6. WATER & SANITATION SERVICES INFRASTRUCTURE PROFILE

6.1 Existing water services infrastructure

ZDM has done extensive work on the development of a database that will serve as an asset register, but also to be used as the basis for the development of an asset management system and to capture asset related information electronically for ongoing use. The system has been named 'MANZI' and access can be gained on the ZDM website at www.zululand.org.za once the user has been issued with a username and password.

Table 5.1(a) below provides a brief overview of the schemes in the district that have been captured on the MANZI system and a summary of the infrastructure under consideration, as well as a rough estimate of the value of assets. These figures will be refined over time once the asset management system has been rolled out.

Table 6.1(a): Summary of schemes in the district

Summary Data	LOS	Total
Number of Schemes	Above RDP - Urban	13
	Above RDP - Rural	25
	RDP	105
	Rudimentary	173
	TOTAL SCHEMES	**316**

Figures 6.1 (a), (b) and (c) and Table 6.1 (b) below show examples of infrastructure data that is currently available on the GIS system and also on MANZI. Although some gaps still exist in the infrastructure information ZDM is working on getting all information gaps systematically updated.

Table 6.1 (b): Summary of infrastructure components available on the ZDM GIS system

Summary Data	Description	Total
Pipelines	Bulk	1 264 km
	Reticulation	6 144 km
Installations	Yard Connection	27 831
	StandPipe - Barrel	305
	StandPipe - Communal	5 792
	Electrical Point	72
	Valve	14 837
	Meter	1 274
	Bulk Metering Points	253
	Handpump	486
	Pump	25
	Pump Station	119
	Source / Abstraction	521
	Break-pressure Tank	499
	Storage - Jojo	228
	Storage - Reservoir	748
	Treatment (Sand filters etc)	12
	Water Treatment Works	39
Replacement Value	Civil	R 2 187 465 532,77
	Mechanical	R 638 857 590,23
	Electrical	R 252 906 251,28
	Telemetry	R 13 480 747,91

Figure 6.1 (a): Existing water infrastructure in the district

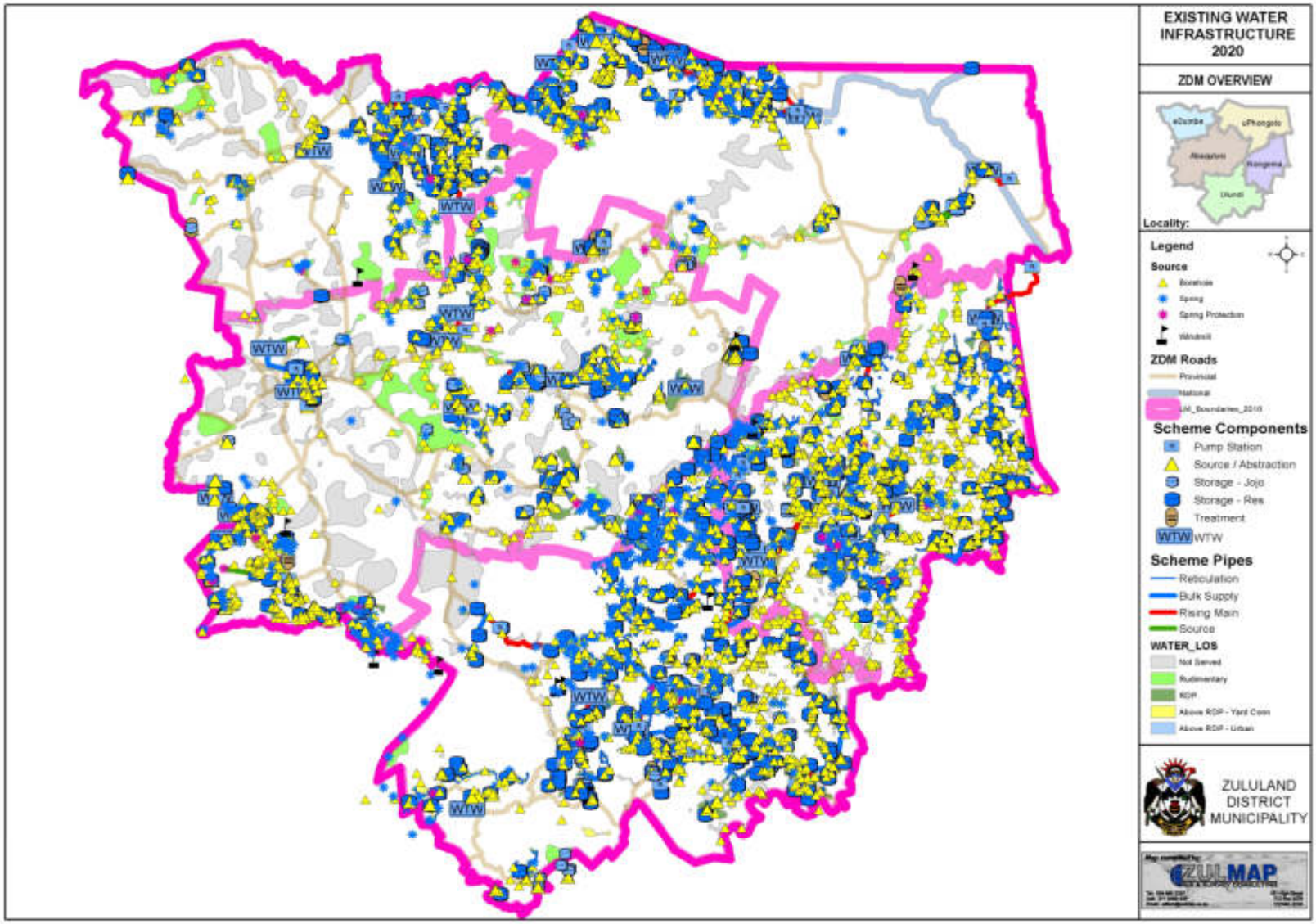


Figure 6.1 (b): Typical Bulk Water Scheme details available on the ZDM GIS database (Ulundi Area)

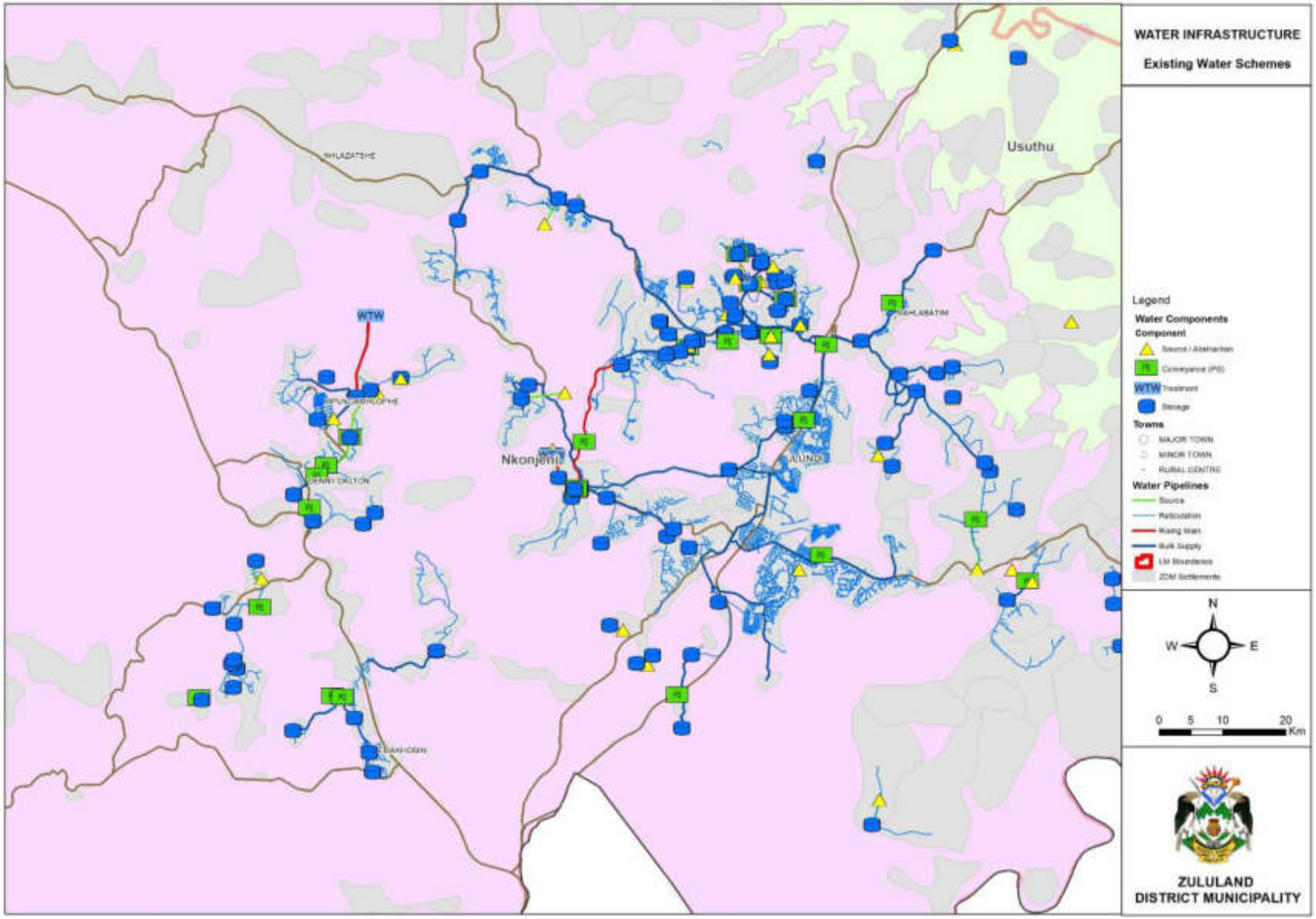
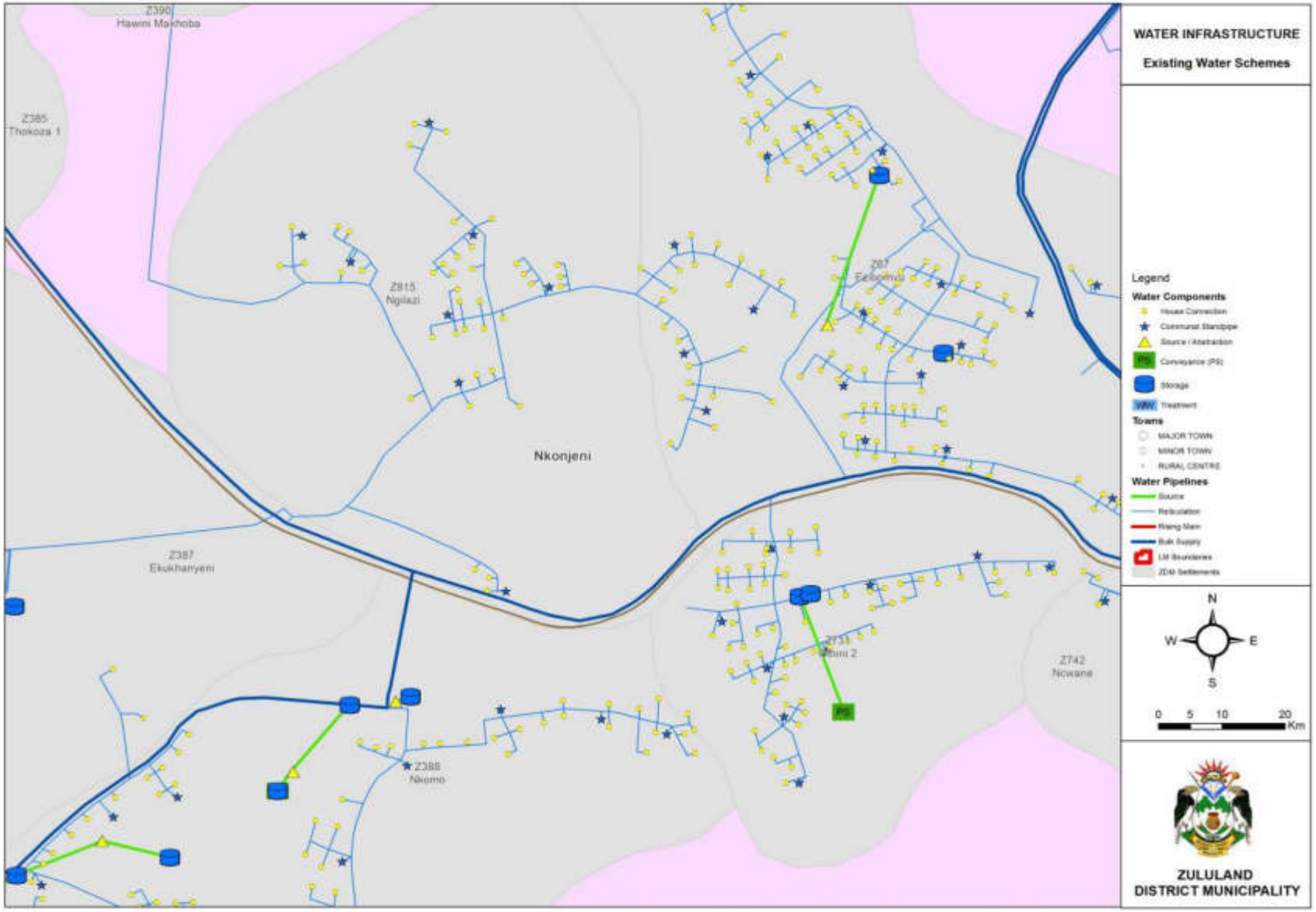
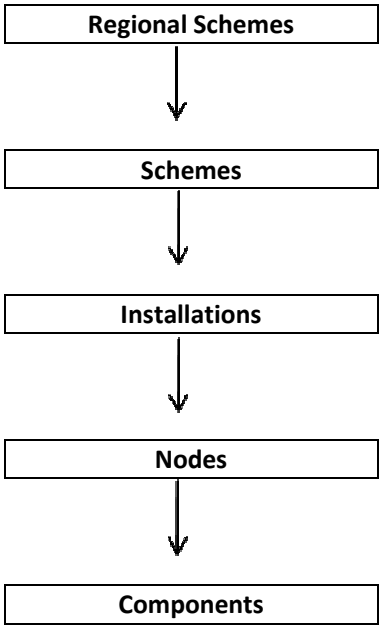


Figure 6.1 (c): Typical Water Reticulation details available on the ZDM GIS database (Nkonjeni Regional Scheme Area)



The asset data in the MANZI system has been structured in a specific data hierarchy as indicated below:

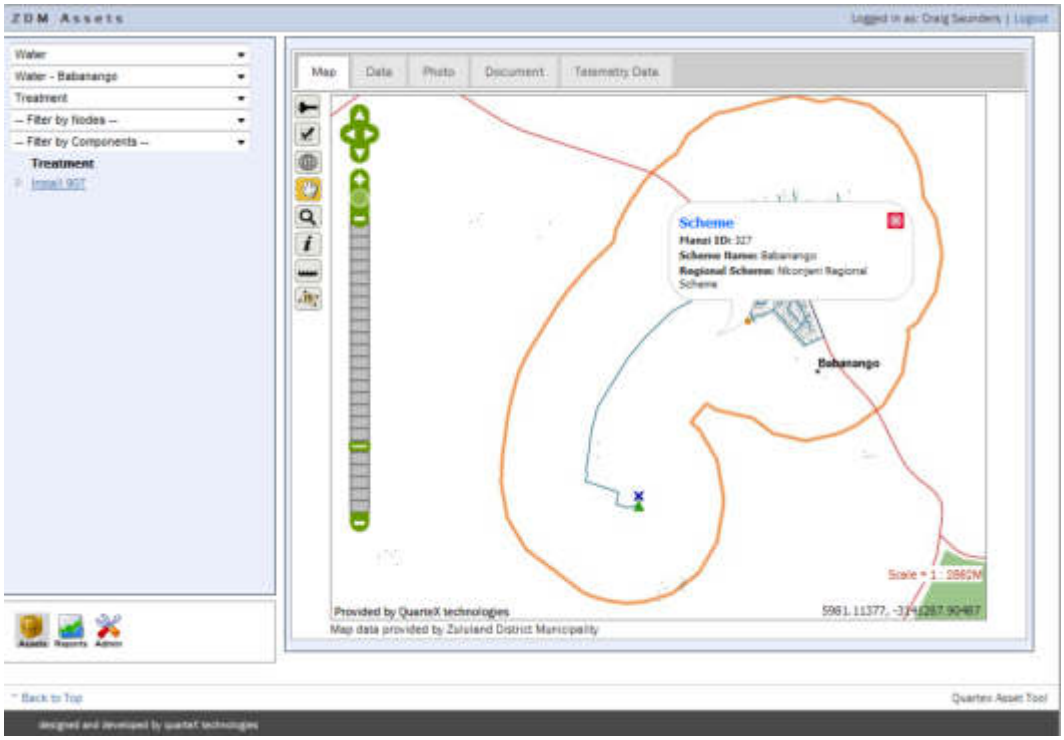


Different asset groups have been identified for water and sanitation infrastructure and these could be either listed as installations, nodes or components. Asset data forms have been developed for each asset group and this is used to capture asset information in the database. The asset data forms provide an overview of the type of information that is available on each asset group. Examples of such asset groups are:

- Water treatment works
- Sewage works
- Pump stations
- Pipelines
- Reservoirs
- Meters
- Valves
- Electrical equipment, etc

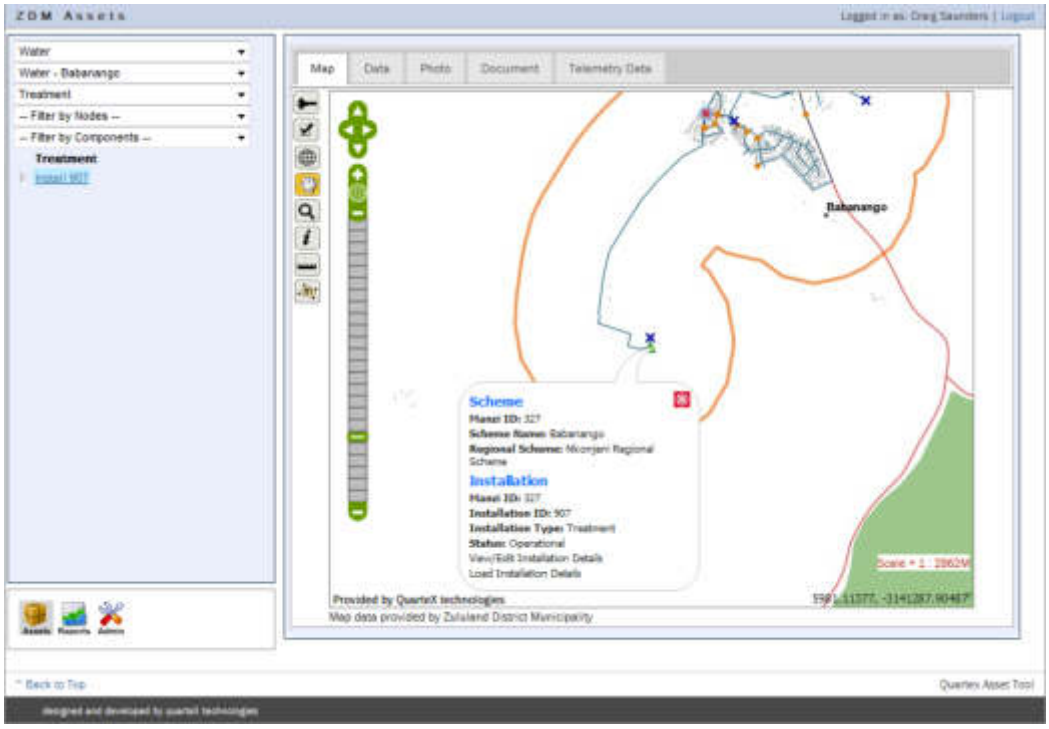
The Nkonjeni Regional scheme is again used as an example to illustrate the data hierarchy that has been used. Inside the Nkonjeni Regional scheme footprint there currently exists a number of schemes, varying from RDP to rudimentary schemes. Each of the schemes are allocated a scheme ID number by the system that is used to identify the scheme in all reporting that is used and to link different assets to the scheme. One of the schemes within this footprint is the Babanango scheme and the information captured at “scheme” level is shown in Figure 6.1 (d) below:

Figure 6.1 (d): Babanango scheme: Map interface showing scheme detail



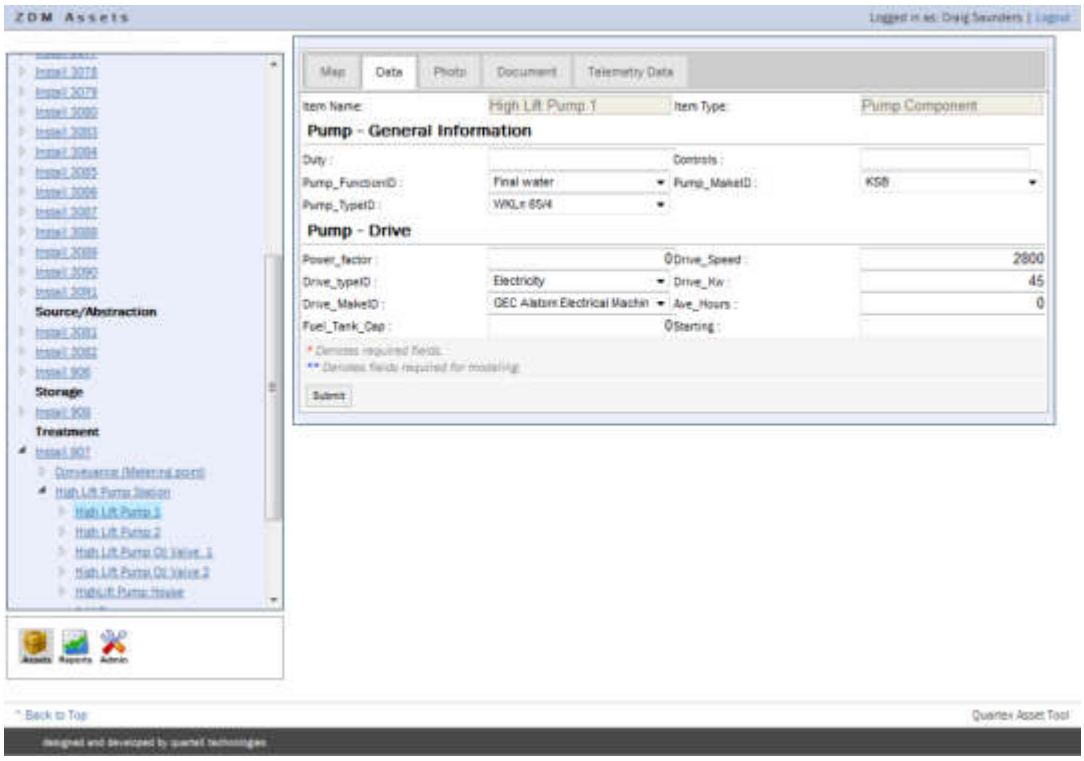
The Babanango water treatment works is one of the installations on this particular scheme and the asset data form captured at “installation” level is shown below in Figure 6.1 (e):

Figure 6.1 (e): Babanango water treatment works: Map interface showing “installation” location



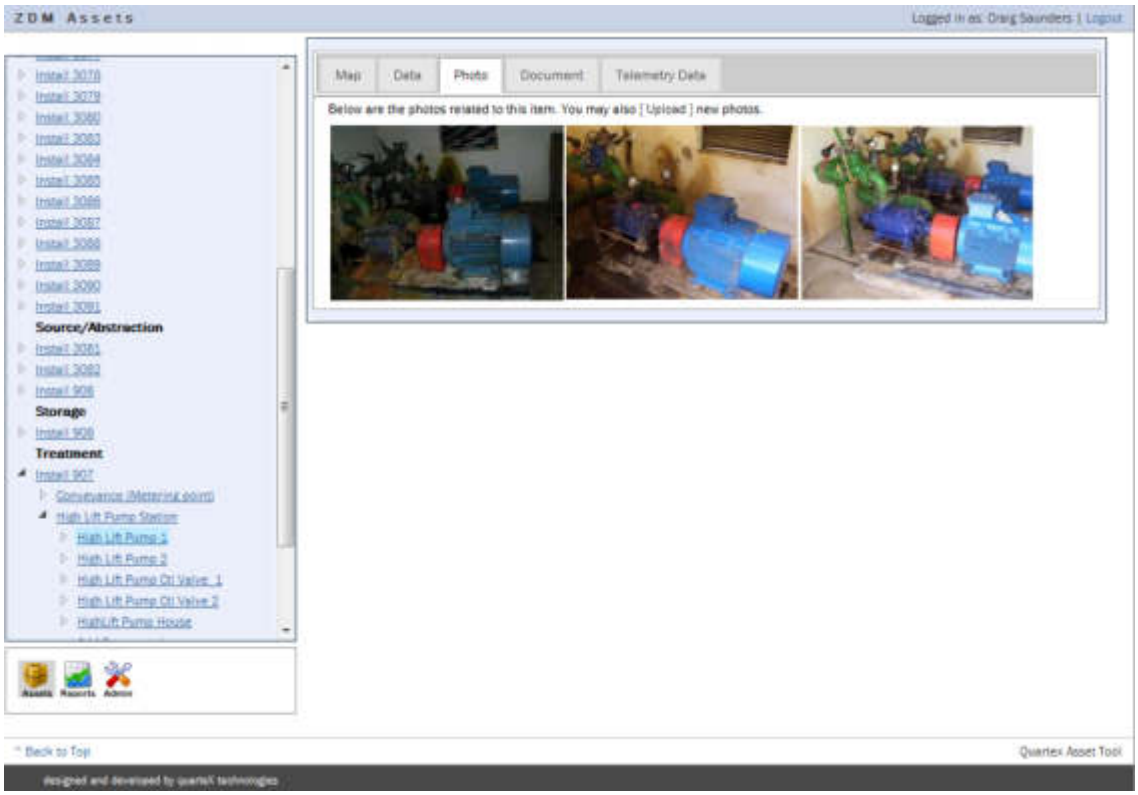
Within the Babanango water treatment works a number of nodes are listed, for example the raw water storage, sedimentation tanks, clarification process, sand filters, etc. The high lift pumping process is used as an example in this case and the asset data form captured at "component" level is shown in Figure 6.1 (f) below:

Figure 6.1 (f): Babanango water treatment works: High lift pumping process: information captured at "component" level – Component details



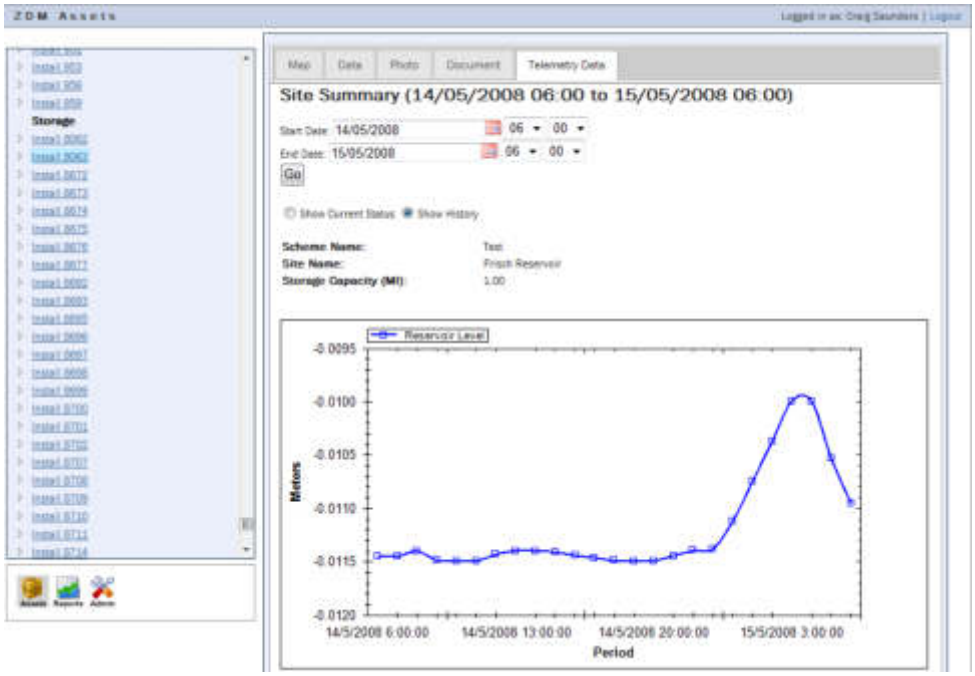
The different nodes within the Babanango water treatment works comprise of a number of components. The clear water pump station is such a node that comprises of various components such as the high lift pumps, electrical equipment, etc. The asset data form captured for the clear water pump station at "component" level is shown in Figure 6.1 (g) below:

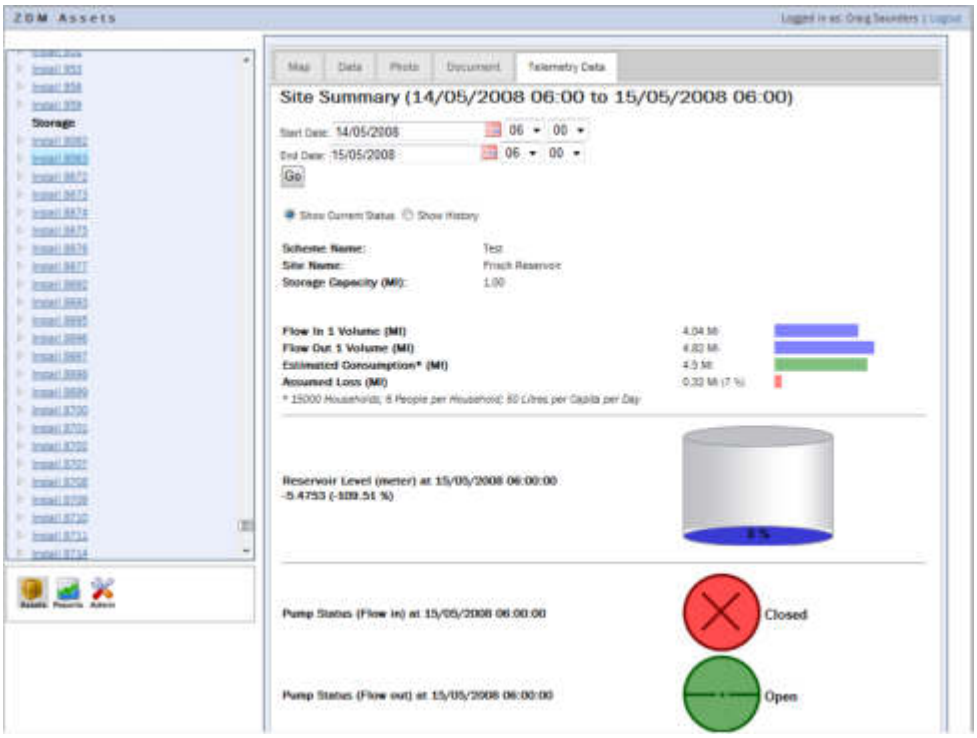
Figure 6.1 (g): Babanango water treatment works: High lift pumping process: information captured at "component" level - Photographs



In the same way documents specific to any level of the scheme map be uploaded to the system.

Telemetry has also been linked to the system and where data logging devices are installed, the outputs are presented, an example of the outputs for the telemetry at the Frischgewaagd Plant is shown in the figure below:

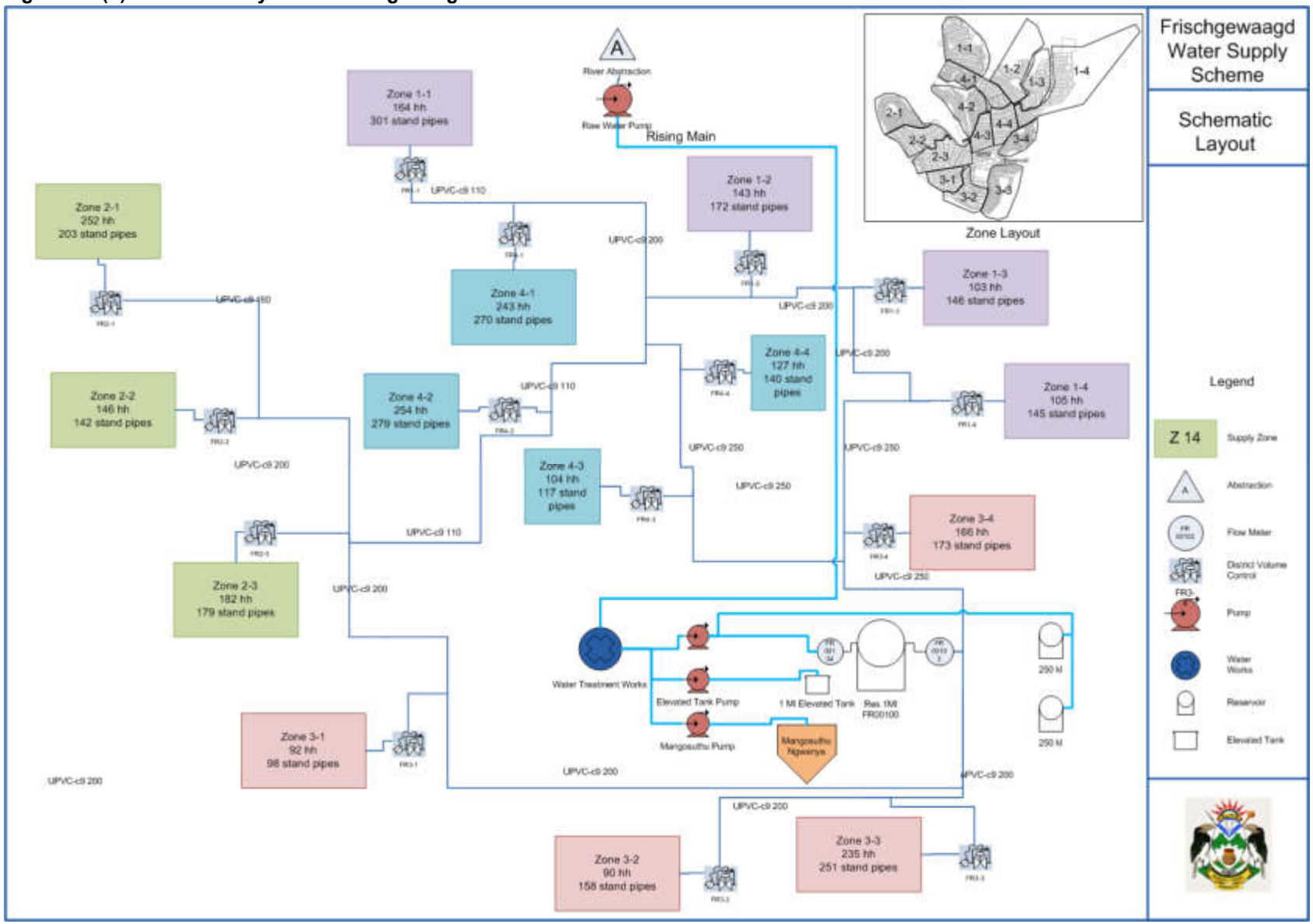




Schematic diagrams are also compiled for each scheme and basically summarises the main installations and nodes that make up the scheme. The diagram also shows how the installations and nodes are connected to make up the scheme and the direction of flow of the water or sewage.

The schematic diagram also forms the basis for the development of a water balance and telemetry installation for the scheme. The Frischgewaagd scheme is used as an example and the schematic diagram is attached herewith in Figure 6.1 (h) below:

Figure 6.1 (h): Schematic layout of Frischgewaagd water scheme



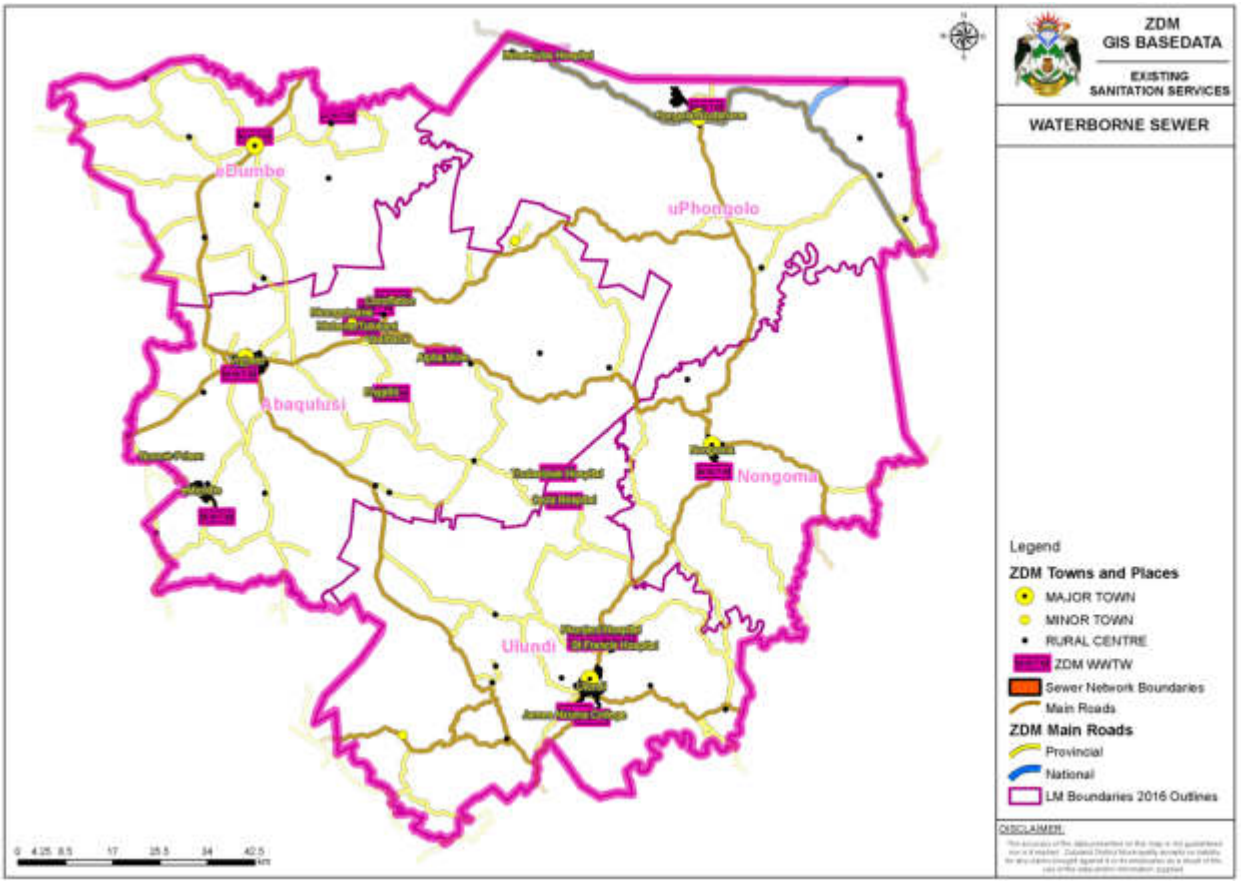
6.2 Existing sanitation services infrastructure

Sanitation services are divided up between formal waterborne sewer services, as well as basic RDP-level services in the form of VIP-type sanitation facilities for households.

There are 18 formal waterborne sewer networks in ZDM. Louwsburg and Paulpietersburg towns only have soak-away drain pits, while Frischgewaagd only has VIP-type sanitation.

A map showing these network locations can be seen in the next map.

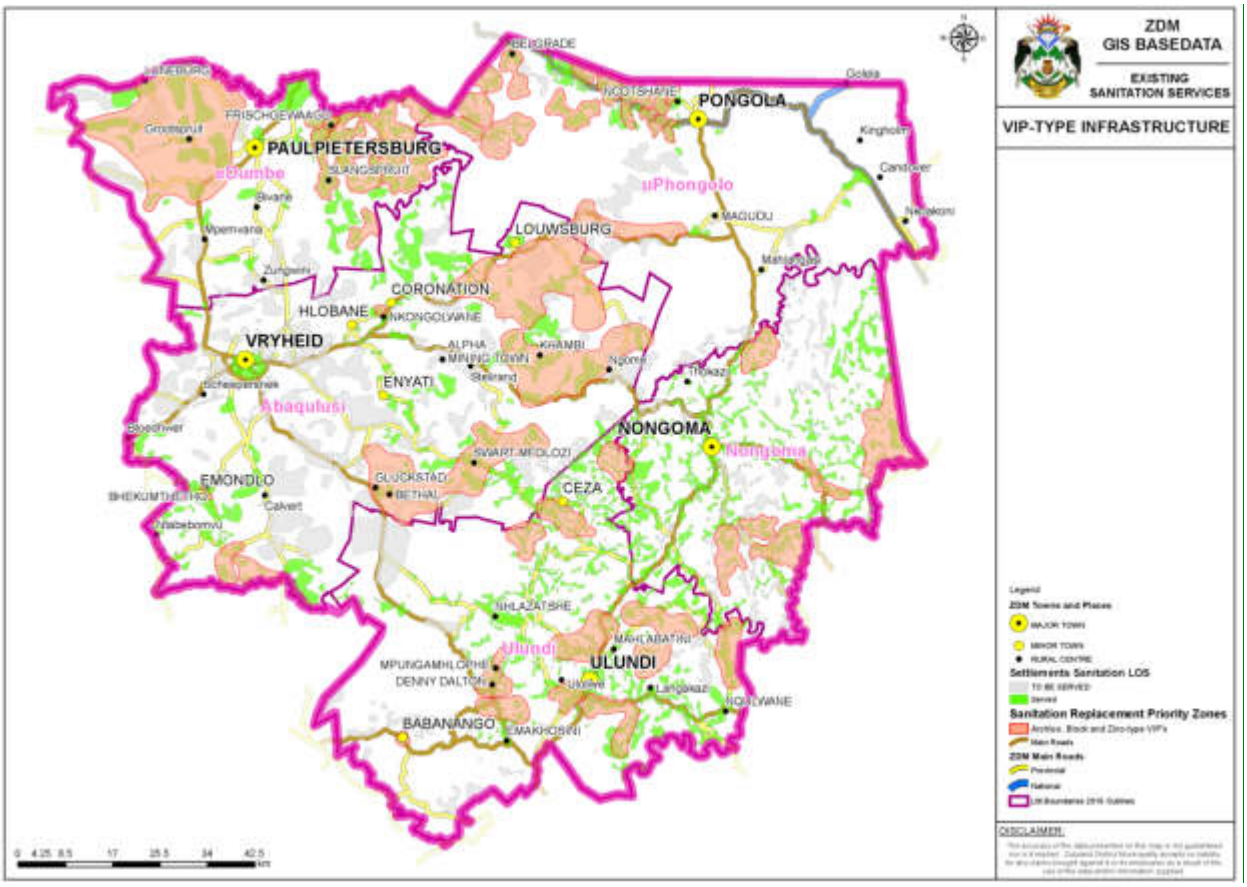
Figure 6.2 Waterborne Sanitation



VIP-type sanitation are mostly found in the more rural communities, and provide a basic sanitation facility for households. Previous programmes were implemented using Archloo, block or Zinc-type VIP's. These VIP's cannot be moved or relocated when the pit is full, and a replacement programme has been identified to replace these units with the current pre-cast type VIP's which can be disassembled and moved should the pit be full.

A map indicating existing settlements served with VIP-type units can be seen in the next map, as well as the areas earmarked for the replacement programme.

Figure 6.3 VIP-type Sanitation



6.2 Asset Management Assessment

As mentioned above ZDM is well advanced with the development of MANZI, the ZDM asset management system. The system currently comprises mostly asset data and work is being done to develop operational and maintenance procedures for the assets, which will guide the activities for the ongoing upkeep of asset conditions. Assessments have already been done on certain issues related to asset management and further work needs to be done on other issues, as summarised below:

- **Human resources** - The ZDM Section 78 investigation was finalised in 2007 and identified the most appropriate water services provider arrangement for the ongoing O&M of water services infrastructure in the district. Current staff organograms were compiled and compared with the minimum required staff resources needed to perform the O&M duties adequately. Shortages in staff numbers were identified and are being addressed over time within the ZDM financial means. Training of existing staff was also identified as a crucial element to ensure highly efficient personnel and this is being addressed annually as part of the ZDM Skills Development Plan. Certain functions have also been indentified that cannot cost effectively be developed in-house and will rather be contracted in externally.
- **Materials, tools & equipment, transport** – The Section 78 investigation has also identified shortcomings in this regard and has listed vehicles and equipment to be purchased in order to have fully functional O&M teams. The need for additional stores has also been identified throughout the district and these are progressively being addressed with the available funding.
- **Budget** – The Section 78 investigation has identified the funding requirements at present and in the future to adequately operate and maintain existing assets and new assets to be added over time. This information guides the preparation of the annual O&M budget, although available financial resources are not sufficient.
- **Asset information** – The locality information on assets is very good and particularly the water assets are viewed to be more than 80% covered. Sewerage information is still lacking but is being addressed. Asset information that also still needs further work includes as-built information, design reports, operating manuals, safety plans, etc. Assessments were also done on asset conditions to determine a brief overview of the status of assets and start identifying where urgent work needs to be done. Photographs were taken of each asset visited and have been included into the MANZI system.
- **Risk management** – ZDM realises that available resources will never really be sufficient to address all needs at once and therefore work has started on the development of a risk based approach to asset management. This model will consider the risk of failure of an asset, the consequence of such a failure and the probability of a failure occurring. This will all be compared to ensure that resources are applied where really needed most.
- **Reporting** – The ZDM WSP reporting system will feed back valuable information to management regarding O&M activities and asset performance. This information will be used to adjust asset management priorities if needed and also track the efficiency of asset management projects that are being implemented.

6.3 Schemes to be transferred

All schemes and related staff that were identified to be transferred from DWA and Department of Works to ZDM have been concluded. There are other schemes in the district still being operated by National Department of Works, e.g water services at prisons, but no formal or informal request have yet been entered into for the transfer of these schemes.

6.4 Schemes to be rehabilitated

There are currently a number of investigations underway to determine the refurbishment requirements of water services infrastructure in the district. The refurbishment requirements at bulk plants are receiving first priority since it is perceived that the most urgent interventions are required at these assets. Investigations are also being commissioned to determine the condition of urban infrastructure and the refurbishment needs in the towns. Whilst new infrastructure has been rolled out in the rural areas to previously neglected communities, the infrastructure in towns have received very little attention and funding since 1994 and it can be expected that most of the refurbishment requirements will be in these areas. The above mentioned investigations have not yet been fully completed and the results will be included once available.

Assessment of the bulk water and sewage works:

ZDM is currently updating its assessments on all water and waste water treatment works. The assessments included recommendations and cost estimates to refurbish and/or upgrade these works in the short term and medium to long term. These assessments also recommended emergency interventions.

The outcomes can be used to secure funding for the emergency interventions, short term refurbishment and medium to long term upgrading.

Emergency interventions are needed where work is needed to attend to fatal problem areas, such as settlements consuming raw untreated water, sewer water spilling directly into rivers and structures that is almost collapsing. Short term refurbishment (not critical work) is needed to refurbish and upgrade the existing works in order to meet the current demands and also to enable the works to function at its design capacity. These short term refurbishments were prioritised using criteria such as cost per capita and current demand versus current capacity.

Medium to long term upgrading (not critical work) is needed to upgrade the existing works in order to meet the future demands. These long term refurbishments were prioritised using criteria such as cost per capita and future demand versus the capacity after short term refurbishment. Some of these works will become redundant in future (As they will be incorporated into larger regional schemes). This was also taken into account.

Table 6.4 (a): The list of Waste Water Treatment works that were assessed

Waste Water Treatment Works		Current Delivery	Regional Area	Local Municipality
		ML/d		
1	Frischgewaagd WWTW	0.08	Sim West	eDumbe
2	Paulpieterburg WWTW	0.30	Sim West	eDumbe
3	Vryheid Town WWTW	9.00	Hlahlindlela	Abaqulusi
4	eMondlo WWTW	2.40	Hlahlindlela	Abaqulusi
5	Nkongolwane WWTW	0.25	Coronation	Abaqulusi
6	Alpha Mine WWTW	0.00	Khambi	Abaqulusi
7	Hlobane WWTW	0.35	Coronation	Abaqulusi
8	Coronation WWTW	1.00	Coronation	Abaqulusi
9	Itshelejuba Hospital WWTW	0.09	Sim Central	uPongola
10	Pongola Town WWTW	2.50	Sim East	uPongola
11	Thulasizwe Hospital WWTW	0.03	Usuthu	Nongoma
12	Holinyoka/Nongoma WWTW	1.80	Usuthu	Nongoma
13	Ceza WWTW	0.14	Usuthu	Nongoma
14	James Nxumalo WWTW	0.08	Nkonjeni	Ulundi
15	Nkonjeni Hospital WWTW	0.20	Nkonjeni	Ulundi
16	St Francis Hospital WWTW	0.06	Nkonjeni	Ulundi
17	Ulundi Town WWTW	2.60	Nkonjeni	Ulundi
18	Enyathi WWTW	0.00	Coronation	Abaqulusi

Table 6.4 (b): The list of Water Treatment works that were assessed

Water Treatment Works		Current Delivery	Regional Area	Local Municipality
		ML/d		
1	Frischgewaagd WTW	1.93	Sim West	eDumbe
2	eDumbe WTW (Paulpietersburg)	2.21	Sim West	eDumbe
3	Ophuzane WTW	0.41	Sim West	eDumbe
4	Tholakele WTW	0.7	Sim West	eDumbe
5	Klipfontein WTW	10	Hlahlindlela	Abaqulusi
6	Bloemveld WTW	5	Hlahlindlela	Abaqulusi
7	Mondlo WTW	9	Hlahlindlela	Abaqulusi
8	Mvuzini WTW	0.62	Hlahlindlela	Abaqulusi
9	Purim WTW	0.45	Hlahlindlela	Abaqulusi
10	Hlobane WTW	2	Coronation	Abaqulusi
11	Louwsburg WTW	0.72	Coronation	Abaqulusi

Table 6.4 (b): The list of Water Treatment works that were assessed (continued)

Water Treatment Works		Current Delivery	Regional Area	Local Municipality
		ML/d		
12	Coronation WTW	0.4	Coronation	Abaqulusi
13	Khambi WTW	0.15	Khambi	Abaqulusi
14	Mountain View WTW	0.1	Khambi	Abaqulusi
15	Belgrade WTW	0.74	Sim Central	uPongola
16	Msibi WTW	0.42	Sim Central	uPongola
17	Khiphunyawo WTW	0.53	Sim Central	uPongola
18	Nkosentsha WTW	0.03	Sim Central	uPongola
19	Spekboom WTW	1.28	Sim East	uPongola
20	Pongola WTW	9.06	Sim East	uPongola
21	Osingisingini WTW	0.04	Usuthu	Nongoma
22	Thulasizwe Hospital WTW	0.16	Usuthu	Nongoma
23	Vuna WTW	1.52	Usuthu	Nongoma
24	Ceza WTW	0.26	Usuthu	Nongoma
25	Khangela Palace WTW	0.03	Usuthu	Nongoma
26	Enyokeni Palace WTW	0.04	Usuthu	Nongoma
27	Ulundi WTW	18.78	Nkonjeni	Ulundi
28	Mpungamhlope WTW	0.82	Nkonjeni	Ulundi
29	Babanango WTW	0.36	Nkonjeni	Ulundi
30	Enyathi WTW	0.09	Coronation	Abaqulusi
31	Mandlakazi WTW	1.77	Mandlakazi	Nongoma
32	Sidinsi WTW	0.11	Mandlakazi	Nongoma
33	Kombusi WTW	0.07	Mandlakazi	Nongoma
34	Embile WTW	0.08	Usuthu	Nongoma
35	Masokaneni WTW	0.01	Nkonjeni	Ulundi
36	Nkonjeni Hospital WTW	0.12	Nkonjeni	Ulundi
37	Itshelejuba Hospital WTW	0.13	Sim Central	uPongola
38	Usuthu WTW	0.09	Usuthu	Nongoma

The results of the assessments are shown in Tables 5.4 (c) & (d) below:

Table 6.4 (c): Assessment of Water Treatment Works

Water Treatment Works		Current Delivery	Cost Estimate Emergency Work	Cost Estimate Short Term	Cost Estimate Long Term (Excludes short term)
		ML/d	ex VAT and Prof fees	ex VAT and Prof fees	ex VAT and Prof fees
1	Frischgewaagd WTW	0.4	R -	R 1 040 000	R 45 000 000
2	eDumbe WTW (Paulpietersburg)	0.15	R -	R 2 490 000	R 20 000 000
3	Ophuzane WTW	0.1	R -	R 540 000	R -
4	Tholakele WTW	0.74	R -	R -	R -
5	Klipfontein WTW	0.42	R -	R 8 870 000	R 4 415 000
6	Bloemveld WTW	0.53	R -	R 3 640 000	R 5 200 000
7	Mondlo WTW	0.03	R 480 000	R 180 000	R 2 400 000
8	Mvuzini WTW	1.28	R -	R -	R -
9	Purim WTW	9.06	R -	R -	R 250 000
10	Hlobane WTW	0.04	R 450 000	R 1 590 000	R -
11	Louwsburg WTW	0.16	R 320 000	R 2 500 000	R -
12	Coronation WTW	1.52	R 850 000	R 1 140 000	R 22 000 000
13	Khambi WTW	0.26	R -	R -	R 150 000
14	Mountain View WTW	0.03	R -	R -	R 265 000
15	Belgrade WTW	0.04	R 226 000	R 95 300	R 12 500 000
16	Msibi WTW	18.78	R 74 000	R 2 055 000	
17	Khiphunyawo WTW	0.82	R 18 000	R 4 140 000	
18	Nkosentsha WTW	0.36	R 77 000	R 1 680 000	
19	Spekboom WTW	0.4	R 334 500	R 1 607 200	
20	Pongola WTW	0.15	R 215 000	R 110 200	R 20 000 000
21	Osingisingini WTW	0.1	R 14 000	R 672 000	
22	Thulasizwe Hospital WTW	0.74	R 16 100	R 42 000	R 800 000
23	Vuna WTW	0.42		R 323 500	
24	Ceza WTW	0.53	R 2 000	R 2 030 000	
25	Khangela Palace WTW	0.03	R 800	R 1 335 000	
26	Enyokeni Palace WTW	1.28	R 36 700	R 28 000	
27	Ulundi WTW	9.06		R 530 000	
28	Mpungamhlope WTW	0.04	R 17 600	R 35 000	R 20 000 000
29	Babanango WTW	0.16	R 3 400	R 2 335 000	R -
30	Enyathi WTW	No assessments scheduled			
31	Mandlakazi WTW	Assessment outstanding			
32	Sidinsi WTW	Assessment outstanding			
33	Kombusi WTW	Assessment outstanding			
34	Embile WTW	No assessments scheduled			
35	Masokaneni WTW	No assessments scheduled			
36	Nkonjeni Hospital WTW	No assessments scheduled			
37	Usuthu WTW	0.00			R 100 000 000
			R 3 135 100	**R 39 008 200**	**R 252 980 000**

Table 6.4 (d): Assessment of Waste Water Treatment Works

Waste Water Treatment Works		Current Delivery	Cost Estimate Emergency Work	Cost Estimate Short Term	Cost Estimate Long Term (Excludes short term)
		ML/d	ex VAT and Prof fees	ex VAT and Prof fees	ex VAT and Prof fees
1	Frischgewaagd WWTW	0.08	R 0	R 300 000	R 40 000 000
2	Paulpieterburg WWTW	0.30	R 550 000	R 1 800 000	R 0
3	Vryheid Town WWTW	9.00	R 0	R 0	R 0
4	eMondlo WWTW	2.40	R 725 000	R 3 630 000	R 5 500 000
5	Nkongolwane WWTW	0.25	R 0	R 0	R 990 000
6	Alpha Mine WWTW	0.00	R 0	R 300 000	R 0
7	Hlobane WWTW	0.35	R 900 000	R 3 150 000	R 450 000
8	Coronation WWTW	1.00	R 850 000	R 3 980 000	R 6 000 000
9	Itshelejuba Hospital WWTW	0.09		R 70 000	R 800 000
10	Pongola Town WWTW*	2.50	R 13 000	R 363 500	R 1 390 000
11	Thulasizwe Hospital WWTW	0.03		R 220 000	R 50 000
12	Holinyoka/Nongoma WWTW**	1.80		R 1 719 753	R 4 310 000
13	Ceza WWTW	0.14		R 660 000	R 2 000 000
14	James Nxumalo WWTW	0.08		R 270 000	R 890 000
15	Nkonjeni Hospital WWTW	0.20		R 70 000	R 1 770 000
16	St Francis Hospital WWTW	0.06		R 75 000	R 840 000
17	Ulundi Town WWTW**	2.70		R 600 000	R 2 900 000
18	Enyathi WWTW	0.00	No assessments Scheduled		
	Total		**R 3 038 000**	**R 17 208 253**	**R 67 890 000**

The above assessments are currently in the process of being reviewed and updated for further interventions.

Figure 6.4 (a): Locality map of the Water Treatment Works

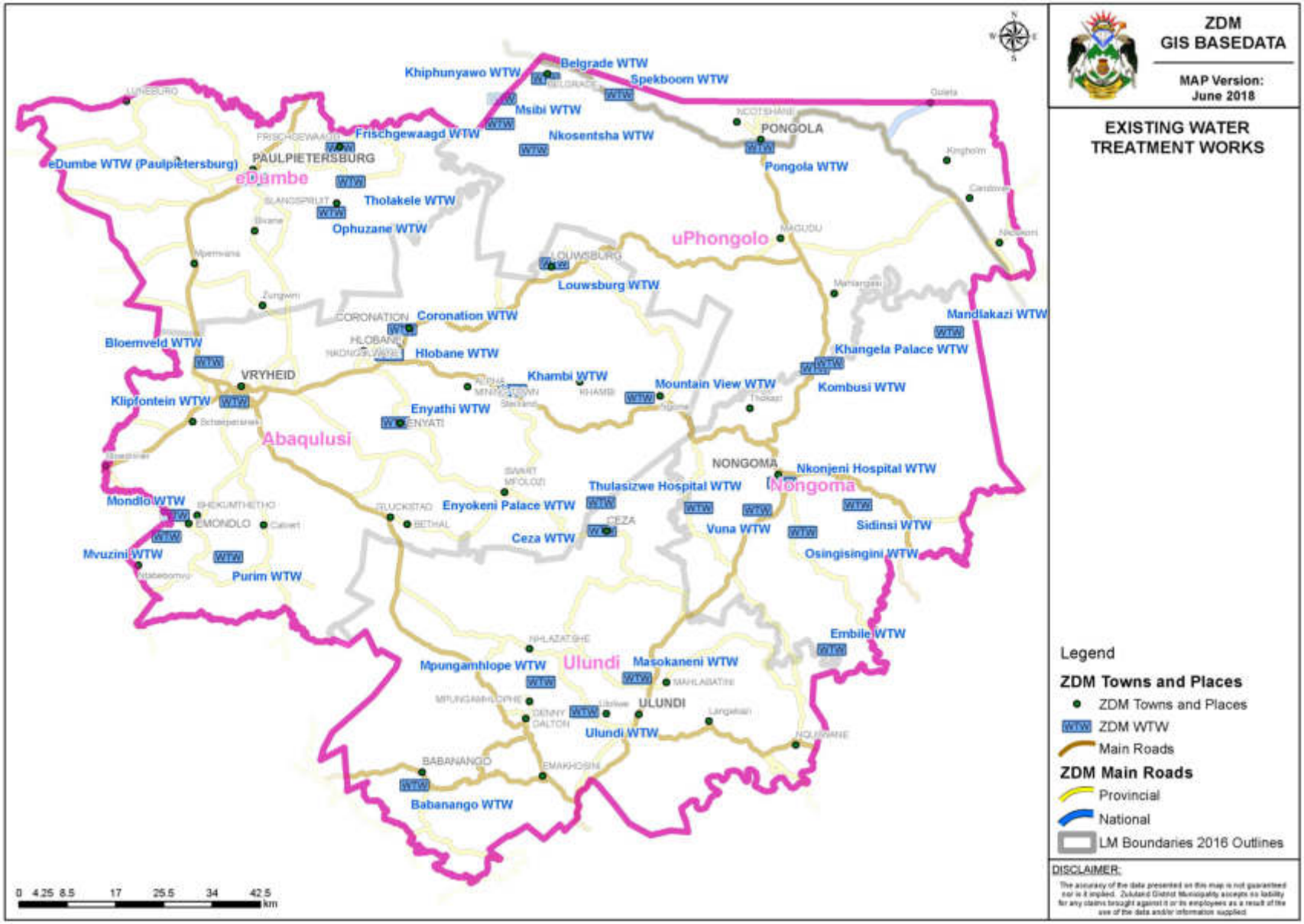
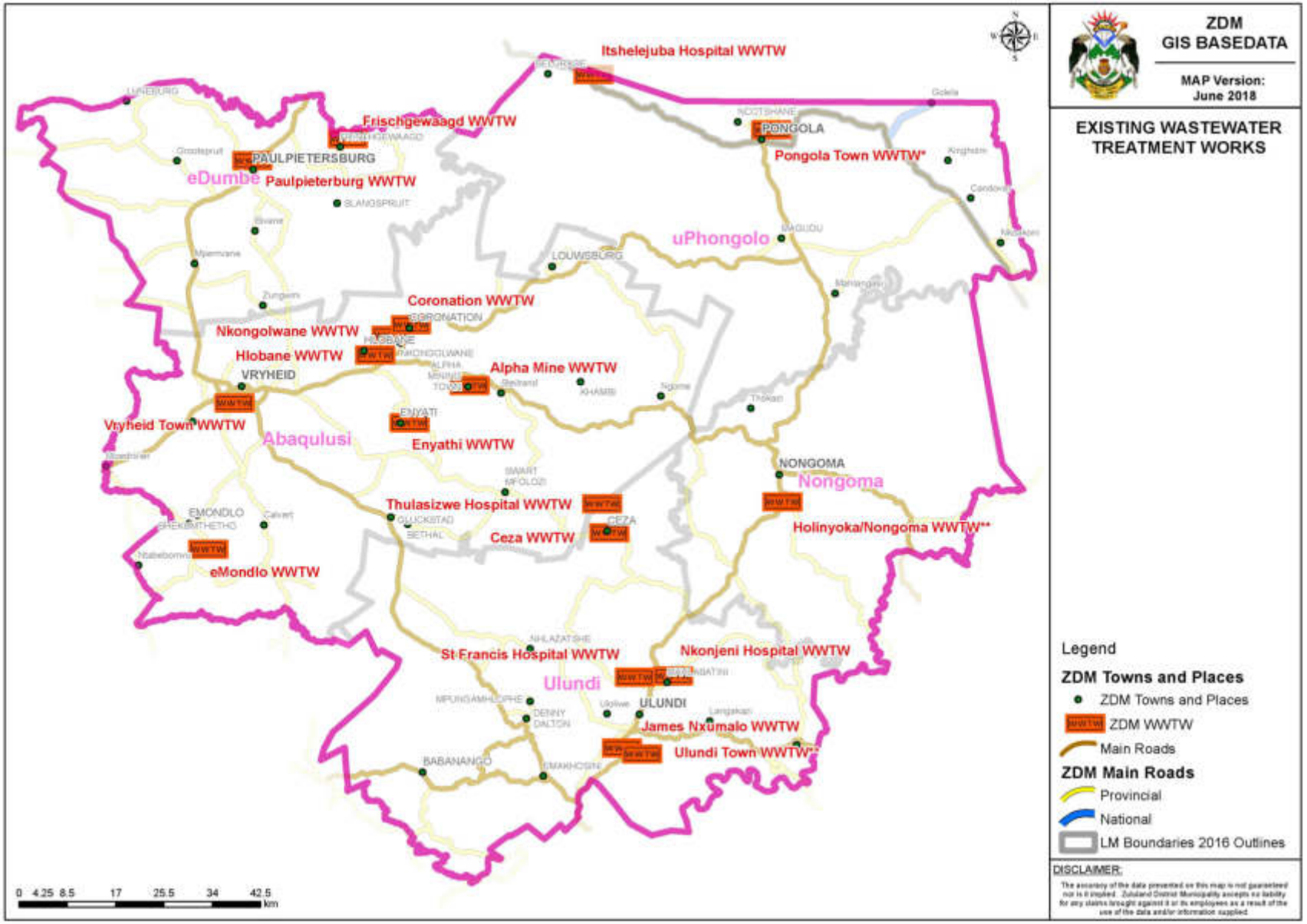


Figure 6.4 (b): Locality map of the Sewage Works



6.5 Blue Drop / Green Drop Assessments

The Blue Drop Report Card and Scoring Criteria

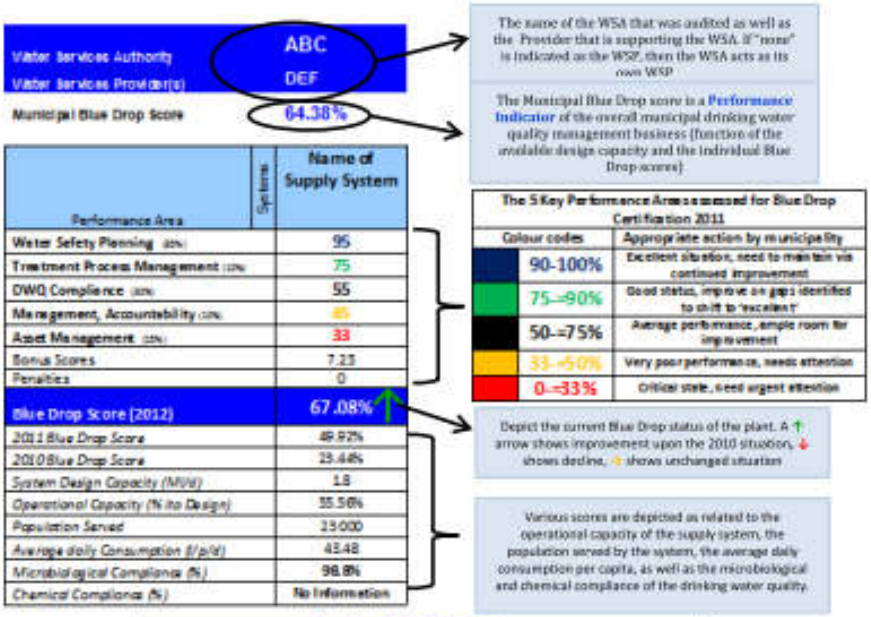
Assessments are conducted by a panel consisting of a qualified drinking water quality professional as Lead Inspector, 2-4 Inspectors (Assessors) and a Learner Assessor who also coordinates the logistical arrangements of the assessments.

The team selection is done based on the outcomes of a Blue Drop Examination which tests the assessor's knowledge and competence in the subject field. Virtual assessments were done in cases where municipalities uploaded their Portfolio of Evidence (or parts of) onto the Blue Drop System. The scorecards outlines the key requirements of the Blue and Green Drop Assessments and indicate the Portfolio of Evidence that was required by each municipality to calculate a Blue and Green Drop score per water supply system.

The latest Blue and Green Drop Assessment outcomes can be requested from the Planning Department of ZDM.

How to read the Report Card

The following is an example of a typical municipal Blue Drop report card. Results are provided in colour-coded format – each colour has a specific meaning and performance reference.



Quality of Drinking Water	
Colour Drop	**Indication of Drop**
	Blue Drop Certified, water safe to drink; complied excellently with national standards throughout the reporting period; Must have scored 95% on adherence to Blue Drop Requirements; Water must comply excellently with SABS 241; Water safe to drink.
	Water complied excellently with standard; safe to drink **Micro > 97%** **Chemical > 95%**
	Water safe to drink but some chemical parameter compliance requires improvement **Micro > 97%** **Chemical < 95% (or no information)**
	Water generally safe to drink but with recorded some microbiological failures **Micro < 97%** **Chemical > 95%**
	Water did not comply according to expected standard targets **Micro > 90% < 95%** **Chemical > 90% < 95%**
	Compliance levels too low; there were extended periods when the water did not comply with standard / or no monitoring to confirm actual quality of tap water **Micro < 90%** **Chemical < 90%**

The Green Drop Report Card

How to Read the Report Card

The following is an example of a typical municipal report card that appears in the Green Drop Report 2013.
Results are provided in colour coded format – each colour has a specific meaning and performance reference.

Water Services Authority	ABC Local Municipality
Water Services Provider(s)	ABC WSP

2013 Municipal Green Drop Score	81.63%
2011 Municipal Green Drop Score	63.80%
2009 Municipal Green Drop Score	75.00%

The Municipal Green Drop score is a Performance Indicator of the overall municipal wastewater business (function of the available design capacity and the individual Green Drop scores).
Arrows: Depict the current Green Drop status of the plant. A ↑ arrow shows improvement upon the 2009situation, ↓ shows digress, → shows unchanged situation

Key Performance Area	Weight	System X
Process Control & Maintenance Skills	10%	67
Monitoring Programme	15%	95
Submission of Results	5%	100
Effluent Quality Compliance	30%	16
Risk Management	15%	90
Local Regulation	5%	100
Treatment Capacity	5%	100
Asset Management	15%	94
Bonus Scores		8.48
Penalties		1.90
Green Drop Score (2013)		74.88%
2011 Green Drop Score		47.00%
2009 Green Drop Score		66.00%
System Design Capacity	Ml/d	2.3
Capacity Utilisation (% ADWF ito Design Capacity)		112.0%
Resource Discharged into		Pienaars River (sensitive, special standard apply)
Microbiological Compliance	%	12.95%
Chemical Compliance	%	24.35%
Physical Compliance	%	20.69%
Overall Compliance	%	20.90%
Wastewater Risk Rating (2012)		76.50%
Wastewater Risk Rating (2013)		76.47%

Colour codes	Appropriate action by institution
90-100%	Excellent situation, need to maintain via continued improvement
80-<90%	Good status, improve where gaps identified to shift to 'excellent'
50-<80%	Fair performance, ample room for improvement
31-<50%	Very poor performance, need targeted intervention towards gradual sustainable improvement
0-<31%	Critical state, need urgent intervention for all aspects of the wastewater services business

≥90% = Green Drop Certification
<30% = Purple Drop Status

Plant is receiving 12% more wastewater compared to its original design capacity (ADWF)

Effluent quality compliance to legislative standards carries a high (30%) weight in the GDC score

The CRR% Deviation (CRR/ CRRmax) score is specific to the wastewater "treatment" function of the service. This score indicates the actual risk as a % of the maximum risk that the plant potentially can reach. An orange and redblock indicate that the plant is in high- or critical risk that warrants urgent attention. A higher value reflects a high risk state (undesirable). A lower value reflects a lower risk state.

Note: volumetric capacity refers to Average Dry Weather Flow

CRR% Deviation	
	90 – 100% Critical risk WWTP
	70 - <90% High Risk WWTP
	50-<70% Medium risk WWTP
	<50% Low Risk WWTP

6.6 New infrastructure to be built

Water infrastructure:

During 2004 the ZDM started a comprehensive water master planning exercise to determine the most appropriate methods of providing previously neglected communities with water services. In all cases the main drivers were to obtain the technical solution that will not necessarily be the lowest in terms of capital requirements to implement, but rather that will provide a sustainable service throughout the year (sustainable water source) at the lowest possible water tariff (R/kl). The first step was to identify sustainable water sources in the district that could be used to provide water supply even during extreme drought situations and then to determine the most cost efficient way of supplying communities from these sources. The planning methodology that was used can be summarised as follows:

- Identify logical supply footprints
- Identify all possible options for supplying water to supply footprints
- Determine the capital and operational costs associated with each option
- Evaluate each option
- Decide on most appropriate solution

From the above planning process the entire district was covered with 10 back-to-back Regional Schemes, which are listed below and indicated on Figure 6.5 (a) attached herewith:

- Nkonjeni Regional Scheme
- Usuthu Regional Scheme
- Mandlakazi Regional Scheme
- Mkhuze Regional Scheme
- Simdlangentsha East Regional Scheme
- Simdlangentsha West Regional Scheme
- Simdlangentsha Central Regional Scheme
- Coronation Regional Scheme
- Khambi Regional Scheme
- Hlahlindlela Regional Scheme

Also indicated herewith on Figure 6.5 (b) is the planned future bulk infrastructure that was identified from the above planning process.

Sanitation infrastructure:

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

Sanitation infrastructure being provided in rural areas (previously unserved communities) is limited to household VIP toilets. The units are being implemented as per sanitation prioritisation model.

Pre-cast Manufacturing Plants

As part of the Rural Sanitation Programme rollout, a Local Economic Development initiative was envisaged by ZDM, to establish a local manufacturing plant producing the pre-cast material for the rural sanitation units. Two locations were initially proposed for manufacturing plants, namely Ulundi and Vryheid.

The manufacturing plant in Ulundi was erected and established in 2008 via the Rural Sanitation Project funding, with a second plant completed in Vryheid during 2013. The objective is that the manufacturing plant will be handed over to local business partners, and in doing so promote local economic development.

Estimated costs:

Table 6.6 (a) and (b) below summarises the estimated costs to provide sufficient water and sanitation services infrastructure to all households in future:

Table 6.6 (a): Cost of infrastructure to be built

WATER	Capital requirements	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
Regional bulk	R 2 204 249 853			R -	R 294 572 595	R 313 011 521	R 1 596 665 737
Secondary bulk	R 1 036 030 068			R -	R 33 478 526	R 35 896 523	R 966 655 019
Reticulation	R 361 760 667			R -	R 11 452 635	R 14 758 965	R 335 549 067
Total capital (new)	**R 3 602 040 588**	**R -**	**R -**	**R -**	**R 339 503 756**	**R 363 667 009**	**R 2 898 869 823**
Regional bulk (WTW)	R 599 570 000						
Secondary bulk	TBA						
Reticulation	TBA						
Total capital (refurbishment)	**R 599 570 000**			**R -**			
Total capital	**R 4 201 610 588**	**R -**	**R -**	**R -**	**R 339 503 756**	**R 363 667 009**	**R 2 898 869 823**

Table 5.6 (b): Cost of infrastructure to be built

SANITATION	Capital requirements	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
Bulk infrastructure	R -						
Reticulation	R -						
VIP toilets	R 385 911 000				59 721 750	59 721 750	59 721 750
Total capital (new)	**R 385 911 000**	**R -**	**R -**	**R -**	**R 59 721 750**	**R 59 721 750**	**R 59 721 750**
Bulk infrastructure (WWTW)	322 510 000				-	-	-
Reticulation	TBA				-	-	-
VIP toilets (Replacement Prgrm)	551 988 000				-	-	-
Total capital (refurbishment)	**R 874 498 000**	**R -**		**R -**	**R -**	**R -**	**R -**
Total capital	**R 1 260 409 000**	**R -**	**R -**	**R -**	**R 59 721 750**	**R 59 721 750**	**R 59 721 750**

Funding sources and budget allocations:

Table 6.6 (c) and (d) below summarises the funding sources, implementation programmes and budget allocations for each programme:

Table 6.6 (c): Sources of capital income: water

WATER	Expected Funding	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022 (Est.)	2022/2023 (Est.)
MIG	R 537 495 750,00				R 179 165 250,00	R 179 165 250,00	R 179 165 250,00
DWA (RBIG)	R 300 000 000,00				R 100 000 000,00	R 100 000 000,00	R 100 000 000,00
Housing							
WSIG	R 345 000 000,00				R 115 000 000,00	R 115 000 000,00	R 115 000 000,00
Loans							
TOTAL	**R 1 182 495 750**	**R -**	**R -**	**R -**	**R 394 165 250**	**R 394 165 250**	**R 394 165 250**
Capital requirements	R 4 201 610 588						
Shortfall up to 2022	**R -3 019 114 838**						

Table 6.6 (d): Sources of capital income: sanitation

SANITATION	Expected Funding	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022 (Est.)	2022/2023 (Est.)
MIG	R 179 165 250,00				R 59 721 750,00	R 59 721 750,00	R 59 721 750,00
DWA							
Housing	R -				R -	R -	R -
Other grant funding							
Loans							
TOTAL	**R 179 165 250**	**R -**	**R -**	**R -**	**R 59 721 750**	**R 59 721 750**	**R 59 721 750**
Capital requirements	R 1 260 409 000						
Shortfall up to 2022	**R -1 081 243 750**						

Table 6.6 (e): Operational income and expenses

Operating costs and income	Total 5yr projected	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Operational costs	R 2 584 611 744	R 431 009 527	R 470 231 394	R 513 022 451	R 559 707 494	R 610 640 876
Personnel costs	R 915 267 755	R 152 629 935	R 166 519 259	R 181 672 512	R 198 204 710	R 216 241 339
Total O&M costs	**R 3 499 879 499**	**R 583 639 462**	**R 636 750 654**	**R 694 694 963**	**R 757 912 205**	**R 826 882 215**
Equitable share: FBS	R 2 328 387 910	R 388 281 673	R 423 615 306	R 462 164 298	R 504 221 250	R 550 105 383
Income: sales (actual payment)	R 133 386 724	R 22 243 553	R 24 267 717	R 26 476 079	R 28 885 402	R 31 513 974
Total income	**R 2 461 774 634**	**R 410 525 227**	**R 447 883 022**	**R 488 640 377**	**R 533 106 652**	**R 581 619 357**
Deficit/surplus	**R -1 038 104 865**	**R -173 114 236**	**R -188 867 631**	**R -206 054 586**	**R -224 805 553**	**R -245 262 859**

Implementation rollouts:

Figures 6.6 (a) to (f) below provide an overview on each of the implementation programmes. Detailed maps and project rollout lists can also be reviewed in Section 10.

Figure 6.6 (a): Locality Map

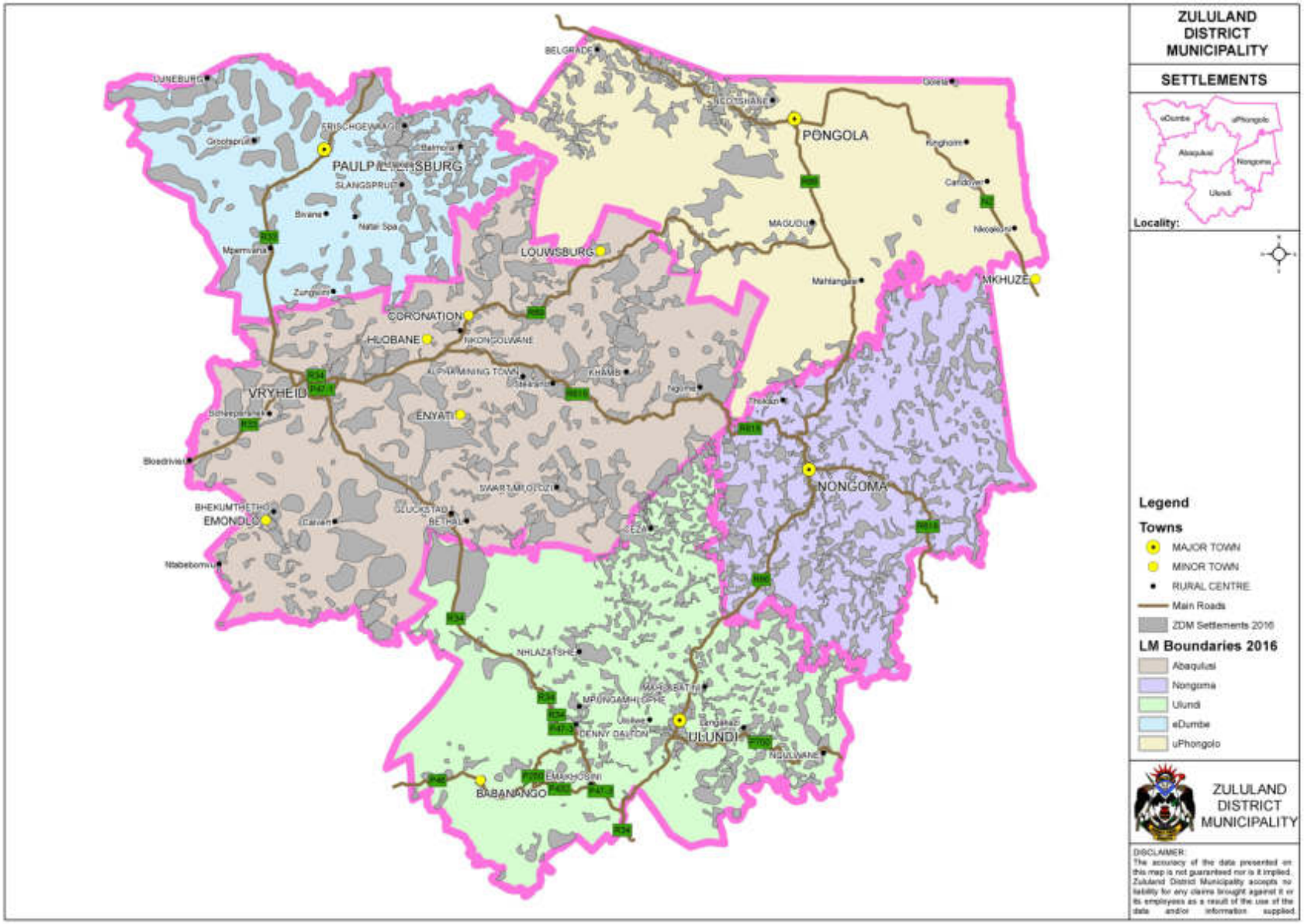


Figure 6.6 (b): Planned future Bulk Infrastructure

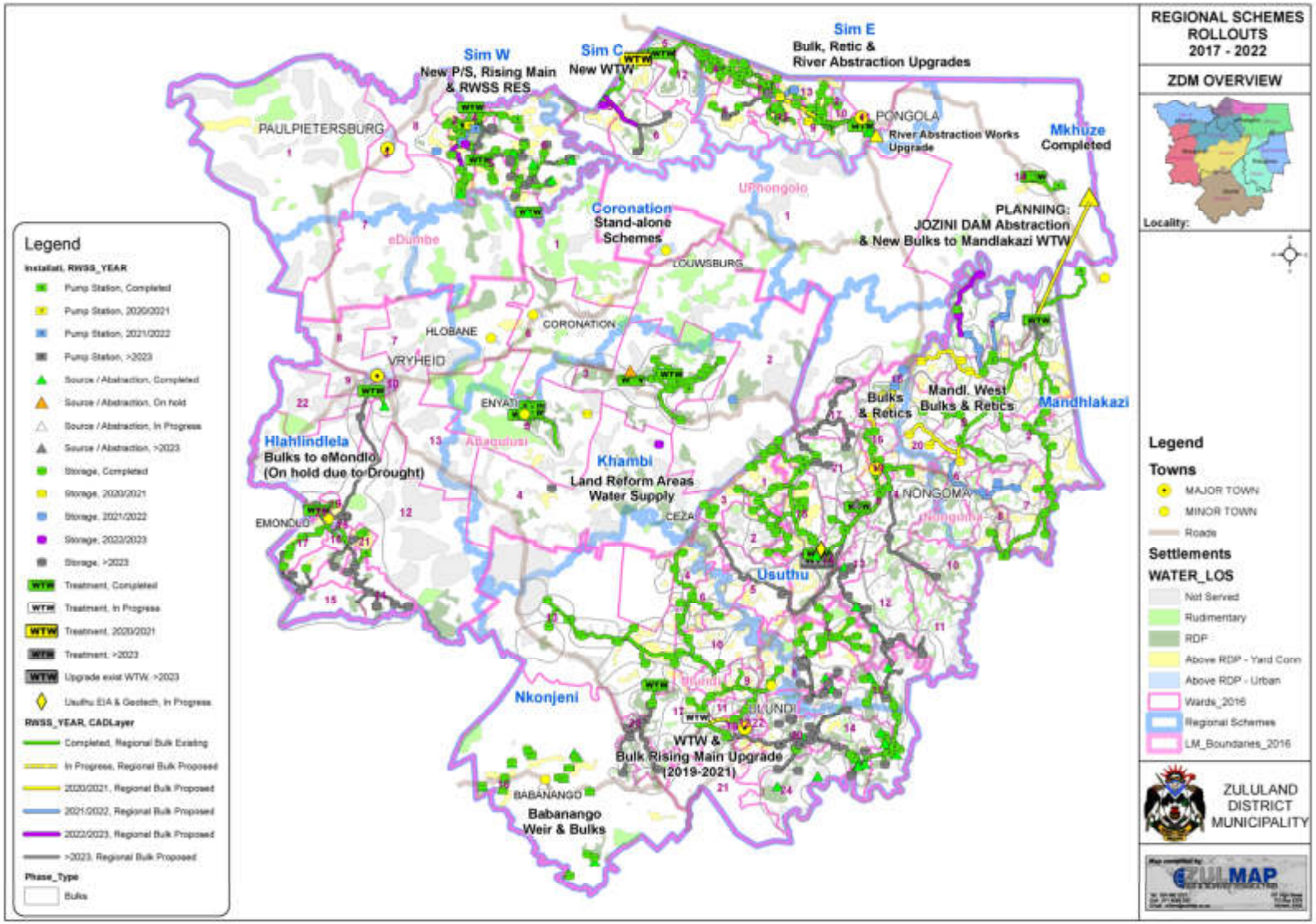


Figure 6.6 (c): Planned future Stand-Alone Schemes to be implemented

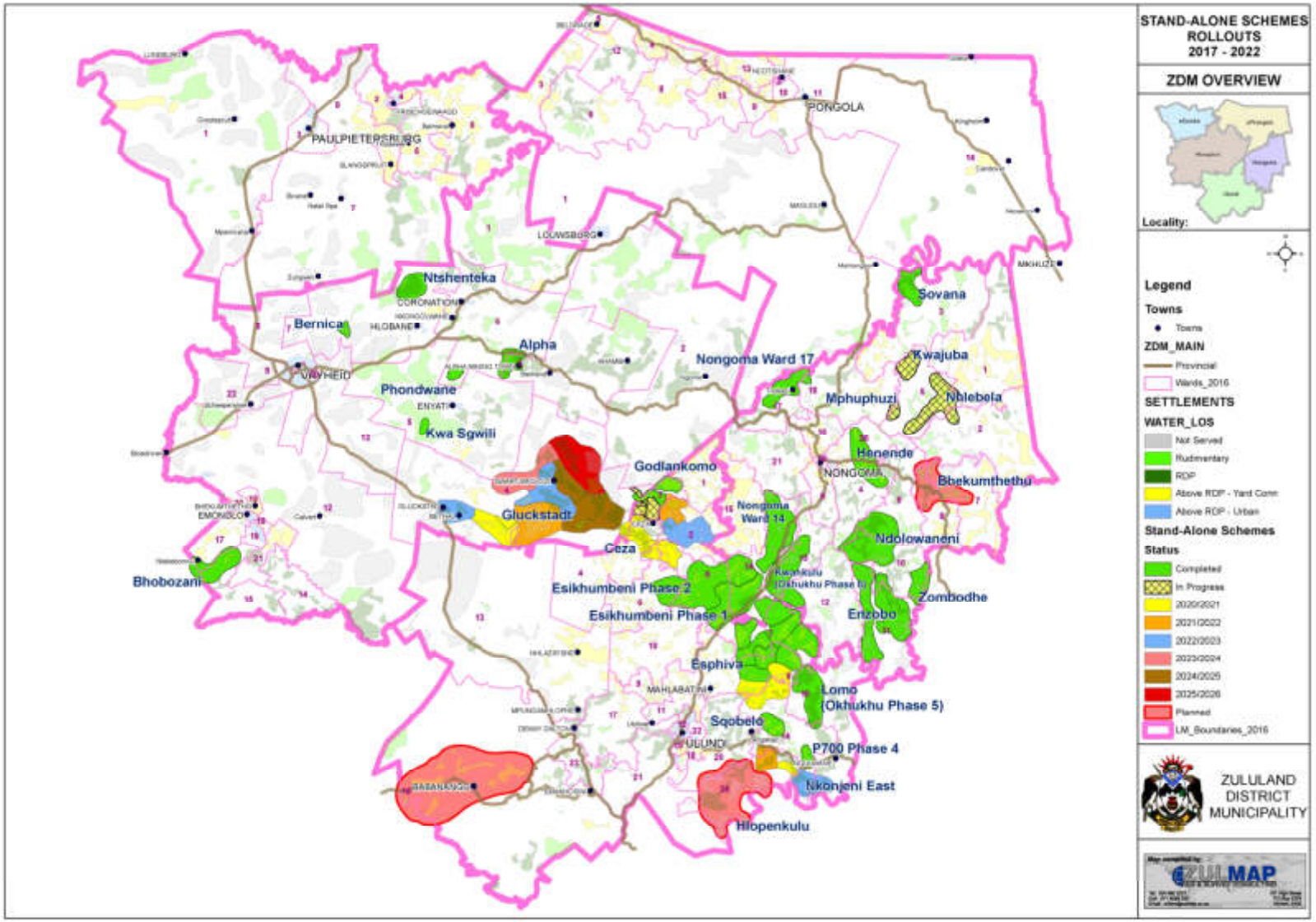


Figure 6.6 (d): Planned rudimentary infrastructure rollouts.

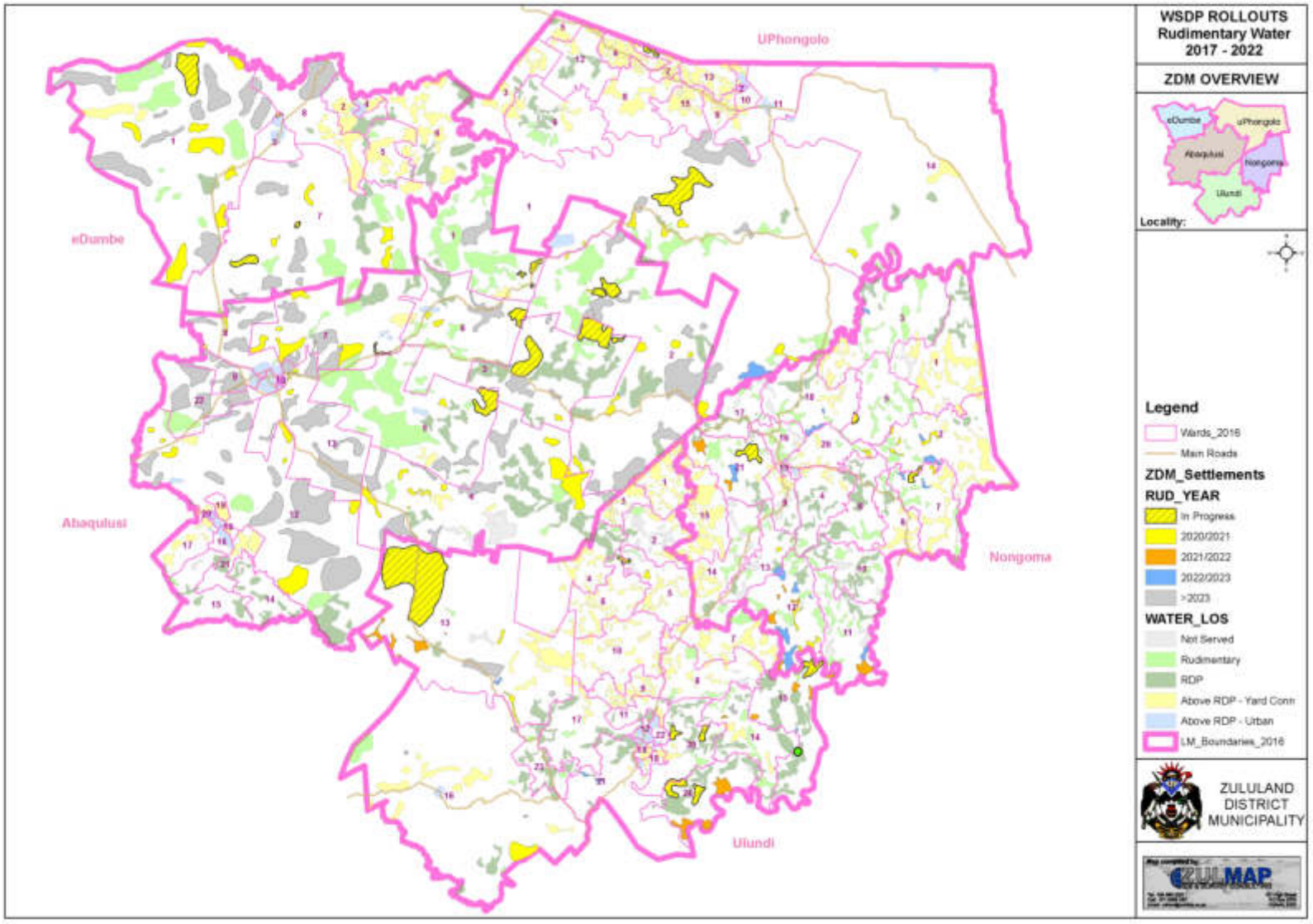


Figure 6.6 (e): Planned rural sanitation infrastructure rollouts.

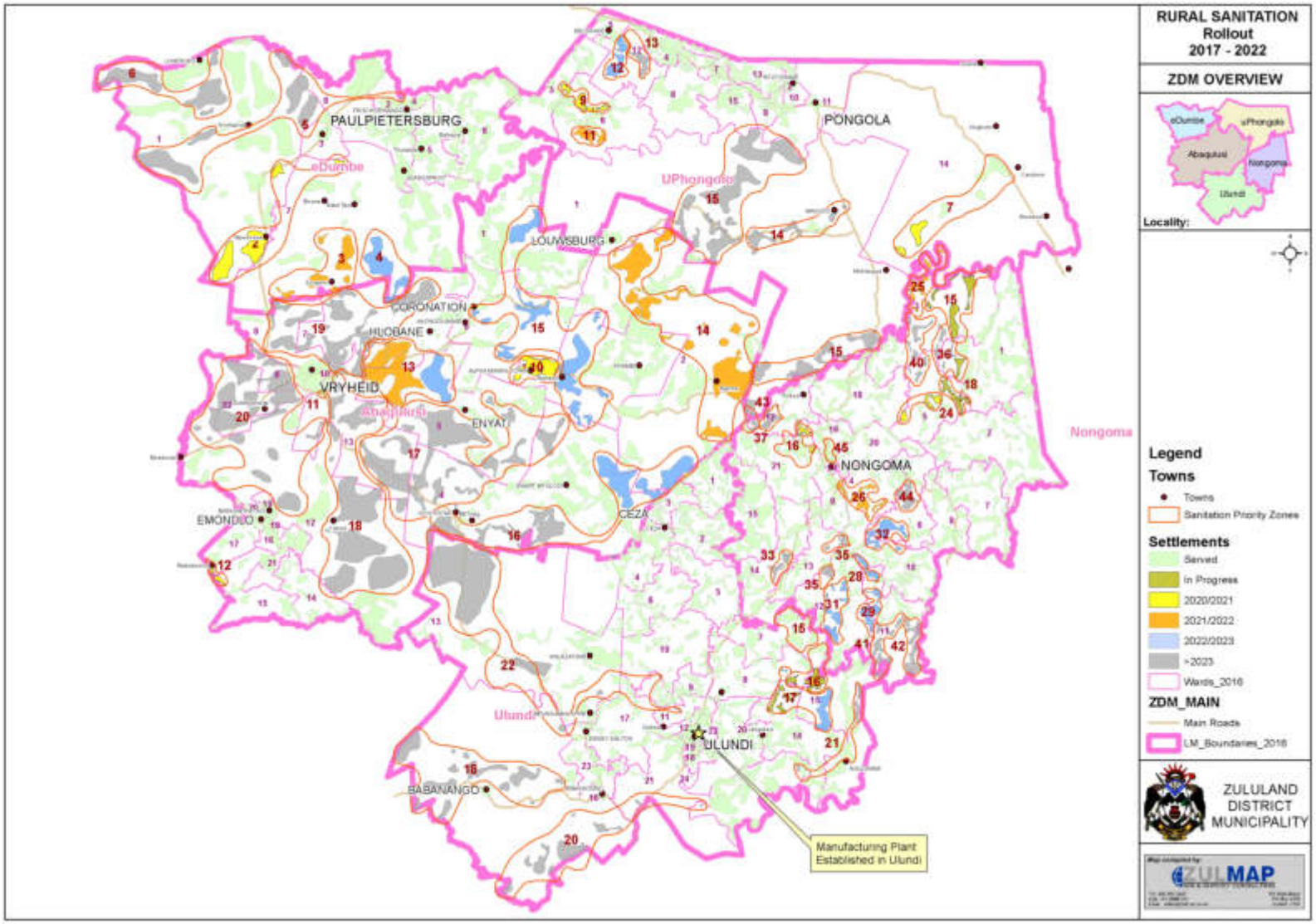


Figure 6.6 (f): Planned rural sanitation replacement programme rollouts.