	2030	2035
AMA 016	1 718	286	1.9	2.0	2.3	2.5	2.6
AMA 015			0.7	0.8	0.8	0.9	1.0
AMA 009	4 065	2 654	2.5	3.3	4.1	4.4	4.6
TOTAL	5 783	2940	5.1	6.1	7.2	7.8	8.2

5.5 NEWCASTLE LM

For the purposes of analysis of water requirements the LM was divided into five WSS areas code-named as follows:

WSS Code	Description	Source
AMA 001	Privately owned rural farming area known as Amajuba Forests	Boreholes
AMA 002	Area in Newcastle LM with privately run WTW and scheme by ArcelorMittal	Buffalo River to be confirmed
AMA 011	Area in / around Charlestown served Dr Pixley ka Isaka Seme LM as WSP	Dr Pixley ka Isaka Seme LM
AMA 012	Area served via a treated water pipeline from Ngagane Treatment Works and includes Newcastle, Madadeni, Osizweni,	Ngagane WTW
AMA 013	Newcastle Rural – no formal water schemes	No supply or Boreholes

The water requirements for the Newcastle LM are presented in this section, per existing Water Supply Scheme (WSS) area and potential future WSS area, therefore for all consumers in the municipality. **Table 5.5A** and **Table 5.5B** represent the water requirements in million m³/a and MI/d respectively.

Table 5.5A Water Requirements (million m³/a), Per Existing and Potential WSS Area

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (Mm ³ /d)				
			2015	2020	2025	2030	2035
AMA 001	240	200	0.04	0.06	0.08	0.09	0.09
AMA 011	7 406	266	0.33	0.37	0.41	0.43	0.45
AMA 012	82 515	5 283	35.50	38.54	41.32	44.36	46.78
AMA 013	1340	814	0.30	0.37	0.45	0.48	0.51
TOTAL	91 501	6 563	36.17	39.34	42.26	45.36	47.83

Table 5.5B Water Requirements (Ml/d), Per Existing and Potential WSS Area

WSS Code	Households (2011)	HH Below RDP (2011)	Water Requirements (Ml/d)				
			2015	2020	2025	2030	2035
AMA 001	240	200	0.1	0.2	0.2	0.2	0.2
AMA 011	7 406	266	0.9	1.0	1.1	1.2	1.2
AMA 012	82 515	5 283	97.0	105.3	112.9	121.2	127.8
AMA 013	1340	814	0.8	1.0	1.2	1.3	1.4
TOTAL	91 501	6 563	98.8	107.5	115.4	123.9	130.6

In addition to the above there are additional water requirements from area in the Gert Sibande DM, sharing resources with WSS AMA 011 as per following table.

Water Requirement Units	Water Requirements				
	2015	2020	2025	2030	2035
Mm ³ /a	1.25	1.13	1.47	1.51	1.56
ML/day	3.4	3.1	4.0	4.1	4.3

6. WATER CONSERVATION AND WATER DEMAND MANAGEMENT (WC/WDM)

This section describes the current programmes planned or implemented within the ADM per Local Municipality.

Water Conservation and Water Demand Management (WC/WDM) forms a critical component in the water services provision business and management of sustainable services. It is a requirement by the DWS that the WSA should illustrate its commitment to implement WC/WDM for any new projects submitted for funding applications.

Activities and programmes related to WC/WDM typically include the following:

- Water billing and auditing – recording of customers in a financial system, metering and billing (revenue management);
- Pressure management – management of pressure in water supply pipelines to reduce or eliminate pipe bursts;
- Metering – bulk and reticulation – to ensure records are kept of water abstracted, treated, stored, supplied and consumed. It includes monitoring of night flows to establish potential leaks in the water supply system;
- Use of supporting or alternative water sources such as rainwater in the form of rainwater harvesting tanks; and
- Consumer awareness and training – to save, conserve and use water responsibly. This should also include awareness in the cost of water and the municipal policy to assist indigents and provision of free basic services.

The uThukela Water (Pty) Ltd Operational Reports for the months of July 2015 to January 2016 indicate the following average monthly production figures (combined for Ngagane WTW, Biggarsberg WTW and Durnacol WTW), which are compared with outputs from the Water requirements Model.

Table 6: Production Quantities Vs Water Requirements

Water Services Area	Water Supply Scheme Area	WTW	Average Daily Consumption (MI/day)	2015 Water Requirements as per Model (MI/day)
Dannhauser	Alcockspruit & Steildrift (AMA 005 & 014)	Ngagane	8.9	10.8
	Hattingspruit (AMA 010)	Biggarsberg	0.3	0.3
	Dannhauser/Durnacol Areas (AMA 004 & AMA 008) Raw Water	Ntshingwayo Dam	3.7	3.0
Emadlangeni	Utrecht (AMA 016)	Ngagane	2.0	1.9
Newcastle LM	Newcastle area (AMA 012)	Ngagane	90.7	97.0
uMzinyathi DM	Biggarsberg to Dundee/Glencoe	Biggarsberg	12.6	19.0
TOTAL			118.2	132.0

There is overall reconciliation of quantities of water recorded as produced with those quantities derived from the water requirements model.

6.1 DANNHAUSER LM

Currently there are two WCDM projects listed in the ADM's IDP and in the Dannhauser LM. These projects are as follows:

- Buffalo Flats (& Dannhauser) WCDM Phases 2 – The project is reported as under implementation and is to address the high levels of NRW arising from leaks, high pressures, illegal connections. The project benefitted from R4M Massification Grant by CoGTA and is subject to further MIG funding of R52M.
- Emafusini WCDM – This project is reported as complete, and was for the reduction of NRW (initially reported as 75%). The outputs of the project could not be confirmed.

The 2015 water requirements were estimated as 15.5MI/d or 15 500kl/day for the Dannhauser LM. For the areas supplied by the Ngagane WTW, Biggarsberg WTW and the Durnacol WTW, the average daily production is 12.9MI/day (8.9MI/d+ 0.3MI/d + 3.7MI/d) against theoretical water requirements of 14.1MI/day (10.8MI/d + 0.3MI/d + 3.0M/d). Refer to **Table 6**.

The variance in the theoretical and measured water requirements may indicate the need for focussed WCDM initiatives for the LM.

6.2 EMADLANGENI LM

Currently there are no WC/WDM programmes in this municipality.

The significant conventional scheme in the area is the Utrecht WSS, also denoted in this report as WSS code-named AMA 016. The 2015 water requirements for Utrecht WSS was estimated as 1.9MI/d or 1 900kl/day. The measured water production quantities, as per uThukela Report for period July 2015 to January 2016, averaged 2.0MI/day for this area.

Again, the service in the LM could benefit from WCDM interventions.

6.3 NEWCASTLE LM

Newcastle LM's Non-Revenue Water is reported to be in the order of 65%, which is unacceptably high. The Newcastle LM has initiated pilot. Water Conservation and Demand Management Projects in three areas, Osizweni (MWIG), Madadeni (MIG) and Newcastle West. The projects involve:

- pressure reduction (through installation of pressure reducing devices) and zone and individual house metering (through the installation of household meters and zonal meters),
- leak repairs

- Replacement of aging asbestos/cement pipes through a pipe replacement programme

It is understood the programme will be extended to cover the entire municipal area, as funding becomes available.

The 2015 water requirements were estimated, for the WSS area covered/supplied by the Ngagane WTW code named AMA 0012, as 99.7MI/d or 99 700kl/day. Currently, the water distributed from the Ngagane WTW to the Osizweni, Madadeni and Newcastle area is estimated is on average below 90.7MI/day.

For the area served by Dr Pixley ka Isaka Seme LM (area in/around Charlestown) the theoretical water requirements for 2015 is 0.9MI/day or 900kl/day. The water consumption billed to the NLM has to be determined.

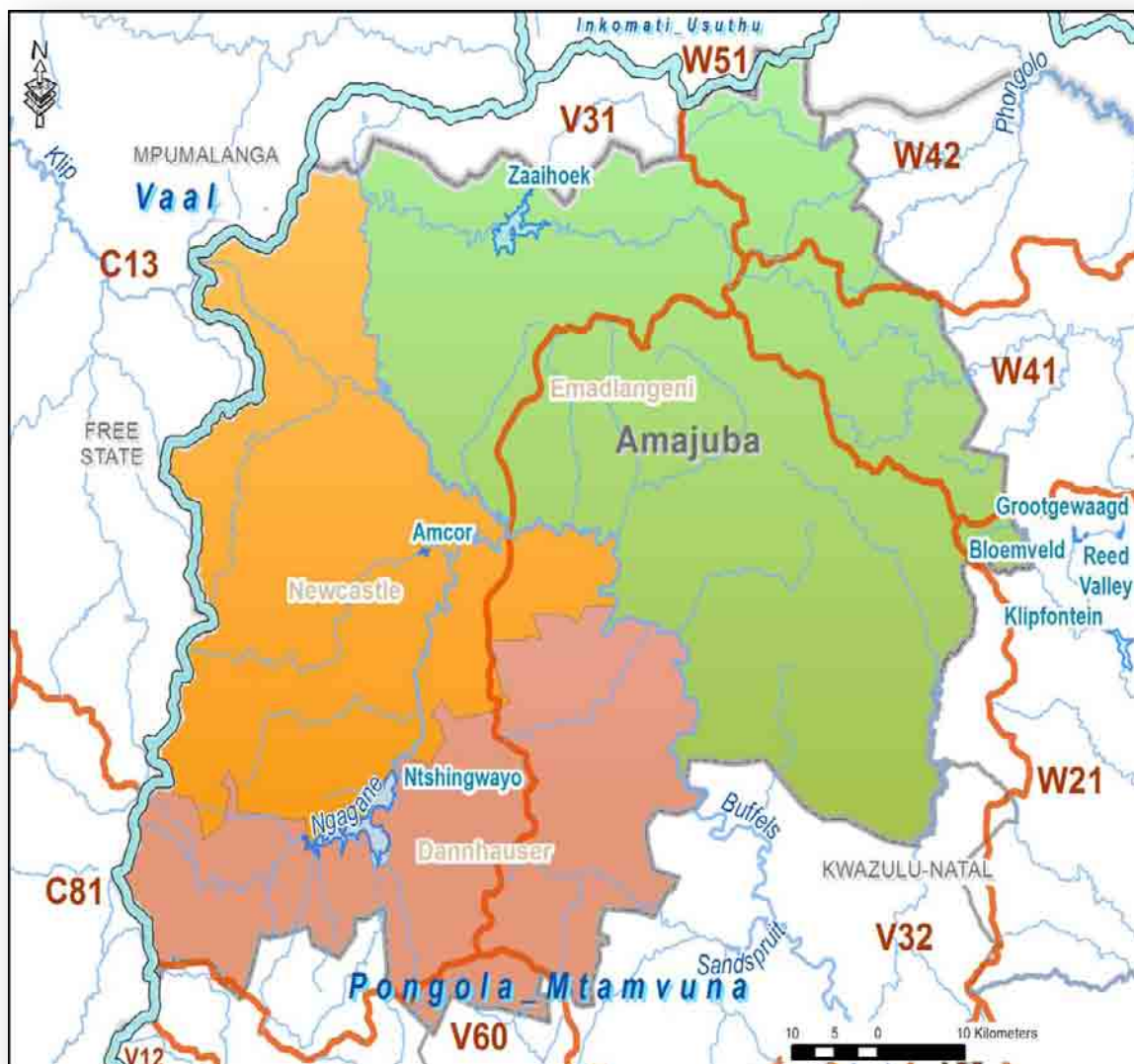
7. WATER RESOURCES

This section provides an overview of the water resources and water sources used for water supply to the domestic consumers in the ADM. Some of the water sources are also shared for the purpose of industrial and irrigation / agricultural use.

The ADM falls within the Pongola Mtamvuna Water Management Area (WMA), which drains towards the east coast of South Africa. The WMA border is formed just north of the ADM with the province of Mpumalanga and west of the ADM with the province of the Free State, as illustrated in the overview in Figure 9.

The most prominent surface water resources in the ADM are the Buffalo River, Ngagane River, Zaaihoek Dam and Ntshingwayo Dam. The Zaaihoek Dam is a DWS dam built in 1988 to supply the Majuba power station near Volksrust. Currently there are no domestic abstractions from this dam.

Figure 9: Overview of Water Resources in the ADM



There are a number of groundwater sources such as boreholes and springs, which are utilised in the rural areas of each municipality as well as in the Buffalo Flats area of the Dannhauser LM. There are 988 boreholes in the Buffalo Flats area which will remain as backup supply once this area is supplied from the Ngagane WTW (Amajuba District Municipality Master Plan for Water Supply, 2011).

The sections providing an overview of the main water sources are mainly extracted from the following reports:

- Development of Universal Access Plan for Water Services in Amajuba District Municipality, 2014;
- All Towns Strategies for:
 - Greater Volksrust WSS, 2011.
 - Continuation of the Water Reconciliation Strategy of the Ntshingwayo Dam Supply Area 2012 to 2040 (2014).
 - Continuation of the Water Reconciliation Strategy of the Dundee / Glencoe Supply Area 2012 to 2040 (2014).
- Water Project Feasibility Report Emergency Water Supply to Ramaphosa Settlement and the New 2MI reservoir at Hilltop (2014);
- First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality (2014);
- The Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013); and
- Amajuba District Municipality Master Plan for Water Supply (2011).

The section starts with the water sources located in the northern part of the ADM or shared (Greater Volksrust WSS) and also therefore the northern part of the catchment.

Information on Full Supply Capacity (FSC) and Historic Firm Yield (HFY) is provided in **Table 6.3A**.

Table 6.3A Water Resources: FSC, HFY

Water Resource	Potential/ Existing WSS Areas to be Served	FSC	HFY	
		Mm ³	Mm ³ /a	
Mahawane Dam	AMA 011 AMA 001	2.1	Not known	
Schuilhoek Dam		Not known	Not known	
Balfour Dam		Not known	Not known	
Buffalo River	AMA 002, AMA 003, AMA 004, AMA 005, AMA 006 AMA 007 AMA 008, AMA 012, AMA 013, AMA 014, AMA015		Not available	
Ngagane River			Not available	
Ntshingwayo Dam		194	43 ⁺	
Mfushane Dams		Not available	Not available	
Dorps Dam		AMA 016	Not available	Not available
Nywerheids Dam			Not available	Not available
Tom Worthington Dam	AMA 007, AMA 010, AMA 005	2.0	1.9	
Verdruk Dam		0.27		
Donald McHardy Dam		2.68	1.1	
Preston Pan		0.27		
Upper & Lower Mpate Dams		0.40	0.4	
Buffalo River at Tayside Weir		Not available	Not available	
Ncandu Dam (Proposed)		AMA 002, AMA 003, AMA 004, AMA 005, AMA 006 AMA 007 AMA 008, AMA 012, AMA 013, AMA 014, AMA015	Not available	16.87
Zaaihoek Dam	AMA 016	184.87	47	

Source: DWS, 2012 & 2015

A proposal exists for Ncandu Dam to be constructed upstream of the confluence of the Ngagane River and Ncandu River. The yield of the proposed dam is indicated as 16.87Mm³/annum with a capacity to sustain another 46MI/day of water supply. This proposal is still subject to evaluation against other potential resources such as the proposed Ngogo and Womeni Dams (uThukela Water Master plan) and further exploitation of Buffalo River.

7.1 MAIN WATER SOURCES

The main water sources are discussed in this section.

7.1.1 GREATER VOLKSRUST WSS

The three water sources in this WSS are the Mahawane Dam (Pongola – Mtamvuna WMA) and Schuilhoek and Balfour Dams (Vaal WMA). The Mahawane Dam is located on a minor tributary of the Buffalo River and the Schuilhoek and Balfour Dams on tributaries of the Sandspruit River.

The Water Use Authorisation and Registration Management System (WARMS) database had a registered water volume of 1.92 million m³ for the storing of water in the Mahawane Dam, with volumes of 0.31 million m³ and 0.35 million m³ registered for the Balfour and Schuilhoek Dams. The registration for taking water from all three dams combined, is only 0.809 m³/a. This needs to be corrected as a matter of urgency, as WARMS also indicates that no WRM charges are currently being levied by the DWS.

The total water required to be registered for the 2030 high growth rate scenario assuming no WC/WDM measures, is 3.64 million m³/a (9.96 Ml/d). The combined storage capacity of the three municipal dams is 2.58 million m³. The hydrological details and the yields of the three dams are not known. It is also not clear how much water is available from the Zaaihoek Dam to augment the water sources for this WSS.

Provision was, however made in the White Paper, WP F -85: Proposed Slang River Government Water Scheme (Zaaihoek Dam) and Supplementary White Paper WP E -86 with the same title, for the supply of up to 1.9 million m³/a, to Volksrust from the Zaaihoek Dam. An off-take was provided from the rising main to the Majuba Power Station which was designed to deliver into the Mahawane Dam. It is further stated that if Volksrust was to take water, the pipeline / pumping tariffs would have to be recalculated.

7.1.2 AMAJUBA FOREST WSS

The Amajuba Forest WSS is reported to be supplied from stand-alone, individual borehole schemes. The area is sparsely populated, thus it would be uneconomical to implement a conventional reticulated scheme for this area.

7.1.3 NEWCASTLE, MADADENI AND OSIZWENI WSS, DANNHAUSER – BUFFALO FLATS WSS & DANNHAUSER WSS

These water supply schemes are grouped together as they are all supplied from the Ngagane WTW, which obtains water from the following sources:

- Ntshingwayo Dam (72MI/d supplied with 90MI/d allocation);
- Ngagane River (18MI/d supplied, 30MI/d allocation); and
- Buffalo River (unreliable supply: allocation of 30MI/d with system capacity of up to 25MI/d, dependent on the level of the river).

The sources are described below.

Ngagane River with the Ntshingwayo and Mfushane Dams

The Ngagane River rises at 1993m MSL near Die Ark on the Normandien Pass on the opposite side of the watershed of the Ncandu River. The Ntshingwayo Dam captures the flow of the river south of Newcastle. The capacity of the dam is 194Mm³ with an available reserve yield of 21 m³/annum. The reserve yield should be preserved for the expected domestic and industrial growth of the supply area of between 11Mm³ and 39Mm³ over the next 20 years (2034) if other dams are not constructed in the demand area not taking account of the associated increase in return flows.

The Ncandu River joins northwest of Madadeni from where the Ngagane River flows in an easterly direction to join the Buffalo River just north of Madadeni. The Mfushane Dam is a relative small dam in a tributary to the Ngagane River, near Durnacol. No further irrigation is possible from this dam. Domestic water for Durnacol and Dannhauser is supplied from the Ntshingwayo Dam.

Buffalo River

The Buffalo River originates in Mpumalanga, about 4km northeast of Volksrust at 2047msl. The Mahawane Dam situated in a tributary of the Buffalo River, just north of Volksrust, with capacity of 2.1Mm³, supplies water to the Vukuzakhe WTW. No irrigation is possible from this Dam. The domestic water supply to Volksrust, Charlestown and Wakkerstroom may be supplemented from the Zaaihoek Dam.

Hereafter the flow is southerly, collecting east-flowing drainage from the Drakensberg range as well as streams draining west from the Balelesberg.

The Buffalo River also serves as water source to the Glencoe and Dundee WSS (and further along its flow path towards the east coast for other WSS).

7.1.4 UTRECHT WSS

The Dorps Dam and the Nywerheids Dam are off-channel Dams supplied by gravity from the Dorpspruit River and are located just north-east of Utrecht. According to the First Order Water

Services Master Plan for the Rural areas of the Emadlangeni Local Municipality (2014), the Nywerheids Dam is not currently in use for supply to the Utrecht WTW.

No further information is available on the Dams or the Dorpspruit River.

The Utrecht WSS however has sufficient capacity to provide for the current and future (2031) water requirements, utilising the Utrecht WTW (and its local sources) as well as the Ngagane WTW (Ntshingwayo Dam).

7.1.5 DUNDEE AND GLENCOE WSS

Water supplied by this scheme from the Biggarsberg WTW is obtained from the following water sources:

- Tom Worthington Dam, FSC of 2.00Mm³/a;
- Verdruk Dam, FSC of 0.27Mm³/a;
- Donald McHardy Dam, FSC of 2.68Mm³/a;
- Preston Pan, FSC of 0.27Mm³/a;
- Upper and Lower Mpate Dams, FSC of 0.26Mm³/a and 0.14Mm³/a respectively; and
- Buffalo River at Tayside weir.

The Tom Worthington Dam is supplied from the Hattingspruit and a small tributary of the Ngobiya River. The Verdruk Dam is supplied from the Ngobiya River. Both Dams are located just east of Hattingspruit and about eight kilometres north of the Biggarsberg WTW. Their combined Historic Firm Yield (HFY) is 1.9Mm³/a without the environmental reserve.

The Donald McHardy Dam and Preston Pan are located just east of Glencoe (before Dundee) and about five kilometres (as the crow flies) south of the Biggarsberg WTW. Their combined Historic Firm Yield (HFY) is 1.1Mm³/a without the environmental reserve.

The Upper and Lower Mpate Dams are located at the Biggarsberg WTW and their combined Historic Firm Yield (HFY) is 0.4Mm³/a without the environmental reserve. Water quality issues have been reported in the Lower Mpate Dam: iron and manganese levels are too high for using this water for human consumption.

The water released (more or less annually) from the Ntshingwayo Dam ensures continued supply at the Tayside weir. Furthermore, treated effluent water from the Newcastle Wastewater Treatment Works is also released into the Buffalo River, making it available for abstraction and use in this WSS. The Dundee and Glencoe WSS is reliant on the operating rules of the Ntshingwayo Dam and return flows into the Buffalo River. The Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes (DWS, 2013) indicated that the Buffalo River abstraction should be used as first priority, followed by use from the municipal dams for this WSS. According to these rules, the WTW's recommended abstraction from the Buffalo River Tayside Weir is limited to the size of abstraction infrastructure, i.e. 14MI/day.

7.1.6 GROUNDWATER

There are a number of households in the non-urban areas that are supplied from groundwater sources. Groundwater is also utilised for agriculture, irrigation and industrial activities, but little information is registered on the WARMS database.

Groundwater quality is often affected by the coal mining activities in the region.

Newcastle LM

According to the 2011 Census, of the 2 214 rural households in the NLM, 35% utilise boreholes for water supply and a further 20% make use of springs.

The Ntshingwayo Dam Supply Area All Towns Strategy for 2014 contains very little information on groundwater sources in this area. It stipulated that there is limited potential for significant groundwater development.

Dannhauser LM

The Buffalo Flats area in the Dannhauser LM is supplied from groundwater (988 boreholes in the area) until consumers are linked to the infrastructure supplied from the Ngagane WTW. The 2011 Census indicated that 45% of the 781 households in the rural west of the DLM obtain their water from boreholes. No further information is available on groundwater within the DLM.

Emadlangeni LM

Groundwater in the northern portion of the Emadlangeni LM is of general good quality, but deteriorates towards the south. SRK Consulting (appointed by DWS) undertook an extensive borehole rehabilitation and drilling program within the Emadlangeni Local Municipality recently. This report is available upon request from SRK. Findings of this report was incorporated and applied in the report: First Order Water Services Master Plan for the Rural areas of the Emadlangeni Local Municipality, (2014).

The Master Plan developed the first full proposed scheme footprint for water supply to almost all consumers in the ELM.

7.2 OTHER WATER RESOURCES

This section provides a brief introduction to some of the other water resources in the study area.

7.2.1 SLANG RIVER WITH THE ZAAIHOEK DAM

The Slang River is the first major tributary of the Buffalo River, joining the Buffalo River 4km east of Volksrust. Rising at 2 275msl south of Wakkerstroom on the high Balelesberg-Skurweberg Plateau, the Slang River flows westerly – a unique feature in Natal – to the Zaaiohoek Dam, from where water is pumped to the Majuba coal-fired power station at a rate of 55 Mm³/annum.

The yield of the Zaaihoek Dam according to White Paper WPE 86 is 47Mm³/annum. The excess water is allocated to the Vaal system. Only water for ecological purposes and for irrigators at an agreed pattern is generally released from this Dam on a continuous basis. In emergency situations, depending on the urgency of supply to the Vaal system, water may be released into the Buffalo river system.

The report – Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013) – listed the water requirements transfer from the Zaaihoek Dam for the Majuba Power Station as 26Mm³/a during 2015/2016. The Full Supply Capacity (FSC) of the Zaaihoek Dam is 184.87Mm³/a. The reported HFY was 59Mm³/a without the environmental reserve

7.2.2 NCANDU RIVER WITH THE AMCOR DAM

The Ncandu River rises at 1 994msl near Die Ark on the Normandien Pass, flows easterly and then northerly to join the Ngagane River east of Newcastle. The Amcor Dam, situated in Newcastle industrial area, with capacity estimated at 720 000 m³, is relatively small in relation to the mean annual runoff (MAR) and will therefore not have a long life. No irrigation is possible from this Dam as it is heavily silted up at this stage and is used for recreational and environmental purposes only.

7.2.3 BLOOD RIVER WITH THE BLOOD RIVER DAM

The Blood River rises at Aasvoëlkrans (1681 msl) near the headwaters of the White Umfolozi River, 17km west of Vryheid. The ADM boundary veers away from the Blood River in a westerly direction, some 10km southeast of the R 33 (Vryheid-Dundee road) The Blood River joins the Buffalo River approximately 25 km east of Dundee. A fairly large private earth Dam captures the water just downstream of the Dundee-Vryheid road.

7.2.4 PONGOLA RIVER

Rising at approximately 2200msl southeast of Wakkerstroom in the Donkerhoek/Nauwhoek valley, the Pongola River flows easterly, crossing the ADM boundary south-west of Luneburg, and passing Paul Pietersburg on the north, forming the northern boundary of KwaZulu-Natal. The

Pongolapoort Dam (net FSC at 100% drawdown level: 2 267Mm³) at Jozini captures the flow of the river. The water is used extensively around Pongola, mainly for the growing of sugarcane. Any new applications for water will only be considered when the DWS completed a major study to establish the environmental reserve. The Pandana and Tsakwane rivers are tributaries of the Pongola River and the same ruling therefore applies.

8. EXISTING WATER SUPPLY SCHEMES

This section provides an overview of the current surface water supplied schemes and the larger groundwater schemes (not for individual consumption) in the ADM. The figures illustrating the schemes are provided in **Annexure B** of this document.

8.1 URBAN AND BULK WATER SUPPLY: PHYSICAL INFRASTRUCTURE

The urban and bulk water supply schemes are briefly described here, focusing on the source of abstraction, treatment (Water Treatment Works – WTW), pumping bulk distribution, storage and reticulation.

8.1.1 GREATER VOLKSRUST WSS

The Greater Volksrust WSS includes the towns of Volksrust and Vukuzakhe (Mpumalanga Province), and Charlestown (KwaZulu-Natal Province). Water is supplied from the Balfour and Schuilhoek Dams – treated at the Volksrust WTW and from the Mahawane Dam – treated at the Vukuzakhe WTW. From the Zaaihoek Dam, water supply to Amajuba Power station is supplied from a rising main which passes near Mahawane Dam. There is an off-take from the main pipeline to Majuba to supplement the water in the Mahawane Dam, although, according to DWA, this has not been used since 2005 (All Towns strategy, 2011).

Charlestown is supplied via the Volksrust WTW which has a hydraulic design capacity of 4.0MI/d and is currently operating at 100% (3.9 – 4.2MI/d, Blue Drop Report, 2012). In winter the dams dry up and the supply is augmented currently (September 2015) from the Mahawane Dam via the Vukuzakhe WTW. The Vukuzakhe WTW hydraulic design capacity is 4.0MI/d and is operating at 2MI/d (50%) under normal, non-drought conditions (correspondence from the officials from the LM, September 2015). The volume of water supplied to Charlestown alone (excluding Volksrust and Vukuzakhe) needs to be established.

The All Towns strategy (2011) indicated that the Vukuzakhe WTW will be upgraded to double its capacity. The total storage available for the WSS is 20.4MI, which is more than the 48h peak requirement for this area (All Towns Strategy, 2011).

The capacity of the bulk infrastructure is not sufficient to meet the current water requirements and even the future water requirements, for Charlestown in Newcastle LM. The municipality has submitted a RBIG business plan to develop a new water supply system from sources within Newcastle LM. Approval is pending from the DWS SAC (KZN).

Newcastle LM assumed water reticulation operations for Charlestown from 1 July 2013 and has since opened an account to purchase bulk water from Dr Pixley ka Isaka Seme LM. A draft agreement has been developed and is yet to be signed after the tariff formula and modelling has been agreed by the two municipalities. The tariff is estimated to be between R6/kl - R9/kl (Newcastle

water services life cycle cost modelling) instead of the current tariff of R13.45/kl, which is one of the highest bulk tariffs in the country by comparison with other bulk water costs elsewhere.

WC/WDM: The meter audit for bulk meters is complete and these are yet to be included in the replacement programs for bulk meters for the whole of Newcastle. The water balance is incorporated in the NRW scorecard for the whole of the municipality. This is not compliant with “No Drop” regulations, as each system must be accounted for separately.

Only water awareness campaigns were held to mitigate drought situations and control demand.

A new WCDM unit is now in place and responsible for all areas in the Municipality.

Pipe replacement projects were implemented to renew sections of the networks with PVC pipes. A more detailed programme is yet to be formulated in line with the NRW master plan developed by Joat (June 2015). No further information is available at this stage on WC/WDM activities implemented in this area.

8.1.2 AMAJUBA FOREST WSS

The WSS is served by rudimentary schemes that may include boreholes and springs. No information is maintained on water utilisation.

WC/WDM: No information is available at this stage on WC/WDM activities implemented in this area.

8.1.3 NEWCASTLE, MADADENI AND OSIZWENI WSS

Information in this section is from the reports: Ngagane BP revision 4-Emergency Upgrade Ngagane WPP – Amended 14 Nov 2013 and Water Development Plans Status Report Feb 2015 v1.0.

The Newcastle, Madadeni and Osizweni WSS includes the towns of Newcastle, Alcockspruit, Madadeni, Osizweni, Blaauwbosch Laagte, Cavan, Jakkalspan, Johnstown and further east up to Inverness (Newcastle LM), Mndozo and Dicks Halt. The scheme also supplies the Waterval Prison located in the Emadlangeni LM. It should be confirmed whether Berouw and Amangthungwa (both also in the Emadlangeni LM) have been connected to the bulk water supplied from the Ngagane WTW.

Abstraction, Ngagane WTW

Water is supplied from the Ntshingwayo Dam (72MI/d supplied with 90MI/d allocation), Ngagane River (18MI/d supplied, 30MI/d allocation) and Buffalo River (unreliable supply: allocation of 30MI/d with system capacity of up to 25MI/d, dependent on the level of the river), then treated at the Ngagane WTW.

According to the Ngagane BP revision 4-Emergency Upgrade Ngagane WPP – Amended (2013), the WTW consists of three modules with design capacities of 45MI/d, 30MI/d and 36MI/d

respectively, totalling 111MI/d. Other sources indicate the WTW to comprise of three modules of 60MI/day, 30MI/day and 30MI/day respectively totalling 120MI/day. Proposals in this report will be based on a current total capacity of 120MI/day.

The Water Development Plans Status Report Feb 2015 v1.0 reported the capacity as 103MI/d with an operating capacity of 90MI/d on average for the period ending February 2014. A Municipal Infrastructure Grant (MIG) project was registered to undertake emergency augmentation of the works to improve capacity and operation. Since then, the average operating capacity was 105MI/d (87.5% of the design capacity) for the period ending December 2014 with the plant capacity being increased to 120MI/d through a five million rand (R5 000 000) MWIG grant.

As at 29 June 2015, this project was practically completed and it is reported that it (Ngagane WTW) has been operated at 123MI/d without any quality issues. It is noted that the capacity of the plant to treat 120MI/d is subject to the availability of raw water from the various sources. The Ngagane WTW also supplies consumers in the Dannhauser-Buffero Flats WSS.

Water quality in the Ngagane River is affected by coal mine dust, iron and manganese from mining operations. This also affects the efficiency of the treatment plant. Drought conditions affect the available supply from the Buffalo River, but it may be augmented from the Zaaiohoek Dam. As on 29 June 2015, NLM reported that the supply from the Buffalo River was affected by the current prevailing drought conditions in the KZN province and DWS has been releasing water from Zaaiohoek dam. The Ntshingwayo Dam has also been affected by drought, pollution and siltation. The dam level is of June 2016 was reported as being about 51% full. Notwithstanding this, the DWS is currently releasing water into Ngagane River to meet the needs of downstream users.

Bulk Water Pipelines and Pumping Infrastructure

A total of four bulk pipelines supply raw water to the Ngagane WTW as follows:

- Two gravity pipelines (one 690mm internal diameter concrete pipe and a 590mm internal diameter steel pipe with a section of AC pipe) supply the Ngagane WTW from Ntshingwayo Dam, These account for about 72MI/day
- A 600mm diameter mild steel lined pumping main supplies the Ngagane WTW directly from the Ngagane River, accounting for 30MI/day
- Another gravity pipeline supplies raw water from the Buffalo River to the Ngagane WTW. This pipeline is an 800mm diameter mild steel pipeline (estimated length 20km) and abstracts water from a weir higher up on the Buffalo River. This pipeline is reported to be old and in need of refurbishment / replacement.

There are excessive leakages on the raw water pipelines from the Ntshingwayo Dam. It is anticipated that after repair of the pipes, mainly at the joints, the capacity would increase from 72MI/day to 80MI/day. The Ngagane BP revision 4-Emergency Upgrade Ngagane WPP – Amended (2013) made provision for leak repairs.

The Ngagane BP revision 4-Emergency Upgrade Ngagane WPP – Amended (2013) made provision for upgrading of the clean water pump station in order to meet demands and coincide with the WTW upgrade.

The capacity of the bulk water supply infrastructure should be sufficient to meet the water requirements with the upgrade of the Ngagane WTW.

Storage

The All Towns Strategy (2014) for Ntshingwayo Dam Supply Area confirmed command reservoirs at Braakfontein and Newcastle town with storage capacities of 78.8MI and 46MI respectively. There is also a 4MI reservoir at Ekuseni supplying the low pressure sections of the town. Total storage, including bulk distribution reservoirs, is 128.8MI. This storage is sufficient to meet 35h storage but not sufficient to meet the 48h storage requirement of the system (The All Towns Strategy, 2014).

WC/WDM: The NLM established a new WC/WDM division which will oversee and implement a new five-year Non-Revenue Water (NRW) strategy adopted by the NLM (Water Development Plans Status Report v1.0, 2015). Activities include regular conduct of the water balance based on district metering areas, active leak detection and repairs, community education and use of the telemetry and SCADA for monitoring and activity planning.

The leaks along the raw water abstraction point from the Ntshingwayo Dam and the Ngagane WTW will be addressed during 2015. The 2015 NRW averaged 35.2% between July 2014 and February 2015 (Newcastle No Drop Spreadsheet), equating to an average of 38MI/d. The NRW for the month of February was 26.3% representing 29MI/day.

8.1.4 DANNHAUSER – BUFFALO FLATS WSS

The Dannhauser – Buffalo Flats WSS includes the towns of Inverness, Mtendeka, Mafahlawane, Naas, Surrey, Phillip, Martha, Uitkyk, Mbanane, Nellie Valley, Kilegethe, Dorset, Curragh and Cloneen in the Buffalo Flats area.

Water is supplied from the following:

- Ngagane WTW: obtaining water from the Ntshingwayo Dam, Ngagane River and Buffalo River; and
- Biggarsberg WTW: obtaining water from Tom Worthington Dam, the Sterkstroom River, two small dams in the Mpate catchment and the Buffalo River at Tayside pump station.

There are however also areas reliant on groundwater supplies and water tankers, such as Chester, Cork, Flint, Greenock, Mullingar, Nyanyadu, Spookmill and Zondo in the north-east and Geduld, Hilltop, Kempshoek, Kliprand, Nguqunguqu, Strijbank, Twhatgwha and Verdriet in the southern part of the scheme area. The volume of groundwater supplied should be established as well as the

potential for increased conjunctive use of groundwater and service water in this area. This may make more water available from the Biggarsberg WTW for other consumers.

The Ngagane WTW and Biggarsberg WTW both supply to other water scheme areas as well.

The volume supplied to the Dannhauser – Buffalo Flats WSS from each of the WTW could not be extracted from the available uThukela Water monthly reports.

The All Towns strategy (2014-2015) for this area is still being reviewed and will become available by July 2015.

Other information on the bulk supply lines, storage and distribution should still be obtained and verified for this WSS.

WC/WDM: This area falls within the Amajuba DM and details on active WC/WDM activities implemented should still be obtained.

8.1.5 DANNHAUSER WSS

The Dannhauser WSS includes the towns of Dannhauser, Durnacol, Emafusini, Rocky Spruit and Skombaren.

Water is supplied from the Ntshingwayo Dam where it is treated at the Durnacol WTW and Dannhauser WTW. The design capacities of the plants are 1.7MI/d and 2.0MI/d respectively. The “Water Project Feasibility Report; Emergency Water Supply to Ramaphosa Settlement and Hattingspruit, (Rev 2)” report by UWP Consulting of December 2014, indicates the design capacities of Durnacol WTW and Dannhauser WTW as 2.0MI/day and 2.4MI/day, respectively. These capacities will have to be confirmed.

A small portion of the Rocky Spruit area utilises groundwater according to the 2011 Census.

The volume supplied from the Durnacol WTW was reported as 1.2MI/d and from the Dannhauser WTW it was reported as 1.7MI/d (Blue Drop Report, 2012). The 2014 report however by UWP indicated the volume supplied from the Durnacol WTW and Dannhauser WTW as 1.52MI/day and 1.4-1.5MI/day respectively. The All Towns strategy (2014-2015) for this area is still being reviewed and will become available by July 2015.

The Water Project Feasibility Report Emergency Water Supply to Ramaphosa Settlement and the New 2MI reservoir at Hilltop (November 2014) included some information on the Dannhauser and Durnacol water supply. The areas are affected by the Eskom load shedding activities (power outages) in the form of pipelines that are damaged due to water hammer. This causes breakages and leakages in the pipelines therefore interrupted supply and water losses.

Other information on the bulk supply lines, storage capacity and distribution should still be obtained and verified for this WSS. It is noted, however, that the raw water pumping main from Ntshingwayo Dam to Durnacol is reported to be over 30 years old and in need of urgent replacement.

Newcastle LM has not experienced frequent load shedding and has been able to operate with minimum disruption.

WC/WDM: This area falls within the Amajuba DM and details on active WC/WDM activities implemented should still be obtained.

8.1.6 UTRECHT WSS

Most information reported in this section was obtained from the report: First Order Water Services Master Plan for the rural areas of the Emadlangeni Local Municipality, October 2014. It includes information on the Utrecht WSS.

The Utrecht WSS includes the towns of Utrecht, Bendsdorp and White City. Water is supplied from two off-channel storage dams (Dorps and Nywerheids) from the Dorpspruit River and treated at the Utrecht WTW. The areas of Berouw and Amangthungwa are supplied via standpipes from the bulk water supplied from the Ngagane WTW.

A bulk water line has been connected from the Ngagane WTW to Utrecht to augment supply during dry periods when water from the existing off-channel dams is not sufficient. The town of Utrecht started utilising this option in September 2015 due to the current drought conditions and local sources not being able to meet the demand.

The Utrecht WTW has a design capacity of 4MI/d and is operating at 2MI/d (50%) under normal, non-drought conditions.

The All Towns strategy (2014-2015) for this area is still being reviewed and will become available by July 2015.

Other information on the bulk supply lines, storage and distribution should still be obtained and verified for this WSS.

WC/WDM: Status of WC/WDM programme implementation to be determined.

8.1.7 DUNDEE AND GLENCOE WSS

The Dundee and Glencoe WSS includes the towns of Bright Home, Dundee, Hattingspruit, KwaTelapi, Ruigtefontein, Shroeders Hope, Sibongile, Sithembile, Springlake Colliery Mine and Wasbank. Hattingspruit, Bright Home and Springlake Colliery Mine are within the Amajuba DM and the other areas within the uMzinyathi DM.

Ruigtefontein and the Springlake Colliery Mine make mostly use of sources such as boreholes, springs, direct use from rivers and water tankers.

KwaTelapi is completely reliant on spring water supply and should rather be excluded from this scheme area (ADM to confirm).

Abstraction, Biggarsberg WTW

Water is supplied from the Biggarsberg WTW (2012 Blue Drop status) that obtains water from the Tom Worthington Dam, Verdruk Dam, Donald McHardy Dam and Preston Pan in the Sterkstroom River, two small dams in the iMpati catchment (Upper and Lower Mpate Dams) and the Buffalo River at Tayside weir. Water from the Tom Worthington Dam (via Verdruk Dam) is pumped to the WTW. Water from the Upper Mpate Dam gravitates to the WTW (Lower Mpate has water quality problems).

The design capacity of the WTW is 23.9MI/d and its operating capacity is 15.58MI/d (65%, Blue Drop Report, 2012). UThukela Water reported the design capacity of the inlet works and raw water supply as 19.3MI/d, the clarifiers' maximum combined capacity as 23.9MI/d and the filters' capacity as 26.1MI/d (maximum). The WTW falls within the uMzinyathi DM and is managed by uThukela Water. The reported supply from each water source is as follows: Mpate Dams – 1.5MI/d, Tayside weir – 16-18MI/d, Sterkstroom – 1.5MI/d and Verdruk Dam – 4MI/d, thus totalling 25MI/d.

The Buffalo River (main source currently for the WTW) is affected by the operating rules of the Ntshingwayo Dam. The existing raw water pumping infrastructure capacity is compromised by the condition of the infrastructure. It is reported that emergency refurbishment is in progress and a R45 Million Business Plan has been submitted to the DWS for this refurbishment and other associated works.

The report: Development of Water Supply and Drought Operating Rules for Stand-alone Schemes and Dams Typical of Rural/Small Municipal Water Supply Schemes. Eastern Cluster. Buffalo River Catchment (Newcastle, Glencoe, Dundee and Others Decision Support System (2013), indicated that the abstraction from the Tayside weir is 14MI/d, but that only 10MI/d reaches the WTW due to losses along the way.

Bulk Water Pipelines and Pumping Infrastructure

The capacity and condition of bulk water pipelines and pumping infrastructure need to be confirmed.

Storage

The All Towns strategy (2014) for this area reported the total storage available for this area as 42.5MI. It is sufficient to meet the 48h storage requirement for the supply area.

WC/WDM: This area falls within the Amajuba DM and uMzinyathi DM and details on active WC/WDM activities implemented should still be obtained. The All Towns strategy (2014) indicated that the

Non-Revenue Water is 8.02MI/d (45% of system input volume), which is quite high. The physical / real losses account for 5.88MI/d (33%), therefore urgent WC/WDM interventions are required for this WSS.

Population figures were provided based on the 2011 Census, but the current water supplied, were obtained and confirmed from officials and based on recent technical reports.

The Water Supply Scheme (WSS) footprints were initially obtained from the DWS Reference Framework geodatabase (spatial database), but have been updated based on discussions with officials from the ADM. Only settlements or areas currently served by an existing scheme are reported on in this section.

9. PLANNED AND POTENTIAL FUTURE WATER SUPPLY – PROJECTS

This section provides an overview of the currently planned and potential future water supply projects in the ADM as registered under the Municipal Infrastructure Grant (MIG) programme and Regional Bulk Infrastructure Grant (RBIG) programme since 2009/2010/2011 or that are still under construction.

9.1 PROJECT LIST FROM COGTA - MIG

Information in this section was obtained from the KwaZulu-Natal Provincial Department of Co-operative Governance & Traditional Affairs – COGTA.

The January 2016 project list for projects not yet completed, received from KZN COGTA is provided in **Table 9.1**.

Table 9.1 MIG Project list for the ADM

Provincial Reference Number	National Project Number	Project Name	Reg Year	Project Status	Total Project Cost	MIG Funds
2007MIGFK252149556	MIG/KZN1206/W/08/10	Viljoenpark Bulk Services	2007	Construction	R 81 340 000	R 81 340 000
2011MIGFK252199363	MIG/KZN2154/W/10/13	Water Conservation and Demand Management Programme (NLM)	2011	Construction	R 24 618 550	R 56 013 761
2014MIGFK252222718	MIG/KZN3284	Emergency Upgrade (Ngagane WTW)	2014	Construction	R 72 846 000	R 126 101 362
2014MIGFK252226030	MIG/KZN3312	Blaauwbosch Bulk Water Project	2014	Construction	R 69 448 946	R 24 362 664
2005MIGFDC250006	MIG/KZN0209/W/05/07	Utrecht Dam	2005	Registered	R1 368 000	R 498 038
2006MIGFDC25113626	MIG/KZN0700/W/06/09	Buffalo Flats Water Supply Scheme Phase 1	2006	Construction	R 24 774 480	R 9 357 063
2007MIGFDC25153355	MIG/KZN1165/W/07/10	Buffalo Flats Water Supply Scheme Phase 2	2007	Construction	R 34 800 553	R 212 031 939
2008MIGFDC25157145	MIG/KZN1267/W/08/14	Buffalo Flats Water Supply Scheme Phase 3 (AFA)	2008	Construction	R 142 187 352	R 15 700 000
2010MIGFDC25195705	MIG/KZN2076/W/08/12	Emadlangeni Rural Water Supply Scheme Phase 1	2010	Des & Tender	R 13 380 000	R 239 235 495
2015MIGFDC25228245	MIG/KZN3617	Emadlangeni Rural Water Supply Scheme Phase 1	2015	Des & Tender	R 1 059 750	R 40 699 215
2015MIGFDC25232312	MIG/KZN3618	Buffalo Flats Water Supply Scheme Phase 3B	2015	Registered	R 68 777 282	R 3 782 830

9.1.1 PROVINCIAL PROJECT NUMBER: MIG/KZN1206/W/08/10: VILJOENPARK BULK SERVICES

This project is located in the Newcastle LM. The project involves upgrading and expansion of new infrastructure and included the construction of additional storage at the Hilldrop Reservoirs. The project was reported as complete in February 2015.

9.1.2 PROVINCIAL PROJECT NUMBER: MIG/KZN2154/W/10/13: WATER CONSERVATION DEMAND MANAGEMENT

This project is for the located Newcastle Municipality. From DWS recommendation for approval, the project is for the reduction of water losses in Madadeni, reported to be in the order of 70%, and will include the following activities:

- Leak repairs to the internal network,
- Installation of bulk and zonal meters to various pipelines and 28 identified zones,
- Installation of pressure reducing devices,
- Repair of broken meters and pressure regulating devices,
- Leak detection and audits, followed by repair work, etc
- Repair of domestic plumbing.

A “Close Out” report dated March 2013 indicates that the project is under implementation with the municipality, having attended to the installation of zonal meters, repair of plumbing to approximately 7 ,000 households and installation of water meters to approximately 1,000 households. This project is in progress.

9.1.3 PROVINCIAL PROJECT NUMBER: 2014MIGFK252226030 BLAAUWBOSCH BULK WATER PROJECT

This project was registered with MIG in 2013. It still in the stage of concept development and is intended to provide/upgrade infrastructure serving the Blaauwbosch area.

The procurement of professional service providers to undertake work was commenced and suspended.

9.1.4 PROVINCIAL PROJECT NUMBER: 2005MIGFDC250006: UTRECHT DAM

This project was registered with MIG in 2013. It still in the stage of concept development and is intended to provide security of raw water supply to Utrecht.

Again, the procurement of professional service providers to undertake work was commenced and suspended.

9.1.5 PROVINCIAL PROJECT NUMBER: 2006MIGFDC25113626 BUFFALO FLATS WATER SUPPLY SCHEME PHASE 1

According to ADM’s IDP 2015/16, this project is reported as complete. The project was to provide a reticulated network to RDP standard (i.e. Standpipe within 200m walking distance) for approximately 3 844 households in the Buffalo flats Area. The areas covered included Alleen 1, Alleen 2, Annieville, Nelly valley and Jessie.

9.1.6 PROVINCIAL PROJECT NUMBER: 2007MIGFDC25153355 BUFFALO FLATS WATER SUPPLY SCHEME PHASE 2

This project is located in Buffalo Flats, Dannhauser LM, The project is for the provision of RDP standard level of water service to communities (3,850 households) residing the areas known as Naas, Thirst, Annieville, Fairbreeze, Uitkyk and Rutland. According to the ADM's IDP 2015/16, the project was reported as under implementation with about 80% household overage achieved. Coverage to 100% was expected to be achieved in the 2015/16 year.

9.1.7 PROVINCIAL PROJECT NUMBER: 2008MIGFDC25157145 BUFFALO FLATS WATER SUPPLY SCHEME PHASE 3

This project will complete service to RDP standard for the remainder of households (estimated at 6,975 in the Buffalo Flats Area). This phase of the project has been limited by the availability of MIG funding and the absence of a sustainable treated water supply source. The latter will be addressed by the availability of a water from the Ngagane system, through a pipeline that has already been constructed.

9.1.8 PROVINCIAL PROJECT NUMBER: 2010MIGFDC25195705 EMADLANGENI RURAL WATER SUPPLY SCHEME PHASES 1

This project is located in Emadlangeni and is for the development of water resources (and subsequent supply of water to 4,287 households) within Emadlangeni Area. Most of the beneficiaries are labour tenants working on privately-owned farms.

As per ADM's IDP (2015/16) the project is at concept development stage.

9.1.9 PROVINCIAL PROJECT NUMBER: 2015MIGFDC25228245 EMADLANGENI RURAL WATER SUPPLY SCHEME PHASE 1)

This project is located in Emadlangeni and is for the development of water resources (and subsequent supply of water to remainder of households), as continuation of Phase 1 of the project and is also within Emadlangeni Area. Most of the beneficiaries are labour tenants working on privately-owned farms.

As per ADM's IDP (2015/16) the project is at concept development stage.

9.1.10 PROVINCIAL PROJECT NUMBER: 2015MIGFDC25232312 THE AMAJUBA REGIONAL BULK WATER SUPPLY SCHEME

This project scope is still to be ascertained.

9.1.11 PROVINCIAL PROJECT NUMBER: 2015MIGFDC25236687. BUFFALO FLATS WATER SUPPLY SCHEME PHASE 3B

This project scope is still to be ascertained.

9.2 PROJECT LIST FROM DWS - RBIG

Information in this section was obtained from the KwaZulu-Natal Provincial Department of Water and Sanitation, Programme Manager for RBIG projects. The ADM has no regional bulk projects registered with RBIG.

9.3 OTHER RELEVANT PLANNING DOCUMENTS

Some planned projects that may be relevant to this project and not on the MIG and RBIG projects list are discussed hereunder:

9.3.1 AMAJUBA DISTRICT MUNICIPALITY MASTER PLAN: WATER SUPPLY, 2011

The Master Plan for Water Supply for Amajuba District Municipality, prepared by SSI (a DHV Company) dated 04 May 2011, indicates the following significant plans:

- The Utrecht WTW is to be decommissioned following the completion of the pipeline from the Ngagane System to Utrecht. Utrecht and the surrounding areas of Amangthungwa and Berouw would then be supplied from this new source.
- In the long term, water supplied from the Ngagane System would be used to supply
 - Koppie Alleen / Alcockspruit,
 - Dannhauser,
 - Durnacol,
 - Hattingspruit, Dundee, Glencoe and Wasbank in Umzinyathi DM
 - Buffalo Flats upgraded to house connections.

In the instance, the Dannhauser, Durnacol and Biggarsberg WTW's would be decommissioned and closed down.

The plans will be taken into account in the water requirements determination and conceptual infrastructure plans.

9.3.2 FIRST ORDER WATER SERVICES MASTER PLAN FOR THE RURAL AREAS OF EMADLANGENI LOCAL MUNICIPALITY, 2014

The "First Order Water Services Master Plan for the Rural Areas of Emadlangeni Local Municipality" of October 2014, prepared by UWP Consulting indicates the following:

- A number of rudimentary sources, e.g. boreholes, springs, etc. have been identified and tested in the Emadlangeni Local Municipality,
- Water supply through conventional systems (WTW and reticulation) is not recommended for the entire Emadlangeni LM other than for the areas of Utrecht and Amangthungwa and Berouw townships.

- The cost of providing rudimentary water supply schemes for the rural areas of Emadlangeni LM would be R234 057 271.

Again, these plans have been taken into account in the water requirements determination and conceptual infrastructure plans.

9.3.3 UTHUKELA WATER INFRASTRUCTURE MASTER PLAN, JUNE 2012

The “uThukela Water Infrastructure Master Plan” dated June 2012, by Jeffares and Green analyses six water supply scheme options for the Amajuba DM and the uMzinyathi DM, concluding with a proposal for the schemes (relevant to the Amajuba DM), described hereunder. The long-term implications of the proposals will be as follows:

- The areas north of the ADM (including Charlestown & Volksrust) would be supplied via a new scheme, “Scheme 1” which will have capacity to relieve the Ngagane System, should this be required,
- The existing Ngagane WTW would first be upgraded to a capacity of 160MI/day and be available, in the long term, as a back-up WTW, following the construction a new WTW at the Ntshingwayo Dam,
- A new WTW would be constructed at the Ntshingwayo Dam with a capacity to serve Newcastle Municipal Area, Dannhauser and Dundee.

Again the Biggarsberg WTW, Dannhauser WTW, Durnacol WTW and Utrecht WTW are not considered.

The proposals of the Master Plan are not adopted, in full, because the water requirements do not justify the adoption of these plans.

The proposals of the Master Plan are discussed further.

9.3.3.1 Scheme 1

The Master Plan describes Scheme 1, as follows:

“Scheme 1 considers the abstraction of water from Ngogo River at a new dam located before the junction with the Buffels River. A second new dam is required on the Womeni River to ensure adequate storage for low flow periods. The anticipated yield from the Ngogo Dam is 33.7 MI/d at a 95% assurance level. The yield from the Womeni Dam is estimated at 9 MI/d.

The scheme covers the northern areas of ADM as well as the town of Newcastle. In so doing, the demand form Chelmsford Dam for Newcastle, is reduced and so the resource can be effectively utilised elsewhere.

A new WTW is to be constructed at the Ngogo Dam with pump stations taking water to the higher northern areas, while a gravity system can be utilised for the feed to Newcastle after a minor boost from the WTW over the ridge surrounding the dam.”

9.3.3.2 Scheme 2

The Master Plan describes Scheme 2 as follows:

“The proposed long term solution for this scheme is to provide water from the Chelmsford Dam through the new water treatment works located at the dam. From there water will be pumped to a location outside Ngagane with gravity feed to the existing Ngagane WTW. From here the water will be pumped via the existing system to another reservoir at Brakfontein and gravity fed through the system. A third pump station is located at Amanthungwa which pumps water to the higher lying area of Eenkantlang.”

9.3.3.3 Scheme 3

The Master Plan describes Scheme 3 as follows:

“The proposed scheme utilises water from the Chelmsford Dam with a water treatment works at the dam pumping potable water to the first command reservoir at Durnacol. From there water is fed to another command reservoir located at Gretna from where it is gravity fed to the remainder of the scheme.”

9.3.4 BULK WATER SUPPLY AND WASTE WATER TREATMENT WORKS FOR CHARLESTOWN OF THE NEWCASTLE MUNICIPALITY: BUSINESS PLAN

The “Bulk Water Supply and Waste Water Treatment Works for Charlestown: Business Plan”, dated July 2014, adopts the recommendations of the Master Plan referred to in section 9.3.3 above for the supply of water Charlestown. This requires the development and construction of the following infrastructure:

- Construction of a weir and abstraction infrastructure on the Buffalo River, downstream of Zaaihoek Dam,
- Construction a new suitably sized water treatment works, to be located in Charlestown,
- Construction of clear water command reservoir in Charlestown.

This project will be considered and costed in this report. However, because of the demands of Charlestown (estimated at 1.2MI/day for year 2035) it is not recommended that the NLM implements this project without collaboration with Dr Pixley Ka Isaka Seme LM who would have a bigger interest in such a scheme. Alternatively more effort should be placed on finalising a service level agreement for bulk water supply from Dr Pixley Ka Isaka Seme LM to NLM.

10. WATER REQUIREMENTS AND AREAS NOT SERVED BY EXISTING SCHEMES

This section describes the areas not yet covered by existing formal water supply schemes. Where possible, it will be indicated whether there is an existing RBIG or MIG-funded project.

This section includes a summary per Local Municipality, of the water requirements for the potential scheme areas not yet included in existing formal water supply schemes.

The areas have been code named in the Water Requirement Model and hence water requirements of the areas are derived from the Model.

The areas are described further in this section and are code-named as follows:

- For Dannhauser LM, the areas are:
 - AMA 006,
 - AMA 007,
- For Emadlangeni LM the areas are
 - AMA 009,
- For the Newcastle LM area these are
 - AMA 001
 - AMA 013

These areas are illustrated in

Figure 10 and are shown as hatched.

10.1 DANNHAUSER LM

AMA 07 is the rural area north of Hattingspruit and south of Buffalo Flats. It extends from the outskirts of Dundee and extends across the LM in a north-westerly direction, as a belt to the border of Dannhauser with Newcastle LM.

AMA 007 includes the rural areas surrounding the Dannhauser town.

10.2 EMADLANGENI LM

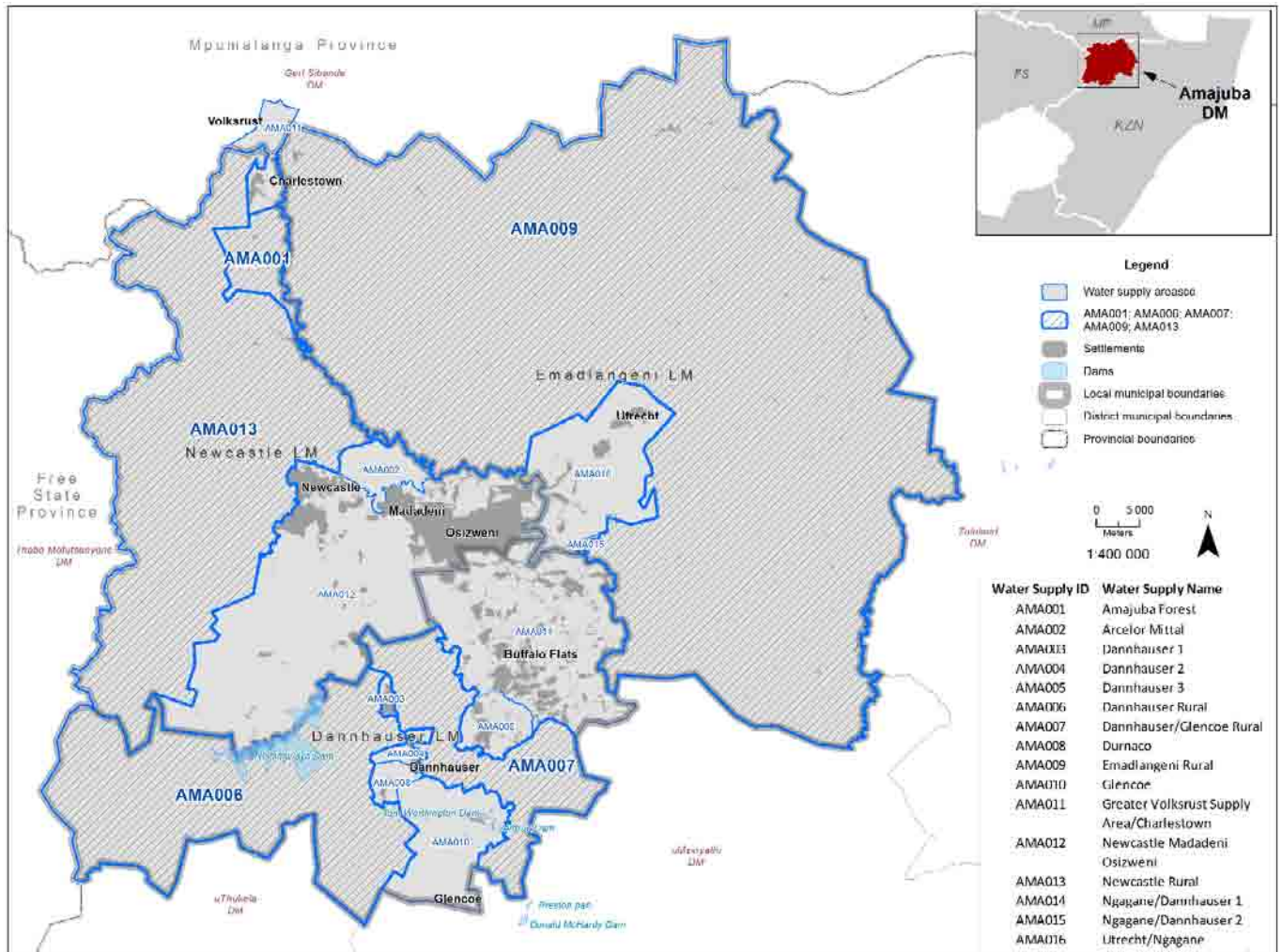
The area code named AMA 009 is the remainder of Emadlangeni LM outside Utrecht. It includes Game Parks, Farms and traditional rural areas.

10.3 NEWCASTLE LM

AMA 001 is situated in northern tip of Newcastle LM and includes Amajuba Forests.

AMA 013 is the rural areas north of Newcastle south of Charlestown. This area extends to the western and northern edges of the Newcastle LM and includes Ingogo and Normandien rural settlements.

Figure 10: Amajuba DM Areas not served by Conventional WSS



11. SYNOPSIS OF EXISTING AND COMMITTED SCHEMES

For the purposes of analysing the current and projected water requirements, the DM has been divided into WSS areas code-named in section 6 of this report. It is noted that, in terms of current planning, a number of WTW's (and associated infrastructure) are targeted to be decommissioned in favour of regional schemes. In the rural areas on the other hand, current planning suggests rudimentary WSS supplied by boreholes, springs, etc. based on high per capita costs associated with conventional reticulation systems.

Thus analysis of schemes and the associated infrastructure may be reviewed for different planning scenarios, as will be discussed, as appropriate in this section. The scheme areas are analysed for the following:

- Yield of raw water source, in relation to current and projected water requirements,
- Capacity / adequacy of raw water abstraction infrastructure,
- Capacity of Water Treatment Works relative to current and future water requirements,
- Capacity / adequacy of primary distribution bulk infrastructure,
- Adequacy of available storage

The WSS areas are discussed under the relevant LM's using the coded names.

11.1 DANNHAUSER LM

As per section 6, the Dannhauser LM has been demarcated into eight WSS areas assessed hereunder:

- AMA 003 – Ngagane/Skombaren
- AMA 004 – Dannhauser: Rocky Spruit & Emafusini
- AMA 005 – Dannhauser: Verdriet, Hilltop, Geduld, Kempshoek, Strijbank (southern Buffalo Flats Area),
- AMA 006 – Dannhauser & Glencoe Rural
- AMA 007 – Dannhauser & Glencoe Rural
- AMA 008 – Dannhauser: Durnacol
- AMA 010 – Dannhauser: Glencoe (Dundee/Glencoe WS)
- AMA 014 – Dannhauser: Buffalo Flats Area North

11.1.1 AMA 003 – NGAGANE/SKOMBAREN

This WSS area is served with treated water via a pipeline of undisclosed size and material. The pipeline serving the area is an extension of the treated water pipeline from the Ngagane WTW to Skombaren en route to Alcockspruit and is an estimated length of 20 km.

The water requirements for years 2015 and 2035 for this area are 0.6MI/day and 0.8/MI/day (or 0.23Mm³/annum and 0.31Mm³/annum).

Raw and treated water requirements will be considered together with those of AMA 012 Newcastle, Madadeni and Osizweni as this area is supplied from the Ngagane WTW.

11.1.2 AMA 004 & AMA 008 – DANNHAUSER AND DURNACOL

These two water supply scheme areas are currently supplied via the Dannhauser WTW (Dannhauser, Emafusini and Rockyspruit) the Durnacol Treatment Works (Durnacol urban area). In the current planning from Uthukela Water (2012), the two water treatment works will be phased out with the treated water supply emanating from the Ngagane Treatment Works. The schemes are discussed further.

(a) Current and Future Water Requirements

The 2015 water requirements are estimated at a total of 3.0MI/day (1.8 MI/day for AMA 004 + 1.2MI/day for AMA 008) while the 2035 requirements are 4.0MI/day (2.4 MI/day for AMA 004 + 1.6MI/day for AMA 008)

(b) Available Abstraction and Water Treatment Capacity

The Dannhauser and Durnacol Treatment Works are reported to have treatment capacities of 2.4MI/day and 2.0 MI/day, respectively. However the WTW's are in need of refurbishment work and per capita treatment costs are reported as high.

Current planning documents indicate that the WTW's will be decommissioned and the areas served by a WTW to be located at the Ntshingwayo Dam. This report proposes that the areas be served by a treated water pipeline approximately 35km in length from the Ngagane WTW to this WSS area. The pipeline may have to be sized for further extension to Glencoe and Dundee (30km from Dannhauser). The current estimated size is 450mm diameter. If it is required that this pipeline is extended to supply Hattingspruit and Glencoe and Dundee, the estimated pipeline size to cater for further extension is 600mm diameter.

11.1.3 AMA 005 & AMA 014 – DANNHAUSER: BUFFALO FLATS AREAS SOUTH AND NORTH

These two water supply scheme areas are currently supplied via the Ngagane WTW via bulk pipelines from Braakfontein Reservoirs and from groundwater (boreholes). The main pipeline into Buffalo Flats North is an off-take from a 450 mm diameter AC pipeline conveying water from the Braakfontein Reservoir to Osizweni and Utrecht.

(a) Current and Future Water Requirements

The 2015 water requirements are estimated at a total of 10.8MI/day (0.5 MI/day for AMA 005 + 10.3MI/day for AMA 014 while the 2035 requirements are 15.4 MI/day (1.0 MI/day for AMA 005 + 14.4MI/day for AMA 014)

(b) Available Abstraction and Water Treatment Capacity

The available abstraction and water treatment capacities will be considered together with that of AMA 012 whose source of treated water is also Ngagane WTW.

For the WSS areas, AMA 005 and AMA 014, the supply can be constrained by the capacity of the bulk pipeline supplying Utrecht, which has been recorded as a 450mm diameter AC pipeline. The capacity of this pipeline at various peak factors is as follows:

Peak factor estimated capacity (MI/day):

- 1. 22.8MI/day
- 2. 11.4MI/day
- 3. 7.6MI/day

The existing pipeline, therefore, appears to be adequately sized.

11.1.4 AMA 006 & AMA 007 – DANNHAUSER & GLENCOE RURAL

These two water supply scheme areas currently get their water services from rudimentary borehole schemes or they do not have formal supply at all. The schemes are discussed further.

(a) Current and Future Water Requirements

The 2015 water requirements are estimated at a total of 0.6MI/day (0.3 MI/day for AMA 006 + 0.3 MI/day for AMA 007) while the 2035 requirements are 1.0 MI/day (0.6 MI/day for AMA 006 + 0.4 MI/day for AMA 007)

(b) Available Abstraction and Water Treatment Capacity

These WSS areas do not have conventional water services infrastructure with water sources being either boreholes or springs. Because of the sparsely distributed population, it is expected that the areas could be served further as required with rudimentary supplies.

11.1.5 AMA 010 – DANNHAUSER: DUNDEE/GLENCOE WS (HATTINGSPRUIT BRIGHT HOME AND SPRINGLAKE COLLIERY)

The Dundee and Glencoe WSS includes the towns of Bright Home, Dundee, Hattingspruit, KwaTelapi, Ruigtefontein, Shroeders Hope, Sibongile, Sithembile, Springlake Colliery Mine and Wasbank. Hattingspruit, Bright Home and Springlake Colliery Mine are within the Amajuba DM and

the other areas within the uMzinyathi DM. The supply area is currently served via the Biggarsberg WTW, which is reportedly operating at 15.6MI/day while it has a capacity to treat 24MI/day. However, the available abstraction and water treatment capacities will be considered together, against requirements of further areas in Umzinyathi DM, also supplied from Biggarsberg WTW.

(a) Current and Future Water Requirements

The 2015 water requirement for the AMA 010 WSS is estimated at a total of 0.3 MI/day while the 2035 requirement is 0.5 MI/day.

Other areas of the Umzinyathi DM also benefit from the same resources serving this scheme. The 2015 water requirements for the additional areas in uMzinyathi DM is estimated at 19.0 MI/day, while the 2035 water requirement is estimated at 25.2 MI/day.

Thus the combined estimated 2015 water requirements for the Dannhauser LM areas in this WSS and uMzinyathi DM areas in the WSS is 19.3 MI/day and the 2035 water requirements is 25.7MI/day.

(b) Current Raw Water Sources

The combined historic yields for the local dam raw water sources provide an equivalent of 9.3 MI/day and are made up as follows:

Source	Historic Firm Yield (M m ³ /annum)	Equivalent Potential Supply (MI/day)
Tom Worthington & Verdruk Dams	1.9	5.2
Donald McHardy & Preston Pan Dams	1.1	3.0
Upper & Lower Mpate Dams	0.4	1.1
Total	3.4	9.3

In addition, the Operating rules indicate that the water allowed for abstraction from the Buffalo River Tayside Weir is based on the capacity of the abstraction infrastructure which is recorded and in theory as 14MI/day (equates to 5.11 million m³/a). However, operationally, the abstraction infrastructure can only deliver 10MI/day because of losses from leaks on the pipework. Thus the equivalent yield of the three dams and the Tayside Weir is 23.3MI/day in theory and practically 19.3MI/day.

(c) Available Abstraction and Water Treatment Capacity

The current future planning proposes that Biggarsberg WTW will also be decommissioned and the WSS areas affected will be supplied from the Ngagane System. This will require the construction of a pipeline extension of about 30km and estimated size 600mm diameter from Dannhauser to the area.

However, in the short term this WTW can be retained and its performance/capacity enhanced by replacing the existing abstraction pipeline from the Tayside Weir.

11.2 EMADLANGENI LM

As per section 6, the Emadlangeni LM has been demarcated into two WSS areas assessed hereunder:

- AMA 016: Utrecht town and urban areas
- AMA 009: Emadlangeni rural areas.

11.2.1 AMA 016 – UTRECHT

This WSS area (Utrecht, Bendsorp, Berouw, Khayaletu and White City) is served with treated from the Utrecht WTW.

(a) Current and Future Water Requirements

The 2015 water requirements for AMA 016 WSS are estimated at a total of 2.5 MI/day while the 2035 requirements are 4.6 MI/day.

(b) Current Raw Water Sources

The current WSS is supplied with raw water from the Dorps Dam and possibly the Nywerheids Dams. No information is available on the HFY of these dams. The 2015/2016 drought conditions resulted in the Dorps Dam running dry and water had to be provided from the Ngagane WTW. There is an existing pipeline connecting the Utrecht WSS to the Newcastle Madadeni/Osizweni WSS.

(c) Available Abstraction and Water Treatment Capacity

The supply area is currently served via the Utrecht WTW, which is reportedly operating at 2MI/day while it has a capacity to treat 4MI/day. Thus, this WTW has just under the capacity to satisfy 2035 water requirements as determined.

The current planning (refer to section 9.3.2) proposes the retirement of the WTW and incorporation of the WSS into the Ngagane WSS. It is recommended that at the stage of retirement of the WTW, a whole life economic assessment be undertaken to merit the retirement.

11.2.2 AMA 009 – EMADLANGENI RURAL

This area is either served with individual rudimentary schemes such as in Groenvlei, Kingstown and other farming communities or is not served at all.

(a) Current and Future Water Requirements

The 2015 water requirement for AMA 009 WSS is estimated at a total of 2.5 MI/day while the 2035 requirements are 4.6 MI/day.

(b) Available Abstraction and Water Treatment Capacity

There is no conventional water treatment works serving the area. The Amajuba DM has commenced a project to identify boreholes for the supply of water to the area. Because of the extent of the area and the sparse population distribution it will be uneconomical to implement a conventional reticulated water supply.

11.3 NEWCASTLE LM

As per section 6, the Newcastle LM has been demarcated into five WSS areas assessed hereunder:

- AMA 001: Amajuba Forest,
- AMA 002: ArcelorMittal;
- AMA 011: Charlestown (Greater Volksrust WSS);
- AMA 012: Newcastle , Osizweni, Madadeni; and
- AMA 013: Newcastle Rural Areas.

11.3.1 AMA 001 – AMAJUBA FORESTS

This WSS area is likely served with an individual rudimentary scheme - obtaining water from boreholes.

(a) Current and Future Water Requirements

The 2015 and 2035 water requirement for the AMA 001 WSS is estimated to be under 0.1 Ml/day.

(b) Available Abstraction and Water Treatment Capacity

There is no conventional water treatment works serving the area. Because of the extent of the area and the sparse population distribution is will be uneconomical to implement a conventional reticulated water supply.

11.3.2 AMA 002 – ARCELORMITTAL

This WSS area, located just north of Newcastle, is served by a privately owned and run WTW.

(a) Current and Future Water Requirements

The present and 2035 water requirements for this WSS area have not been determined.

(b) Available Abstraction and Water Treatment Capacity

There is no information available for the privately owned water treatment works serving the area.

(c) Raw Water Source

It is understood that this system's raw water source is the Ngagane River.

11.3.3 AMA 011 – CHARLESTOWN

This WSS area is served with treated water purchased from Dr Pixley ka Isaka Seme LM, from the Volksrust WTW.

(a) Current and Future Water Requirements

The 2015 water requirement for the AMA 011 WSS is estimated at a total of 0.9 MI/day while the 2035 requirement is 1.2 MI/day. Additional areas in Gert Sibande DM obtaining water from the same WSS have a 2015 water requirement estimated at 3.4MI/day while the 2035 is estimated at 4.3MI/day. Thus the total water requirement for 2015 is 4.3MI/day while the 2035 requirement is 5.5MI/day.

(b) Current Raw Water Sources

The current WSS is supplied with treated water purchased from the Dr Pixley ka Isaka Seme LM, treated at the Volksrust WTW, which obtains its water from the Balfour and Schuilhoek Dams. The treatment works has a hydraulic capacity of 4.0MI/day.

The NLM (Refer section 9.3.4) has commenced a project for the development of a separate WSS to supply Charlestown. This project will be considered in Chapter 12 as an intervention.

11.3.4 AMA 012 – NEWCASTLE, OSIZWENI, MADADENI

This scheme area is served by the Ngagane Water Treatment Works. From current planning strategies, the Ngagane Treatment Works will be upgraded further to be able to supply additional areas, including the following:

- Dannhauser Areas supplied via the Durnacol and Dannhauser WTW's (AMA 004 and AMA 008)
- Utrecht (AMA 016)
- Dannhauser Areas with WSS AMA 005 and AMA 014 (Buffalo Flats South and North) and
- Areas in both ADM and Umzinyathi DM currently supplied from Biggarsberg WTW.

The theoretical water requirements will therefore take into account inclusion of these WSS areas.

(a) Current and Future Water Requirements

The 2015 water requirements are estimated at a total of 117.6MI/day while the 2035 requirements are 161.3MI/day, respectively and as illustrated in the table overleaf.

WSS	Water Requirements (MI/d)	Water Requirements (MI/d)
	2015	2035
AMA 012	97.0	127.8
AMA 004 & AMA 008	3.0	4.0
AMA 005 & AMA 014	10.8	15.4
AMA 003	0.6	0.8
AMA 010	19.3	25.7
AMA 016	1.9	2.5
Total	132.6	176.2

It is noted that for AMA 010 the quantities of 19.3MI/day in 2015 and 25.7MI/day in year 2035 include areas in the uMzinyathi DM that are to be served in this WSS.

The total water requirements convert to an annual water requirement of 48.53 Mm³ /annum for 2015 and 64.49 Mm³ /annum for 2035.

(b) Available Abstraction and Water Treatment Capacity

The Ngagane WTW currently treats raw water from three sources, Ntshingwayo Dam, Ngagane River and the Buffalo River.

- Ntshingwayo Dam via two pipelines (590 mm diameter concrete and 590 mm diameter steel) which can deliver 72MI/day. Following repair work currently in progress on the pipelines, it is expected that these pipes would deliver 80 MI/day.
- Raw water pipeline from Buffalo River with a capacity to deliver up to 25MI/day, depending on river levels
- A direct pipeline from the Ngagane River, which delivers 18MI/day. Newcastle LM is implementing a project to increase the delivery of this pipeline to 30MI/day by upgrading the existing pump station.

On successful completion of the above, the capacity of raw water infrastructure to serve the Ngagane WTW will be increased to over 120MI/day.

(c) Registered Use

The registered water use for the system is 138 MI/day made up of the following:

- Ntshingwayo Dam with a registered use of 90.4 MI/day. An application has been made to DWS to increase this use to 145 MI/day,
- Buffalo River with registered use of 30MI/day. The existing infrastructure can only convey 10MI/day from the river to the Water treatment works,
- Ngagane River with a registered use of 30MI/day.

When the Newcastle Municipality succeeds in increasing the registered use from the Ntshingwayo Dam as a raw water source to 145MI/day, the total registered use for this system will be 205MI/day.

(d) Water Treatment Capacity

Records indicate that the Ngagane WTW has been operating at 111 MI/day. A project to optimise the treatment works is currently in progress and will improve the plant performance so that it is able to treat 120MI/day.

(e) Delivery / Distribution Infrastructure comprises the following:

- 3 no. pipelines from Ngagane WTW to Newcastle (400mm diameter and 2 no. 600mm diameter, with an estimated capacity of 10.5MI/hour
- 3 no pipelines from Ngagane WTW to Braakfontein Reservoirs (2 no. 600mm diameter and 1 no. 375 mm diameter ac pipeline), with an estimated capacity of 10.3MI/hour.

The system can therefore potentially distribute an estimated amount of 240MI/day with a peak factor of two.

(f) Reservoir Storage

The WSS area has bulk reservoirs of capacity 120 MI. The required capacity for the WSS area is 270MI for all areas to be supplied from the Ngagane system.

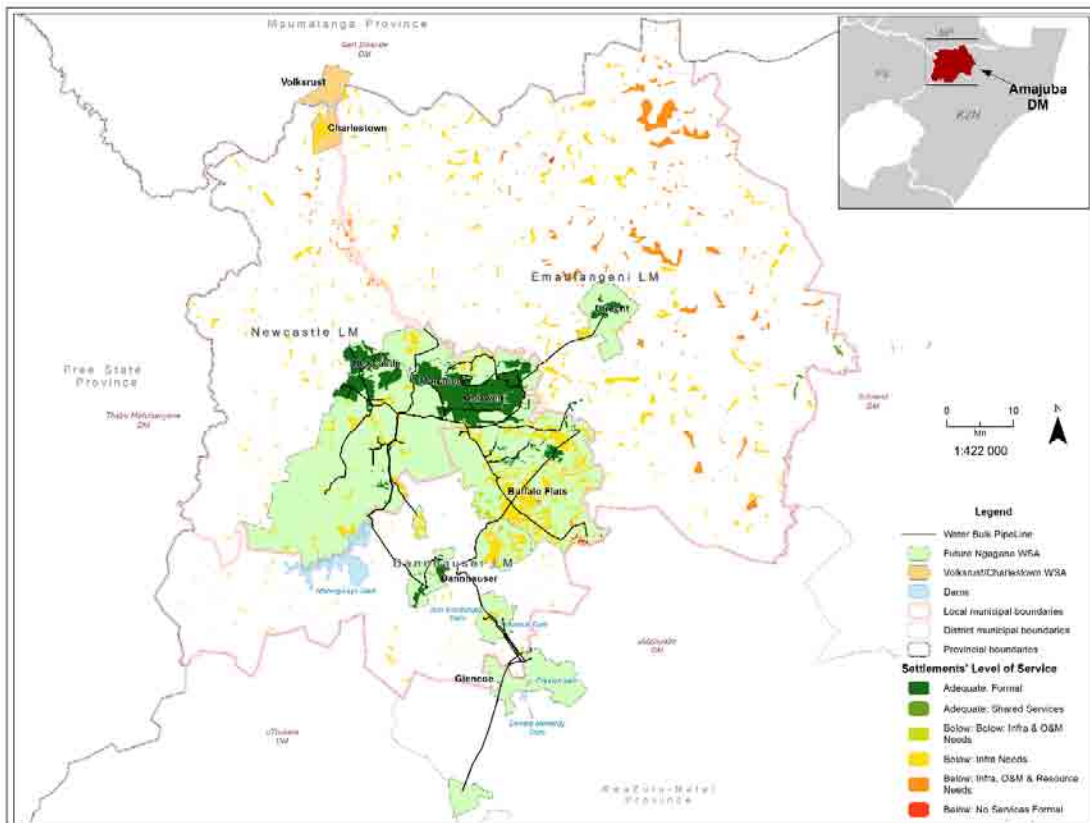
12. BULK WATER SUPPLY INTERVENTIONS CONSIDERED – RECONCILIATION

This section develops the needs of each WSS based on the synopsis provided in section 11 of this report.

For the interventions, proposed, and as further discussed in this section, the NLM and ADM will be supplied from the following conventional WSS's;

- The Ngagane WSS redefined to include the following:
 - Dannhauser LM areas served by Durnacol WTW and/or Dannhauser WTW on the premise that the two existing WTW's will be retired,
 - The Dundee/Glencoe areas in Dannhauser LM and Endumeni LM, on the premise that the Biggarsberg WTW will be retired,
- The proposed Charlestown WTW as proposed by the NLM, with its raw water source as of-river abstraction downstream of the Zaaiohoek Dam.

All other areas will be supplied from rudimentary stand-alone schemes as it is considered uneconomical to supply these via a reticulated conventional WSS. The re-defined WSS's are illustrated in the following Figure.



The proposals in this report are still subject to further feasibility studies, including whole life cost assessments against other potential solutions.

Again, the WSS areas are discussed under the relevant LM's using the codes and names.

12.1 DANNHAUSER LM

As per section 6, the Dannhauser LM has been demarcated into eight WSS areas assessed hereunder:

- AMA 003: Ngagane/Skombaren
- AMA 004: Dannhauser Urban
- AMA 005 & AMA 014: Buffalo Flats South and Buffalo Flats North
- AMA 006: Dannhauser Rural
- AMA 007: Dannhauser/Glencoe Rural
- AMA 008: Durnacol
- AMA 010: Hattingspruit Bright Home and Springlake Colliery

12.1.1 AMA 003 – NGAGANE/SKOMBAREN

This WSS area is served with treated water via a pipeline of undisclosed size and material. It is assumed that the pipeline provided to feed the area is adequate, *however, this will need to be confirmed.*

The requirements for this area would then be a reservoir facility to store treated water to provide security of supply, i.e. reservoir of capacity of 2MI. This can either be situated in the area, at a strategic location or anywhere in between the Ngagane Treatment Works and WSS area.

12.1.2 AMA 004 & AMA 008 – DANNHAUSER URBAN & DURNACOL

The decommissioning of the two treatment works (Dannhauser & Durnacol) in the future (no time indications are available) will require construction of the following:

- Pipeline from the Ngagane WTW to the WSS area capable of delivering 4.0MI/day to this area. In addition, it will have to be able to cater for the demands of the area currently served by Biggarsberg whose water requirement for 2035 is estimated to be 25.2MI/day. Thus the pipe should be able to deliver 29.2MI/day. . The size of this pipeline is estimated at 600mm diameter x 35km long, The size of this pipeline has been estimated for further extension to cater for the supply to WSS area AMA 010 Hattingspruit,
- No details are available for the capacity of existing reservoirs, thus it has been assumed that reservoir(s) of capacity of 4MI will be required, subject to confirmation at the time of implementation.

12.1.3 AMA 005 & AMA 014 – DANNHAUSER: BUFFALO FLATS SOUTH AND BUFFALO FLATS NORTH

These two water supply scheme areas are currently supplied via the Ngagane WTW via bulk pipelines from Braakfontein Reservoirs and boreholes. The main pipeline into Buffalo Flats is an off-take of a 450 mm diameter AC pipeline conveying water from the Braakfontein Road Osizweni and Utrecht.

The pipelines supplying the area do not have the capacity to meet the 2035 water requirements, thus the following will be required:

- A replacement pipeline of diameter 450mm and estimated length of 10 km. The existing pipeline is indicated as an AC pipeline and it is assumed that the pipe will be subject to replacement in future in a replacement programme in line with the general trends.
- Reservoir capacity of 15MI (estimated).

12.1.4 AMA 006 & AMA 007– DANNHAUSER & GLENCOE RURAL

These WSS areas do not have conventional water services infrastructure with water sources being either boreholes or springs. Because of the sparsely distributed population, it is expected that the areas could be served further as required with rudimentary supplies. No projects are thus proposed as part of this study.

12.1.5 AMA 010 – HATTINGSPRUIT BRIGHT HOME AND SPRINGLAKE COLLIERY

The Dundee and Glencoe WSS includes the towns of Bright Home, Dundee, Hattingspruit, KwaTelapi, Ruigtefontein, Shroeders Hope, Sibongile, Sithembile, Springlake Colliery Mine and Wasbank. Hattingspruit, Bright Home and Springlake Colliery Mine are within the Amajuba DM and the other areas within the uMzinyathi DM. The scheme area is discussed further.

The existing raw water sources with HFY of 23.3 MI/day (refer to section 11.1.5) has the capacity to service the 2015 WSS water requirements of 19.3MI/day.

The 2035 water requirement is estimated at 25.7MI/day which is above the possible available yield. The yield is limited by the raw water infrastructure delivering from the Tayside Weir. Should the infrastructure be repaired, the HFY will be in the order of 23.3 MI/day. Thus, it appears logical to retain the Biggarsberg WTW.

In terms of the future planning documents (refer to section 9.3), the Biggarsberg WTW will be decommissioned and treated water will be supplied from the Ngagane WTW. This will require the construction of a pipeline 30km from Durnacol to the WSS area. The size of pipeline is estimated to be a 600mm diameter pipeline.

Thus the proposals in this report are for the following development:

- Pipeline from Durnacol to Biggarsberg WTW (30km x 600mm diameter),
- Construction of storage reservoirs with estimated capacity of 15 MI.

It is proposed that the Biggarsberg WTW, however, be retained as a back-up system, contrary to current planning strategies.

It is further noted that the water requirements catered for include those for the areas served by this system and are in the uMzinyathi DM (the area of Stratford / Talana may be connected in future).

12.2 EMADLANGENI LM

As per section 6, the Emadlangeni LM has been demarcated into two WSS areas assessed hereunder:

- AMA 016: Utrecht Urban
- AMA 009: Emadlangeni Rural

12.2.1 AMA 016 – UTRECHT URBAN

For this WSS the following is required:

- Confirmation of the adequacy of raw water sources,
- Confirmation of adequacy of the pipeline from the Ngagane System. Based on the water requirements, this pipe would have to be of diameter up to 300mm diameter. This pipeline has been excluded in the proposals for new infrastructure.
- Reservoir storage of 5MI/day.

12.2.2 AMA 009 – EMADLANGENI RURAL

This WSS area is either served with individual rudimentary schemes such as in Groenvlei, Kingstown and other farming communities or is not served at all.

(a) Current and Future Water Requirements

The 2015 water requirements for the AMA 009 WSS are estimated at a total of 1.9 MI/day while the 2035 requirements are 4.6 MI/day.

(b) Available Abstraction and Water Treatment Capacity

There is no conventional water treatment works serving the area.

Because of the sparsely distributed population, it is expected that the areas could be served further as required with rudimentary supplies. No projects are thus proposed as part of this study, however, the study: First Order Water Services Master Plan for the rural areas of the Emadlangeni Local Municipality, (UWP, 2014) already developed conceptual scheme areas, including the estimated costs for implementation.

12.3 NEWCASTLE LM

As per section 6, the Newcastle LM has been demarcated into five WSS areas assessed hereunder:

- AMA 001: Amajuba Forest
- AMA 002: ArcelorMittal
- AMA 011: Charlestown & surrounding areas

- AMA 012: Newcastle , Osizweni, Madadeni
- AMA 013: Newcastle Rural

12.3.1 AMA 001 – AMAJUBA FOREST

This WSS area is either served with individual rudimentary schemes or is no served at all. No plans are proposed for additional bulk services' to meet current and future water requirements.

12.3.2 AMA 002 – ARCELORMITTAL

This WSS area is served by a privately owned and run WTW. No plans are proposed for additional bulk services' work.

12.3.3 AMA 011 – CHARLESTOWN & SURROUNDING AREAS

This WSS area is served with treated water purchased from Dr Pixley ka Isaka Seme LM. Proposed interventions will be in line with proposals by NLM (refer to section 9.3.4). This will entail the development of the following:

- A weir on the Buffalo River downstream of Zaaihoek Dam, together with abstraction infrastructure,
- Raw water pipeline from the weir to a proposed WTW, size 315 mm diameter x 4km long
- Construction of a new WTW capable of treating 2 Ml/day,
- Reservoir storage estimated at 2Ml/day

This will cater for the needs of the NLM only.

12.3.4 AMA 012 – NEWCASTLE, OSIZWENI, MADADENI

The Ngagane WTW serves this scheme area. From current planning strategies and/or proposals in this report, the Ngagane System will be upgraded further to be able to supply additional areas as follows:

- Construction of the following raw water infrastructure:
 - New raw water pipeline from Ntshingwayo Dam to Ngagane WTW. The size of pipeline would be at least 750mm diameter and 20km long and will replace the existing concrete pipeline and cater for the additional water, following registration of usage from the Ntshingwayo Dam of 145Ml/day.
- Ensure unaccounted for water is reduced to 20% by 2035.
- Upgrade of the Ngagane WTW from a capacity of 120Ml/day to 180Ml/day. The uThukela Water Master Plan further proposes that a new WTW be constructed at the Ntshingwayo Dam, as replacement to the Ngagane WTW, after the Ngagane WTW has been upgraded to 160Ml/day. The proposals in this report are not aligned to the Water Master Plan, in this regard, i.e. all upgrades are envisaged at the Ngagane WTW. Refer to Annexure D.

- Construction of additional storage reservoirs of combined capacity of 50MI, it being noted that other reservoir facilities have been provided for in the different WSS areas and that existing reservoir capacity for this WSS area is estimated at 147MI.

12.3.5 AMA 013 – NEWCASTLE RURAL

This WSS area is either served with individual rudimentary schemes or is not served at all – most are however farming communities.

There is no conventional water treatment works serving the area.

Because of the sparsely distributed population, it is expected that the areas could be served further as required with rudimentary supplies. No projects are thus proposed as part of this study.

13. RECOMMENDATIONS

This section recommends projects that have been identified and provides cost estimates and proposal for timing. These projects are illustrated in Annexure C.

The total project costs are R2 362.34M broken down as follows in **Table 13**. The estimated costs for construction assume the following:

- Where there is no available information on existing storage facilities, the reservoir capacities for all WSS areas are based on total requirements for year 2035, and assumed existing storage capacity.
- Only costs for bulk infrastructure have been provided.

Table 13 Total Project Cost

Local Municipality	WSS Area	Reservoirs	Pipelines	WTW Upgrade	Total (Rand, million)
Dannhauser	AMA 003	2 ML	N/A	N/A	15.53
	AMA 004 & AMA 008	4 MI	35km x 600mm dia pipeline	N/A	505.63
	AMA 005 & AMA 014	15 MI	10km x 450mm dia	N/A	142.06
	AMA 006 & AMA 007	N/A	N/A	N/A	N/A
	AMA 010	15 MI	30km x 600mm dia pipeline	N/A	311.27
Sub-Total LM					974.49
Emadlangeni	AMA 009	N/A	N/A	N/A	N/A
	AMA 015	N/A	N/A	N/A	N/A
	AMA 016	5 MI	N/A	N/A	27.70
Sub-Total LM					27.70
Newcastle	AMA 001	N/A	N/A	N/A	N/A
	AMA 002	N/A	N/A	N/A	N/A
	AMA 013	N/A	N/A	N/A	N/A
	AMA 011	2 MI	4km x 315 dia raw water pipeline	2MI	68.40
	AMA 012	50 ML	20km x 750mm dia raw water pipeline (Ntshingwayo) & 20km x 800 mm dia (Buffalo River)	60MI upgrade of Ngagane WTW	1 291.75
Sub-Total LM					1 360.15
TOTAL FOR AMAJUBA DM					2 362.34

The projects are further discussed per LM area.

13.1 DANNHAUSER LM

The estimated costs for construction, for proposed infrastructure in the LM, assume the following:

- As there is no available information on existing storage facilities, the reservoir capacities for all WSS areas are based on the total requirements for year 2035 and estimated capacity of existing reservoir storage.
- The rural areas of Glencoe and Dannhauser (AMA 006 and AMA 007) are excluded from the costing of infrastructure,
- Only costs for bulk infrastructure have been provided.

13.1.1 PHASING

The recommended order of undertaking work would be as follows, starting with the highest priority:

- Construction and commissioning of bulk pipelines from the Ngagane WTW to Dannhauser and Durnacol to be followed by decommissioning of the Dannhauser and Durnacol WTW's.
- Construction of further bulk pipelines from Dannhauser to WSS area AMA 010: Hattingspruit, Bright Home and Springlake Colliery, followed by the decommissioning of Biggarsberg WTW,
- Construction of the new replacement pipeline to serve Dannhauser from the Braakfontein Reservoirs.
- Construction of storage facilities.

Bulk Pipelines are to be constructed as soon as funding permits and the target completion is by 2020. The remainder could then be done gradually to 2035.

Based on the above, the cash flows have been estimated as follows:

Year	Activity	Annual Expenditure (RM)	Cumulative Expenditure (RM)
2017	Bulk Pipelines	175.00	175.00
2018		175.00	350.00
2019		175.00	525.00
2020		175.00	700.00
2021	Storage & Remainders	274.49	974.49

13.2 EMADLANGENI LM

The estimated costs for construction assume the following:

- As there is no available information on existing storage facilities, the reservoir capacities for all WSS areas are based on total requirements for year 2035, and assumed existing storage capacity.

- The Utrecht WTW will be decommissioned as per current planning and supplied from the Ngagane WTW. The existing pipeline from the Ngagane system has been considered as adequate and no replacement pipeline has been included.
- The infrastructure for rural areas of Emadlangeni (AMA 009) are excluded from the costing of infrastructure,
- Only costs for bulk infrastructure have been provided.

13.2.1 PHASING

The construction of all work can be targeted for 2020. Based on this, the cash flows could be as follows:

Year	Activity	Annual Expenditure (RM)	Cumulative Expenditure (RM)
2017	Storage	8.00	8.00
2018		8.00	16.00
2019		6.00	22.00
2020		5.70	27.70

13.3 NEWCASTLE LM

The estimated costs for construction assume the following:

- Based on the reservoir information of existing reservoir capacity, additional reservoir capacity required for 2035 water requirements would be 50MI. This can be developed progressively up to 2035.
- The preferred source of supply is Ntshingwayo Dam. A replacement pipeline (to replace the existing concrete pipeline) has been proposed to cater for the total abstraction of 145MI/day. NLM will need to obtain permission to increase abstraction from the Ntshingwayo Dam from the DWS.
- The Ngagane WTW will be upgraded from 120MI/d to treat 180MI/day by year 2035. See further details for comparison of a new WTW at the Ntshingwayo Dam, in **Annexure D**.
- The raw water gravity main from the Buffalo River will be replaced, subject to a condition assessment.
- The infrastructure for the rural areas of the Newcastle LM (AMA 013) and Amajuba Forests (AMA 001) are excluded from the costing.

The NLM has a business plan to develop a separate scheme for the Charlestown area. The costs have been included. Alternatively, this area can continue to be served from Dr Pixley ka Isaka Seme LM. This will require the NLM to exercise due diligence and conclude the Service Level Agreement.

Moreover the water requirements for this area are not foreseen to increase significantly up to the projected period of 2035.

Only costs for bulk infrastructure have been provided.

13.3.1 PHASING

The proposals in this report assume that the NLM continues with efforts to reduce Non-Revenue Water to acceptable levels. This would allow the progressive development of infrastructure to meet the future water requirements up to 2035.

The recommended order of undertaking work would be as follows, starting with the highest priority:

- Finalising the water use license to extract 145MI/d from the Ntshingwayo Dam,
- Construction of the raw water pipeline from Ntshingwayo Dam to Ngagane WTW. This work can be targeted for completion by 2020,
- Replacement of the raw water pipeline abstracting water from the Buffalo River, subject to a condition assessment
- Upgrade of the Ngagane WTW by another 60MI/day and work to be completed by 2025, ,
- Construction of reservoir facilities.

Bulk Pipelines are to be constructed as soon as funding permits and the target completion date is by 2020. The remainder could then be done gradually to 2035.

Based on this, the cash flows could be as follows:

Year	Activity	Annual Expenditure (R)	Cumulative Expenditure (R)
2017	Raw Water Pipeline	10.00	10.00
2018		80.00	90.00
2019		80.00	170.00
2020		30.00	200.00
2021	Upgrade of Ngagane WTW	220.00	420.00
2022		220.00	640.00
2023	Storage Facilities	220.00	860.00
2024		300.00	1 160.00
2025		200.15	1 360.15

ANNEXURE A – REFERENCES



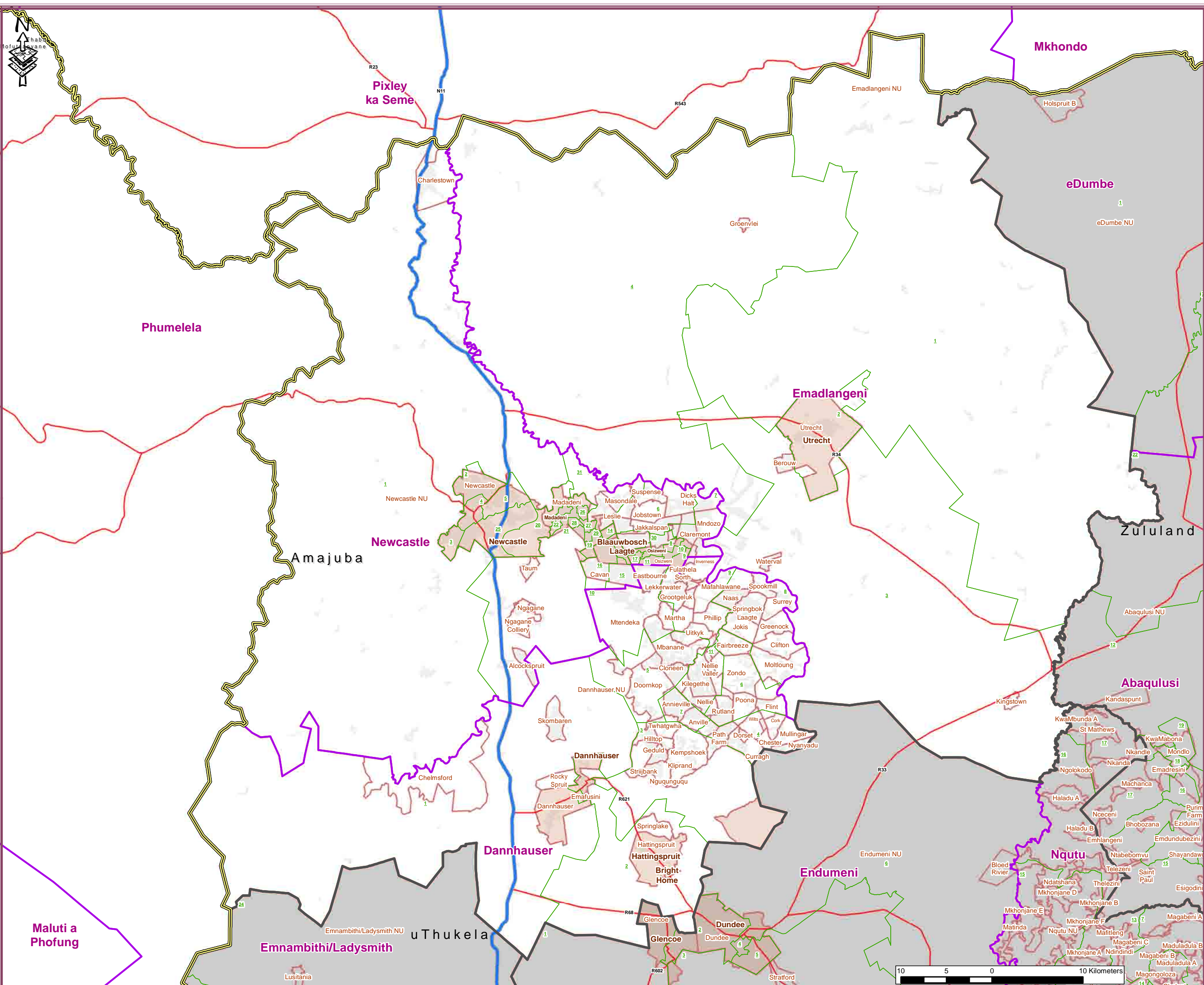
REFERENCE LIST

UWP (October 2014)		First Order Water Services Master Plan for The Rural Areas of Emadlangeni Local Municipality
Amajuba Municipality (2015)	District (March)	Integrated Development Plan
Amajuba Municipality	District	5 Year Strategic Management Plan for the Reduction of Non-Revenue Water in the Amajuba District Municipality
Amajuba Municipality	District	Integrated Development Planning – Framework Plan 2014/15 IDP Review Process
Amajuba Municipality 2014/2015	District	Draft Annual Report 2014/2015
Newcastle Municipality		Newcastle Integrated Development Plan 2012 to 2017
Amajuba Municipality (2014)	District (June)	Engineering Projects Progress Report
Jon Lijnes Pr Eng (June 2014)		Ncandu Dam Affordability Study Final Report
Urban-Econ Development Economists (March 2014)		Newcastle Local Municipality Economic Scenario Report
Ncandu Water (Pty) Ltd (26 April 2013)		Ncandu Dam Project Bid Document
Newcastle Municipality (March 2014)		SDF Review Process Plan 2014/2015
Department of Water Affairs (2014)		Baseline Determination: Blue Water Services Audit Criteria 6
Department of Water Affairs (February 2012)		Water Supply & Drought Operating Rules for Stand Alone Dams and Schemes Typical of Rural/Small Municipal Water Supply Schemes
Water for Africa (June 2011)		Development of Water Reconciliation Strategy for all Towns in the Eastern Region
Nqabashe Consulting Engineers (January 2015)		Water Conservation and Demand Management for Madadeni
Pawacons (Pty) Ltd		Osizweni WCDM Project
MN Pawandiwa Pr Eng (February 2015)		Water Supply Status Report Development Planning Information

Department of Water Affairs (July 2014)	Bulk Water Supply and Waste Water Treatment Works for Charlestown
Umzinyathi District Municipality (2014)	Update of the Reconciliation Strategy of the Dundee/Glencoe Supply Area.
Amajuba District Municipality (2014)	Master Plan Water Supply
Department of Water and Sanitation. (2014)	Emergency Water Supply to Ramaphosa Settlement and Hattingspruit
Department of Cooperative Governance and Traditional Affairs. (2014)	Development of Universal Access Plan for Amajuba District Municipality.
Amajuba District Municipality (2014)	First Order Water Services Master Plan For The Rural Areas of Emadlangeni Local Municipality.
Umgeni Water. (2015)	Meeting Munites No.1 for Universal Access Plan Phase 2-Progressive Development of a Regional Concept Plan for the Amajuba DM, Newcastle LM and Uthukela DM.
Department of Water and Sanitation (2014)	Update of the Reconciliation Strategy of the Ntshingwayo Dam Supply Area.
uThukela Water (Pty) Ltd, January 2016	uThukela Water (Pty) Ltd, Monthly Operational Report
Author not stated, July 2014	Bulk Water Supply and Waste Water Treatment Works for Charlestown of the Newcastle Municipality: Business Plan
Jeffares & Green (Pty) Ltd, November 2011	Bulk Water Services Master Plan

ANNEXURE B – MAP SERIES

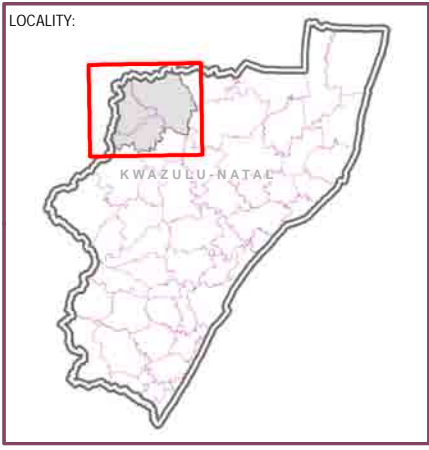




Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

CONSULTANTS:

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 PO Box 25549, Monument Park
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Project No.: 27811

PROJECT TITLE

**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:

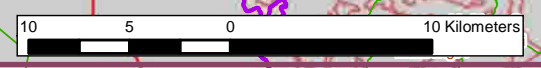
**General Orientation
 Study Area**

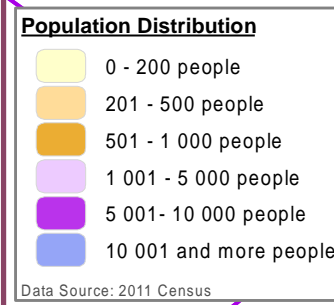
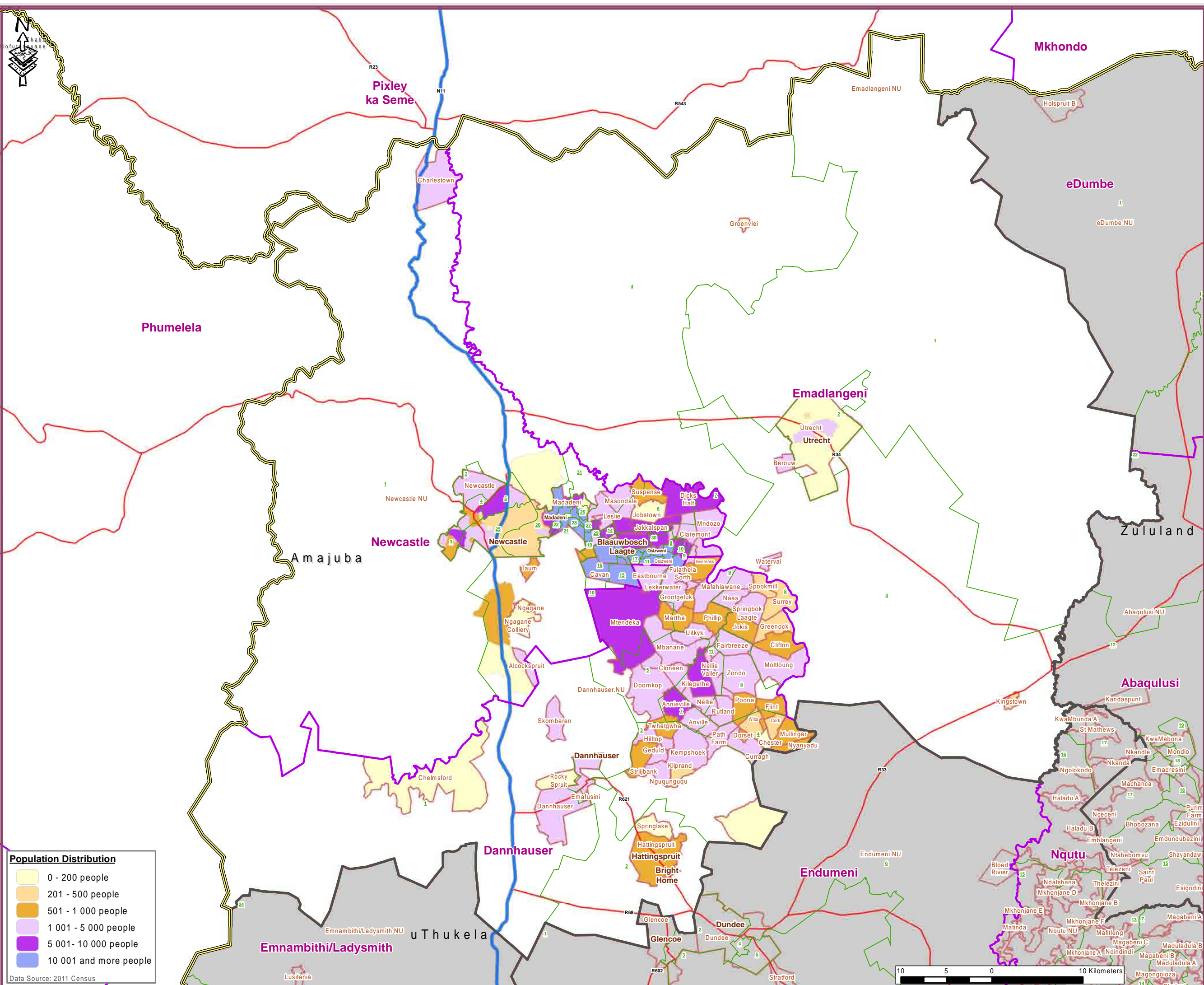
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2016/06/22

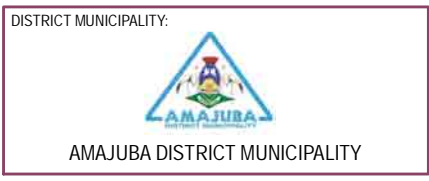
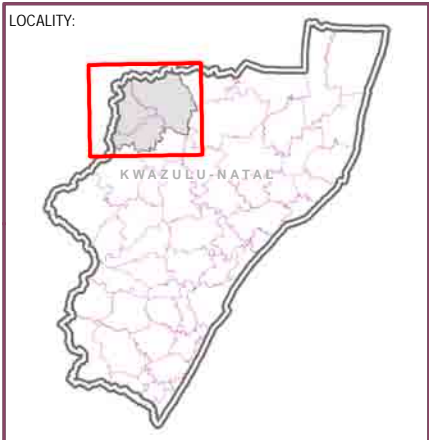
MAP NO.:

DC25_Figure 1





- Legend**
- Provincial Boundaries
 - District Municipality Boundaries
 - Local Municipality Boundaries
 - Ward Boundaries & Numbers
 - Census Main Places
 - National Roads
 - Main Roads



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 Supply Master Plan**

MAP TITLE:

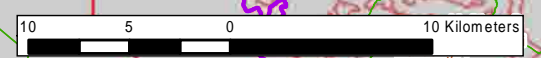
**General Orientation
 Population Distribution**

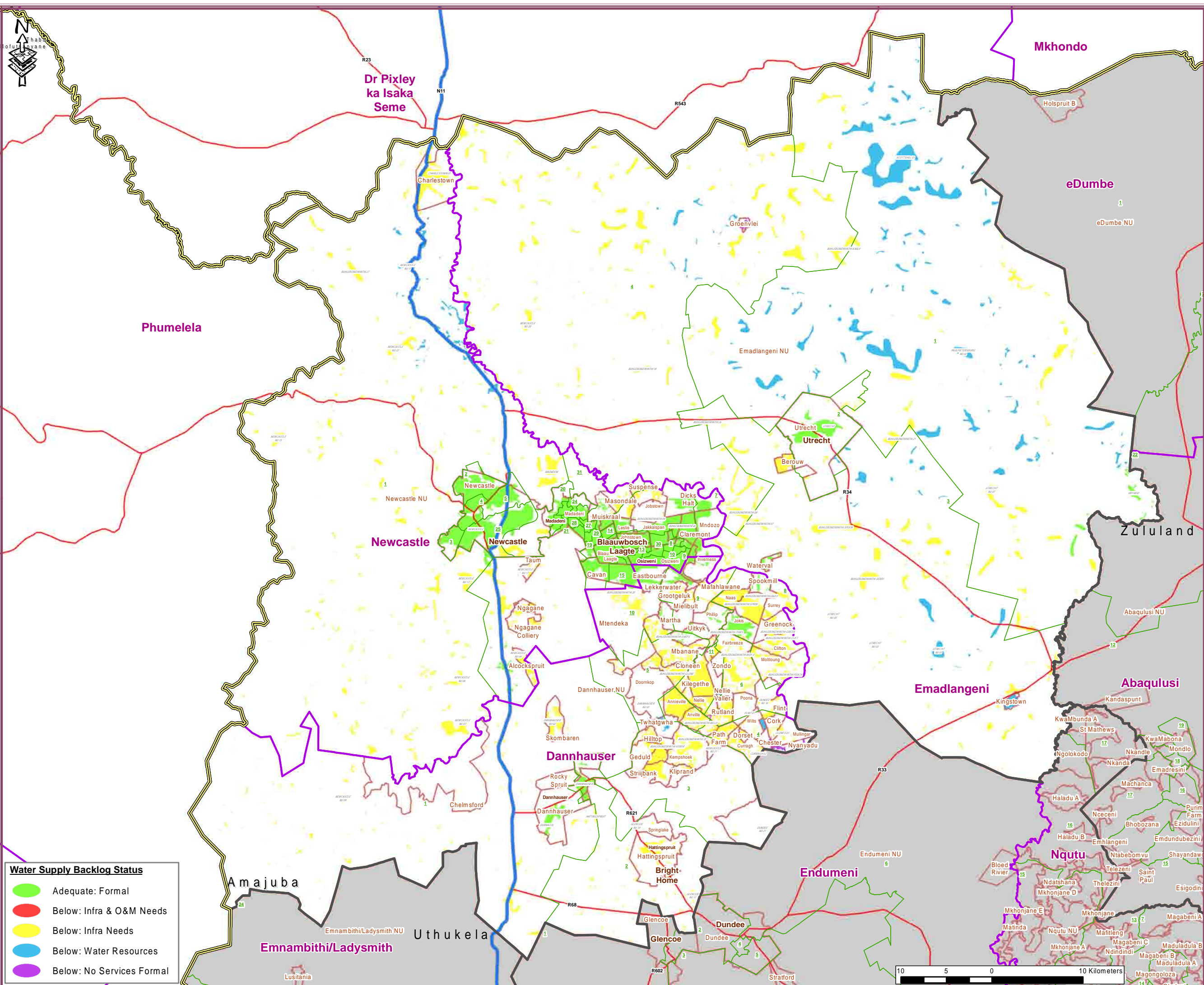
DATE COMPLETED:

2016/03/31

MAP NO.:

DC25_Figure 2



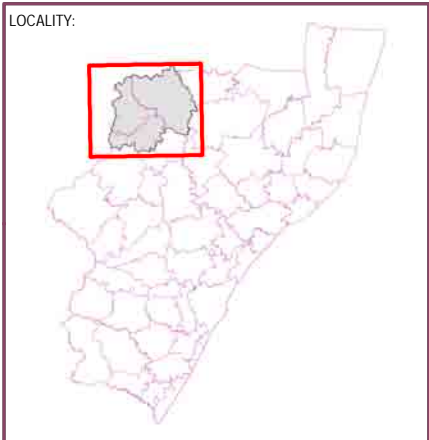


Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads



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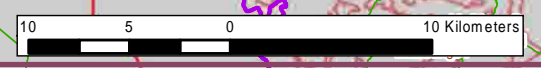
Project No.: 27811

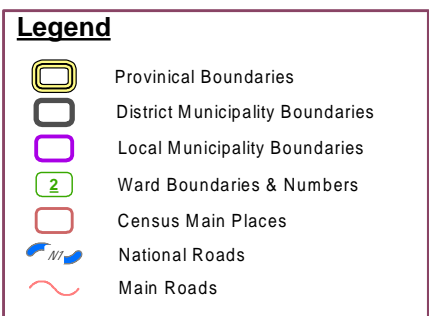
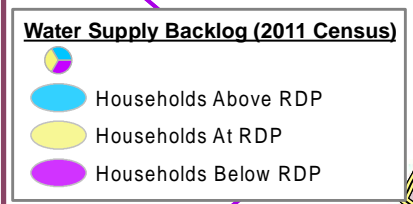
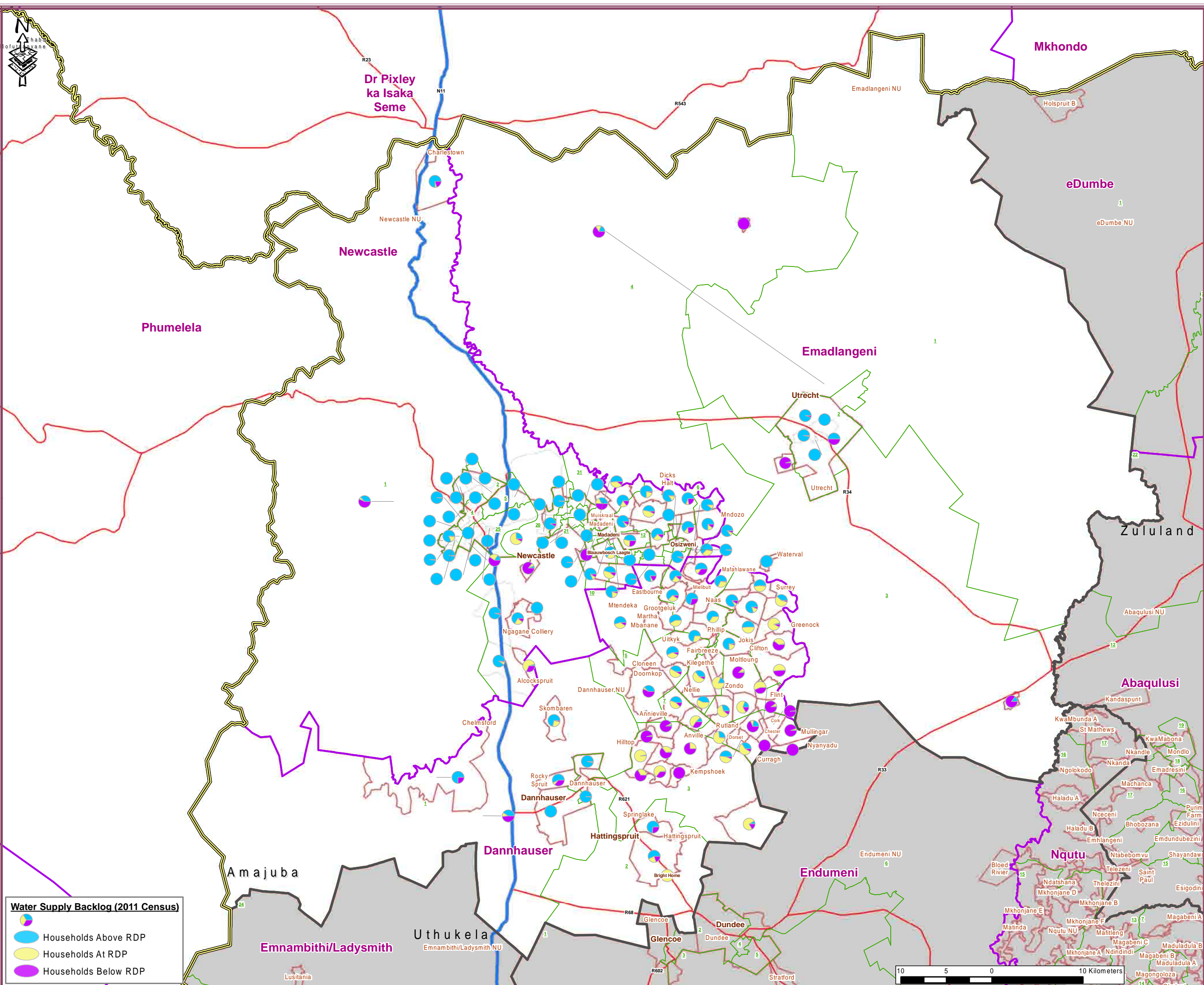
PROJECT TITLE:
**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:
Water Supply Backlog Status

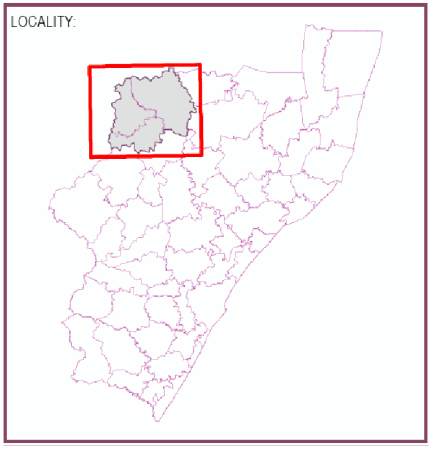
DATE COMPLETED: 2016/06/20

MAP NO.: **DC25_Figure 3**





DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE:

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

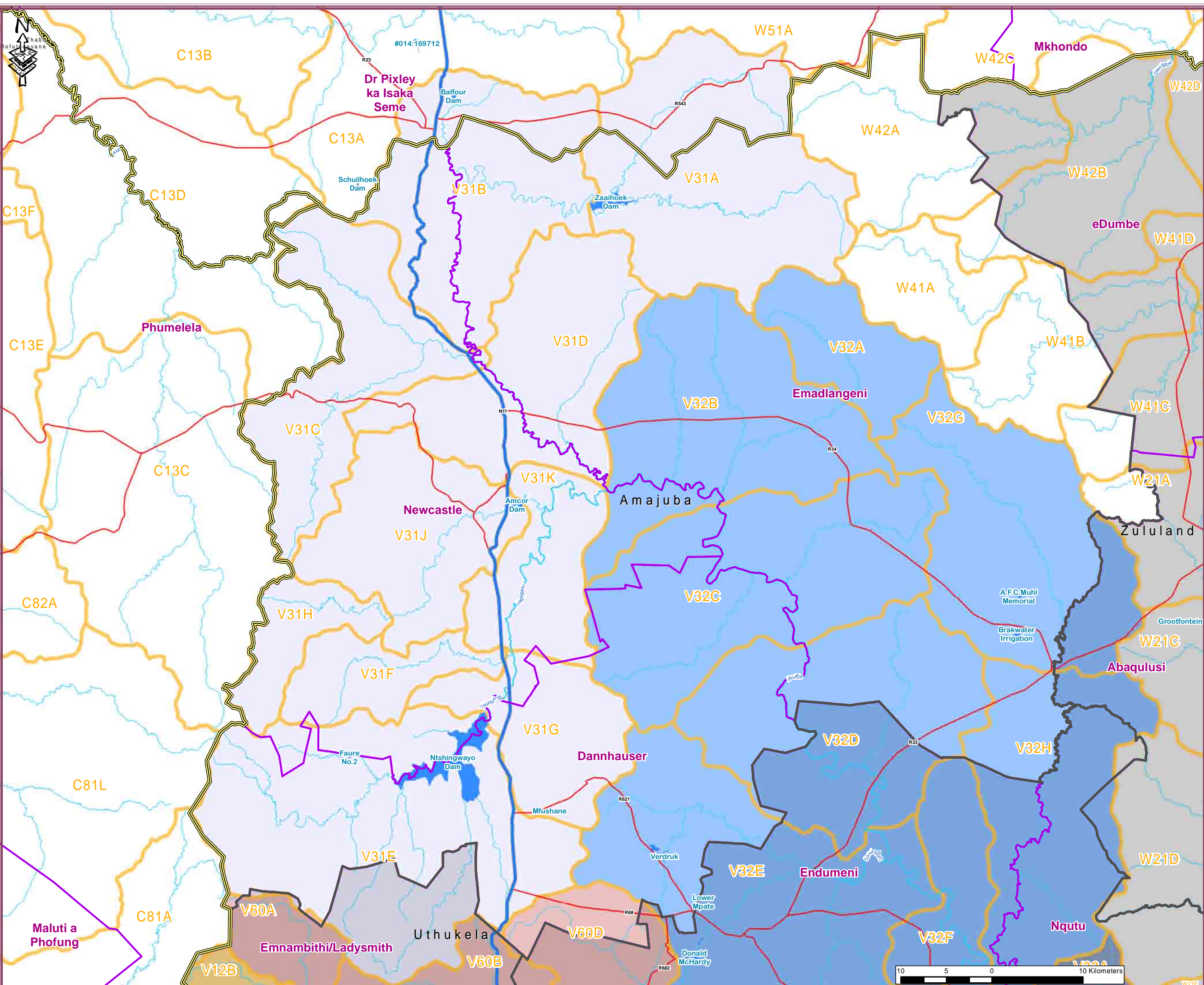
Water Supply Backlog 2011 Census

DATE COMPLETED:

2016/03/31

MAP NO.:

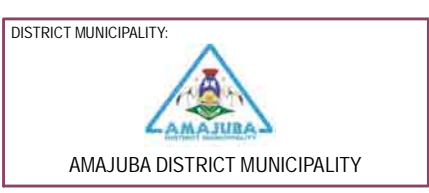
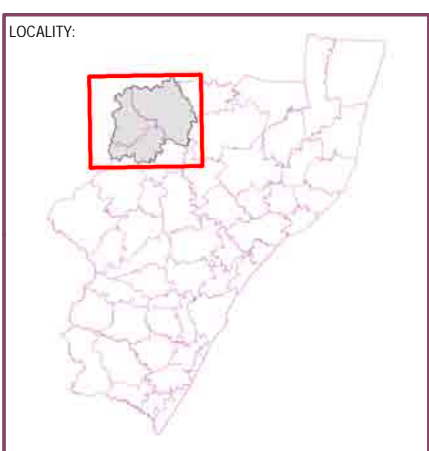
DC25_Figure 4



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Census Main Places
- National Roads
- Main Roads
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers
- Quaternary Catchments

DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

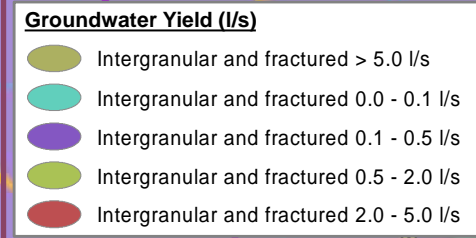
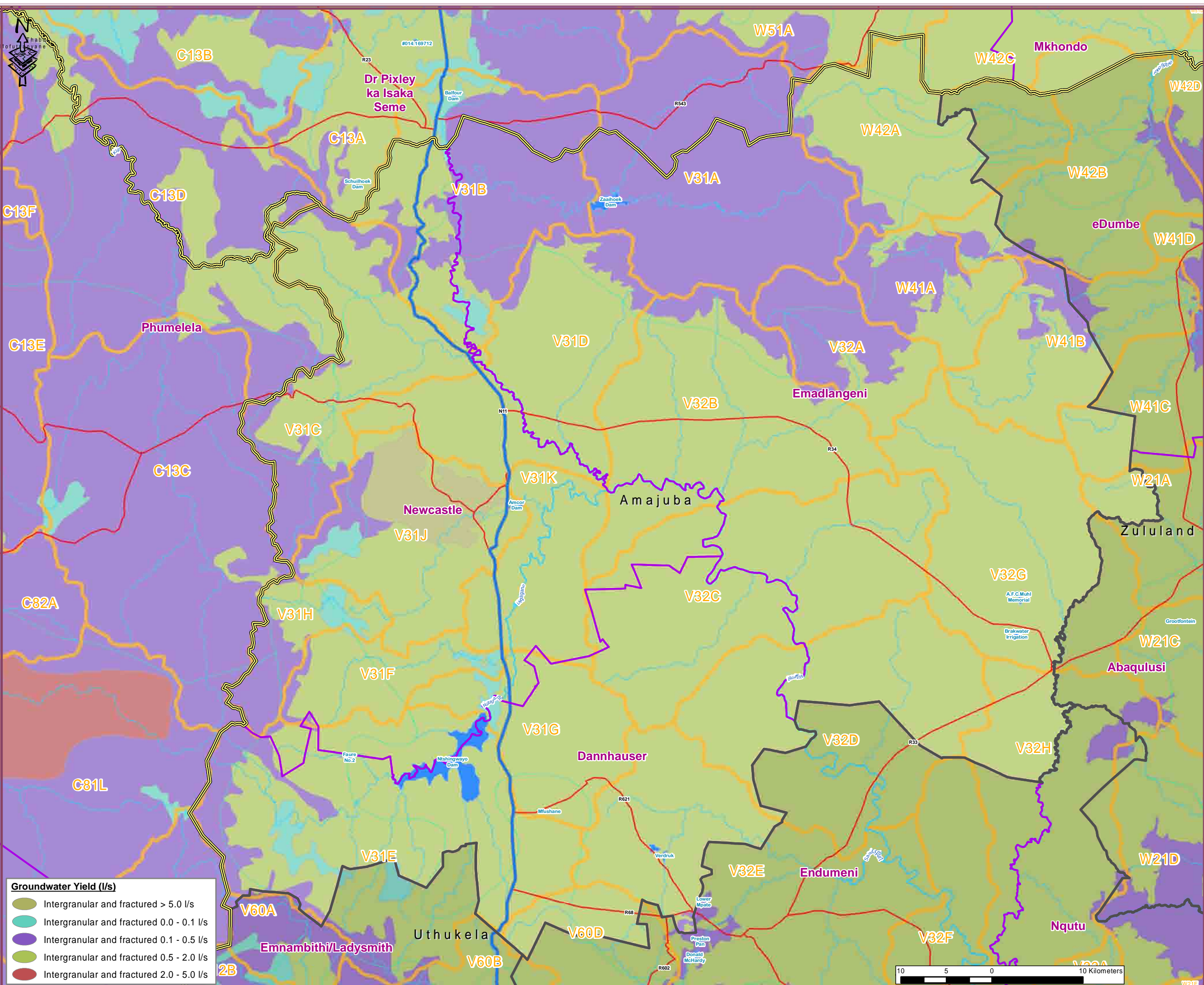
Surface Water Resources

DATE COMPLETED:

2016/03/31

MAP NO.:

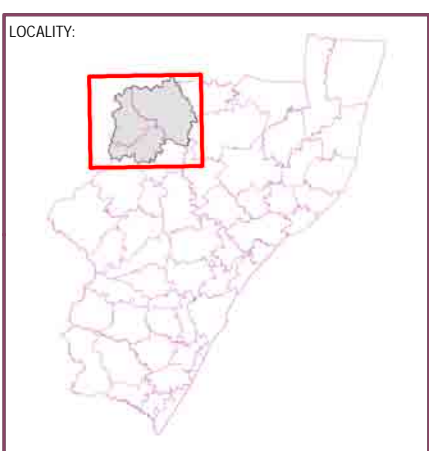
DC25_Figure 5



Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Census Main Places
- National Roads
- Main Roads
- Groundwater Aquifer Class: Minor (whole of the UDM)

DWS: Dept. of Water & Sanitation



CLIENT:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Groundwater Resources

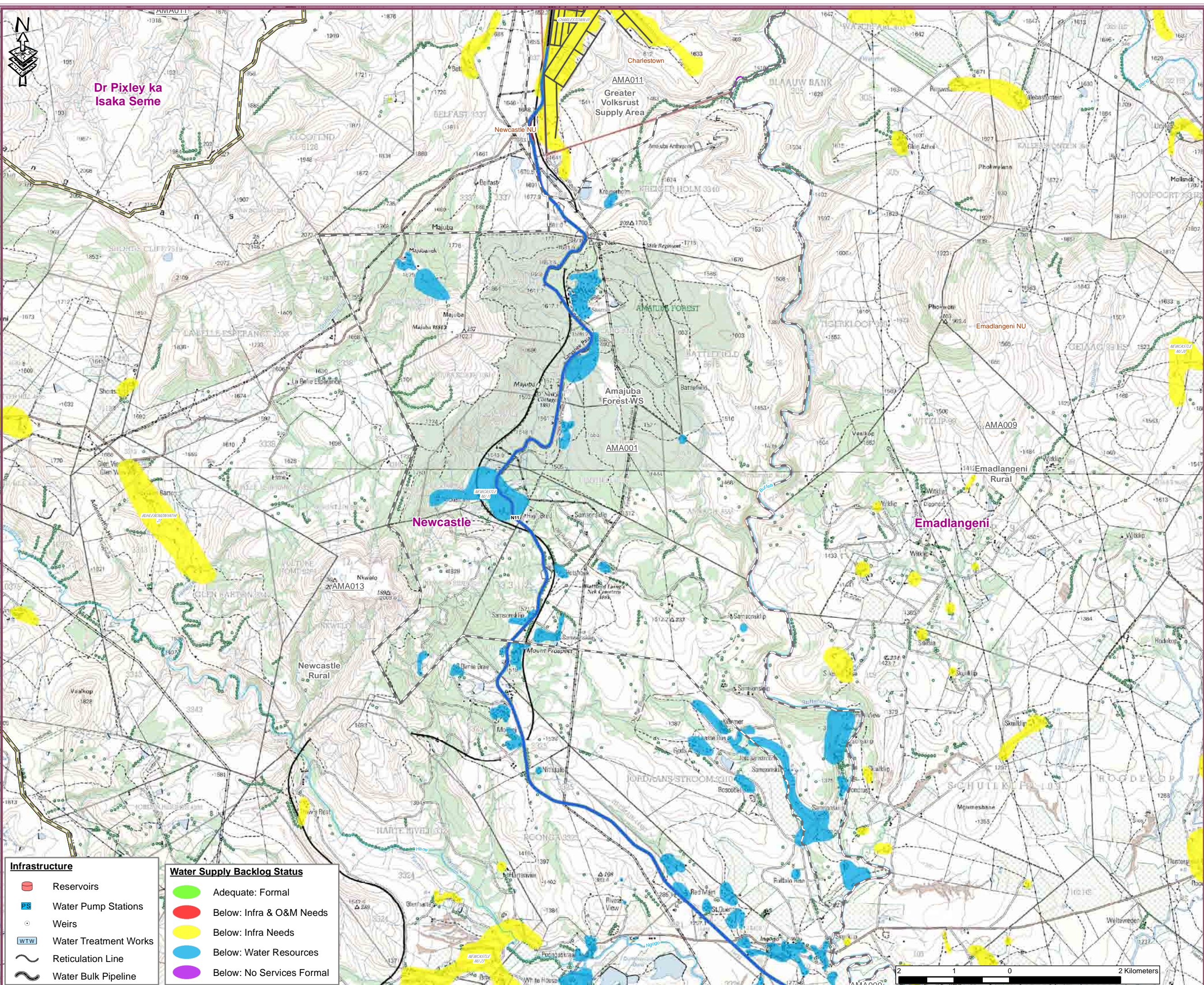
DATE COMPLETED:

2016/03/31

MAP NO.:

DC25_Figure 6





Infrastructure		Water Supply Backlog Status	
	Reservoirs		Adequate: Formal
	Water Pump Stations		Below: Infra & O&M Needs
	Weirs		Below: Infra Needs
	Water Treatment Works		Below: Water Resources
	Reticulation Line		Below: No Services Formal
	Water Bulk Pipeline		

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE

**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:

**Water Supply Areas
 (All Towns Clusters)
 Amajuba Forest WS**

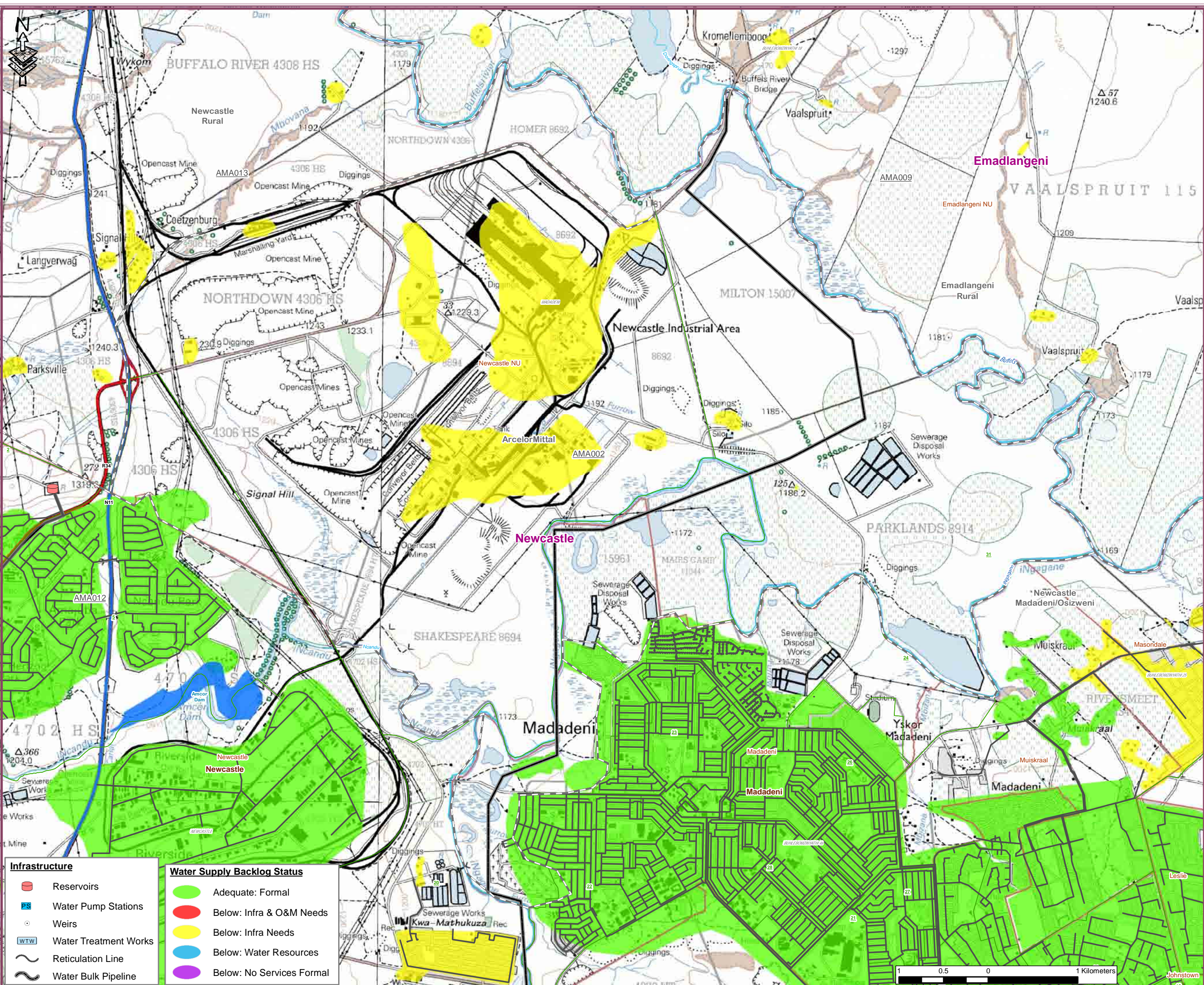
DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA001

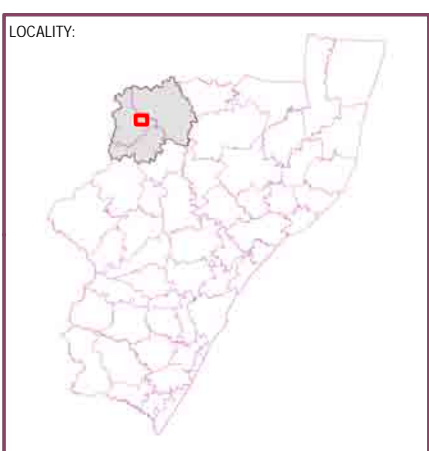




Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

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Project No.: 27811

PROJECT TITLE:

**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:

**Water Supply Areas
 (All Towns Clusters)**
ArcelorMittal

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA002

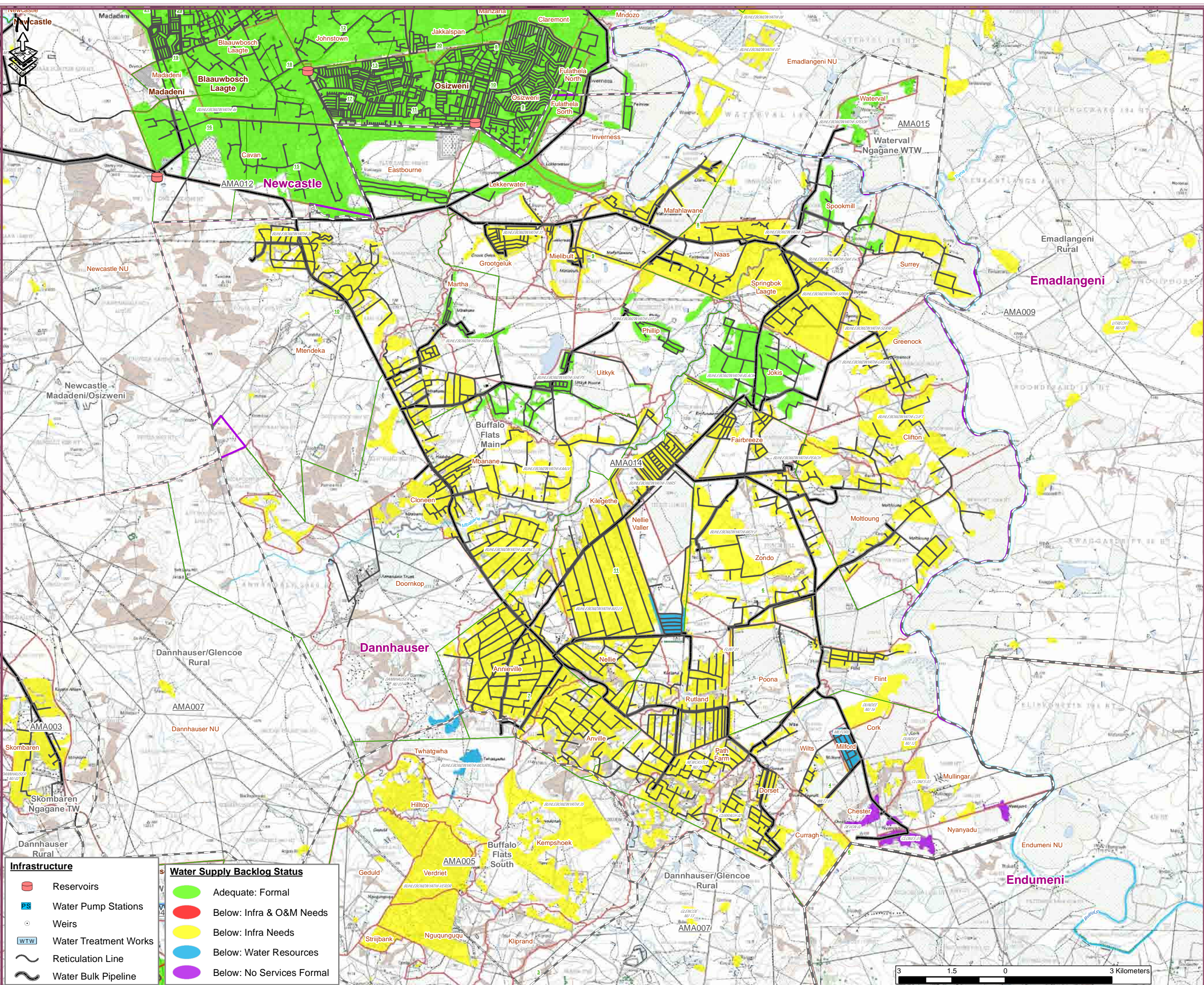
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Buffalo Flats Main

DATE COMPLETED:

2016/06/20

MAP NO.:

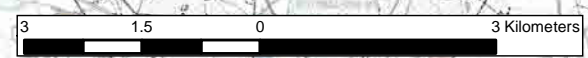
DC25_Figure 7/AMA014

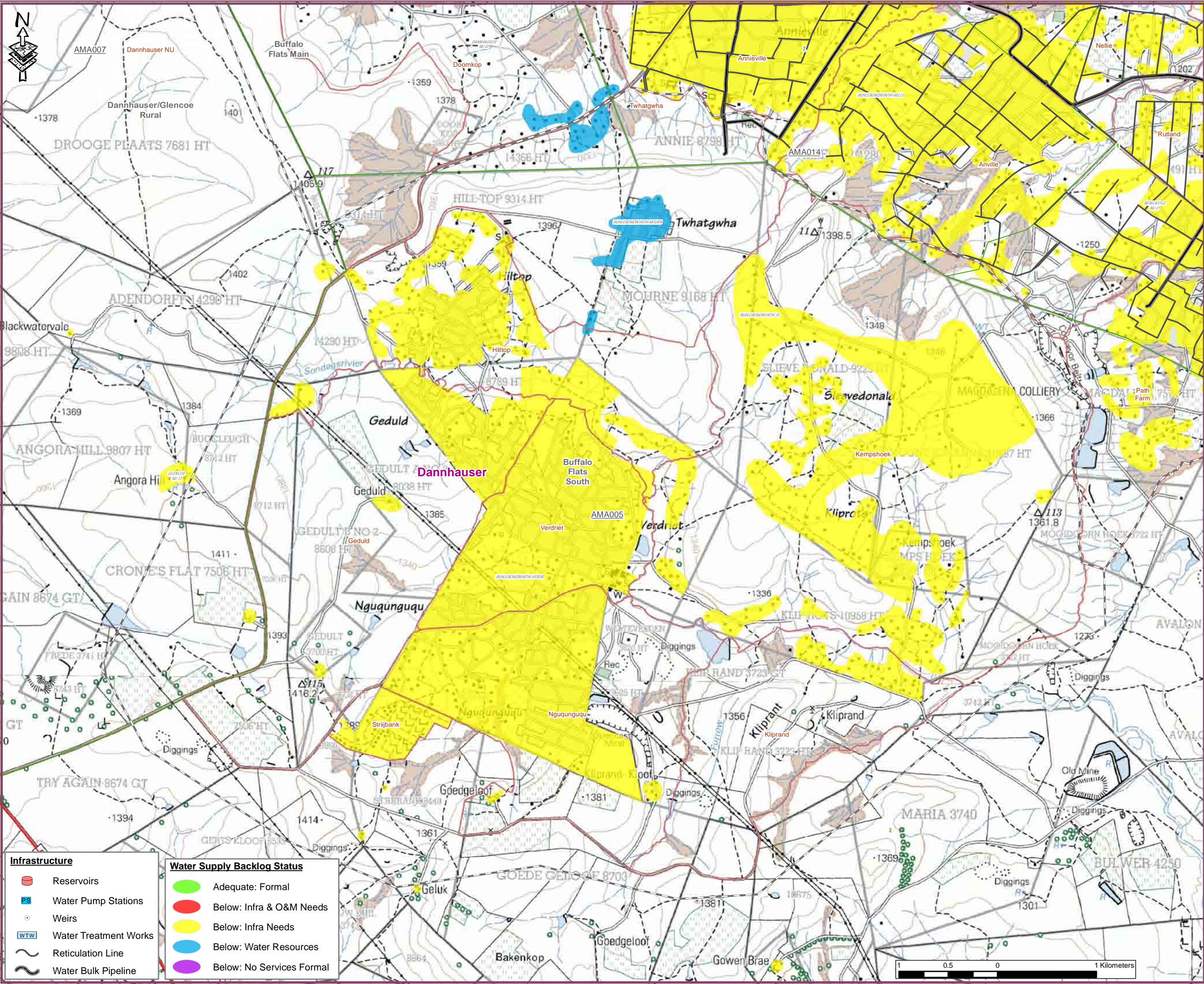
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Infrastructure		Water Supply Backlog Status	
	Reservoirs		Adequate: Formal
	Water Pump Stations		Below: Infra & O&M Needs
	Weirs		Below: Infra Needs
	Water Treatment Works		Below: Water Resources
	Reticulation Line		Below: No Services Formal
	Water Bulk Pipeline		

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

AMAJUBA DISTRICT MUNICIPALITY

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

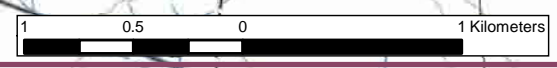
Water Supply Areas (All Towns Clusters)
Buffalo Flats South

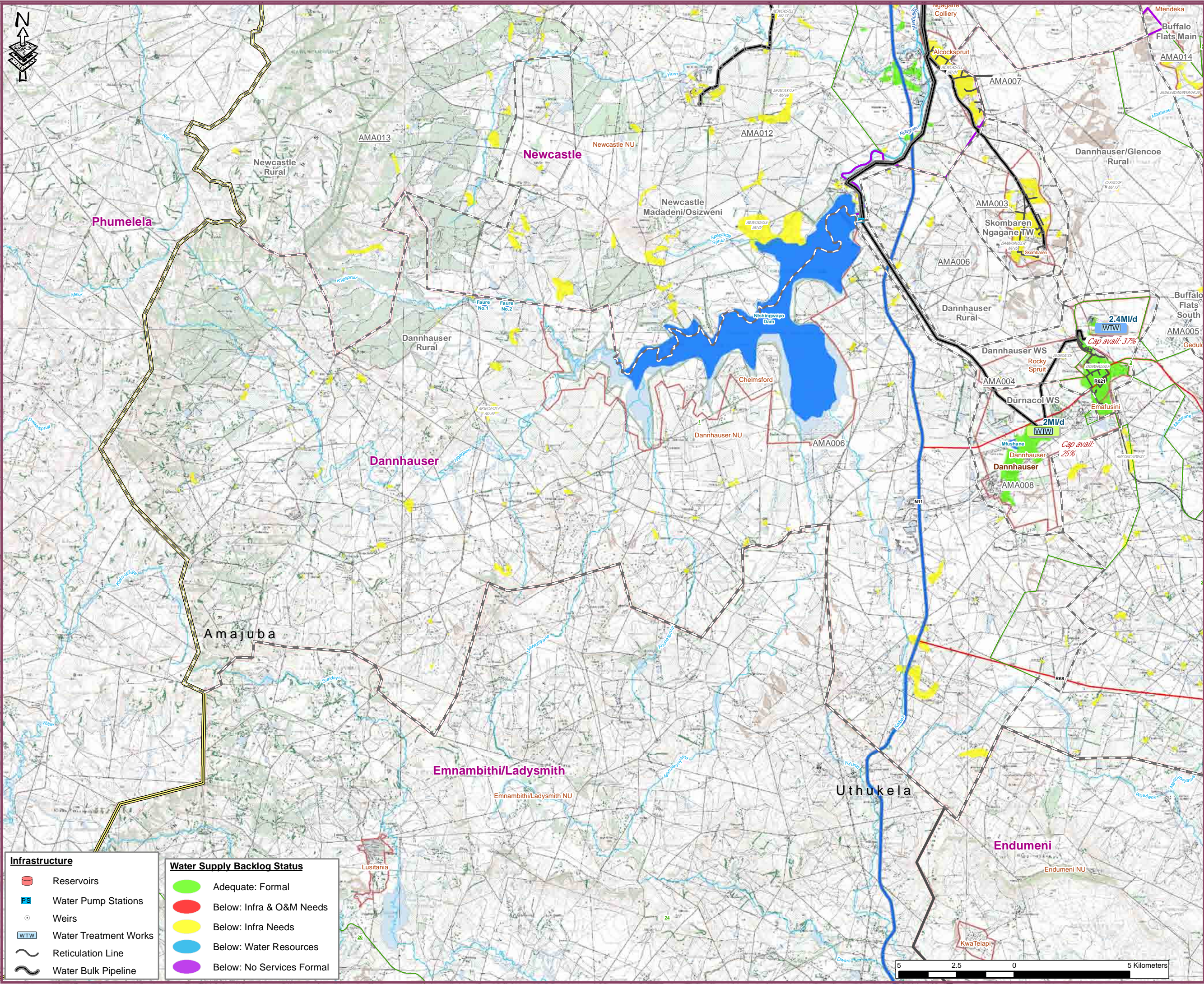
DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA005





Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters) Dannhauser Rural

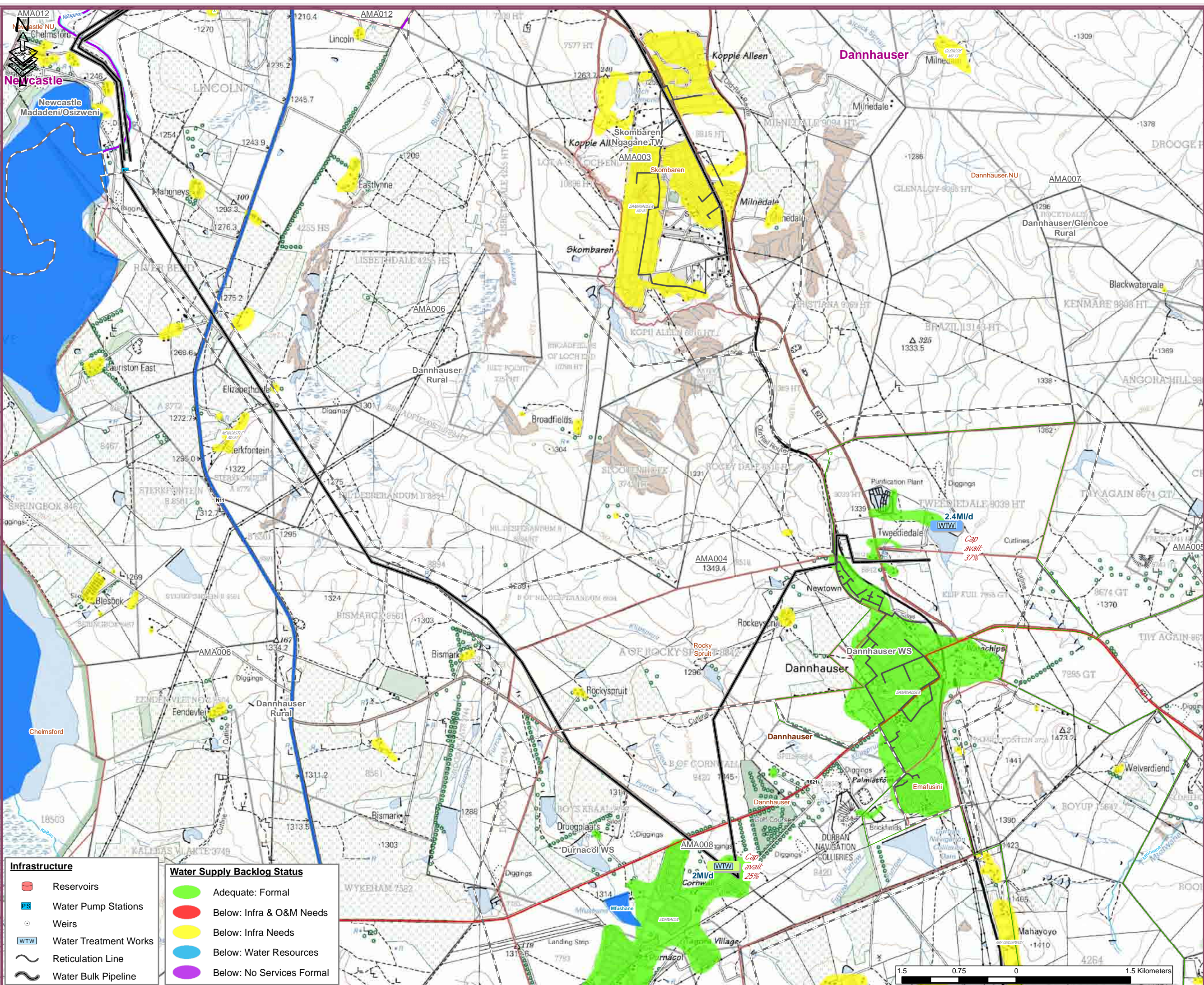
DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA006





Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

AMAJUBA DISTRICT MUNICIPALITY

CONSULTANTS:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Dannhauser WS

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA004

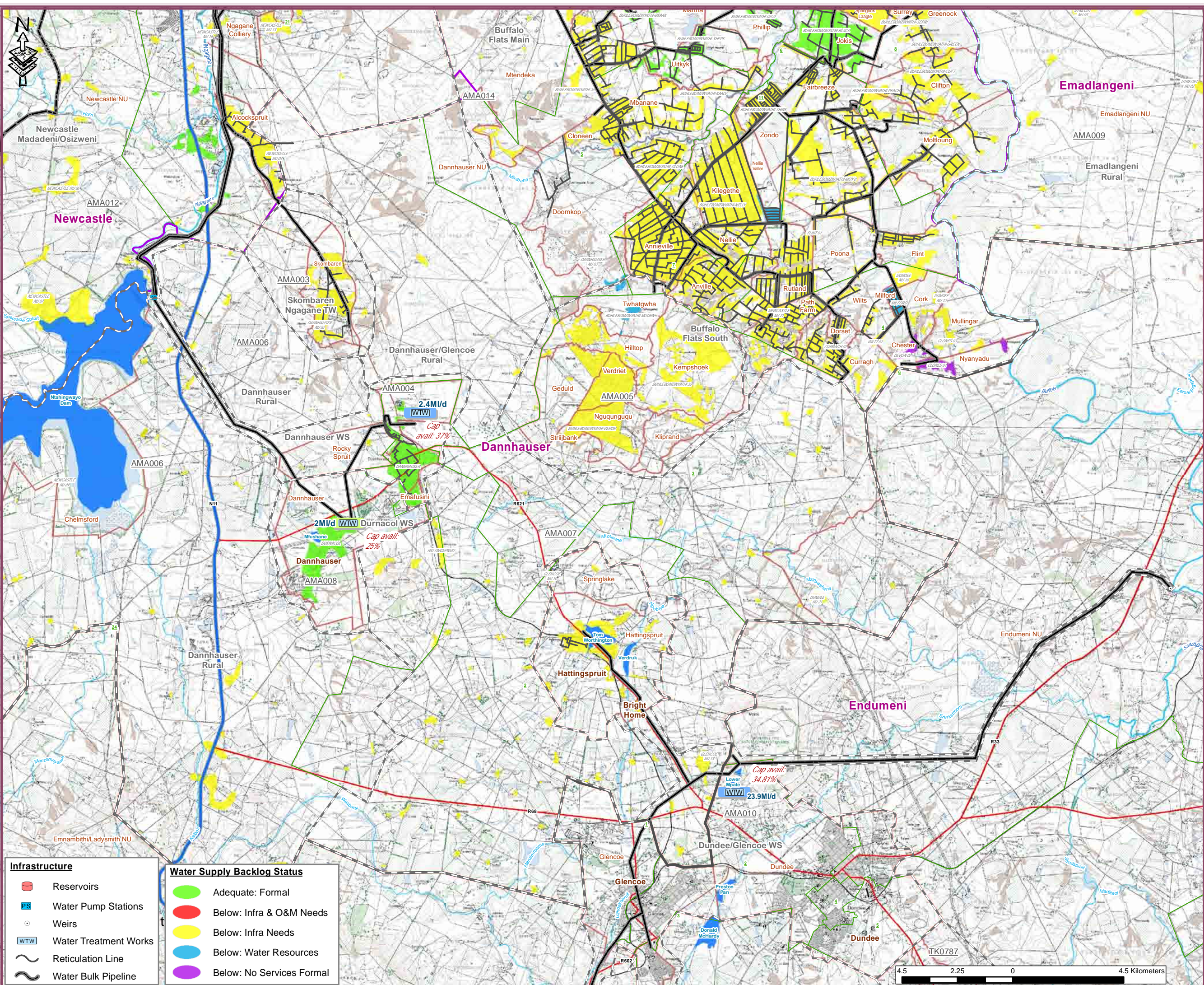
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters) Dannhauser/Glencoe Rural

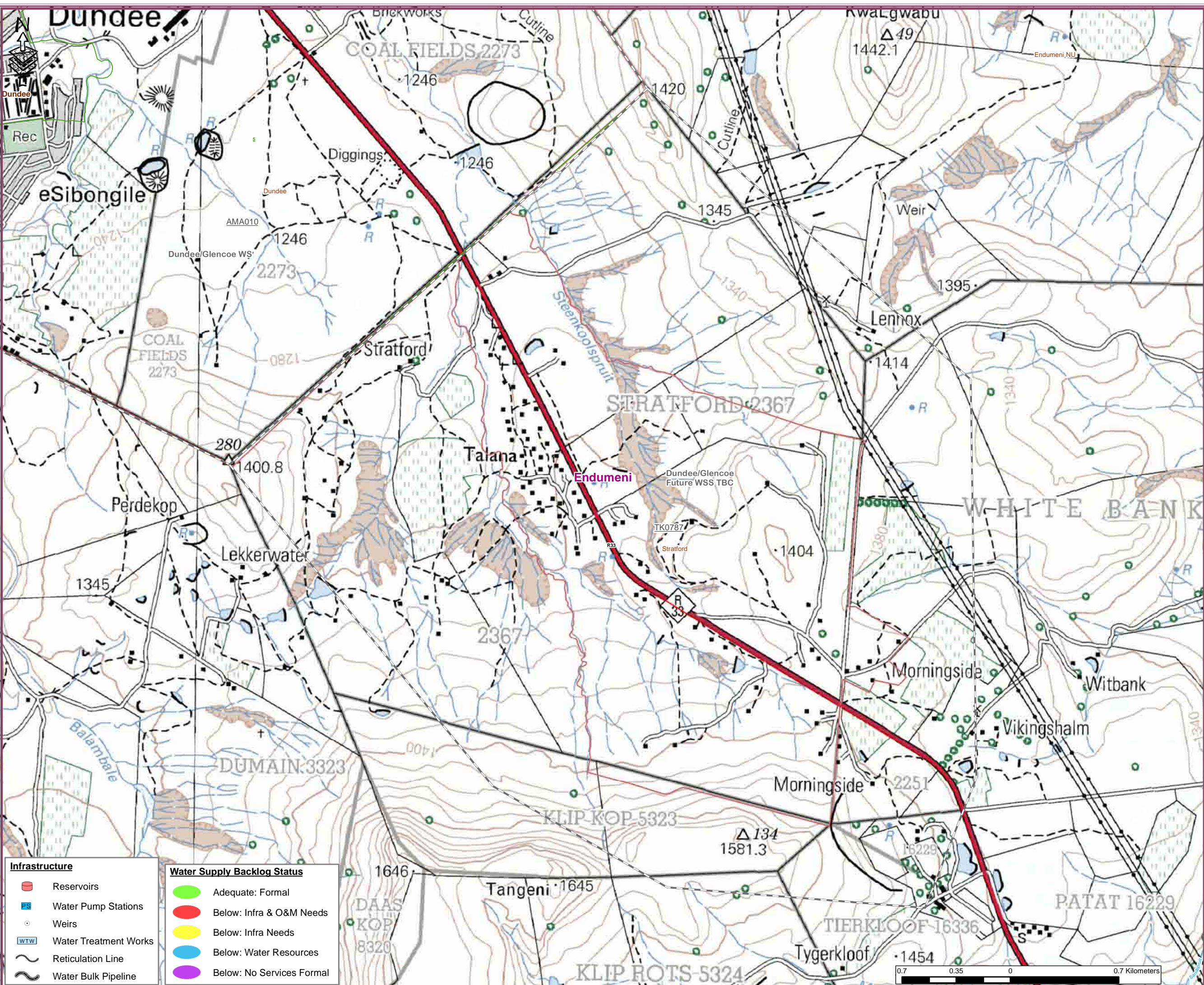
DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA007





Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Dundee/Glencoe Future WSS TBC

DATE COMPLETED:

2016/06/20

MAP NO.:

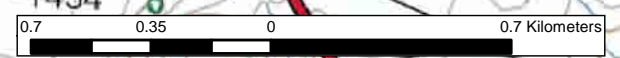
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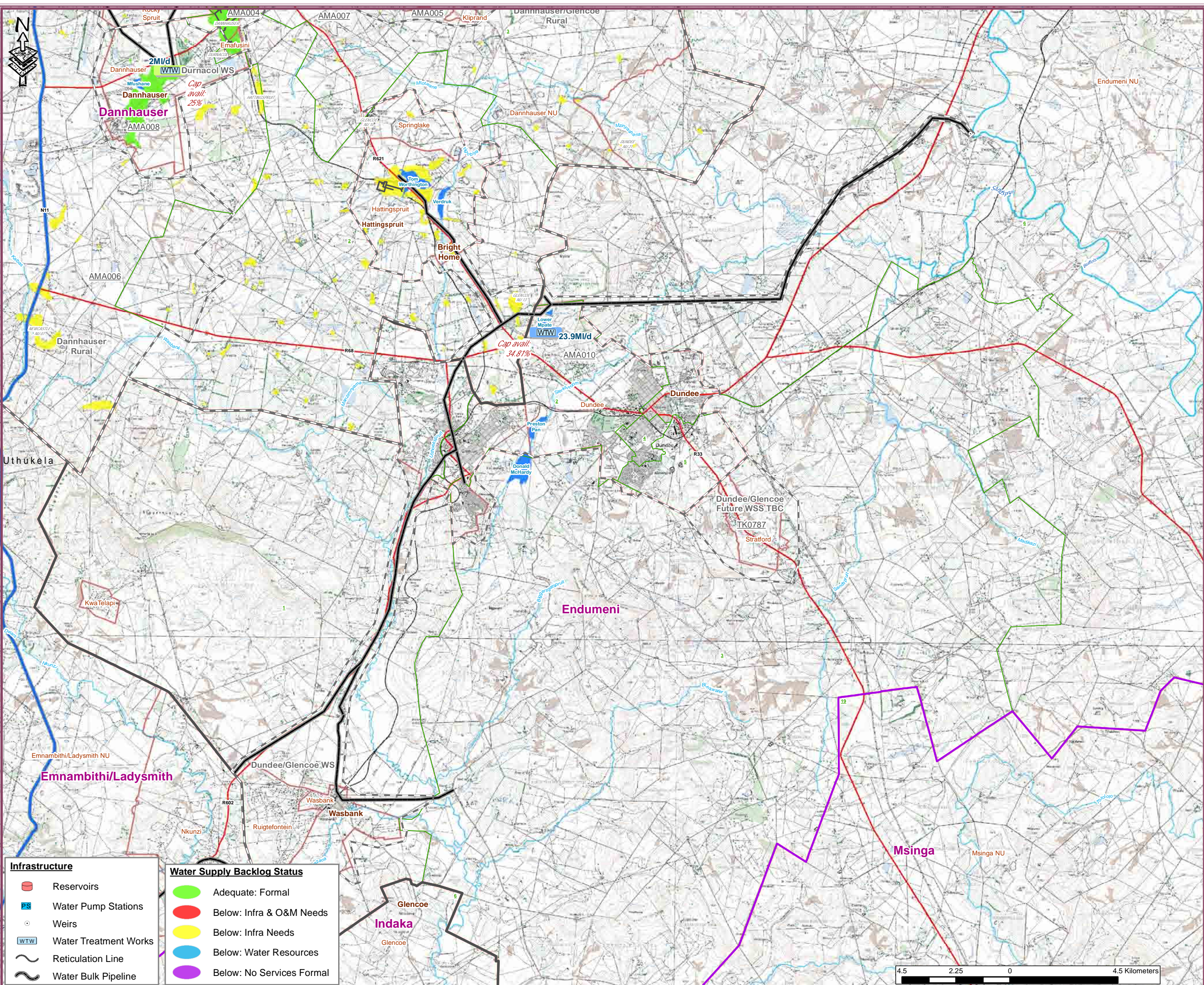
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



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DISTRICT MUNICIPALITY:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Dundee/Glencoe WS

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA010

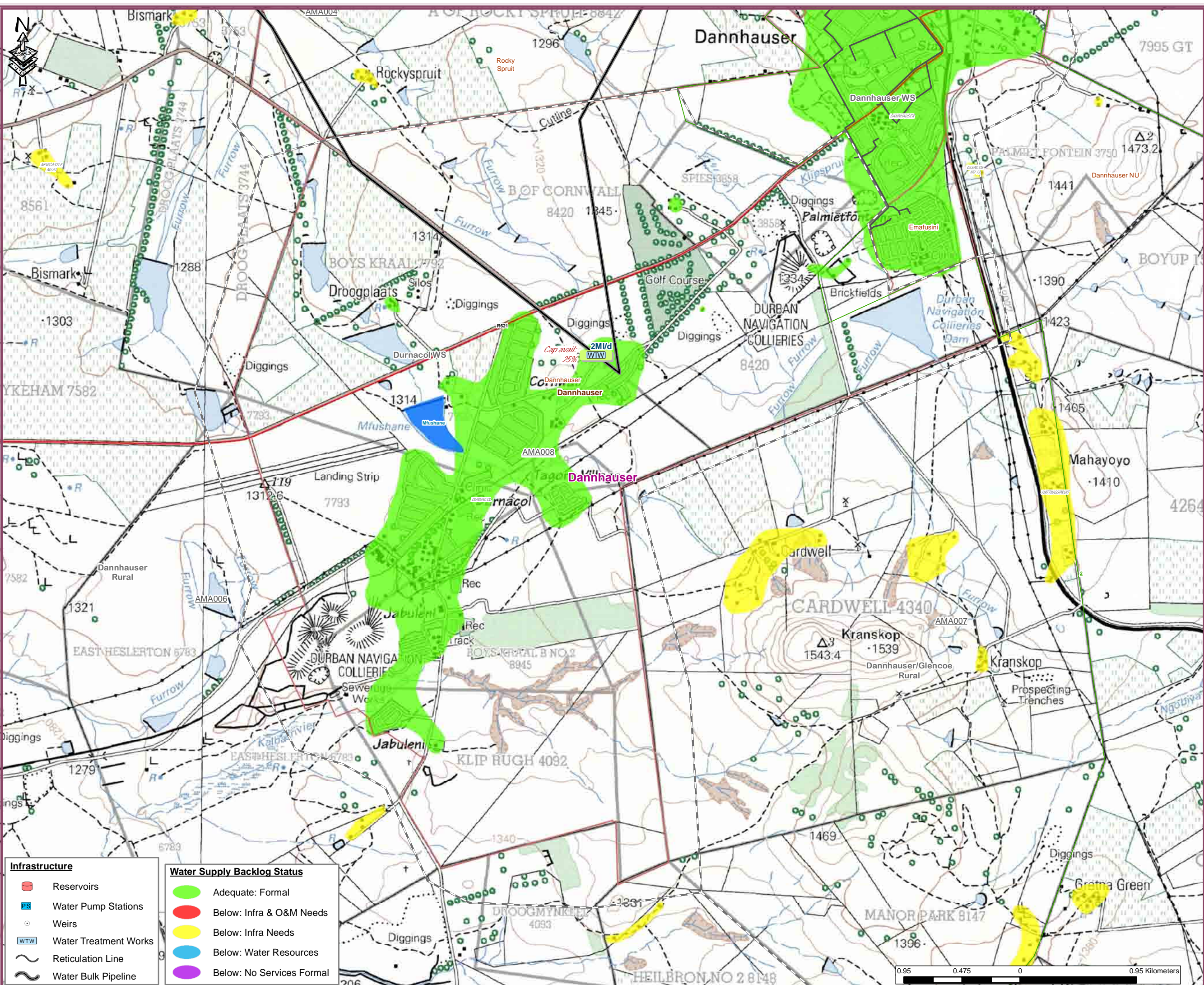
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

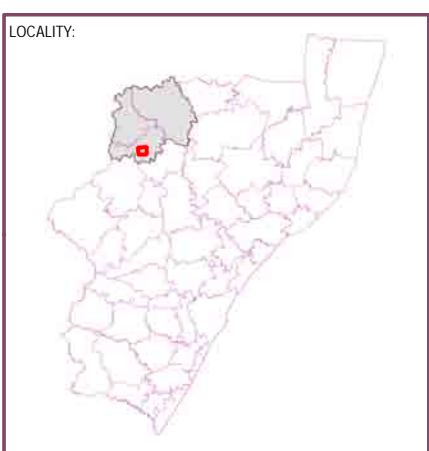




Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



CLIENT:

DISTRICT MUNICIPALITY:

AMAJUBA DISTRICT MUNICIPALITY

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Durnacol WS

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA008

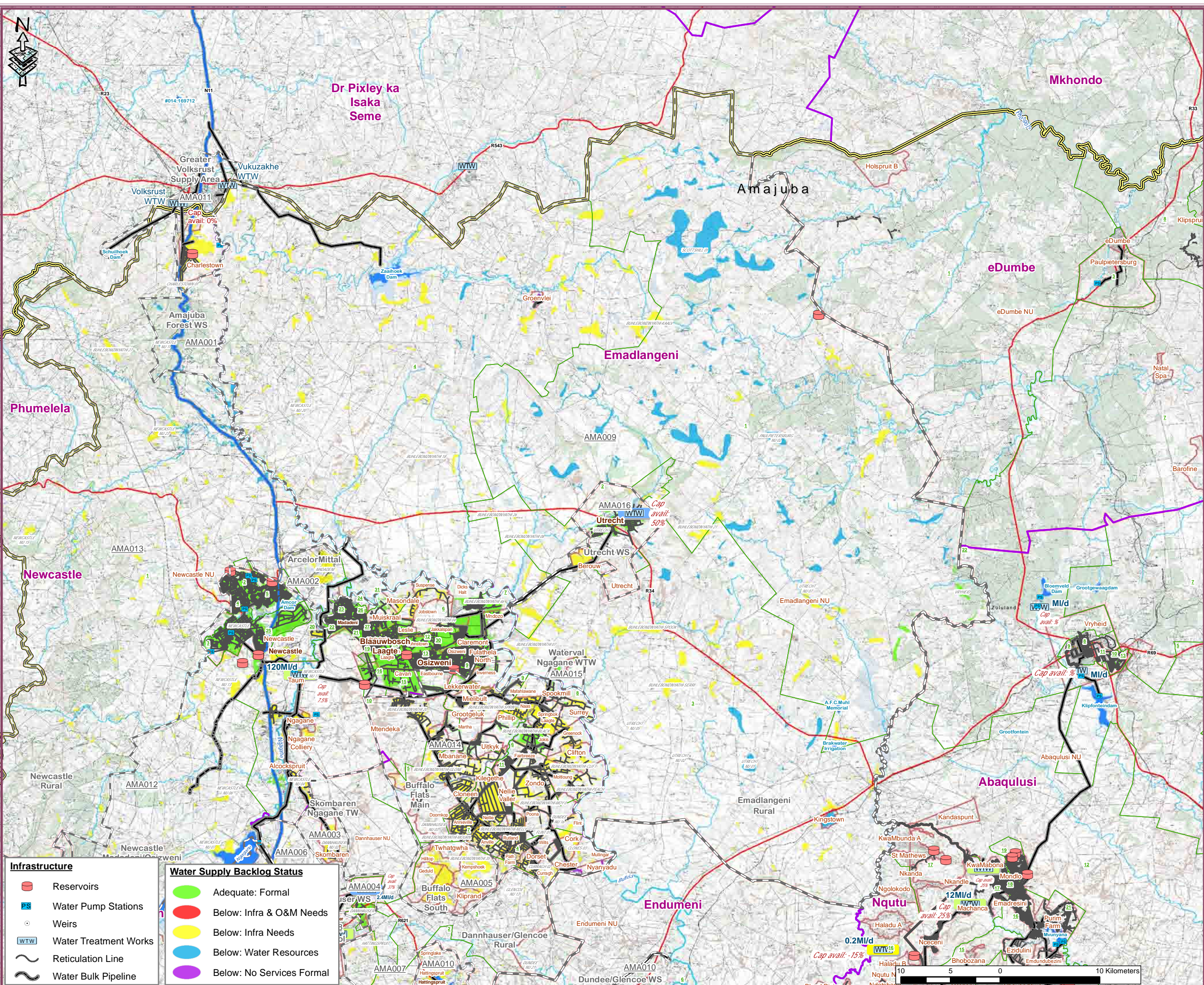
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

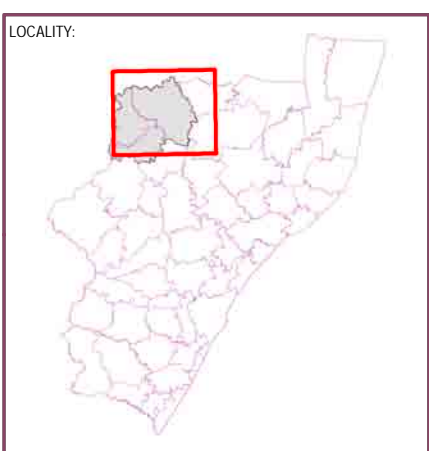
Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

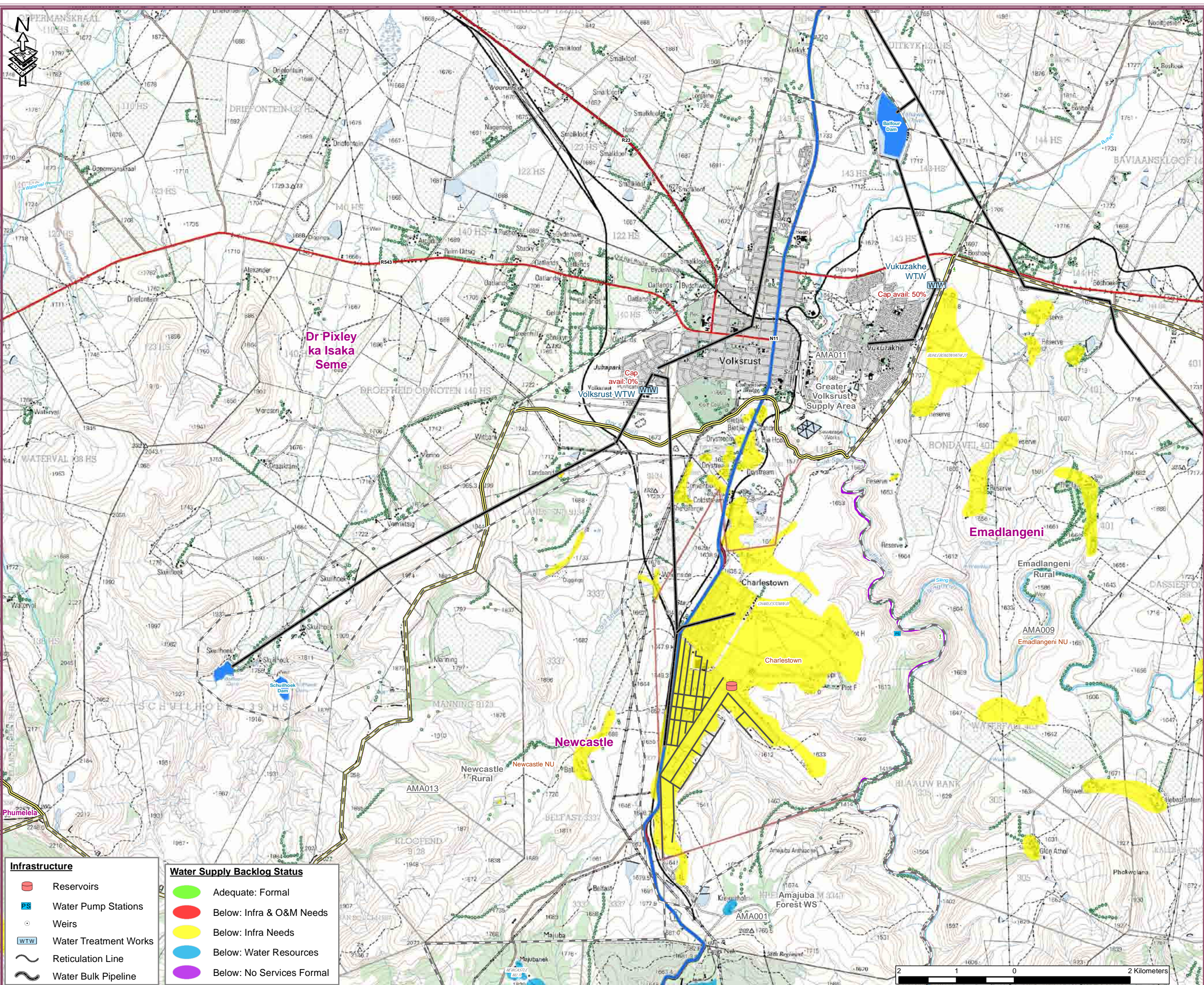
Water Supply Areas (All Towns Clusters) Emadlangeni Rural

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA009



Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

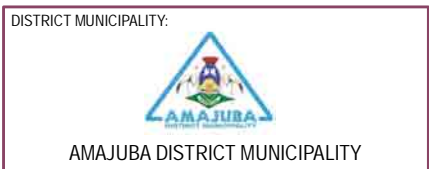
Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE

**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:

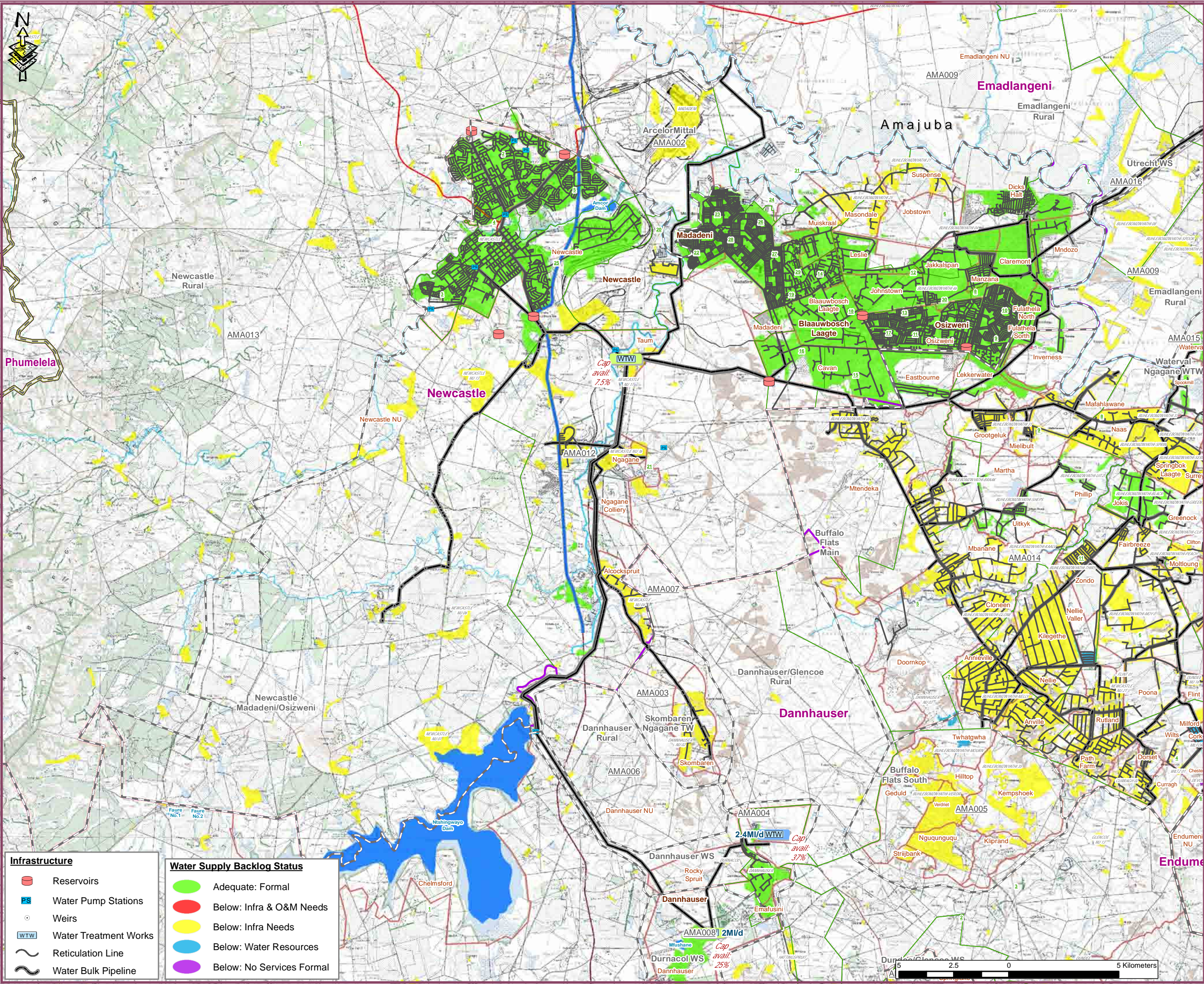
**Water Supply Areas
 (All Towns Clusters)
 Greater Volksrust Supply Area**

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA011



Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

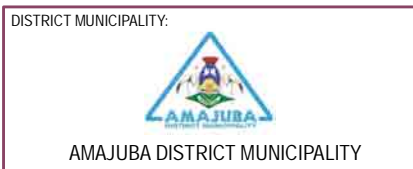
Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

DWS: Dept. of Water & Sanitation



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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

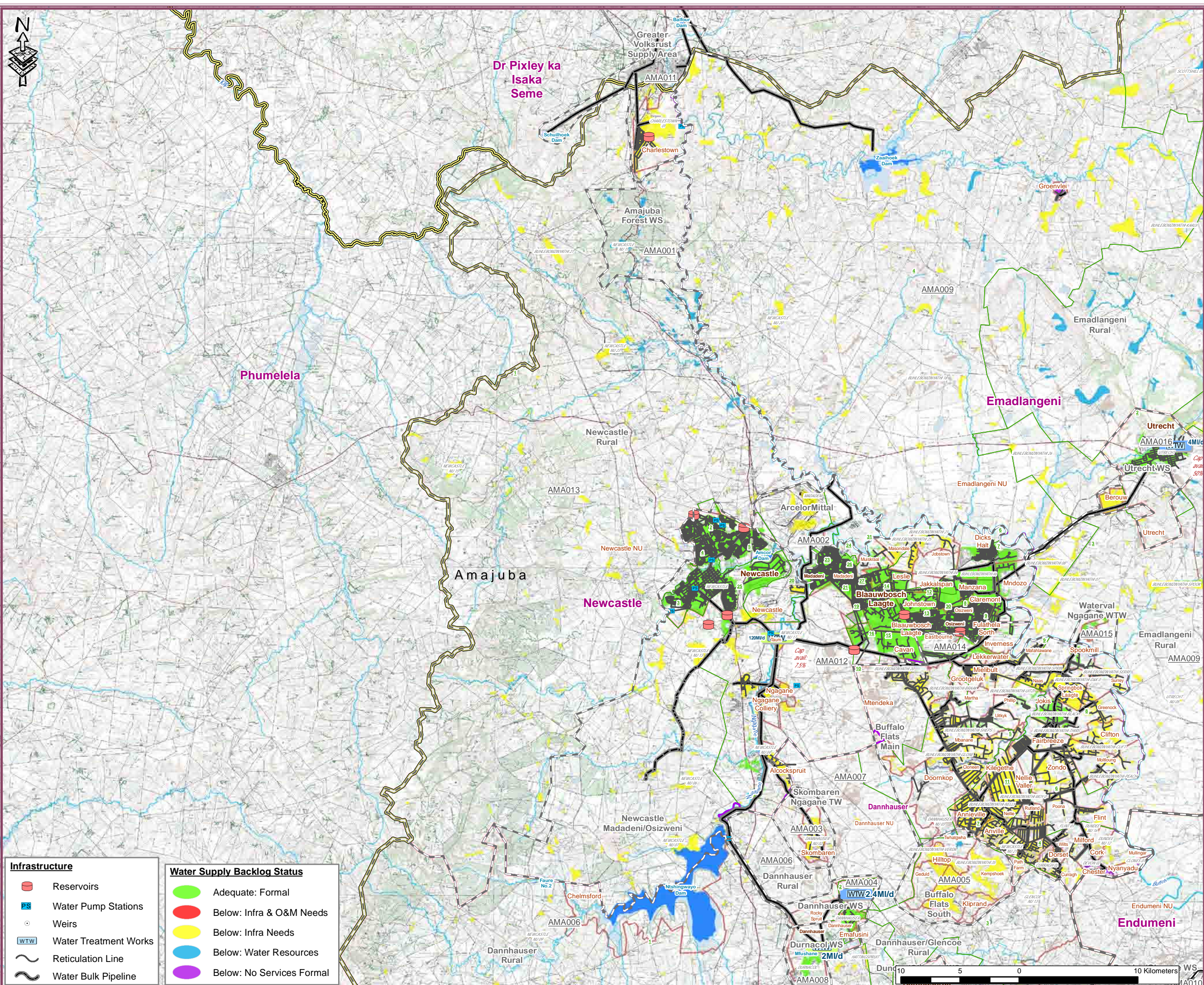
Water Supply Areas (All Towns Clusters) Newcastle Madadeni/Osizweni

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA012

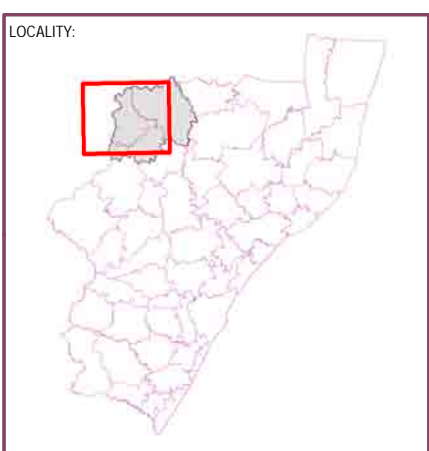


Infrastructure		Water Supply Backlog Status	
	Reservoirs		Adequate: Formal
	Water Pump Stations		Below: Infra & O&M Needs
	Weirs		Below: Infra Needs
	Water Treatment Works		Below: Water Resources
	Reticulation Line		Below: No Services Formal
	Water Bulk Pipeline		

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

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CLIENT:

DISTRICT MUNICIPALITY:

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Water Supply Areas (All Towns Clusters)
Newcastle Rural

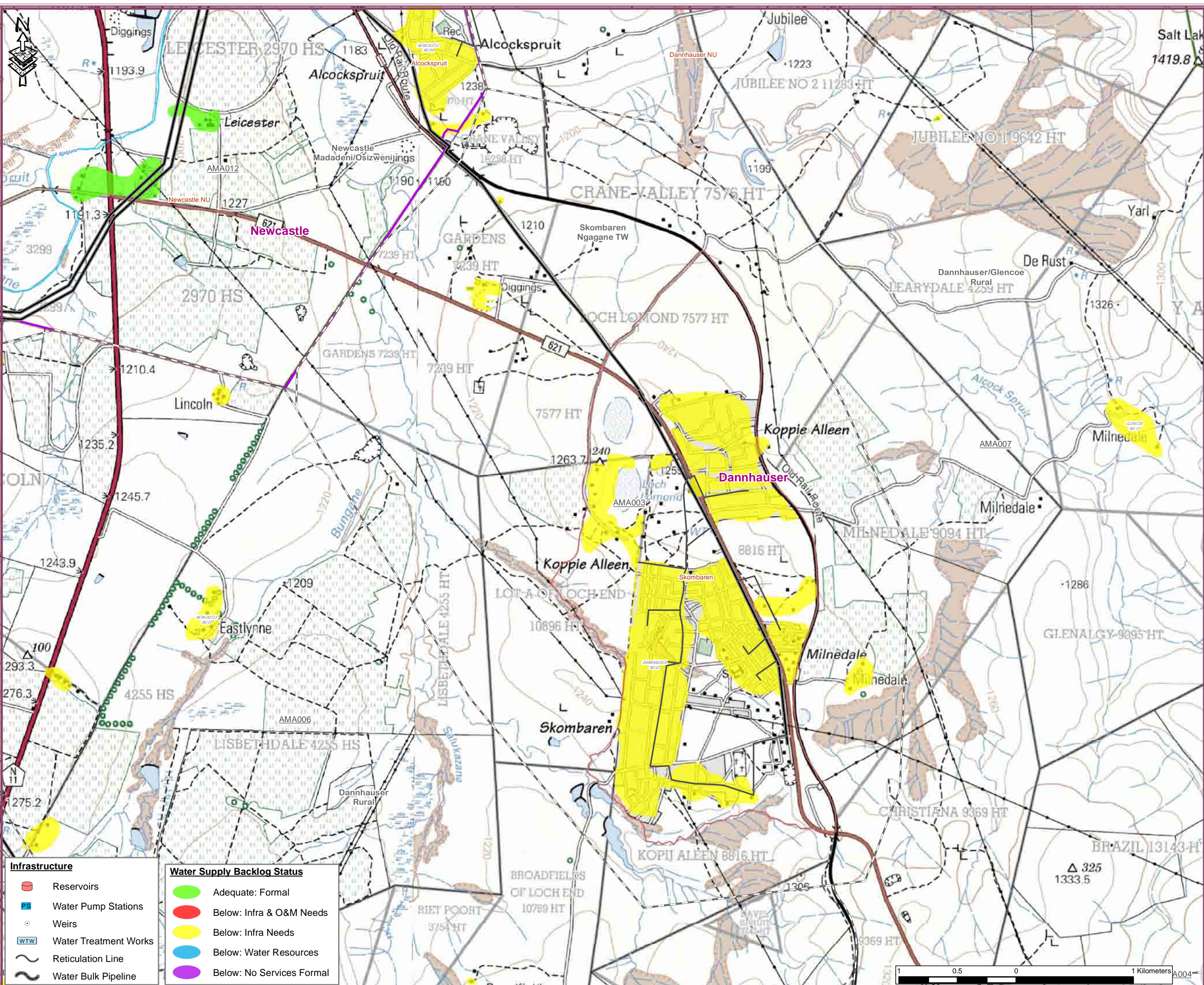
DATE COMPLETED:

2016/06/20

MAP NO.:

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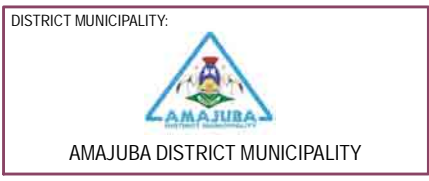




Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Existing Water Supply Areas
- Dams & Dam Names
- Primary Rivers
- Secondary Rivers

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Project No.: 27811

PROJECT TITLE

**Amajuba DM: Universal Access
 Plan Phase 2 - Progressive
 Development of a Regional Water
 Supply Master Plan**

MAP TITLE:

**Water Supply Areas
 (All Towns Clusters)
 Skombaren Ngagane TW**

DATE COMPLETED:

2016/06/20

MAP NO.:

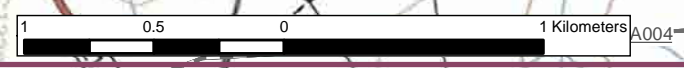
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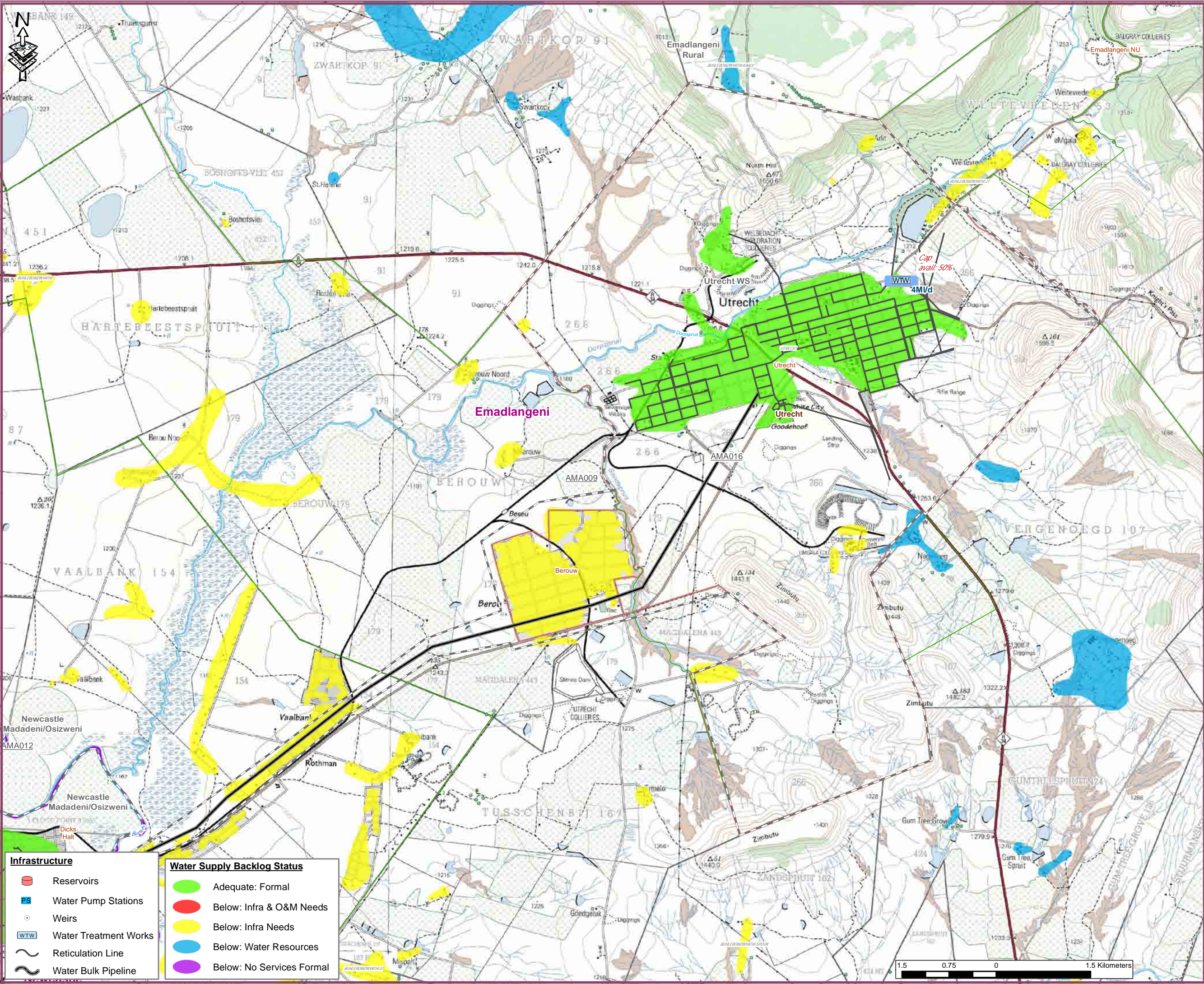
Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal





Infrastructure

- Reservoirs
- Water Pump Stations
- Weirs
- Water Treatment Works
- Reticulation Line
- Water Bulk Pipeline

Water Supply Backlog Status

- Adequate: Formal
- Below: Infra & O&M Needs
- Below: Infra Needs
- Below: Water Resources
- Below: No Services Formal

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
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Project No.: 27811

PROJECT TITLE

**Amajuba DM: Universal Access
Plan Phase 2 - Progressive
Development of a Regional Water
Supply Master Plan**

MAP TITLE:

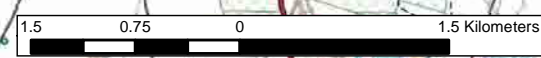
**Water Supply Areas
(All Towns Clusters)
Utrecht WS**

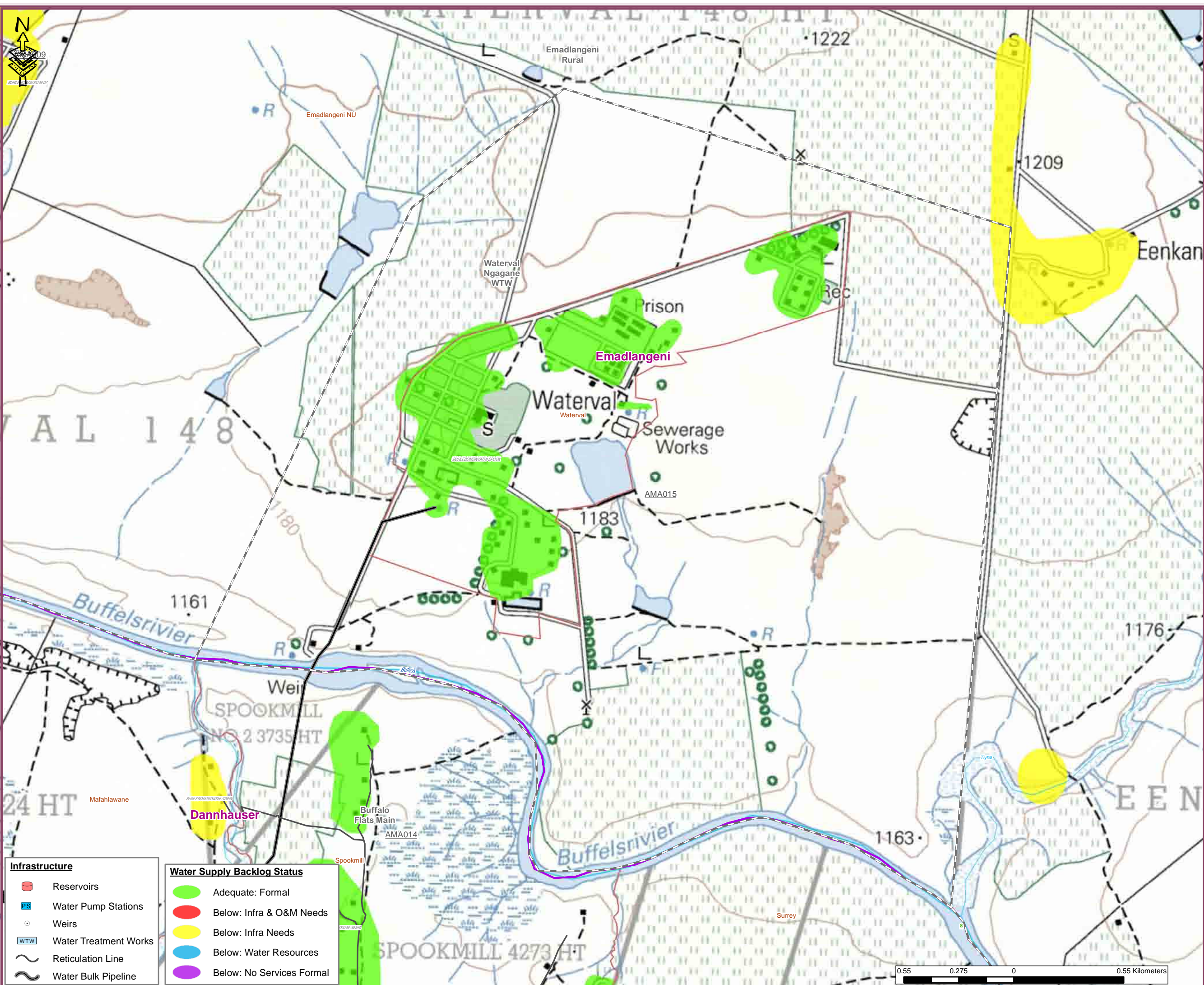
DATE COMPLETED:

2016/06/20

MAP NO.:

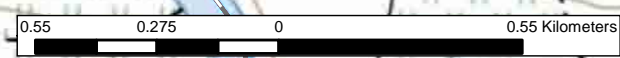
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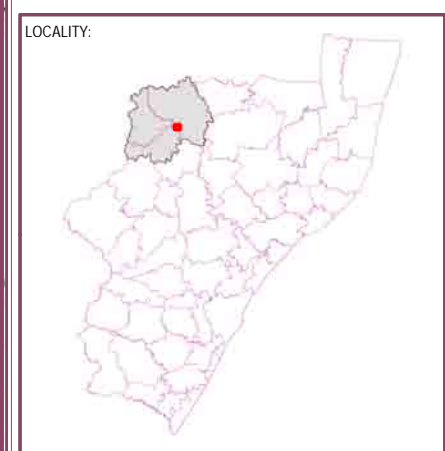


- Infrastructure**
- Reservoirs
 - Water Pump Stations
 - Weirs
 - Water Treatment Works
 - Reticulation Line
 - Water Bulk Pipeline

- Water Supply Backlog Status**
- Adequate: Formal
 - Below: Infra & O&M Needs
 - Below: Infra Needs
 - Below: Water Resources
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- Legend**
- Provincial Boundaries
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PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

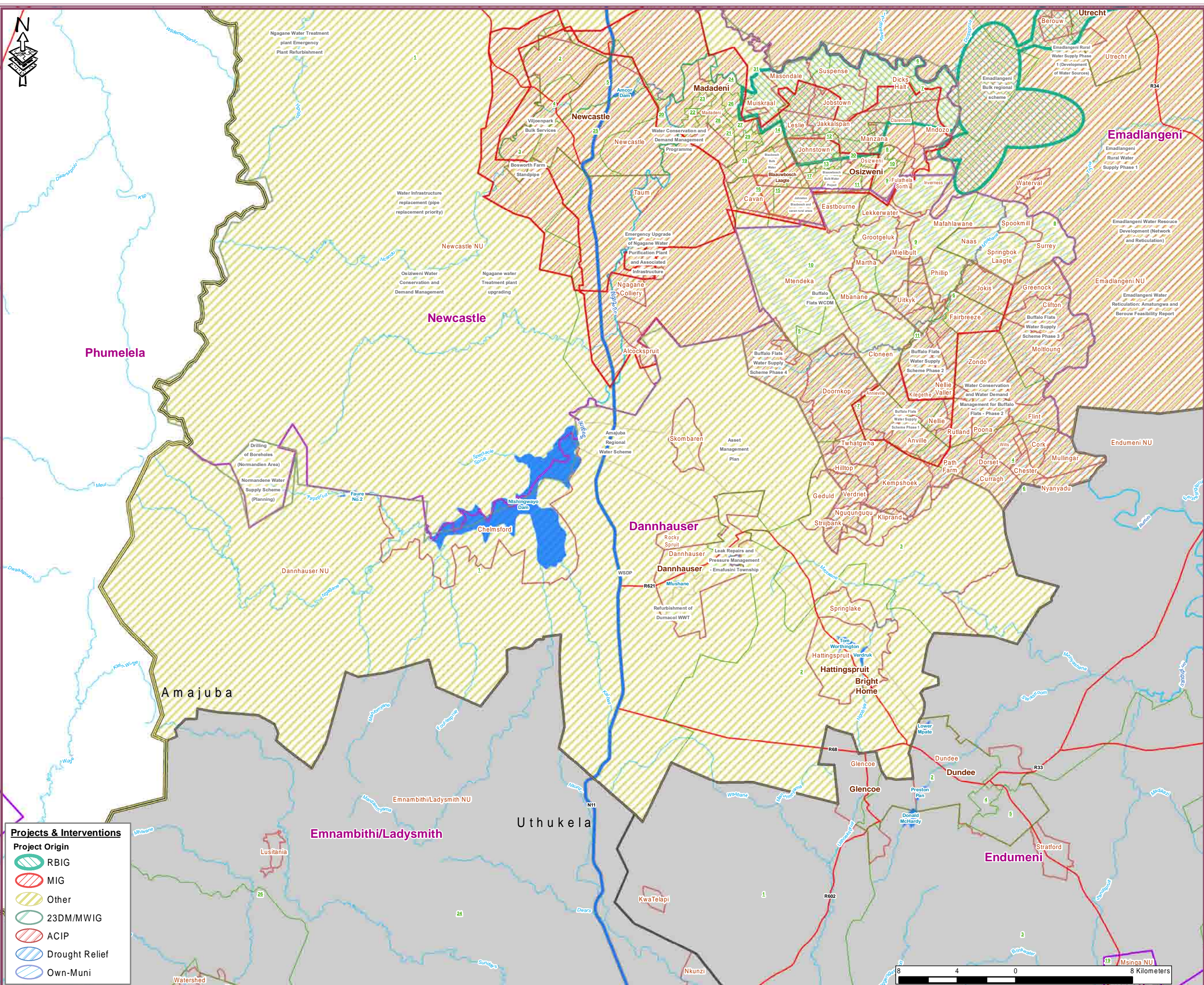
Water Supply Areas (All Towns Clusters)
Waterval Ngagane WTW

DATE COMPLETED:

2016/06/20

MAP NO.:

DC25_Figure 7/AMA015



Projects & Interventions

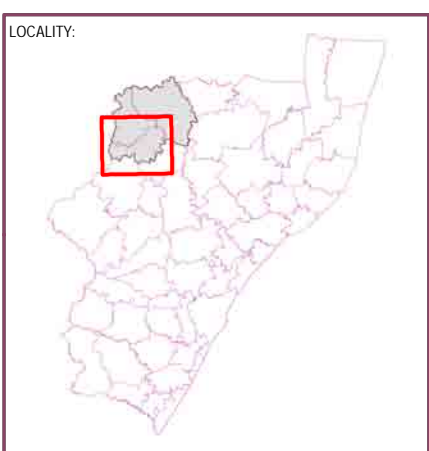
Project Origin

- RBIG
- MIG
- Other
- 23DM/MWIG
- ACIP
- Drought Relief
- Own-Muni

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
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- Secondary Rivers

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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

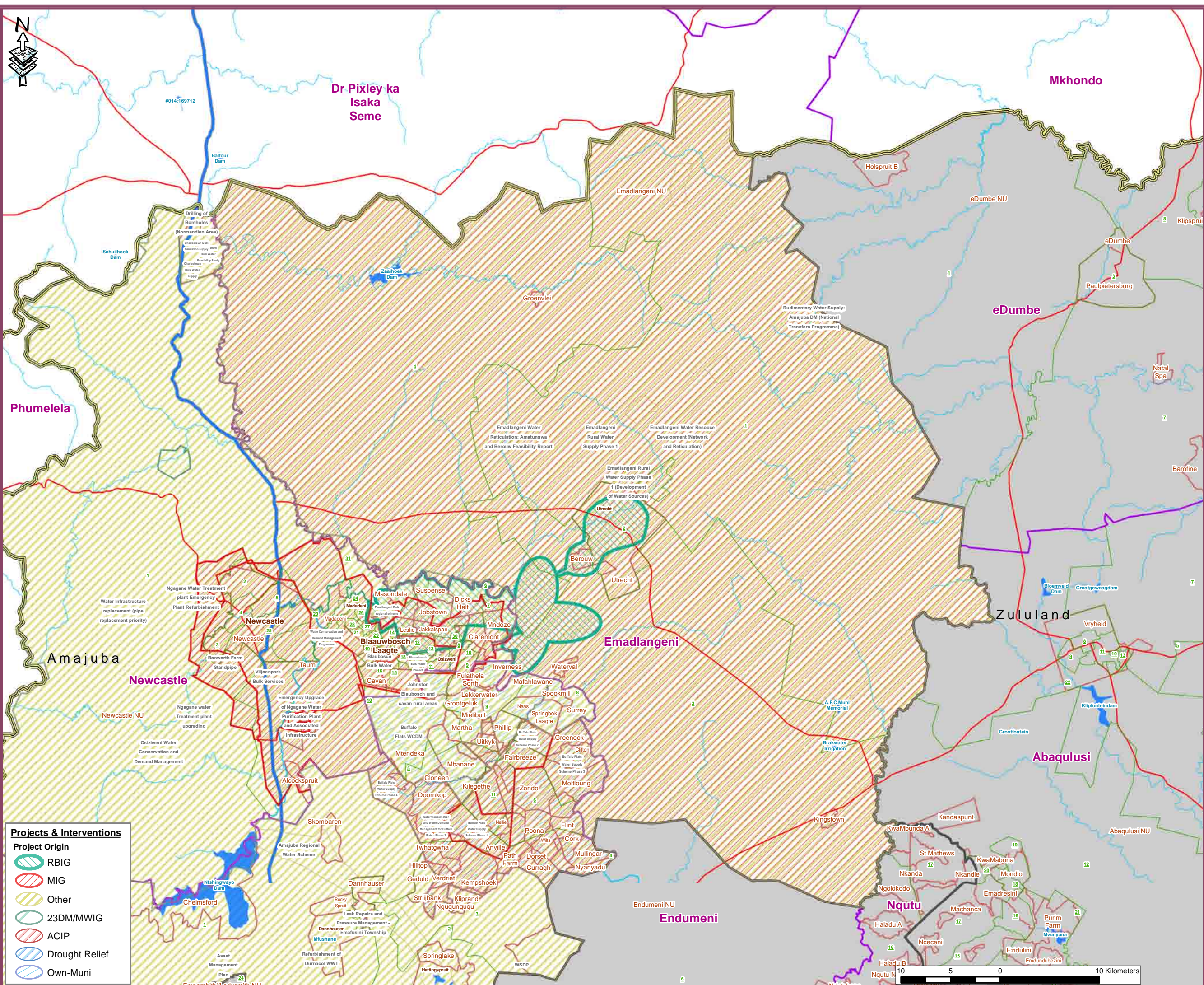
Projects and Interventions
Dannhauser

DATE COMPLETED:

2016/03/31

MAP NO.:

DC25_Figure 8/KZN254



Projects & Interventions

Project Origin

- RBIG
- MIG
- Other
- 23DM/MWIG
- ACIP
- Drought Relief
- Own-Muni

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
- Ward Boundaries & Numbers
- Census Main Places
- National Roads
- Main Roads
- Dams & Dam Names
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- Secondary Rivers

DWS: Dept. of Water & Sanitation

LOCALITY:

CLIENT:

DISTRICT MUNICIPALITY:

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Project No.: 27811

PROJECT TITLE

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 Supply Master Plan**

MAP TITLE:

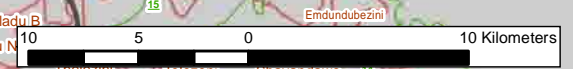
**Projects and Interventions
 Emadlangeni**

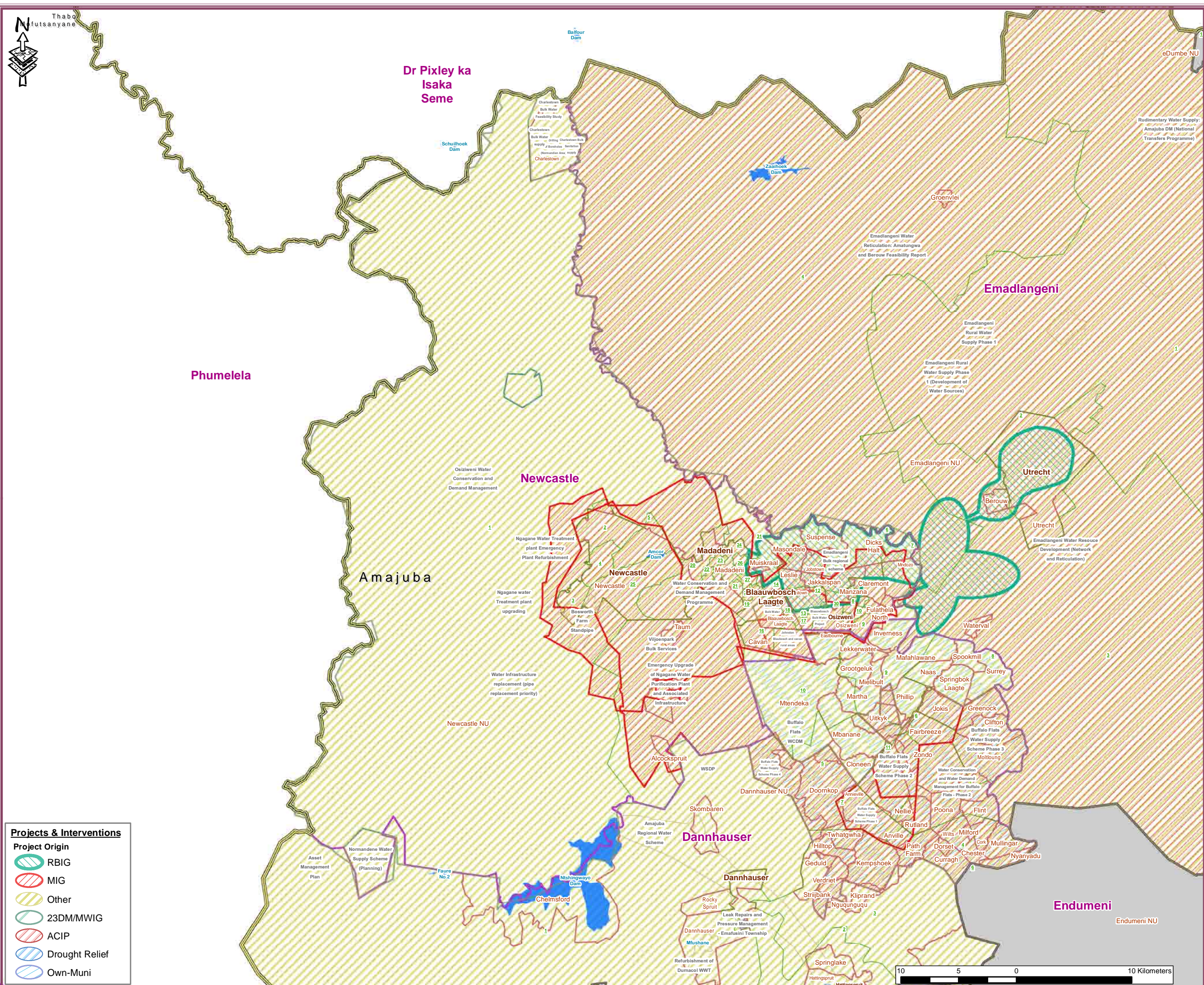
DATE COMPLETED:

2016/03/31

MAP NO.:

DC25_Figure 8/KZN253





Projects & Interventions

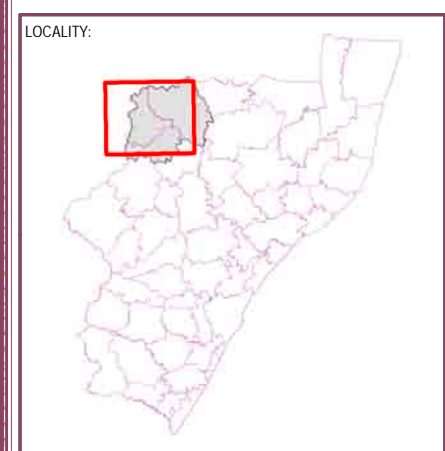
Project Origin

- RBIG
- MIG
- Other
- 23DM/MWIG
- ACIP
- Drought Relief
- Own-Muni

Legend

- Provincial Boundaries
- District Municipality Boundaries
- Local Municipality Boundaries
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Project No.: 27811

PROJECT TITLE

Amajuba DM: Universal Access Plan Phase 2 - Progressive Development of a Regional Water Supply Master Plan

MAP TITLE:

Projects and Interventions
Newcastle

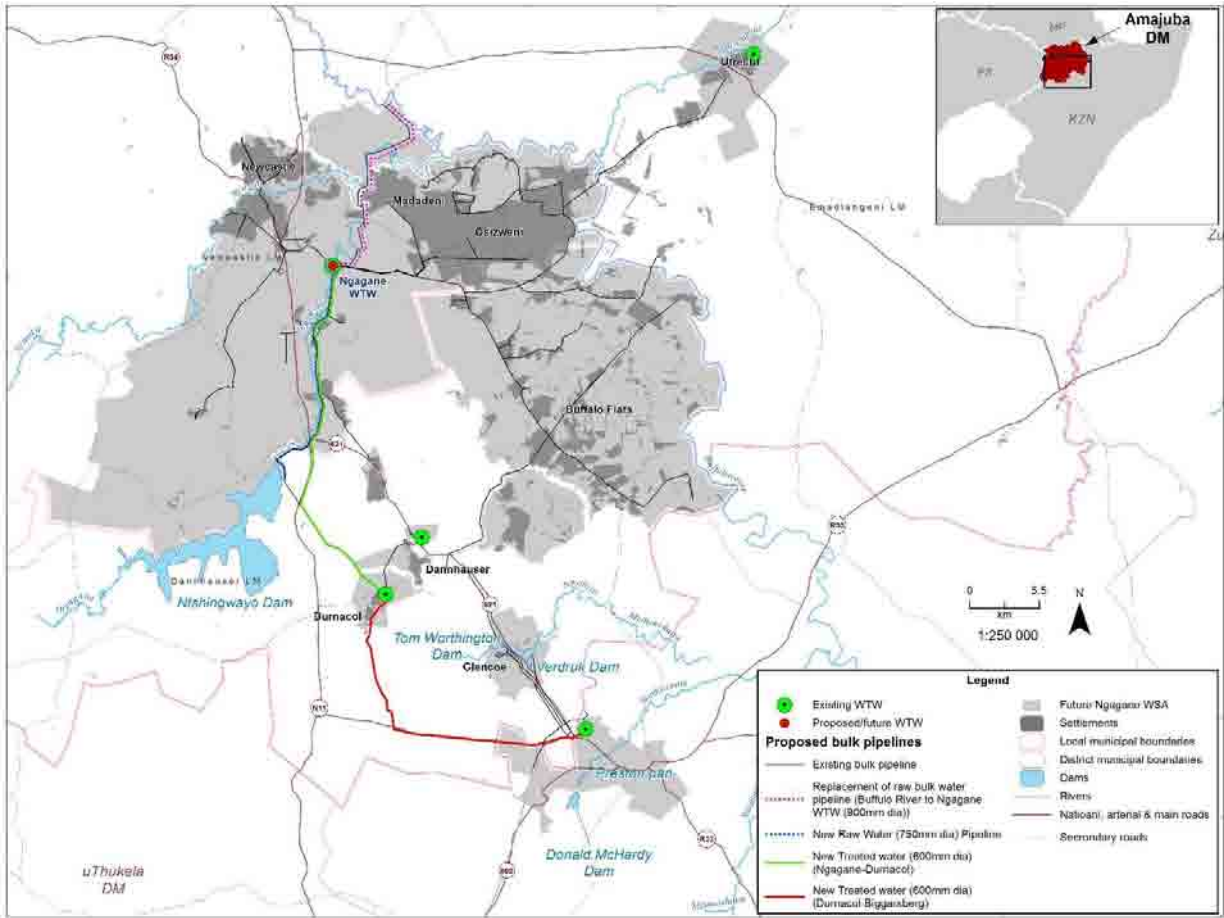
DATE COMPLETED:

2016/03/31

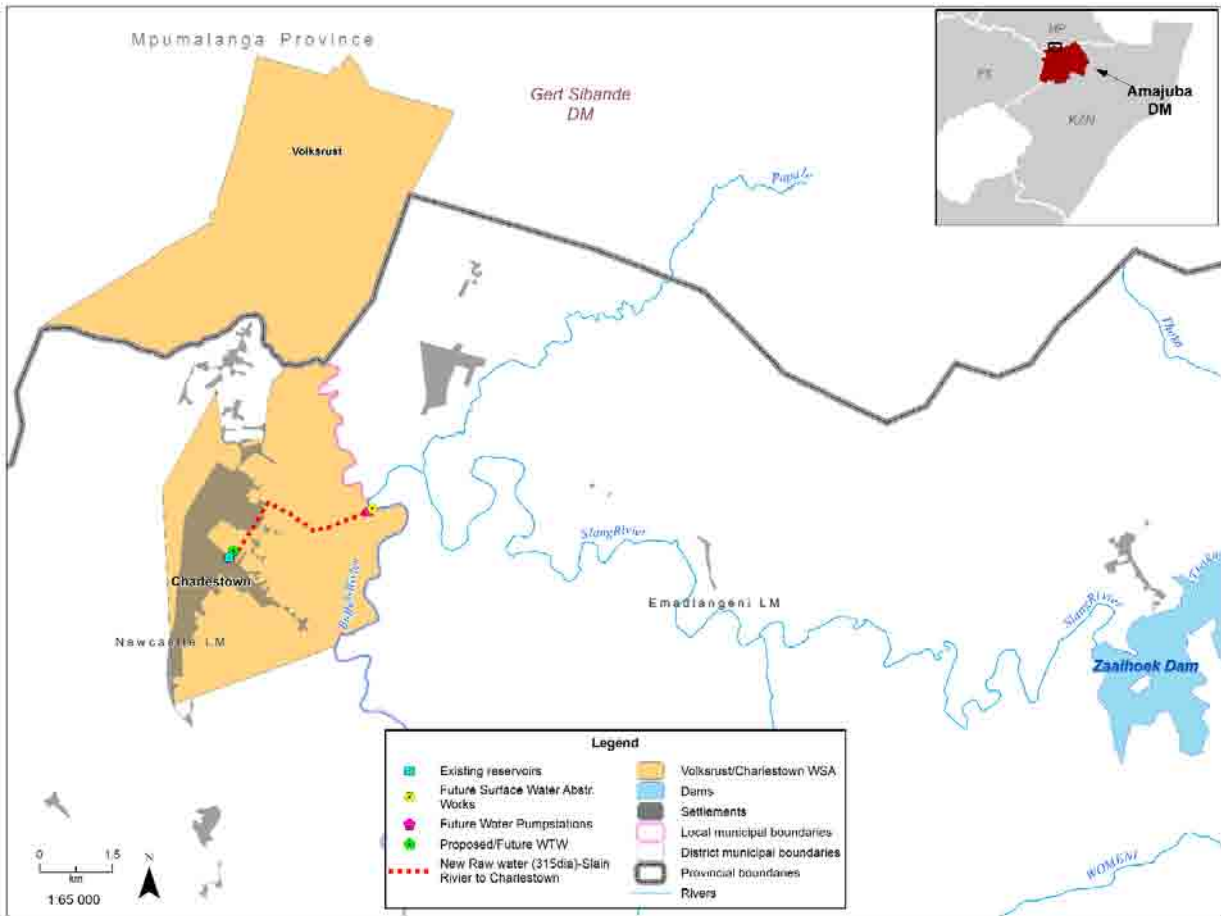
MAP NO.:

DC25_Figure 8/KZN252

ANNEXURE C – PLANNED PROJECTS



Proposed Projects for the Ngagane WSS



Proposed Projects for the Greater Volksrust WSS (Charlestown)

ANNEXURE D – LOCATION OPTIONS FOR THE NGAGANE WTW

OPTION COMPARISON: - LOCATION OF WTW SERVING NTSHINGWAYO/NGAGANE SYSTEM

Two options for meeting the water requirements for the area to be served by the Ntshingwayo/Ngagane System were considered;

Option 1 – Master Plan Proposal

The uThukela Master Plan proposes the following upgrades to the WTW supplied by the Ntshingwayo Dam:

- Upgrade of the Ngagane WTW from present capacity to a capacity of 160MI/day,
- Construction of new treatment works at the Ntshingwayo Dam to meet projected demands (in this instance 2035 demands of 180MI/day).

Option 2 – Proposals in this report

The proposals in this report are as follows:

- Upgrade of the existing Ngagane WTW to 2035 water requirements of 180MI/day,
- No new treatment works.

These options are compared side by side.

Criteria	Option 1	Option 2
Ngagane Upgrade	40MI/day	60MI/day
New Treatment Works Capacity	180MI/day	Nil
Pump station requirements	Pump station at Ntshingwayo Dam	Pump station at Ngagane WTW
Power Requirements of Pump stations	3 No. 520kW Pump stations	1 000kW
Pipelines	<ul style="list-style-type: none"> • 15km x 600mm Diameter, • 10km x 450 mm diameter 	<ul style="list-style-type: none"> • 35km x 600mm Diameter, • 10km x 450mm diameter
Capital Cost (R M)	1 074.00	911.06
Net Present value (Based on costs only) Capital, Refurbishment and O & M costs	-R1 145 Million	-R978 Million

Based on the Net Present Value over a 50-year life cycle, Option 2 is more viable and has been adopted for the purpose of this study (this did not include a detailed feasibility study to evaluate all the options).