OPERATIONS AND MAINTENANCE MANAGEMENT PLAN FOR ILEMBE DISTRICT MUNICIPALITY

2022/23

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Acronyms and Abbreviations

DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DME	Department of Minerals and Energy
DoT	Department of Transport
DWS	Department of Water and Sanitation
SALGA	South African Local Government Association
IWA	International Water Association
IDM	iLembe District Municipality
IDP	Integrated Development Plan
KDM	KwaDukuza Local Municipality
MLM	Mandeni Local Municipality
MPLM	Maphumulo Local Municipality
MTSF	Medium-Term Strategic Framework
NLM	Ndwedwe Local Municipality
LM	Local Municipality
NT	National Treasury
PCU	Vuthela Programme Project Coordinating Unit
SDF	Spatial Development Framework
SP	Service Provider
ToR	Terms of Reference
WWTW	Wastewater Treatment Works
WTP	Water Treatment Plants
GIS	Geographic Information System
O&M	Operations and Maintenance
R&M	Repairs and Maintenance
FAR	Fixed Assets Register
IAM	Infrastructure Asset Management
WSP	Water Safety Plan
PPM	Planned Preventive maintenance
PPE	Property Plant and Equipment

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1 INTRODUCTION AND BACKGROUND

1.1 Introduction

As part of improving the quality and efficiency of water and sanitation service delivery in the iLembe District Municipalities (IDM) area of supply, AB Projects LTY LTD was tasked with the review and update of the 2021/2022 Operations and Maintenance (O&M) Plan to optimize asset management.

1.2 Background

AB Projects PTY LTD was assigned by the Vuthela iLembe LED Programme (contract VILP/I/030) to provide technical support to IDM for the implementation of various recommendations provided in the Infrastructure Asset Management (IAM) Plan and the Practices Assessment and Improvement Plan. This will apply to all water and sanitation infrastructure owned and operated by the IDM but excludes the infrastructure currently operated by the concessionaire.

The deliverables for this assignment are the improvement of operations and maintenance management efficiency and effectiveness, with the focus being on the maintenance of the infrastructure assets. Operations and Maintenance (O&M) Management improvement seeks to address the organizations' processes (and documentation thereof) for all activities involved in the operations and maintenance of infrastructure assets. This includes the existence and quality of documentation and how extensively it is used in normal operations. It also includes an assessment of the following sub-categories: maintenance strategies, operations and maintenance manuals, standard operating procedures, and emergency response plans.

Whilst the IDM was identified to have relatively strong practices in Project identification/Prioritisation processes, proposed projects aligned with LOS requirements, CAPEX evaluation, quantification of the impact on community outcomes, management of contract works, and handover processes, there is a need to address key areas in the O&M processes. A current O&M plan was developed for IDM and will require reviewing and updating – recommended to be done annually.

2 SCOPE OF SERVICES

AB Projects PTY LTD will be required to address the following aspects:

- Review and update the IDM O&M Plan for water and sanitation infrastructure including Standard operating procedures; and
- O&M monitoring and reporting processes and documentation.
- Development of an Asset Management Strategy (to be incorporated into the (O&M Plan).

This will include a maintenance management improvement strategy (5 years) comprising of an annual maintenance plan and asset prioritisation schedules as well as an asset management process review and improvement plan. This should be done to also ensure alignment with the O&M policy for IDM and aim to inform the IDM's budgeting process to ensure adequate funds are allocated incrementally for O&M.

The Vuthela Programme will assist the IDM in the procurement of an Asset Management System and digitisation of the Operations and Maintenance process. A crucial element of this digitisation process will be the implementation of a Computerized Maintenance Management System (CMMS) that will:

- Serve to automate, regulate, standardise, and record maintenance activities through a work order system.
- Serve as a platform for operational efficiency improvement.
- Provide a platform for review of maintenance management strategies and tactics to improve effectiveness (and resourcing strategy); and
- Provide a spatially enabled interface (GIS).

AB Projects PTY PTD will be required to provide support to the IDM to ensure a smooth transition from a manual maintenance system to the new proposed digitized system.

3 ASSUMPTIONS

This report is written specifically for the objectives outlined in the previous section. The report will be reviewed by Vuthela and municipal officials after which comments and feedback will be provided to AB PROJECTS PTY LTD. The O&M Management Plan will then be finalised and submitted to the IDM.

It is to be noted that the IDM has a fair amount of baseline information on the scope of above-ground assets that would be made available. However, a great amount of information on the nature, extent, location, status, and performance of below-ground assets is not available. This is a substantial portion of the asset portfolio and significantly constrains the outputs of the asset management and maintenance planning processes.

Therefore, the following assumptions have been made in the development of the Operation & Management Plan Report:

- Vuthela and IDM have made all information available to AB Projects PTY LTD that could be provided to date, no information has been withheld.
- Vuthela and IDM will supply all available information to AB Projects PTY LTD for the completion of subsequent project deliverables as required, and the project deliverables will be based on the information provided.
- All information received from IDM is deemed to be the most recent; and
- All information is assumed to be correct and verified by the IDM.

4 CONTEXT AND LIMITATIONS OF OPERATIONS AND MAINTENANCE PLAN

This O&M Plan is viewed as only one of a suite of management, strategic, and/or operational documents and is not intended to be an Operational Management Plan, which includes corporate and business management aspects of iLembe's existence and operation. It is not to be substituted for any of the following documents, although key linkages do exist as presented in

Figure 1:

- iLembe's Business Plan
- Water and Wastewater Master Plan
- Financial Management Plan
- Asset Management Plan
- Operational Management Plan
- Human Resource Plan (Dependent of Transfer of Staff)

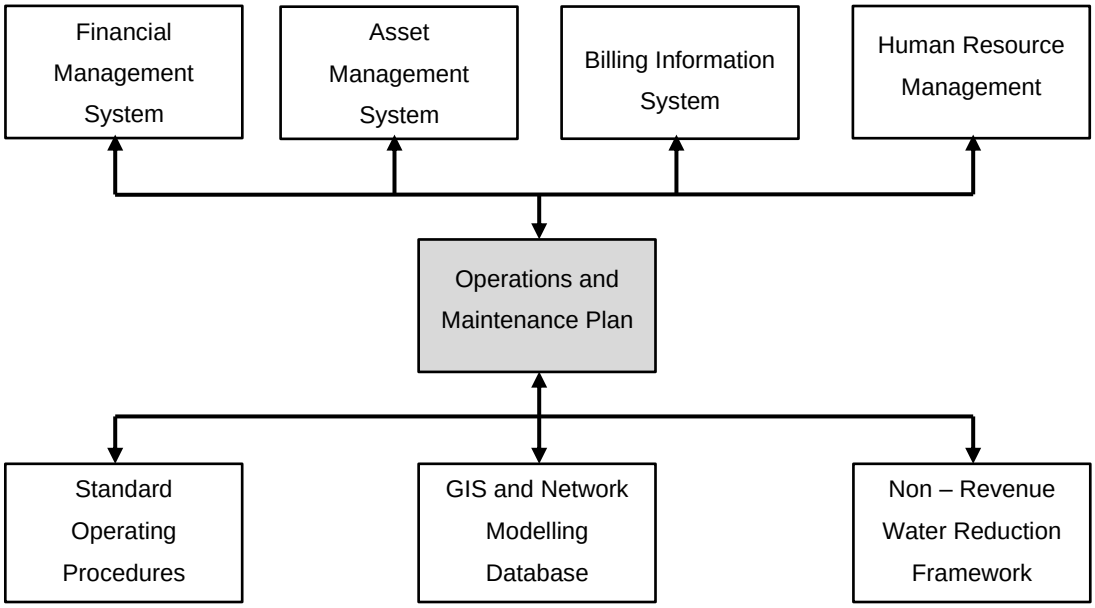


Figure 1: O&M Plan in Context of Other Management Plans

The O&M Plan provides support and guidelines for all immoveable or fixed water and wastewater assets only and should be one of a suite of Operational Manuals that contribute towards the overall daily operations of iLembe. Other Operational Manuals that could exist but have not been included would be:

i. Project management manual
ii. Accounting systems manual
iii. Billing and debt management manual
iv. Procurement manual
v. Human resource management manual
vi. Employee Health and Safety management manual
vii. Quality Assurance manual

5 SCOPE OF REPORT

The objectives of this first draft of the O&M Plan are as follows:

i. Provide a descriptive overview of the water supply and wastewater systems as owned and operated by the IDM and the concessionaire.

ii. Provide information on the prevailing regulatory framework, supporting strategy, and policy necessary for updating the current O&M Plan.

iii. Present international best practice Standard Operating, Procedures that could be included in the final version of the O&M Plan.

iv. Present options for monitoring and evaluation of the implementation of the O&M Plan, including international best practices in terms of performance management and benchmarking.

v. Provide typical preventative maintenance log sheets, duties, and records for inclusion in the final version of the O&M Plan.

vi. Indicate the role that the O&M Plan should play in the greater corporate governance of iLembe, including linkages between information databases, models, and other strategic or operational documents/systems, such as an Asset Management System

vii. Provide the basis of a management tool that can be work shopped and institutionalized within iLembe.

The O&M Plan covers the traditional water cycle and as such includes the treatment, distribution, and storage of drinking water as well as the collection, conveyance, treatment, and disposal of wastewater. As such, the following key components have been included and addressed in this Plan:

5.1 Operations

- Resources required to operate and maintain assets.
- Responsibility for, control of, access to, and security of the asset (logistics management);
- Operating policies (i.e., working hours, energy management);
- The level and standard of performance required of the asset.
- Arrangements for collecting, monitoring, and reporting performance data.
- Training staff in the use of the asset; and
- Estimates of operating costs.

5.2 Maintenance

Definition of maintenance standards and formulation of processes and procedures (incident Detection, verification, work order preparation, job card creation, materials/stores Requisition, implementation, and closure);

- Allowance for the rectification of existing defects.
- Description of the work to be carried out;
- Forecast of the necessary maintenance, major repairs, and preventative maintenance expenditure
- For the planning period.
- Proposals for digitisation of the maintenance processes; and
- Budget requirements.

This O&M plan will include the maintenance type (preventative or corrective) per asset group, maintenance approach (interval-based, condition-based, planned, emergency), and maintenance actions (inspections, testing, monitoring, servicing, repairs). It should further state the method of record-keeping and management of maintenance tasks performed, whether by an electronic system, job cards, filing system, or other.

6 OPERATIONAL AREA

The overview of the full operational area of the project is provided in **Figure 2** below.

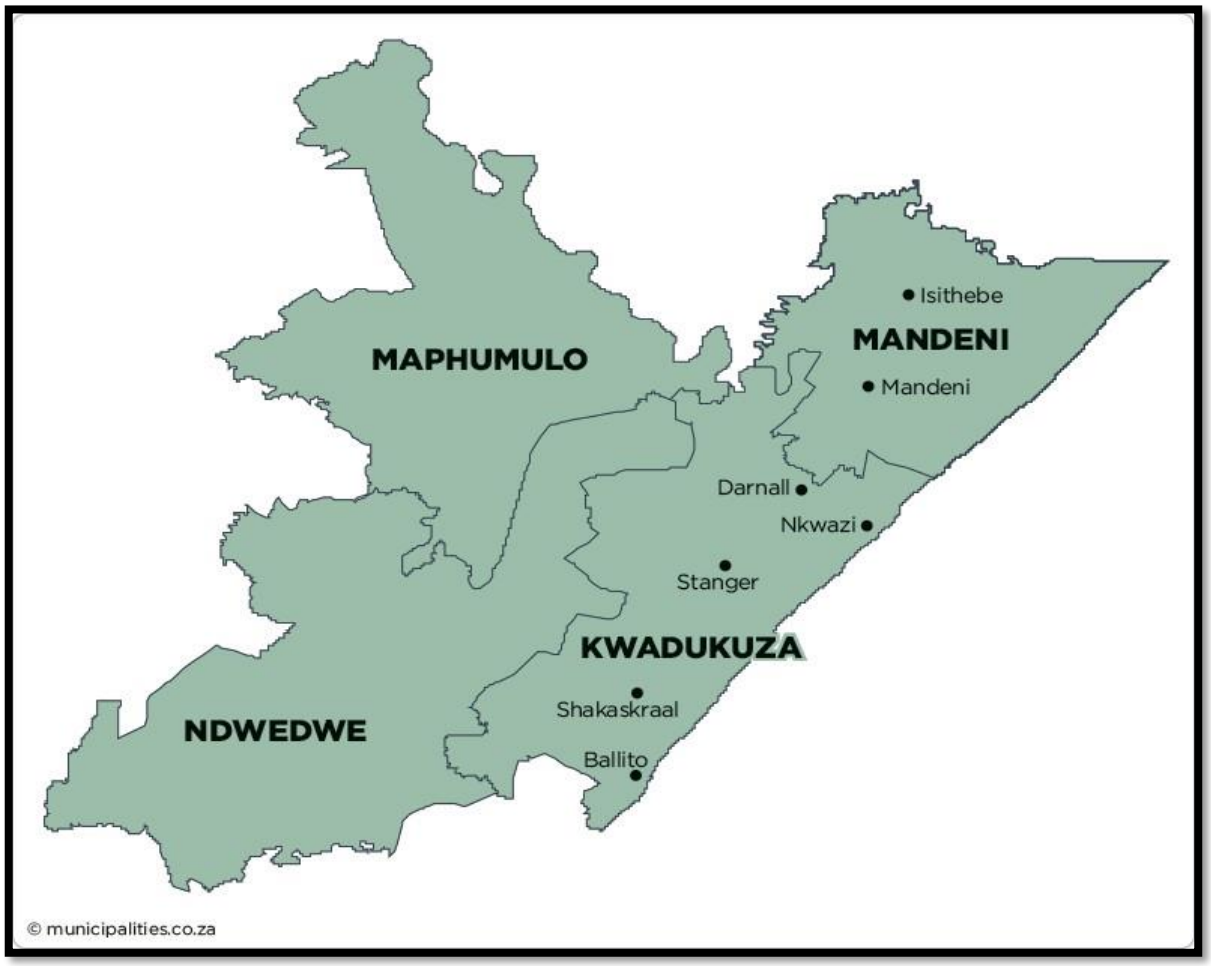


Figure 2: IDM's Operational Area

iLembe District Municipality comprises four local municipalities (LM) namely:

- **Mandeni Local Municipality**
- **Maphumulo Local Municipality**
- **KwaDukuza Local Municipality**
- **Ndwedwe Local Municipality**

6.1 Descriptive Overview of Water Supply Systems

Information for this section was sourced from the Universal Access Plan (UAP) Phase III: Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the iLembe District Municipality (Umgeni Water, 2021).

The following sections give a brief overview of the urban and bulk water supply schemes (WSS). Bulk water supply schemes (see **Figure** 3) can be identified as schemes with a large geographic footprint, or with water treatment plants (WTP) of a design capacity of 2Mℓ/d or more.

A summary of the Water Treatment Plants is provided in **Table 1** below.

Table 1: Summary of WTPs and supply systems

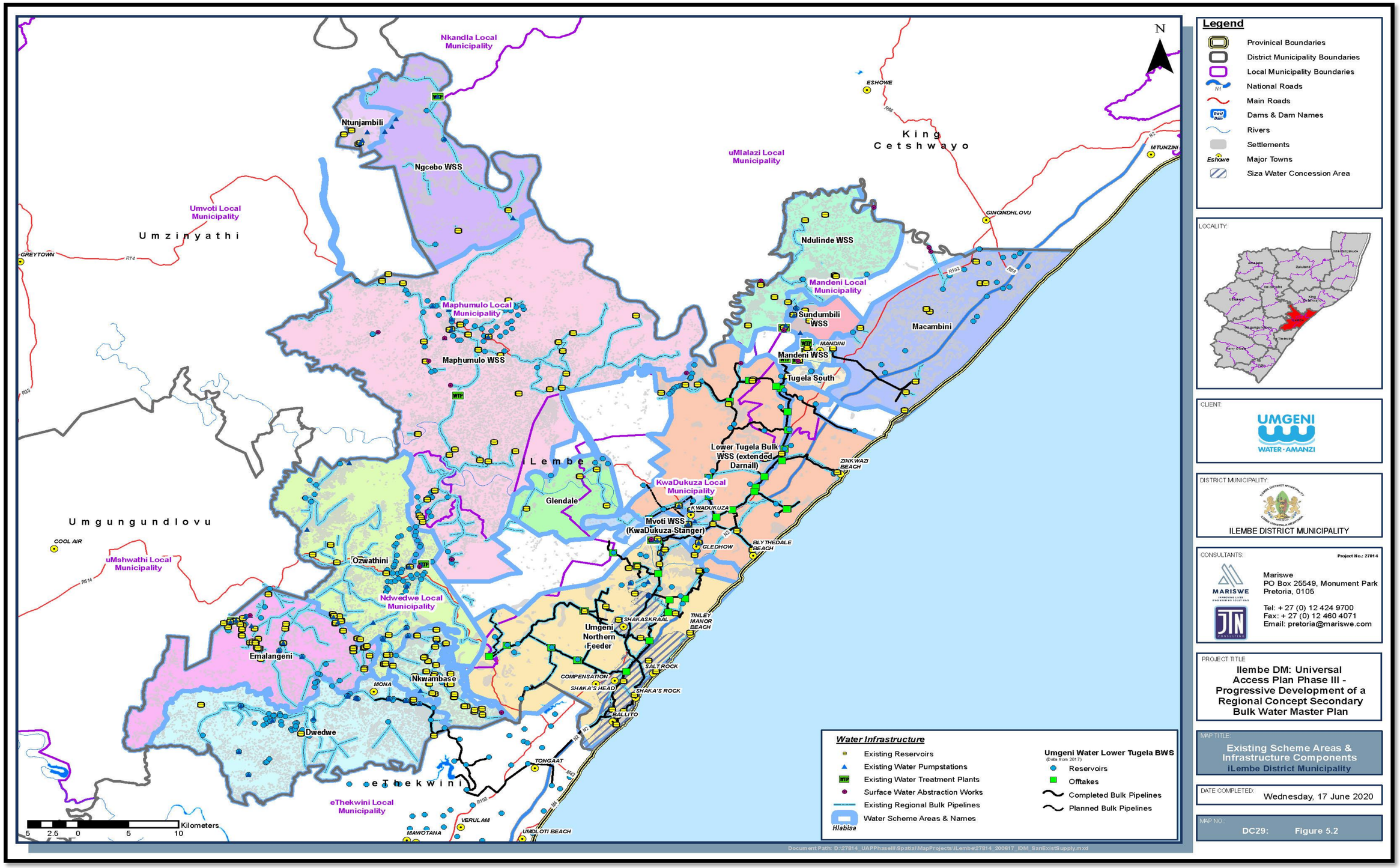
LM Name	Plant/System Name	Owner	Design Capacity (Mℓ/d)	Annual Average Production (Operational) (Mℓ/d)	Class
KwaDukuza	Mvoti – Stopped operating from November 2021 (Impaired)	IDM	12	11	B
	Lower Tugela Bulk Water Scheme	Umgeni Water	Bulk Supply	Bulk Supply	Unknown
	Hazelmere-Dolphin Coast	Siza Water	Bulk Supply	Bulk Supply	Unknown
Mandeni	Mandeni (decommissioned, using pumps only)	IDM	6.6	0	Unknown
	Tugela treatment works (decommissioned) using pumps	IDM	unknown	unknown	unknown
	Sundumbili WTP and Supply System	IDM	40	27	A
	Ifalethu supply system	IDM	Bulk Supply/UW		E
	Lambothi supply system	IDM	Bulk Supply/UW		E
	Makwanini supply system	IDM	Bulk Supply/UW		E
Maphumulo – include borehole systems (2)	HLIMBITWA 1 - WTP and Supply System	IDM	0.5	unknown	Unknown
	HLIMBITWA 2 - WTP and Supply System	IDM	0.5	unknown	Unknown
	Vukile WTP and Supply System	IDM	0.35	unknown	Unknown
	Ngcebo WTP and Supply System	IDM	4	1.6	C
	Isithundu Supply System	IDM	Bulk Supply/UW	Bulk Supply/UW	D
	Maphumulo Borehole Supply system (Ngididi, Thafamasi, Ntunjmabili, Ndukwende)	IDM	Bulk Supply/UW	Bulk Supply/UW	E
	Maqumbi T BH	IDM	Unknown	Unknown	Unknown
	Maqumbi I BH	IDM	Unknown	Unknown	Unknown
	Otimati G2 BH	IDM	Unknown	Unknown	Unknown
	Mxhosa BH	IDM	Unknown	Unknown	Unknown
	Mvozane BH	IDM	Unknown	Unknown	Unknown
	Ndukwende BH	IDM	Unknown	Unknown	Unknown
Ndwedwe (Glendale, Kwasithane and waterfall))	Esidumbini WTP and Supply System	IDM	1.5	1	C
	Montebello WTP and Supply System	IDM	500	400-500	C
	Ntabaskop WTP and Supply System	IDM	200	unknown	D
	Nsuze WTP and Supply System	IDM	2	0.25-0.30	C
	Isiminya (Impaired)	IDM	200	unknown	unknown
	Glendale supply system	IDM	Bulk Supply/UW	Bulk Supply/UW	E
	KwaSathane supply system	IDM	Bulk Supply/UW	Bulk Supply/UW	E
	Waterfall supply system	IDM	Bulk Supply/UW	Bulk Supply/UW	C
	Ntabaskop BH	IDM	Unkown	Unkown	unknown
	Mabutho BH	IDM	Unkown	Unkown	unknown
	MthombisaBH	IDM	Unkown	Unkown	unknown
	Magwaza BH	IDM	Unkown	Unkown	unknown
	DedaNkivane BH	IDM	Unkown	Unkown	unknown
	ChiliShangase BH	IDM	Unkown	Unkown	B
	Nhlgangakazi BH	IDM	Unkown	Unkown	E

Source: iLembe DM correspondence received and from interviews (June 2019); Umgeni Water (2020)

** The Maphumulo package plant is operated as an additional module to the Maphumulo WTP*

The operations at the Maphumulo WTP and package plant are hampered during times of drought and electricity outages and are then not able to meet the demands of consumers. The package plant is operated as an additional module of the Maphumulo WTP. The remaining WTPs generally have spare operating capacity to meet future water demands.

Figure 3: Existing Water Supply Schemes



6.1.1 Concession Area: Ballito to Tinley Manor and Shakaskraal

The internal components of this system, including the ILembe-owned secondary and reticulated infrastructure, are managed and maintained by Siza Water while the bulk primary components including the Avondale and Ballito Terminal Reservoirs as described under the North Coast System are owned, operated, managed, and maintained by Umgeni Water. For water balance purposes Umgeni Water has bulk meters measuring the inflow and outflow of water from their bulk components including sales meters at the reservoirs supplying Siza Water. Siza Water is charged a bulk tariff by Umgeni Water and in turn, sells potable water to all the end users within the system who are predominantly supplied via house or yard connections. The system has a bulk and distribution storage capacity of 27.3ML. Where viable, Siza Water undertake the upgrade of community standpipes to yard connections. Due to strict controls being enforced, illegal connections have been maintained at a very low level. Most of the large water consumers consist of developed estates, industries, hotels, and business complexes. In terms of provincial development, this area may be regarded as the economic hub interspersed with many upmarket developments and proposals for the construction of new developments. The footprint of the developed area is continuously expanding, albeit under a controlled environment with services rolled out in accordance to progression. However, with the effects of the COVID outbreak and the downturn in the world economy, the rollout of new developments has been negatively affected resulting in a delay in the provision of phased implementation and upgrade of the water and sanitation infrastructure. A reverse osmosis (RO) processing plant has been installed at the 12ML/day Frasers Waste Water Treatment Works, owned by ILembe but operated by Siza Water. Approximately 3ML/day of treated effluent is reused/recycled by blending into the potable water system for redistribution via the water reticulation networks. Siza Water implements and maintains a WC/WDM programme and the water loss in the system is about 9%, which is economically feasible to maintain.

6.1.2 Sundumbili WSS, Mandini WSS, Ndulinde WSS, and Macambini WSS

The areas north of the Thukela River, located centrally and along the northern boundary of Mandeni Municipality and King Cetshwayo District Municipality have historically been served potable water from a number of standalone large schemes sourcing raw water from various sources. Sundumbili and Ndulindi are served from the Sundumbili Water Treatment Works, Mandeni is served from the Mandeni Water Treatment Works, and Macambini from local boreholes. The intention previously was to also supply the greater Mandeni area from the Lower uThukela System but the recently upgraded 40ML/day Sundumbili Water Treatment Works (previously 27ML/day) has sufficient capacity to supply the Sundumbili System area for a significant time in the future.

The Sundumbili System has been developed into a large regional bulk supply system. In 2011 the Sundumbili Water Treatment Works was upgraded to produce 40ML/day with the raw water sourced from the Thukela River. Treated water is pumped to Reservoir A. Reservoir A directly supplies part of Sundumbili Town as well as areas adjacent to Sundumbili, and indirectly supplies the remainder of Sundumbili Town, Isithebe Industrial Estate, Ndulinde, Mathonsi, Thembeni, Masomango, MandeniTown, South Thukela, Macambini, Greater Thukela Mouth and the Inyoni Settlement via several distribution reservoirs. Sometime around 2019, the 6.5ML/day Mandeni Water Treatment Works was decommissioned, although the pump stations were incorporated to be used into the

Sundumbili System with the source of potable water to the area supplied from the Sundumbili Water Treatment Works whose supply area has further been extended into the north-eastern located Macambini area. Although the Sundumbili System supplies mainly domestic consumers at various levels of service it also supplies the Isithebe Industrial Park located outside Mandeni. Water connections are mainly house or yard connections. However, many illegal connections need to be formalised as they often are of poor workmanship causing leaks and no billing is taking place. The 19 bulk reservoirs have a combined total capacity of 80 ML. The bulk and reticulation pipeline infrastructure is generally in good condition as the extensions are relatively newly built. Bulk meters, read manually, are installed at the abstraction works, the treatment works, and bulk reservoirs.

Information indicates that no monitoring system or telemetry has been installed to expedite and simplify bulk meter readings. The supply area is a combination of urban, peri-urban, and rural with dispersed settlement patterns. Most consumers are domestic, but there are several larger businesses, industries, and health facilities supplied by this System.

Mandeni Sub-System:

Mandeni is being supplied treated water from the Sundumbili Water Treatment Works via the 21ML Reservoir A distributed to the Rocky Ridge Reservoir via the Mandeni Pump Station. The Rocky Ridge Reservoir provides storage for the Mandeni Township and also supplies or has the design potential to supply the Macambini rural area, Thukela Mouth as well as several proposed private coastal developments. The Rocky Ridge Reservoir was upgraded from a capacity of 3.5ML to 8.5ML to accommodate the increase in demand of the region.

Macambini Sub-System:

The Macambini Sub-System is situated within the Macambini Tribal Authority Area and is located approximately 12.7km north-east of Mandeni and 10.7km south- west of Gingindlovu. The northern area of Macambini is still supplied by King Cetshwayo but this has been reduced due to their demand and therefore unable to cover the entire reticulated area.

Ndulinde Sub-System:

The Ndulinde Sub-System is located in the north-western reaches of the Mandeni Local Municipality, and sources its treated water supply from the Sundumbili Water Treatment Works via the Reservoir A command reservoir, which in turn supplies Reservoir B, and then onwards to Reservoir C. A pump station at Reservoir C then pumps water to the Ndulinde Reservoir via a rising main. From the Ndulinde Reservoir, water is then pumped via a rising main to supply water to the newly constructed Northern Reservoir in the very northern most parts of the Ndulinde Water Supply Scheme. From the NorthernReservoir water then gravitates to standpipes within the Ndulinde rural area.

Mvoti WSS (uMvoti WSS)

The Mvoti System is sandwiched between the Lower uThukela System and the Mdloti System and may be regarded as one of three sub-systems that represent the North Coast System, although the system is not owned nor operated by Umgeni Water where bulk components of the North Coast System are

owned and operated by Umgeni Water (Mdloti System and Lower uThukela System). The Mvoti System is owned and operated by ILembe and supplies KwaDukuza and surrounding areas treated water from the 16ML/day Mvoti Water Treatment Works which sources raw water from the Mvoti River. Treated water supply to KwaDukuza is restrained due to limitations in the availability of raw water from the Mvoti River and the size of the 16ML/day Mvoti Water Treatment Works, which operates at approximately 11ML/day. The supply zone areas around KwaDukuza are supplied treated water from the 3ML Mvoti Balancing Reservoir which is fed potable water from the Mvoti System and water transfers from the Mdloti System and the Lower uThukela System. From the Mvoti Balancing Reservoirs, potable water is also gravity-fed to the Saunders Street Reservoir which then supplies the town of KwaDukuza.

With an estimated total capacity of 8ML, there are at least five bulk reservoirs in the Mvoti System. Bulk water is metered at the treatment works and at the bulk reservoirs (inflow and outflow) which are read manually. Domestic water connections are mainly house or yard connections. The system serves a mixture of domestic, industrial, business, commercial, and institutional consumers at a high level of service.

6.1.3 Lower uThukela Bulk WSS

As a result of a Reserve Determination on the uThukela River confirming the availability of a maximum of 110ML/day of raw water from the river for supply to the North Coast coastal areas an abstraction works with a modular water treatment plant was constructed on the northern bank of the uThukela River.

Raw water is abstracted from the uThukela River in the vicinity of Mandeni for treatment at the 55ML/day Lower Thukela Water Treatment Works situated close to the abstraction works. At a later stage in the future, as demand dictates, this plant is capable of being upgraded to treat the full 110ML/day authorised for abstraction. Bulk potable water is then supplied from the treatment works southwards through a 3km 900mm diameter rising main into a 30ML balancing reservoir located southeast of the plant, south of the uThukela River. From this balancing reservoir, a 29km 900mm diameter gravity pipeline supplies water to the Mvoti Balancing Reservoir, located south of the Mvoti River. 8 off-takes have been installed on the Lower Thukela pipeline between the Lower Thukela Reservoir and Mvoti Balancing Reservoir. Of these eight, seven off-takes have been commissioned with a sales meter. Treated water from the Lower Thukela Water Treatment Works serves the communities south of the uThukela River including San Soucci and St Christopher, Darnall, Zinkwazi, Nonothi, Blythedale, KwaDukuza, Etete, Groutville, Saunders Street Reservoir (via dedicated off-take AV69) and rural developments between uThukela River and Shakaskraal. KwaDukuza Town is supplied potable water from the Mvoti Water Treatment Works, owned and operated by ILembe, and augmented by the

Lower Thukela System through the Mvoti Balancing Reservoir. At the time of commissioning in 2017, the system demand was 7.7ML/day which has subsequently (2021) increased to approximately 30ML/day through the inclusion of new supply areas and natural growth on existing supply. Further increases in demands are dependent on the timing of ILembe's future off-takes from this pipeline. It must be noted that there is also likely to be a decrease/reduction of supply in the North Coast System from the south due to a planned increase in supply to eThekwini from Hazelmere over the next five years and as a result, the supply to Avondale Reservoir in Ballito will have to be transferred onto the Lower Thukela System to allow Hazelmere Water Treatment Works to accommodate this additional

growth. It is the intention that in the future once the plant is operating to its full capacity of producing 110ML/day treated water the areas north of the uThukela River located in Mandeni and the entire North Coast System will be supplied from this plant. The System consists of 15 bulk reservoirs, with bulk meters read manually installed at the reservoirs and offtakes, with a total capacity of 75ML and, as the system is newly constructed, the bulk infrastructure is in good condition.

6.1.4 Mdloti WSS (Hazelmere Dam system, part of the North Coast System / Northern Feeder)

Mdloti System (Hazelmere System):– treated water from the 75ML/day Hazelmere Water Treatment Works serves the areas north of eThekwini Municipality including parts of rural Ndwedwe and the Siza Water concession area feeding the coastal towns along the Dolphin Coast. This system is a cross-border system and also serves large areas within the northern areas of eThekwini municipality including Phoenix, Verulam, and La Mercy. Currently, the Hazelmere Water Treatment Works is operating at 50ML/day supplying both eThekwini and ILembe. Several sub-systems supplying various areas within ILembe emanate from this system:-

These two systems have sub-systems as described as follows:-

Hazelmere/Ndwedwe Sub-System: this system supplies approximately 11ML/day to the rural communities of Ndwedwe by stage pumping via a 500mm diameter steel rising main from the Hazelmere Water Treatment Works through Ndwedwe Reservoirs 1, 2.1, 2, 3, 4 and 5 (Ndwedwe Reservoirs 1 and 2.1 feed eThekwini). Meters are installed at the primary reservoirs (Umgeni-owned) and the secondary bulk reservoirs which are ILembe-owned;

Hazelmere/La Mercy/Avondale Sub-System: this system consists of two steel pipelines (450mm and 750mm diameter) running parallel from the Hazelmere Water Treatment Works to the N2 Tongaat Toll Plaza from where the pipes split directions. The 450mm pipe supplies the La Mercy Reservoir and the 700mm pipe continues in a northerly direction into ILembe to supply the Avondale Reservoir in Ballito. The Avondale Reservoir pipeline has two off-takes, one supplying the Mamba Ridge Reservoir and the other reticulation to the Greylands/Frasers area. The old North Coast Pipeline, PL I supplies water from the Avondale Reservoir to the areas of Ballito and Zimbali, Ballito Lea, Shakas Rock, Tiffany, and Shakas Head (Hugh Dent Drive).

6.1.2 Maphumulo Bulk WSS

The supply area of this supply system, implemented by Umgeni Water, predominantly serves the central and southern areas of Maphumulo while the Ngcebo system serves the northern extent of the municipality. To alleviate supply deficiencies of borehole schemes within Maphumulo, the Maphumulo System was implemented in 2013 and finalised in 2017 and was designed to supply a basic level of service to meet the backlogs of the rural communities, predominantly rural with dispersed settlement patterns, within the system footprint. Raw water is abstracted from the 3 200 000m^3 iMvutshane Dam constructed in 2015 and located on the iMvutshane River (a tributary of the Hlimbitwa River which is a tributary of the Mvoti River), treated at the 6.0ML/day Maphumulo Water Treatment Works, and pumped to a booster reservoir. From the booster reservoir, potable water is pumped to the Maphumulo and the Nyamazane Reservoirs. The Maphumulo Reservoir serves as a distribution reservoir for the town of Maphumulo and the Balcome/KwaSizabantu Scheme and also supplies the Masibambisane Reservoir,

which in turn supplies the Maphumulo Hospital Reservoir. The Nyamazane Reservoir serves as a distribution reservoir for the towns of Nyamazane and Maqumbi via the Maqumbi Reservoir F, from which both the Maqumbi Reservoir T and Ashville Reservoirs are supplied.

In 2020/2021 the average demand placed on the water treatment works was 7.9ML/day with the plant operating approximately 33% above design capacity. Plans of upgrading the treatment works to 12ML/day have been made and, in the interim, an additional 3ML/day package plant has been installed to augment the 6ML/day capacity until the upgrade is implemented and commissioned which is expected to be completed by 2025.

During the early stages of commissioning, the iMvutshane Dam was unable to impound water as a result of the devasting drought experiences within the region as a result of the El Nino effect on local climatic conditions. To alleviate this setback, a new weir, abstraction works and pump station were constructed on the Hlimbitwa River to augment the abstraction from the iMvutshane Dam. Furthermore, a new rising main was installed directly feeding the abstraction works at the iMvutshane Dam. Since the drought, the dam has managed to impound sufficient raw water for adequate yield for treatment at the water treatment works but did suffer a slight setback with the development of a crack in the dam wall which was subsequently repaired. Pumpstations are problematic with the interruptions exacerbated by load shedding and load reduction. This results in the system not operating to its designed efficiency.

The Hlimbithwa Supply Scheme, owned and operated by ILembe, also serves portions of the Maphumulo System.

In 2020, as part of the uMshwathi/Ndwedwe Bulk System, Umgeni Water commenced with the construction of a bulk pipeline originating at the Ozwatini Reservoir following in a north-easterly route towards Maphumulo. It includes online take-offs and a termination point and supplies areas in Ndwedwe that are currently serviced through the Maphumulo Bulk & Reticulation System. This will reduce the demand required from the Maphumulo Water Treatment Works and also the drought-sensitive iMvutshane Dam.

- **Maphumulo/KwaDukuza Sub-System:** this sub-system is situated in southern Maphumulo and is supplied treated water from the Maphumulo Command Reservoir which is supplied by the Maphumulo Water Treatment Works sourcing raw water from the iMvutshane Dam. In addition, a bulk pipeline from the Maphumulo Command Reservoir supplies the areas of Ashville and Ensikeni, located within KwaDukuza Municipality.
- **Balcome/KwaSizabantu Sub-System:** this sub-system is centrally located within Maphumulo Municipality and is an extension of the Maphumulo/KwaDukuza Sub-System to supply the Mangongo, Balcom, and KwaSizabantu areas with water supply supplied from the Maphumulo Command Reservoir. The source of water is treated water from the Maphumulo Water Treatment Works supplied raw water from the iMvutshane Dam.

Various operational stand-alone schemes are located within the Maphumulo Bulk System footprint area and infrastructure such as distribution reservoirs, where feasible, will be connected to one of the sub-systems serving the area. This infrastructure has been designed to cater to an RDP level of

service and will require upgrades to cater to the higher level of service currently being implemented throughout the municipality.

The operations at the 6.0ML/day Maphumulo Water Treatment Works and 3.0ML/day package plant are hampered during times of drought and electricity outages and are then not able to meet the demands of consumers.

6.1.3 Ngcebo WSS

The Ngcebo System is in the north of the Maphumulo Local Municipality, and borders on the uMzinyathi and King Cetshwayo District Municipalities, but does not serve any communities within these municipalities. Umgeni Water previously operated and maintained the system on behalf of ILembe but transferred the responsibility back to the municipality in October 2015 and is therefore no longer involved with the operations of the system.

The Ngcebo System was implemented in 2008 and finalised in 2013 and was designed to supply a basic level of service to meet the backlogs of the rural communities within the system footprint. Raw water is abstracted via the Madungela Abstraction Works from the Thukela River upstream of the Lower Thukela Water Treatment Works abstraction point, treated at the 4ML/day Ngcebo Water Treatment Works, and transferred to localised command **reservoirs** within Ngcebo. It appears that the treatment works may have been upgraded to 4ML/day but is operating at 1.6ML/day as the pipeline infrastructure needs to be upgraded to provide for the full capacity of supply of 4ML/d. Further to this upgrade, the Ngcebo Water Treatment Works will require a further upgrade to 14ML/day to supply the Maphumulo North/Umvoti South (Ntunjambili) Sub-System

The infrastructure provides for community stand pipes, but there are many illegal connections resulting in a yard/house connection level of service. The bulk reservoir capacity for this scheme is unknown. The bulk (mostly PVC and HDPE) and reticulated infrastructure are generally in good condition as it is newly constructed. Water is metered at the bulk reservoirs (inflow and outflow) which are read manually. Large consumers in this scheme comprise public facilities such as the Ntunjambili Hospital and schools. The many illegal connections are also causing many leaks and contributing to the higher water demand. In areas of need, water tankers deliver treated water to designated points of delivery from which the community is served a very basic level of supply.

6.2 Other Water Supply Schemes

There are very few areas that are not included in local or regional schemes, most of which are in the rural Maphumulo and Ndwedwe Local Municipalities, and are discussed later in this report.

Flow diagrams for the bulk water infrastructure for the Umgeni-owned and operated schemes, extracted from Umgeni Water's 2022 Water Masterplan.

Maphumulo Local Municipality

Various small water supply schemes currently exist within the Maphumulo Local Municipality, but most small water schemes will become redundant once the bulk regional supply schemes are implemented;

namely the Balcome/ KwaSizabantu Bulk Water Supply Scheme, the Maphumulo/KwaDukuza Bulk Water Supply Scheme and the Maphumulo North/Umvoti South (Ntunjambili) Bulk Water Supply Scheme (IDM Water and Sanitation Master Plan, 2016).

Amongst these small schemes are Hlambithwa 1 (serving part of ward 11) and 2 (serving part of ward 6) which obtain water from local sources and have package plants to treat water to a potable standard. There are two package plants to treat water, one having a design capacity of 0.5Mℓ/d and operating at full capacity, the second having a design capacity of 0.5Mℓ/d and operating at 0.45Mℓ/d (IDM, 2019/2020).

Consumers are serviced through community standpipes and the water supply is further augmented through water tankers by the IDM. Many illegal connections need to be formalised. Most of the pipelines are either PVC or HDPE and an estimated 45% are in good condition. The remainder of the pipeline infrastructure is in poorer condition and aging. Consumers in the smaller schemes in Maphumulo LM, such as the Ntunjambili WSS, will in the future be supplied from the Maphumulo-KwaDukuza Bulk WSS (IDM, 2019/2020).

6.2.1 Ndwedwe Local Municipality

Historically, water supply within the Ndwedwe area has not been reliable largely due to the constraints in the capacity of the existing bulk infrastructure, an increase in consumer demands, leaks in the reticulation system, illegal connections and topography challenges as a result of the area being having high ridges with deep valleys. Consumers furthest from the source have suffered due to pressure and leakage problems in the networks. A new system has been introduced to the region to alleviate these challenges.

This System, unless otherwise stated, owned and operated by Umgeni Water, is a new system serving the western and central areas of Ndwedwe and feeds into the Hazelmere/Ndwedwe Sub-System (a component of the Mdloti System). This system is fed potable water from the uMshwathi Regional Bulk Water Supply Scheme (formerly known as the Southern Ndwedwe Bulk Water Supply Scheme) which is supplied water from the D.V. Harris Water Treatment Works, with the raw water sourced from the Midmar Dam.

Primarily the purpose of the uMshwathi Regional Bulk Water Supply Scheme is to supply bulk treated water to the rural areas located in the hinterland east and north east of Pietermaritzburg located within the uMgungundlovu and ILembe District Municipalities. The areas benefitting from this supply within ILembe include Swayimane, Ozwathini, and Efaye.

The uMshwathi/Ndwedwe Bulk System design has allowed for 25ML/day of potable water to be available at the Nondabula (Ozwathini?) Reservoir for distribution to consumers in both northern and southern Ndwedwe areas. One of the terminal points of the uMshwathi Regional Bulk Water Supply Scheme, the Dalton Reservoir, will be the supply node to the Nondabula and Montebello reservoirs,

Treated water is to be supplied from the Dalton Reservoir in uMgungundlovu to ILembe via the Ozwathini Reservoir including Efaye. From the Ozwathini Reservoir central Ndwedwe is supplied

including the linkage to the Mdloti System. The Ozwathini Reservoir also links into the Maphumulo System via a northerly traversing bulk pipeline which will be owned and operated by ILembe (in 2020, as part of the uMshwathi/Ndwedwe Bulk System, Umgeni Water commenced with the construction of a bulk pipeline originating at the Ozwatini Reservoir following in a north-easterly route towards Maphumulo. It will include online take-offs and a termination point and will supply areas in Ndwedwe that are currently serviced through the Maphumulo Bulk & Reticulation System). From the Ozwathini Reservoir 18ML/day of potable water will be supplied into northern and central Ndwedwe.

Further to this, the Bruyns Hill Reservoir (a terminal reservoir of the uMshwathi Regional Bulk Water Supply Scheme) in uMgungundlovu will supply the south western portion of ILembe including the Swayimane area. Of importance is the densification or growth around the southern areas of Ndwedwe due to the proximity to the provincial economic centers of eThekwini Municipality and the rapidly growing growth node of the Dube Tradeport. In addition to this growth, growth although minor in comparison is taking place around the Montebello Hospital. From the Bruyn's Hill Reservoir 10ML/day of potable water will be supplied to consumers in Swayimane and southern Ndwedwe.

The supply area is predominantly rural with dispersed settlement patterns.

The uMshwathi/Ndwedwe Bulk System will be extended to supply water up to the Ndwedwe Reservoir 5 which will then back-feed into Ndwedwe Reservoirs 4 and 3. The demand from these three reservoirs will thus be removed from the Hazelmere Supply System (Mdloti System). The uMshwathi/Ndwedwe Bulk System will also supply water into the southern Ndwedwe region via Bruyns Hill Reservoir. Supply will terminate at Cameni Reservoir in southern Ndwedwe. A take-off before Cameni Reservoir will supply eThekwini's communities to the north of Inanda Dam. Presently the terminal Ndwedwe Reservoir 5 is being fed potable water from the Hazelmere Dam but in the future, the reservoir will be fed from the Midmar Dam and will gravity reverse feed upstream Reservoirs 3 and 4 in the system.

6.2.2 uMshwathi Regional Bulk WSS

The IDM is working with Umgeni Water on the planning and future implementation of the uMshwathi Regional Bulk WSS (Midmar WTP), which is being executed in six phases (Umgeni Water Infrastructure Master Plan, 2018) within the uMgungundlovu DM and IDM.

The Umgeni Water 2020 Infrastructure Master Plan provides the following description of the scheme:

"The uMshwathi Regional Bulk Water Supply Scheme (RBWSS) supplies the rural hinterland east of Pietermaritzburg in KwaZulu-Natal. The Scheme will provide bulk water supply to large areas within the uMgungundlovu and iLembe WSA boundaries and will include the rural areas of Swayimane, Ozwathini, Efaye, and the major part of Ndwedwe Local Municipality. The scheme will also supply economic activities in the areas of Appeldoorns and Marburg and will reinforce the supply to the towns of Wartburg, Dalton, Cool Air, and Schroeders. Umgeni Water implemented the uMshwathi RBWSS, which is an expansion of the earlier Wartburg Bulk Water Supply (Section 7.3.1 (h) in Volume 2). The extension will enable economic growth and provision of social services in existing centers, whilst greatly extending the supply area into the traditional settlement areas thereby improving the quality and reliability of water supply and supporting backlog eradication.

The uMshwathi RBWSS initially consisted of three phases with the fourth and fifth phases added during the implementation stage. Following is a brief detail of each phase:

- Phase 1 – Pipeline from Claridge Reservoir to Wartburg (Section 7.5.2 (f) in Volume 2)
- Phase 2 – Pipeline from Wartburg to Dalton (Section 7.5.2 (f) in Volume 2)
- Phase 3 – Pipeline from Dalton to Efaye including Ozwathini Reservoir (Section 7.5.2 (f) in Volume 2)
- Phase 4 – Supply from Ozwathini Reservoir into Central Ndwedwe linking with the Hazelmere System
- Phase 5 – Supply from Ozwathini Reservoir in a northerly direction within Central Ndwedwe, linking with the Maphumulo Supply System. Phase 5 will be implemented and operated by iLembe District Municipality.
- Phase 6 – This is a new phase added to the uMshwathi BWSS. It is a supply from Bruyns Hill Reservoir into the southern portion of Ndwedwe.

Umgeni Water completed a detailed feasibility study (DFS) for Phase 4 of the uMshwathi RBWSS (previously known as the Southern Ndwedwe BWSS) at the end of November 2015, which included a preliminary design phase.

The supply area of Phase 4 comprises the central and southern parts of the Ndwedwe Local Municipality and occupies roughly 50% of the total area of Ndwedwe Municipality. Within the study area, the proximity of neighboring eThekwini and the Dube Trade Port is the major economic driver leading to densification in the southern parts of the study area. The area immediately around Montebello Hospital is another minor growth node. The remainder of the study area is predominantly rural with dispersed settlement patterns.

The DFS determined that the proposed source of water for the southern Ndwedwe area is the uMshwathi RBWSS. The uMshwathi RBWSS is supplied with water from the D.V. Harris WTP in Pietermaritzburg. One of the terminal points, the Dalton Reservoir, will be the supply node to the Nondabula and Montebello reservoirs, whereas the Bruyns Hill Reservoir, another terminal point of the uMshwathi RBWSS, will be the supply node to the Swayimane area and the western parts of the southern Ndwedwe area.

The uMshwathi RBWSS design has allowed for 25 ML/day of potable water to be available at the Nondabula Reservoir for distribution to consumers in both northern and southern Ndwedwe areas."

The areas to be served in the NLM would rely on the implementation of Phase 1, Phase 3, and Phase 6.

6.3 Descriptive Overview of Wastewater Sewage Systems

Information for this section was sourced from the Universal Access Plan (UAP) Phase III: Progressive Development of a Regional Concept Secondary Bulk Water Master Plan for the iLembe District Municipality (Umgeni Water, 2021).

Bulk sanitation supply schemes can be identified as schemes with a large geographic footprint or with a wastewater treatment plant (WWTP) of a design capacity of 2Mℓ/d or more.

A summary of the Wastewater treatment plants is provided in **Table 2.**

Table 2: Summary of WWTPs

LM Name	Plant Name	Owner	Design Capacity (Mℓ/d)	Annual Average Volume Treated (Operational) (Mℓ/d)	Class of Plant*
KwaDukuza	Darnall	IDM	0.5	0.3	D
	Frasers	IDM (operated by Siza Water)	12	6.8	C
	Gledhow	IDM	0.3	0.2	D
	Melville	IDM	0.4	0.3	
	Palm Lakes	Managed by PL Estate	1		
	SAPPI	WWTWSappi	unknown	unknown	unknown
	Shakaskraal	IDM (operated by Siza Water)	1.6	1.2	D
	Sheffield	IDM (operated by Siza Water)	6	0.2	
	Stanger	IDM	10	7	C
Mandeni	Amatikulu (Decommissioned) Used as a septic tank - remove	IDM	0.25		D
	Mandeni	IDM	1.2	1	D
	Sundumbili	IDM	12	12	D
	Tugela	IDM	0.75	0.117	D
Maphumulo	Maphumulo Hospital	IDM	0.2	0.165	D
	Ntunjambili	IDM	0.2	0.15	D
	Vukile High School (Non-discharge Ponds)		1		E
Ndwedwe	Glendale Sugar Mill	Not operated by IDM (Unknown) Glendale			
	Montobello Hospital	Montobello Hospital	0.15	0.145	D

Source: iLembe DM correspondence received and from interviews (June 2022; August 2023)

* Note: All the classifications for the WWTPs need to be confirmed by the DWS (correspondence from the IDM, 20 February 2020).

The IDM collects and captures water and wastewater quality results that are submitted to the DWS on the IRIS system. Not all wastewater treatment plants have flow meters and operational volumes in these cases have to be estimated.

The USAID South Africa Low Emissions Development Program (SA-LED) performed energy audits on some of the WWTPs (Darnall, Gledhow, Stanger, and Sundumbili) in the IDM and made recommendations to improve energy efficiencies and identify opportunities for co-generation and beneficiation. The Sundumbili WWTP may be investigated further for options of waste to energy and co-generation.

The following sections provide a brief overview of the main WWTPs.

6.3.1 Concession Area: Ballito to Tinley Manor and Shakaskraal

Siza Water operates three WWTPs, namely Frasers, Sheffield, and Shakaskraal and they also handle the plans for upgrades and refurbishment.

The Frasers WWTP has been designed to treat 12 Mℓ/d. The majority of the influent is pumped from coastal and inland pump stations. This has an impact during peak times when all the pump stations pump during this period. The works have catered for this through a balancing reservoir at the inlet works (IDM Water and Sanitation Master Plan, 2016).

The existing Hugh Dent PS pumps southwards towards Frasers, however, this will change soon. To redirect effluent northwards to the Sheffield WWTP. The Sheffield WWTP is sized to treat 6 Mℓ/d but will be able to expand to an 18 to 20Mℓ/d treatment facility. Effluent is received from Sheffield Gardens and Tiffany's Spar pump stations (IDM Water and Sanitation Master Plan, 2016).

Information presented further in this sub-section was sourced from IDM and SW officials and supplemented by the recently-completed Siza Water Infrastructure Master Plan (IMP) for 2019-2023.

Sanitation is mostly waterborne connections, but there are also VIPs and septic tanks.

Siza Water installed a Reverse Osmosis (RO) component at the Frasers WWTP (12Mℓ/d design capacity, can be upgraded to 18Mℓ/d) and can treat and reuse approximately 3Mℓ/d (upgradeable to 5Mℓ/d) from the current wastewater volume of 6-8Mℓ/d (Feb-Nov; else +-11Mℓ/d during peak summer periods), which is blended into the water supply system. The Frasers WWTP serves the areas of Sheffield Beach, Salt Rock, Shakas Rock, Simbithi Estate, Ballito, Compensation, and Zimbali Estate. The Frasers WWTP operates at its peak during the high tourism season. Treated effluent is discharged to a tributary of the Tongaat River.

There is also the Shakaskraal WWTP with a design capacity of 1.6Mℓ/d and operating at 1.2Mℓ/d. The Shakaskraal WWTP serves the areas of Shakashead, Umhlali, and Woodmead. It cannot be upgraded due to site restrictions and additional sewer volumes can be diverted to Sheffield WWTP. Planning is under way for the design of the pipework and pump stations to implement the decommissioning of the Shakaskraal WWTP and divert sewer flows to the Sheffield WWTP.

The Sheffield WWTP has a design capacity of 6Mℓ/d (upgradable to 18Mℓ/d) and is operating at 0.2Mℓ/d. The IDM will also utilize this WWTP for receiving and treatment of sewage from the IDM's areas of operation. The Sheffield WWTP discharges to a tributary of the Mhlali River.

6.3.2 Darnall SS

The 2011 Census stipulates the population for the town area Darnall as 8 435 and consisting of 2 374 households. The majority of consumers have waterborne sanitation or are served though septic tanks. The Darnall WWTP discharges into the Nonoti River, south of the town of Darnall.

The IDM Water and Sanitation Master Plan (2016) provides the ultimate design capacity of the Darnall WWTP as 3Mℓ/d, with 1.5Mℓ/d installed capacity at the time. The Darnall WWTP is an activated sludge system and runs as a semi-automated process. The electricity for this plant is provided directly by Eskom (USAID SA-LED, 2016).

6.3.3 Gledhow SS

The 2011 Census stipulates the population for the Sub-Place of Gledhow as 1 253 and consisting of 362 households. Most consumers have waterborne sanitation or are served though septic tanks. The Gledhow WWTP discharges into a canal that flows to the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) provides the ultimate design capacity of the Gledhow WWTP as 0.3Mℓ/d. It is planned that the works will be decommissioned and the sewer pumped to the Stanger WWTP.

The Gledhow WWTP is an activated sludge system. The sludge activation is done manually as is the sludge pumping and drying process. The plant is not in good condition and only operates at 50% of its capacity. The electricity for this plant is provided by the KwaDukuza Local Municipality (USAID SA-LED, 2016).

6.3.4 Melville SS

The 2011 Census stipulates the population for the Sub-Place of Eradamishini SP, which includes Melville as 6 384 and consisting of 1 728 households. The 2011 Census indicates that 12% of consumers in Eradamishini have waterborne sewer, 7% septic tanks, 27% VIPs, and the remainder have a pit, bucket, or chemical system. The Melville WWTP discharges to the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) does not provide any information on this facility and only indicates that this area will be served in the future by the Stanger WWTP.

6.3.5 Palm Lakes SS

The 2011 Census stipulates the population for the Sub-Place of Royal Palm Estate SP as 367 and consisting of 129 households, all with waterborne sanitation. The Palm Lakes Estate is one of several estate developments in the KwaDukuza LM. The Palm Lakes package plant discharges to a small stream entering the Mhlali River.

The Palm Lakes package has been designed to treat 2 Mℓ/d. The works are currently operated by Palm Lakes, but will shortly be handed over to IDM. The treatment works are adequately sized to cater to the fully developed residential area only and should the commercial and business parks start to develop, the Palm Lakes package plant would require upgrading (IDM Water and Sanitation Master Plan, 2016).

At present, (2020), the Palm Lakes package plant is still being operated by the estate. In 2016, the IDM performed due diligence on taking over the operations of the plant and provided a list of conditions to be met before it could take over the operations and maintenance.

6.3.6 Stanger SS

The 2011 Census stipulates the population for the town area KwaDukuza (excluding Gledhow) as 42,054 and consisting of 12 012 households. The majority of consumers have waterborne sanitation. The Stanger WWTP, located in the east of KwaDukuza town, upon entering from the N2 KwaDukuza/Blythedale offramp, discharges into the Mbozamo River, a tributary of the Mvoti River.

The IDM Water and Sanitation Master Plan (2016) provides the design capacity of the Stanger WWTP as 10Mℓ/d. The Master Plan indicated that sewer infrastructure was being constructed, including linkage to Gledhow, Groutville, Melville, Njebane (five to 20 years), and Njebane Township (within five years). This will lead to a wastewater demand of up to 14Mℓ/d. A proposal was made for a new regional KwaDukuza WWTP.

The Stanger WWTP has a dual-geared aerated and anaerobic digester. The electricity for this plant is provided by KwaDukuza Local Municipality (USAID SA-LED, 2016).

The IDM commenced with the feasibility and detailed design study for the regional KwaDukuza WWTP in 2019. Furthermore, the Vuthela iLembe LED Support Programme added to the scope (funded by the Vuthela programme) the investigation of options for water reclamation and reuse, enhanced energy efficiencies, water efficiencies, and energy from sludge. The study is still in the initial stages. There have however been concerns surrounding the proposed site and the sensitivity of the already-polluted receiving waters. The DWS indicated during 2020 that it would not allow any effluent released until the sources of pollution upstream are addressed. The IDM commissioned a study to find the source/s of pollution. Due to the COVID-19 lockdown regulations, the study was put on hold under Level 5 lockdown but could commence under Level 3 lockdown (Level 3 lockdown commenced on 28 May 2020). The results of the study are expected by the end of October 2020. This may influence the design options of the proposed regional KwaDukuza WWTP.

6.3.7 Mandeni SS

The town areas served by the Mandeni WWTP are Mandeni SP and Mfusanvu. The 2011 Census stipulates the population for these areas as 3 853 and consisting of 1,133 households. All consumers have waterborne sanitation. The Mandeni WWTP discharges into the Tugela River, south of Mfusanvu.

The IDM Water and Sanitation Master Plan (2016) provided costing for future upgrades to Mandeni WWTP. However, it also indicates that it will be decommissioned by 2036 and the sewer to be treated at the Sundumbili WWTP. There is a project currently (2020) underway to upgrade the Sundumbili WWTP, but challenges are encountered in managing the large stockpile of existing sludge which is also contaminated with heavy metals, likely emanating from effluent from the Isithebe Industrial Estate.

6.3.8 Sundumbili SS

The town areas served by the Sundumbili WWTP are Sundumbili A SP and the Isithebe Industrial Estate. The Isithebe Industrial Estate is one of the biggest industrial parks in South Africa with facilities and warehousing covering textiles, manufacturing, and industrial activities. The 2011 Census stipulates the population for these areas as 27,472 and consisting of 9 151 households. About 87% of consumers have waterborne sanitation with the remainder having access to septic tanks, VIPs, or others, but below basic sanitation levels of service. The Sundumbili WWTP, located east of Sundumbili town discharges into a small stream leading to the Tugela River.

The IDM Water and Sanitation Master Plan (2016) indicates the design capacity of the Sundumbili WWTP as 12Mℓ/d, operating at 11Mℓ/d. The volume of influent received at the plant is correlated to the activities and utilisation at the Isithebe Industrial Estate and can represent up to 90% of the inflow at the WWTP. Should the Industrial Estate develop further, it is recommended that the Sundumbili WWTP be upgraded to 18Mℓ/d.

The Sundumbili WWTP is a Biofiltration Plant with an anaerobic plant and biodigesters and maturation ponds. The plant has a low energy requirement and is less affected by electricity outages than for example the Stanger WWTP. The Sundumbili WWTP does however require a larger land area. The electricity for this plant is provided directly by Eskom. It was suggested to conduct a detailed feasibility to assess the potential for waste to energy and co-generation from this WWTP (USAID SA-LED, 2016).

As of 2019/2020, the plant is operating at full capacity. There has not yet been a detailed feasibility study to determine the potential for waste to energy and co-generation from this WWTP. However, it may be earmarked by the Vuthela iLembe LED Support programme to conduct such a study especially if it will encourage a circular economy and energy savings that can illustrate the mitigation of direct and indirect greenhouse gas emissions. It was considered for a funding application in 2020 to ICLEI – Local Governments for Sustainability, however, a proposal could not be prepared due to insufficient information and time constraints.

7 MUNICIPAL STRUCTURAL OVERVIEW

7.1 Staff Organisational Structure

The IDM water department comprises four Local Municipalities which collectively manage the water infrastructure within iLembe. The four LMs are namely Mandeni LM, Maphumulo LM, KwaDukuza LM, and Ndwedwe LM. The current staffing management structure was provided by the municipality shown in **Figure 4** below. The information provided indicated the setup and structure of each division, the roles and responsibilities of each position, and the resources they have available to them. The full-staff organisational organogram of IDM's Technical Services: Project Planning and Development Department is indicated in **Figure 5** below. Some positions highlighted in **RED** indicate a Budgeted Replacement Post (BRP) or vacancies that need to be filled. Positions that are filled are indicated in **GREEN**.

7.1.1 Technical Services Department: Operations and Maintenance – Management Structure

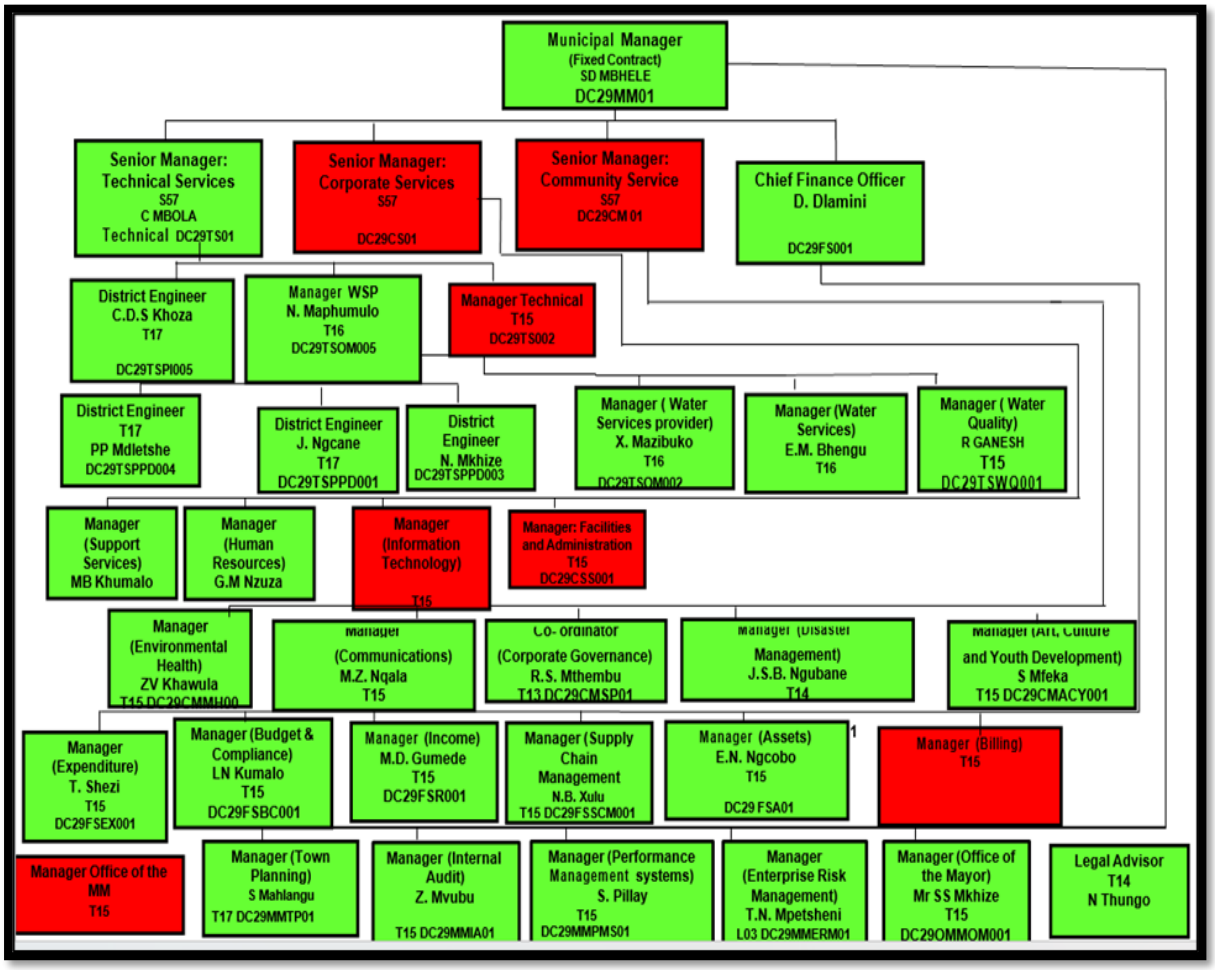


Figure 4: Staffing Organogram (Management Structure)

7.1.2 Technical Services Department: Project Planning and Development

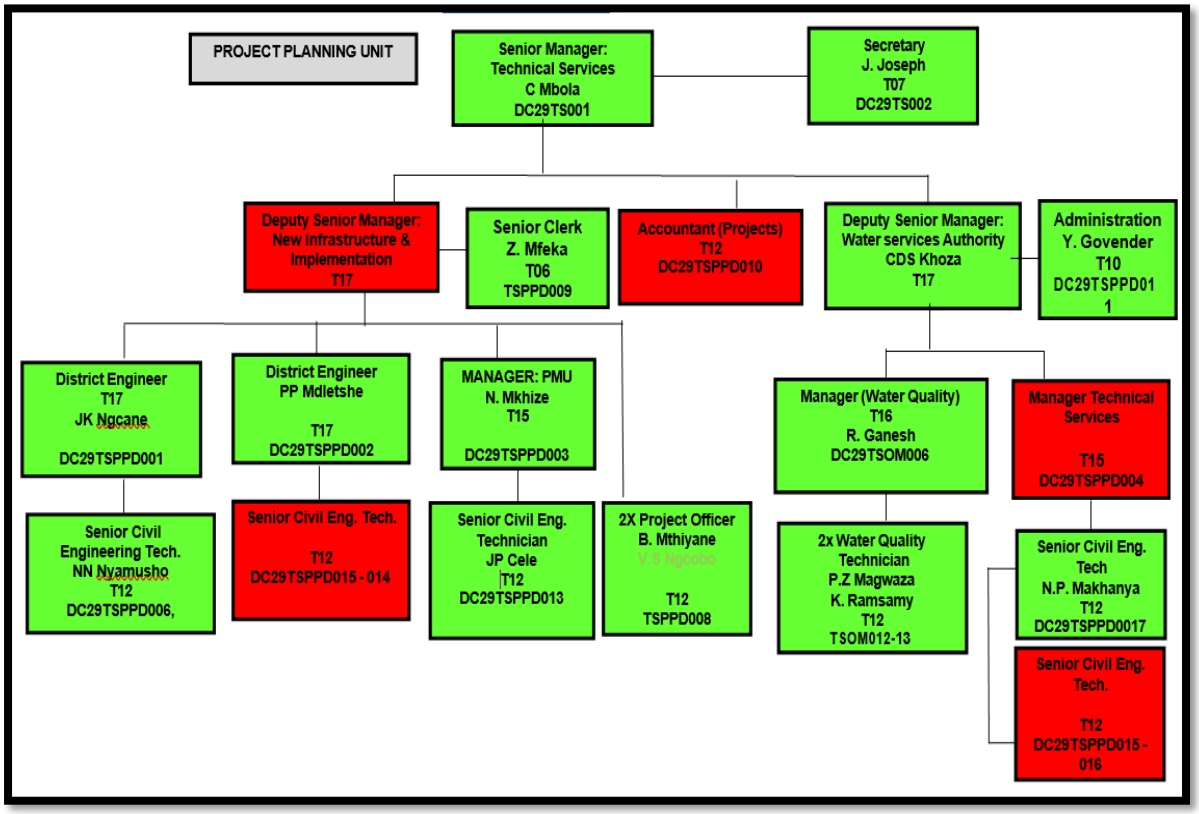


Figure 5: Staffing Organogram (Project Planning and Development)

7.2 Decision Analysis

7.2.1 The conditions and elements of making choices

Decisions must be made and actions must be taken in all organizations. It is up to the appropriate people in the organization to select the actions, determine how to carry them out and take responsibility for their successful implementation.

The thinking pattern for making choices

A systematic procedure is based on the thinking pattern we use when a choice is to be made:

i. Appreciate the fact that a choice must be made.
ii. Consider the specific factors that must be satisfied if the choice is to succeed.
iii. Decide what kind of action will best satisfy these factors.

Consider all risks that may be attached to the final choice of action that could jeopardize its safety and success.

7.2.2 The major elements of decision analysis

The objectives for the decision

Objectives are defined as the specific results and benefits the decision is to achieve. We establish these objectives once we agree upon the correct statement of our decision. This is done before discussing alternatives.

These objectives are categorized as Needs and Wants.

Alternatives

If we must choose among several alternatives, we will have to decide which one will best fulfill our objectives with the smallest acceptable risk. If there is only one alternative, we must decide whether it is good enough to accept

The consequences of the choice

Thoroughly investigate and evaluate the possible adverse consequences of any alternative before we make a final decision. This will allow the decision-maker to deal with such effects or any changes at no cost.

7.3 Municipal Finance Management Cycle

Municipal planning and budgeting are all governed by the Municipal Systems Act of 2000. All municipal projects must be part of the municipal Integrated Development Plan (IDP). It is drafted every 5 years and annually updated when new projects are ready to be included. During the annual Municipal Financial Management Cycle budgets are allocated to the priority projects.

iLembe District Municipality follows the same cycle all municipalities follow as per **Figure 6** below:

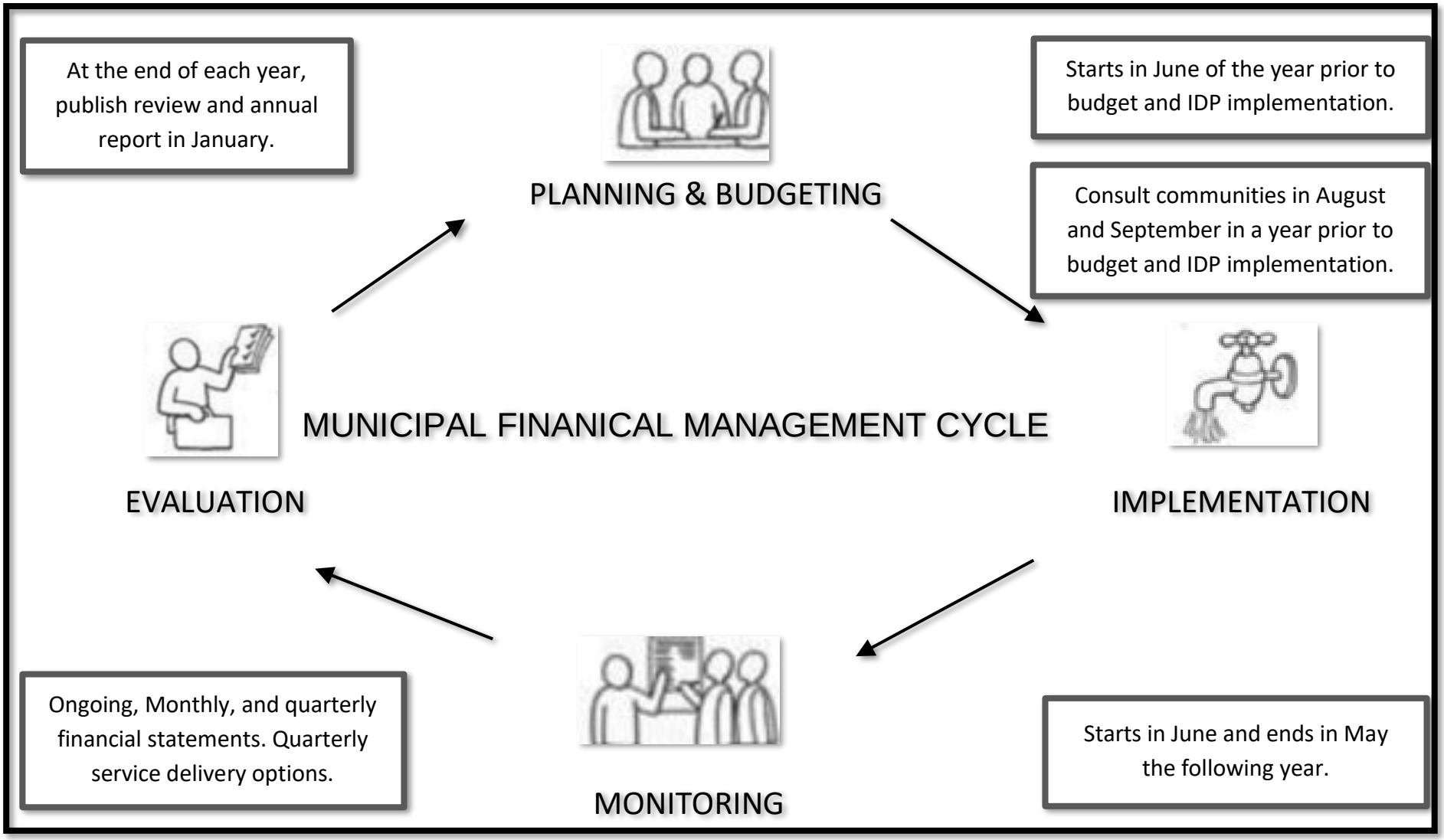


Figure 6: Process flow diagram - Implementation of new projects

7.3.1 Awarding of Contracts/Projects

i. Bids are evaluated by the SCM department for formal compliance as well as by the technical department for functionality.

ii. The functionality evaluation is conducted by a small technical team that scores the bids according to the quality of work presented.

iii. Bids which are used in complex tenders are often voluminous and evaluators must go through large amounts of documentation daily.

iv. A written evaluation report is thereafter submitted to the Bid Evaluation Committee that finalises the score which includes preferential procurement criteria and price. It then is sent to the Bid Adjudication Committee to undergo review.

v. The Bid Adjudication Committee recommends the bidder to the municipal manager who makes the award.

vi. In some cases, the municipal manager can delegate his/her authority to the Bid Adjudication Committee. They ensure that they are compliant with various procedures.

vii. The technical department issuing the tender is responsible for the Terms of Reference and the specifications as well. Diligence is critical at all stages of a tender process to prevent the result from being challenged by unsuccessful competitors which can often result in long delays.

8 INFRASTRUCTURE OVERVIEW

8.1 2022/2023 Fixed Assets Register

Table 3: iLembe DM Infrastructure Overview

Infrastructure class	No. of Locations
Pump Stations (Water and Sanitation)	198
Reservoirs and Tanks	576
Wastewater Treatment Works (WWTW)	12
Water Treatment Plants (WTP)	11
Transport Assets and Plant	144

8.2 Conditional Grading of Current Assets

Overview and Conditional Grading of Current Assets can be seen in **Figure 7** below:

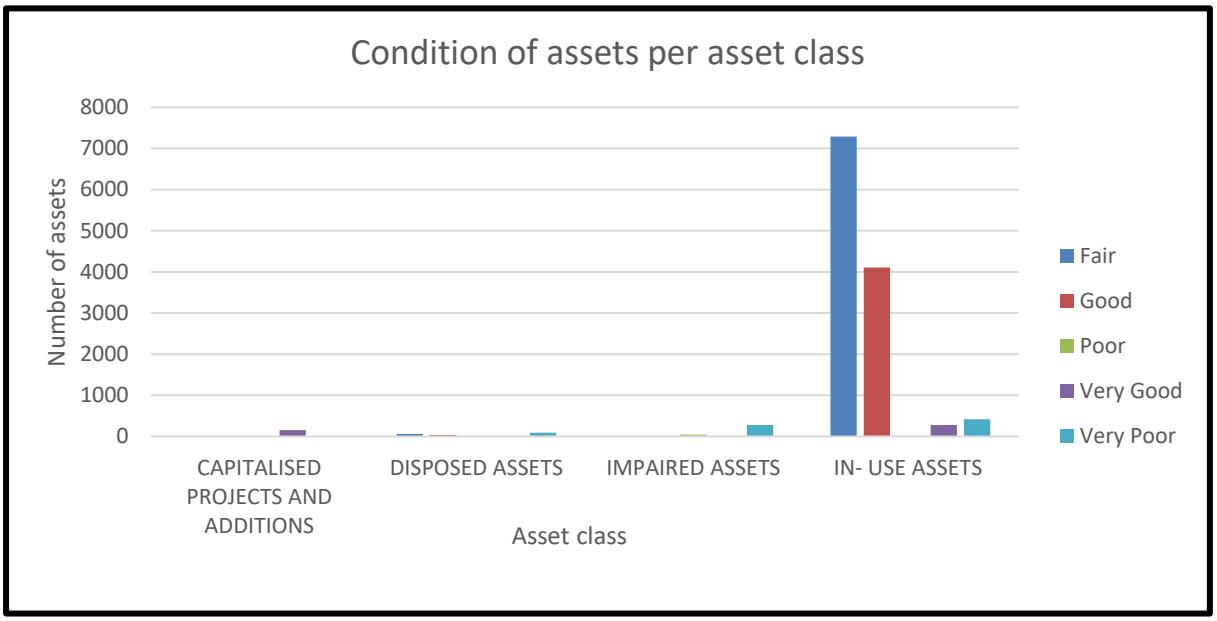


Figure 7: Overview of the asset's current conditions

8.3 Transport Assets

Table 4 below depicts the vehicles and equipment available in iLembe DM with each local municipality having its own plant and equipment. It should be noted that 70 of these vehicles are leased to the fleet horizon and 32 are owned by iLembe DM. Additionally, there is one excavator in iLembe DM that is shared between the local municipalities.

Table 4: Available Transport Assets and Plant

Vehicles and Equipment Available								
Region	**Mandeni LM**		**Maphumulo LM**		**KwaDukuza LM**		**Ndwedwe LM**	
Item	**No.**	**Condition.**	**No.**	**Condition.**	**No.**	**Condition**	**No.**	**Condition.**
Water Truck	9	Good	12	Good	4	Good	10	Good
Sewer Trucks	2	Good	0	Good	2	Good	4	Good
3 Ton Truck	1	Good	1	Good	2	Good	1	Good
Bakkies	9	Good	5	Good	9	Good	8	Good
TLB	2	Good	2	-	2	Good	2	Good
Excavator	0	-	0	-	1	Good	0	-
Jetting Machine	1	Good	0	-	2	Good	0	-

Recommendations

It is recommended that iLembe DM make supplementary plant and equipment available to streamline operation and maintenance procedures. Mandeni LM and Ndwedwe LM require more water trucks to efficiently carry out day-to-day tasks and allow for regular and more frequent maintenance on the other vehicles. Additionally, a supplementary sewer truck is required in Ndwedwe LM. Since there are surplus vehicles available, this will reduce the strain on the vehicles and extend their lifespan.

8.4 Water Supply Infrastructure

The List of assets in **Table 5** below shows the number of assets controlled by iLembe for all Water Infrastructure. There are a total of 8926 major infrastructure assets which include motors, pumps, and equipment as well as other structures and electrical assets.

Table 5: Main Bulk Water Infrastructure

Description of Assets	No. of Individual Assets
Water Supply Infrastructure (Total no. of assets)	**8926**
Boreholes	**492**
Bulk Mains (Length of Mains)	**100 km**
Reticulation (Length of pipework)	**7384 km**
No. of Pump Stations (Locations)	**109**
Pump station assets (Line items)	**1543**
Reservoirs (Line Items)	**4450**
Water Treatment Plants (WTP) (Locations)	**22**
Water Treatment Plants (WTP) (Line Items)	**2377**

Figure 8 below shows a pie chart of all major water infrastructure assets and their weightings.

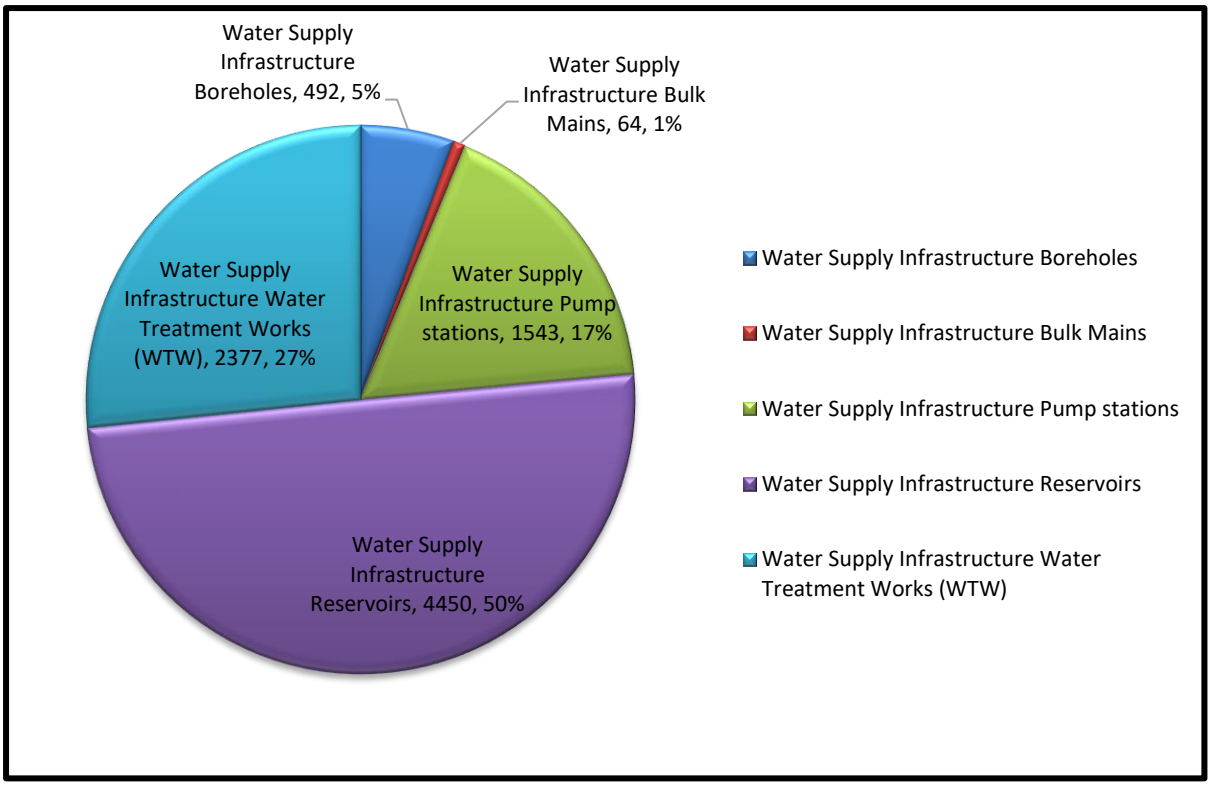


Figure 8: Graph indicating all major water infrastructure assets

8.5 Sanitation Infrastructure

The List of assets in **Table 6** below shows the number of assets controlled by iLembe for all Water Infrastructure. There are a total of 2718 major infrastructure assets which include motors, pumps, and equipment as well as other structures and electrical assets.

Table 6: Main Bulk Sanitation Infrastructure

Description of Assets	No. of Individual Assets
Sanitation Infrastructure (Total no. of assets)	**2718**
Outfall sewers (Bulk Mains)	**Insufficient Data on GIS**
No. of Pump Stations (Locations)	**39**
Pump station assets (Line items)	**1081**
Wastewater treatment works (Locations)	**16**
Wastewater treatment works (Line Items)	**1625**

Figure 9 below shows a pie chart of all major water infrastructure assets and their weightings

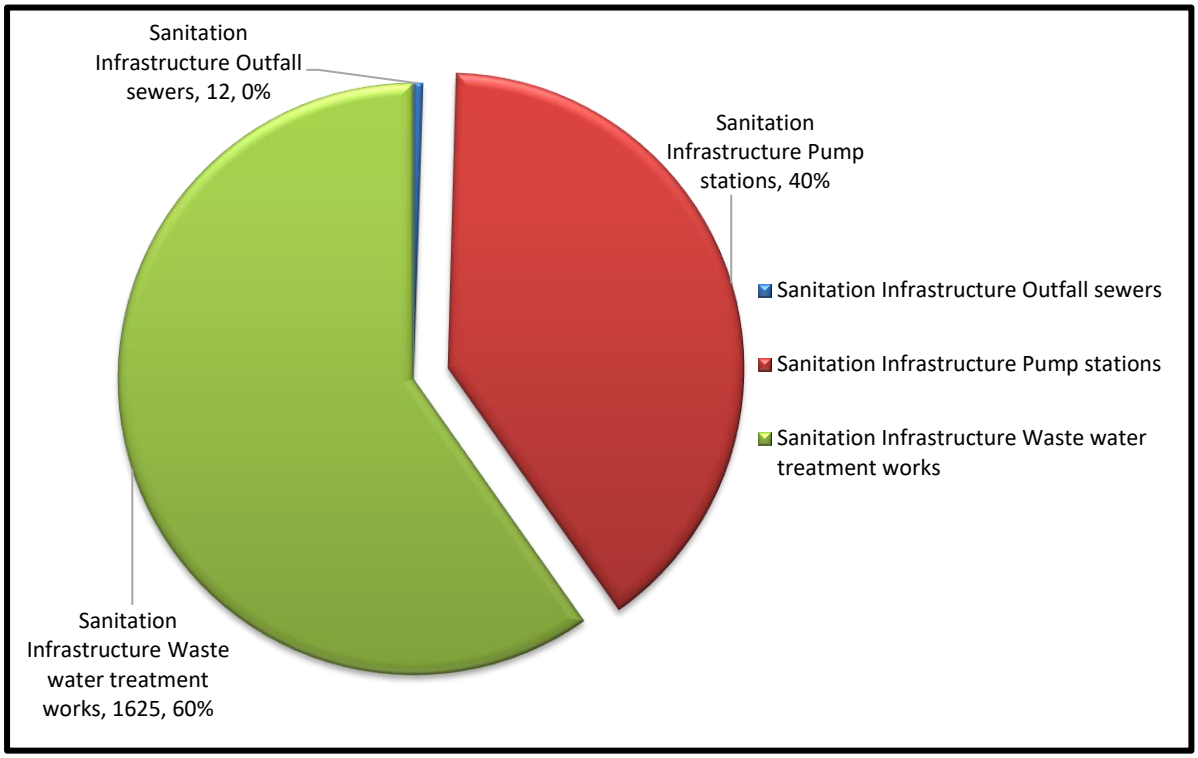


Figure 9: Graph indicating all major sanitation infrastructure assets

8.6 Geographic Information System (GIS)

A geographic information system is a form of a database comprising geographic data, combined with software tools for managing, analysing, and visualizing those data. It is utilized for mapping, urban planning, surveying, geology, asset management and planning, and community development among others. The iLembe DM uses the ESRI® suite of software, primarily ArcMap and ArcGIS Pro.

The GIS Unit (under the IDP & Planning Department)receives accurate information in terms of as-built records as they are surveyed and captured accordingly by the consultant and submitted to the Project Management Unit (PMU). Design drawings received are of high accuracy. However, in terms of CAD drawings being converted for use in the iLembe DM's corporate GIS, there are always challenges due to the way information is stored and displayed in CAD, versus the GIS. The GIS Unit often has to perform data conversions in which process not all of the CAD drawing information can be transferred to GIS due to skills and time constraints.

The GIS Unit utilizes hardware such as Lenovo laptops, Epson plotter scanners, A3 printers, and GPS handheld devices (owned by technical services). Additionally, the GIS Unit is working on implementing a full server-based environment as it has many benefits in allowing the GIS Unit to operate more effectively. The equipment utilized in the department delivers accurate and precise information.

Layout Maps for each local municipality are provided in **Annexure A** showing all reticulation networks, reservoir positioning, and main bulk lines

Table 7 below is information that was extracted from the GIS corporate geodatabase in terms of assets recorded and located in each Local Municipality.

Table 7: Infrastructure Assets extracted from GIS

KWADUKUZU DISTRICT MUNICIPALITY		
DESCRIPTION	**UNIT**	**TOTAL**
Reservoirs (Total no. of facilities)	No.	108
Kwadukuza Water Reticulation (Length in kilometers)	km	1 426
Kwadukuza Bulk Pipeline (Length in kilometers)	km	372
Mvoti Reticulation (Length in kilometers)	km	196
Sewer Reticulation (Length in kilometers)	km	235
Umgeni Reticulation (Length in kilometers)	km	112
Water treatment Plant (Total No. of facilities)	No.	3
Waste-Water treatment plant (Total No. of facilities in operation)	No.	11

MAPHUMULO DISTRICT MUNICIPALITY		
DESCRIPTION	**UNIT**	**TOTAL**
Reservoirs (Total no. of facilities)	No.	93
Maphumulo Water Reticulation (Length in kilometers)	km	2 280
Maphumulo Bulk Pipeline (Length in kilometers)	km	193
Umgeni Reticulation (Length in kilometers)	km	72
Water Treatment Plant (Total No. of facilities)	No.	6
Waste-Water Treatment Plant (Total No. of facilities)	No.	3

NDWEDWE DISTRICT MUNICIPALITY		
DESCRIPTION	**UNIT**	**TOTAL**
Reservoirs (Total no. of facilities) – **IDM ONLY**	No.	139
Ndwedwe Water Reticulation (Length in kilometers)	km	3 637
Ndwedwe Bulk Pipeline (Length in kilometers)	km	275
Umgeni Reticulation (Length in kilometers)	km	22
Water Treatment Plant (Total no. of facilities)	No.	8
Waste-Water Treatment Plant (Total no. of facilities)	No.	1

MANDENI DISTRICT MUNICIPALITY		
DESCRIPTION	**UNIT**	**TOTAL**
Reservoirs (Total no. of facilities)	No.	58
Mandeni Water Reticulation (Length in kilometers)	km	1 497
Mandeni Bulk Pipeline (Length in kilometers)	km	226
Sewer Reticulation (Length in kilometers)	km	330
Umgeni Reticulation (Length in kilometers)	km	29
Water Treatment Plant (Length in kilometers)	No.	4
Waste-Water Treatment Plant (Total no. of facilities)	No.	3
Pump station (Total no. of facilities)	No.	14

8.6.1 Challenges

- The main challenge faced is the lack of sewer infrastructure information for Ndwedwe and Maphumulo as well as the underground assets, especially in older, established township areas such as KwaDukuza. This is due to the lack of as-built drawings provided to the GIS department. This is a work-in-progress project and will be updated in the future, but to date, this information is not available on GIS.
- There are no pump stations represented on GIS for Ndwedwe, Maphumulo, and Kwadukuza Local Municipalities
- Water Reticulation pipework for some smaller towns is not shown on GIS.

Recommendations

- Standard Operating Procedures (SOPs) should be streaMLined between the various departments involved in a project for example. GIS design drawings should be given to the GIS department at the inception of the project and the project should be followed through implementation until finalization.
- The department requires additional equipment and stationery such as guillotines, filing cabinets, and external hard drives to ensure that operations are carried out more efficiently.
- A separate GIS budget is required to improve operations and allow for skills training to further develop the department's knowledge on the subject matter and keep them informed of new technology.

It is noted that through the Vuthela programme, a project (VILP/I/041) was initiated during 2022 to amongst other – develop the first draft SOPs, for the iLembe District Municipality to guide the process of information management as it relates to water and sanitation infrastructure assets. The Departments involved are IDP and Planning (GIS Unit), Finance (Financial Asset Management); Technical Services (including the PMU office); and ICT.

Furthermore, through the Vuthela programme, a new project (VILP/I/044) commenced in January 2023, for the procurement, installation, and implementation of a computerised asset management information system based on the EDAMS platform. The project under Vuthela will be completed in September 2023, with the following modules installed and operational: Network & Data Management; Operations and Logs; Maintenance Management; Water Audit (Balancing and Non-Revenue Water); Rehabilitation Planning; and Asset Valuation. All relevant officials from the IDM received training in the respective modules and officials are in the process of implementation of the modules, which will take some time as it involves change management processes in operations and coordination between departments. The service provider EDAMS Technology, a Division of Hydro-Comp, will continue support to the IDM till June 2025 (funded by Vuthela, thereafter costs for support, software license and maintenance to be carried by the IDM).

9 STANDARD OPERATING PROCEDURES

9.1 Operational Procedures

9.1.1 Faults and Incident Reporting and Actions

IDM uses a call centre system where faults are reported via landline or email to the municipality. Incidences include mains bursts, sewer collapses, pump failures, flooding or pollution events, missing manhole covers and pipe collapses. The Call Centre System is ONLY being operated by Kwadukuza LM. Once the procedure has been streamlined implementation in Maphumulo, Ndwedwe, and Mandeni will commence.

The faults are logged by the system operators on the call centre records. The details of the faults are forwarded to the supervisor who then generates the job cards and allocates them to either the external contractors or internal team plumbers. The plumbers attend to the fault according to the details supplied and then return the completed job card to the municipality. The fault is closed out with the respective foreman who approves the work done on-site.

Figure 10 below is a workflow diagram indicating the call centre system reporting channels for faults allocated to the internal team vs faults allocated to the contractors.

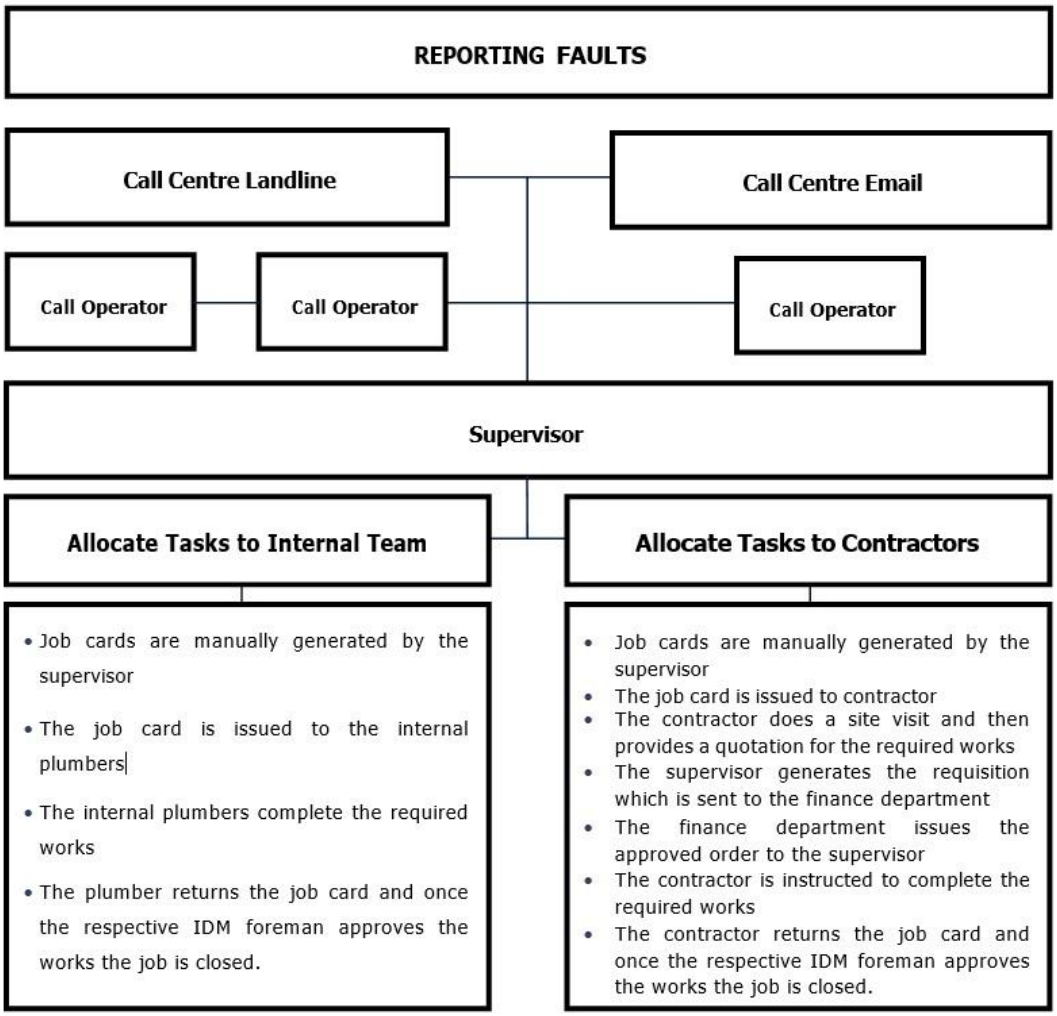


Figure 10: Call Centre System Reporting Channels

9.1.1.1 Challenges

The following challenges were noted during the project:

i. Lack of a digital system: It was noted that IDM does not use a digitally integrated system which was developed to be used as an alternative system to report and log water faults. The application was not finalised due to budget constraints. The COVID-19 pandemic also halted the launch of the app to the public. The IDM indicated that the call centre system needs to be updated and improved whether it is through the use of an app or a specific digital programme.

ii. Lack of integrated systems: It was noted that IDM does not use an integrated digital system where maintenance activities are recorded against assets in the FAR. This process is done manually when the job cards are returned.

iii. Identification and prioritisation of areas requiring maintenance: It was noted that IDM does not have a system in place to monitor maintenance per area/region, therefore, maintenance cannot be prioritised and planned for.

9.1.1.2 Recommendations

IDM makes use of a manual system to record tasks and issue them to the respective maintenance teams. The use of the current manual systems in Maphumulo, Ndwedwe, and Mandeni does not allow IDM to track the progress of tasks or record the history of maintenance procedures in each LM.

It is recommended that the operational LMs start recording incidents, queries attended to and challenges met in a consolidated register that can be managed electronically. This information will provide a primary database for a digital system. Programmes such as Excel are available to start recording maintenance tasks to create a digital database.

It is recommended that the IDM makes use of a digital system for the operation and maintenance processes. This system, a Maintenance Management System, should integrate with the Asset Management System to ensure that the maintenance activities performed are recorded against assets on the FAR. The information stored in the primary database will provide an up-to-date and clear understanding of the condition of water infrastructure in each region. IDM will then be able to identify key areas for preventative maintenance activities. The overview of the integration of the systems is indicated in **Figure 11.**

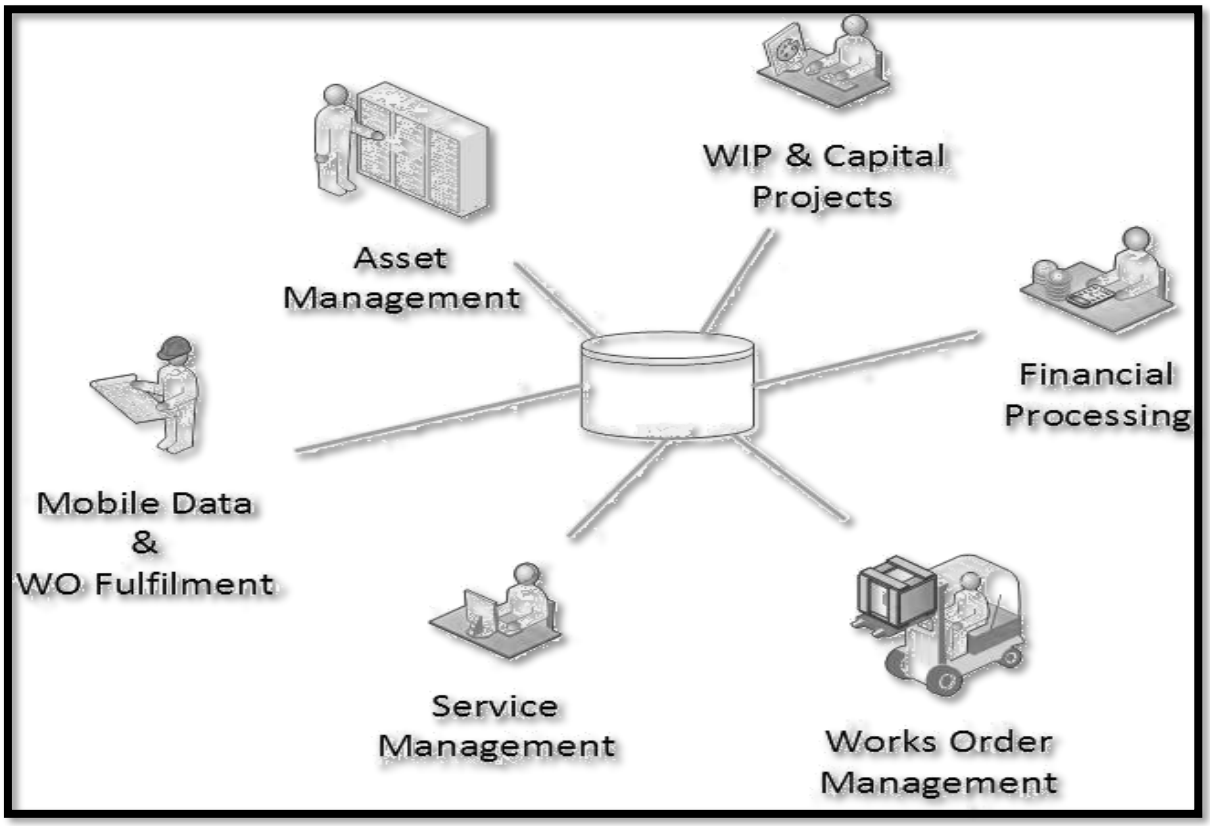


Figure 11: Integration of the FAR into the Management Systems

9.1.2 Incident Management

When notice of an incident is received, the following information should be sought from the person notifying the incident:

i. Their name and contact details.
ii. The nature of the incident.
iii. The location of the incident.
iv. If the incident is causing a major problem such as hindering traffic or causing flooding

The information received, augmented by site assessment of the operational staff member sent to investigate the incident decides the likely cause of the problem and, if on a service connection, whether the problem is likely to be on the section that is the responsibility of IDM, or the customer.

If the problem is within the responsibility of the customer (that is from behind the water meter into the property), IDM may wish, for a fee, to rectify the problem for the owner.

If the problem is on or caused by an asset managed by IDM, the operator will deploy appropriate resources and inform his supervisor of actions being taken. If the problem can be resolved without further investigation, the operator will go ahead and do so. If further investigation is required, the line manager will assign an appropriate member of his staff to investigate further or appoint further operational staff to attend to the matter.

The following flow chart illustrates the process to be adopted in resolving an incident for which iLembe is responsible see **Figure 12** below.

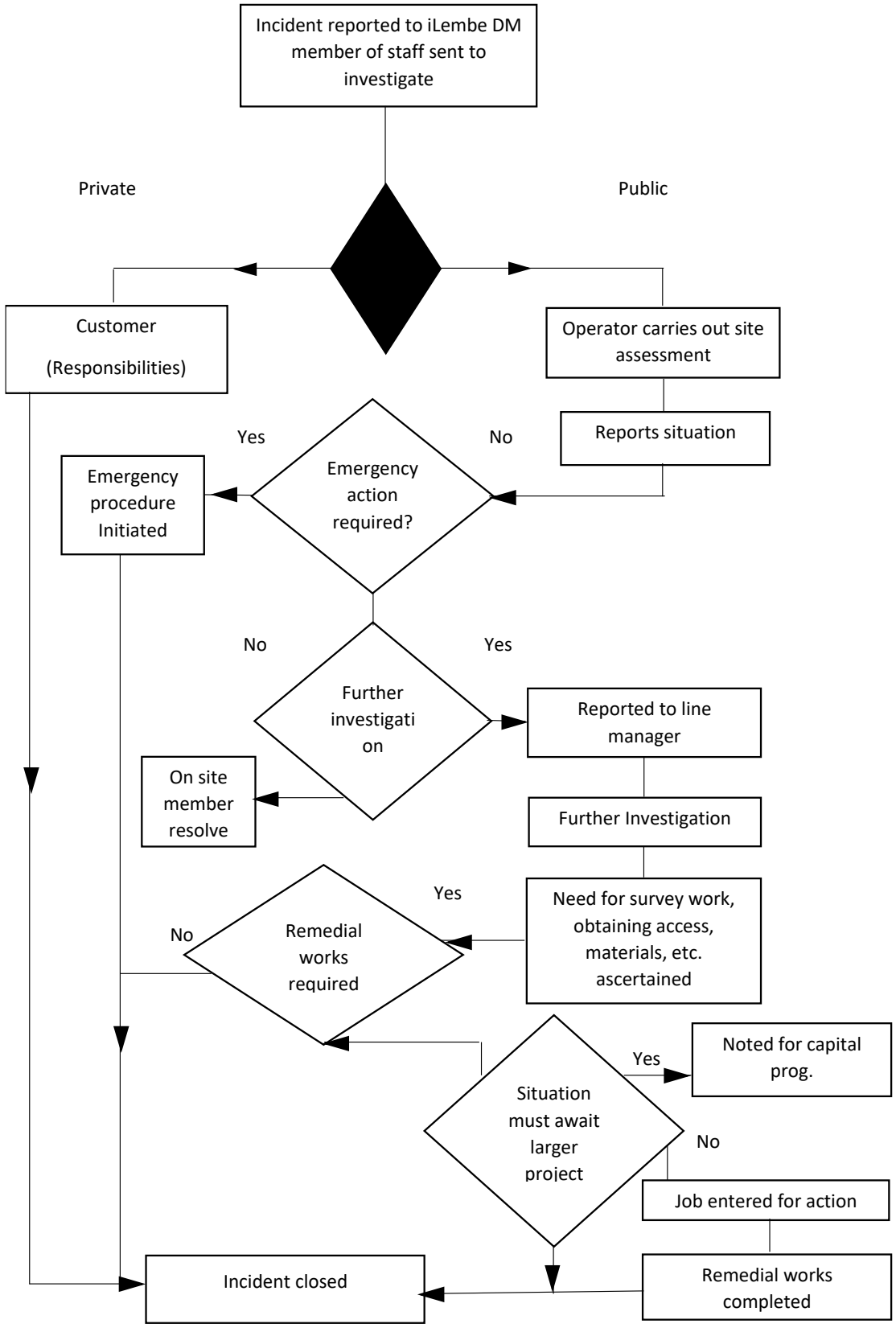


Figure 12: Incident Management

9.1.2.1 Call centre incident reporting system

9.1.2.1.1 Call Logging Process

- The call centre system consists of a Virtual Server which is built in. It is hosted in the cloud by Teraco which is based in Durban.
- All call centre software is installed and configured accordingly.
- The call centre system is custom-built and tailor-made for municipal-specific services. Every field in the system is aligned to meet all municipal processes.
- Each process is aligned with the system and its user manuals.
- This system is scalable and customisable to add or remove business processes.
- Mobile devices are given to field engineering staff.
- The call centre system is accessible from any place at any given time.
- At the call centre every agent must display a certain level of telephonic etiquette to ensure a positive customer experience.
- Every agent must answer an incoming call within three rings.
- It is important to be polite during conversations.
- Try to resolve a customer complaint by recording the issue if there are any delays.

The call Logging Process is shown in **Figure 13** below:

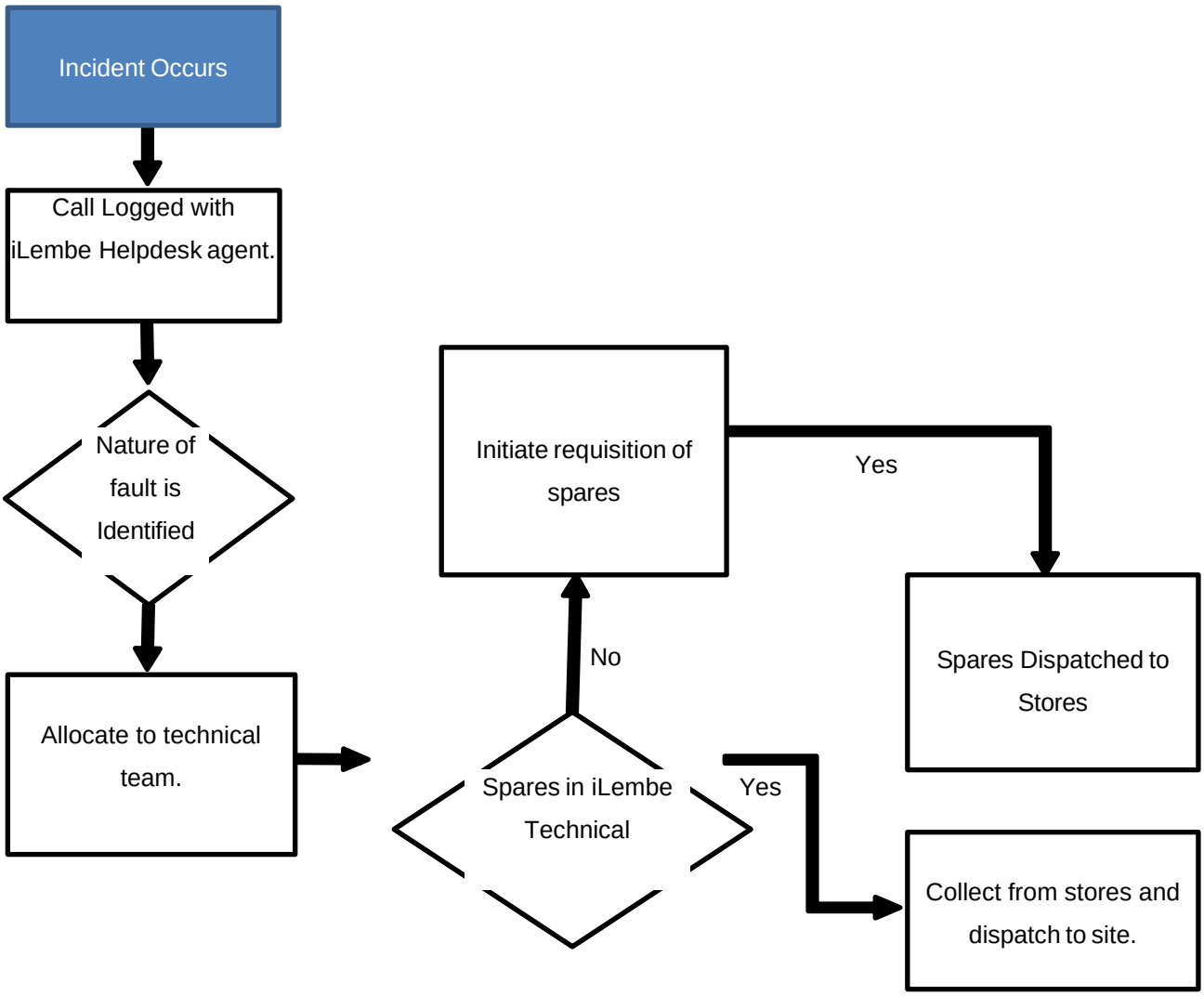


Figure 13: Call Centre Logging Process Flow Chart

Phase 2 – implementation completed before the end of 2022

1. **Create User Profiles**: Known as a persona is a fictional user used for products or services advertised. It can be used for the maintenance of generic data, for example, your name, surname, contact details, demographics, etc. This provides a glimpse of motivation, needs, and objectives.
2. **Map processes**: A graphical representation of all customer service processes. This allows the call centre to be more efficient in terms of work productivity. It helps the call centre visualize the workflow to identify and correct any inefficiencies. This mapping process reduces call centre mismanagement, establishes accountability, and as a result boosts agent productivity.
3. **Create workflows:** This goal allows a wide range of processes to take place. This reduces errors, reduces after-call work, and allows notifications.

4. **Create Fields:** The structure of each department should be presented within different departmental units to categorize sub-structures, such as technical services, indicating whether the position is available or not.
5. **Create Job cards**: This is a type of management tool that proves to be an asset that improves performance. Monitoring and periodically updating job cards can reflect the latest needs that need to be met. There is a lack of a digital system, integrated O&M, and job card system**.**
6. **Create reports**: Provides accessibility and collaboration in successful reporting. Reporting processes provide insights from within contact of the call centre system. All reports are made via email or telephonic means of communication, thereafter all faults are sent to the relevant area managers or supervisors. Tasks and jobs are created and allocated to a responsible area team.
7. **User training**: Provides training to teach the correct way for behavior required for the successful running of the implementation process. This increases customer service satisfaction skills.
8. **Incident Reports:** Capture/ Document any issues reported to the call centre. Make sure that all data captured is recorded. Identify witnesses and note statements. Act by finding an appropriate way forward by sending the report to the technical advisors. Close the report by gathering information from management on the incident that took place. Sign off on accountability measures as this ensures that the information in the report is accurate and unquestionable. Reports are meant to be kept in good order as they are crucial documents for the company.
9. **Information Hotline:** The purpose of this no-cost telephonic line is to report fraud or corrupt activities within the municipality. This forms a part of the call centre as it connects and coordinates referrals for assistance.

9.1.3 Procedures for Investigation and Remedial Works

9.1.3.1 General

The following procedures relate to the activities:

1. Repair of water mains;
2. Sewer access manhole repairs;
3. Sewer blockages or collapses.
4. Water mains flushing;
5. Sewer cleaning

9.1.3.2 Repair of Water Mains

A similar procedure can be prepared for new connections to mains; cutting tees and valves etc. into pipeline and sewer repairs.

Reported Incidents

Loss of water can be either a “leak” or a “burst”, the difference is merely related to the volume of water being lost and concerning the pipe size – a pipe burst on a water main will have a much larger volume of water loss compared to a leak on a distribution pipe.

Incidents are generally reported either directly by the public or by an IDM employee (See **Section 9.1.1** for faults and incident reporting procedures). The probability of a water loss somewhere within the system might be indicated by changes from the “norm” of pump flows and pressures, through visual inspections or observations, or by customer complaints.

Site Inspection

A field inspection of the problem should be made by operational staff to assess the extent of the problem and the urgency of the need for repair.

If necessary, the leak detection team is to be used to locate the point of the leak which may not be where the water is escaping to the surface. In some instances, the escaping water may not be visible and the leak is only known due to customer complaints of poor pressure and/or dirty water.

Classification and Priorities

The nature of the incidence will be classified thus: - Incorporated into existing information provided

i. Emergency – usually a “burst” where the loss presents a serious problem to the maintenance of supplies; the volume of water lost will be considerable; is a clear nuisance or threat to the safety of highway traffic or pedestrians.
ii. Class 1 - A smaller burst that has less consequence or a serious leak.
iii. Class 2 – A leak that has little immediate consequence.

When the incident is reported out-of-hours, the decision has to be made whether the repair should be affected immediately or wait until the following day. Such decisions are to be based upon the policy of IDM and will take into consideration such concerns as:

i. Any damage being caused and the seriousness of the damage e.g., property flooding;
ii. The consequential effect on supplies when the demand increases;
iii. Access to the site during the day e.g., will the excavation be on a busy road;
iv. The volume of water being lost;
v. The nuisance of breaking open the surface during the night.

Recommendations: It is to be expected that “emergencies” be dealt with immediately by operational staff; Class 1 incidents will be dealt with that day when the operational team becomes available and Class 2 incidents will be planned to be repaired at a suitable time.

Supervisors must be able to plan the work, allocate the labour and plant resources, and ensure that the required repair parts are available.

Procedures for carrying out Repair work on Watermains

The required fittings to affect the repair are to be available in the IDM Local stores. The couplings used are to be those approved by the pipe manufacturer. Only the correct tools are to be used for cutting the pipe, tightening bolts, and any other activity.

Warning, by the most appropriate means, shall be given to customers likely to be affected by the mains shut-down to affect the repair including, in particular, hospitals and other “sensitive” customers. The local authority and police are to be informed if the excavation is in a public place and/or if road traffic is affected.

If the excavation is in a location to which the public has access, barriers, and other warnings are to be provided around the excavation and any traffic management measures adopted.

Isolating valves are to be determined from the record drawings, located on-site, and operated. If the intended valves cannot be found or operated, alternatives are to be decided and, if necessary, any additional customers affected, be warned. Any pumping plant delivering into the broken main is to be shut down.

At all times the excavation is to be kept as dry as possible by the use of trench pumps. Under no circumstances is groundwater to enter any open pipe. New pipes and fittings to be inserted in the pipeline are to be cleaned and chlorinated by hand spray to prevent contamination.

The excavation is to be back-filled with suitable, dry excavated material and the surface reinstated. If insufficient suitable excavated material is unavailable, new material is to be brought to the site.

Following the repair, the water is to be turned on, and the section of the main repaired and flushed to remove any dirty or contaminated water that may have entered the pipe.

Sampling

Following the repair, sufficient water samples are to be taken for bacteriological analysis to demonstrate that the water supplied by the company has remained within quality parameters.

9.1.3.3 Sewer Manholes

This procedure sets out to react to incidences of reported access manhole problems on the sewer network. A similar procedure can be prepared for valve and other water main apparatus chambers and covers.

Reported Incidences

Incidences are generally reported either directly by the public or by a staff member.

Recommendations: All manholes serving large and deep sewers are to be inspected regularly and replaced as necessary to ensure access for cleaning purposes.

Site Inspection

A site inspection of the problem is to be made to assess the extent of the problem and the required remedy within 48 hours of receipt. As a means of defining the priority, the checklist provided in **Table 8** is to be completed.

Table 8: Sewer Manhole Inspection Checklist

Check		Y or N
1)	**Is the cover broken, missing, or cracked?**	
2)	**Does the cover rock by 10mm or more?**	
3)	**Is the cover too smooth (i.e., worn)?**	
4)	**Is the clear access to the shaft sufficient for man entry (with any necessary equipment)?**	
5)	**Are there any missing step irons?**	
6)	**Is there any gas or oxygen deficiency?**	
7)	**Is there any other odor rising from the shaft?**	
8)	**Is the structural condition of the cover block, shaft, and invert acceptable? Check brickwork, pointing, benching, etc.**	
9)	**Is there silt in the invert? What depth (mm)?**	
10)	**Is the manhole surcharged or running freely? If surcharged, what depth (mm)?**	
11)	**Is there evidence of rodent infestation?**	
12)	**Is there evidence of infiltration or other freshwater ingress from the pipe?**	
13)	**Is there evidence of infiltration or other freshwater ingress from the manhole?**	

When operational staff is examining the damaged sewer and, in the repair, due care is to be taken and the manhole is to be considered as a “confined space”. Appropriate safety precautions are to be taken and protective clothing is worn. Gas detectors, breathing apparatus, and emergency rescue equipment are to be available on the site.

Classification and Priorities

The nature of the incidence will be classified as follows:

i. Emergency - where a missing, manhole cover presents a clear threat to the safety of highway traffic or pedestrians.

ii. Class 1 - A missing cover could allow refusing to be dumped into the shaft. Where access prevents responding to a polluting incident. Where it is clear that the structural condition of the manhole is poor.

iii. Class 2 - where access is denied preventing cleaning of the sewer.

iv. Class 3 - all other reported incidences of broken, missing, raised, or sunken manhole covers, and step irons, ingress of water.

Broken or missing cover cases are to be responded to within one day, to either cover the hole and make it safe or cone off the hole with appropriate signing. The following Priority Matrix illustrated in **Figure 14** can be used as a basis for work planning a remedial programme for non-emergency cases. Depending on the availability of funds and resources, defects should be dealt with based on priorities working from the top left to the bottom right of the matrix.

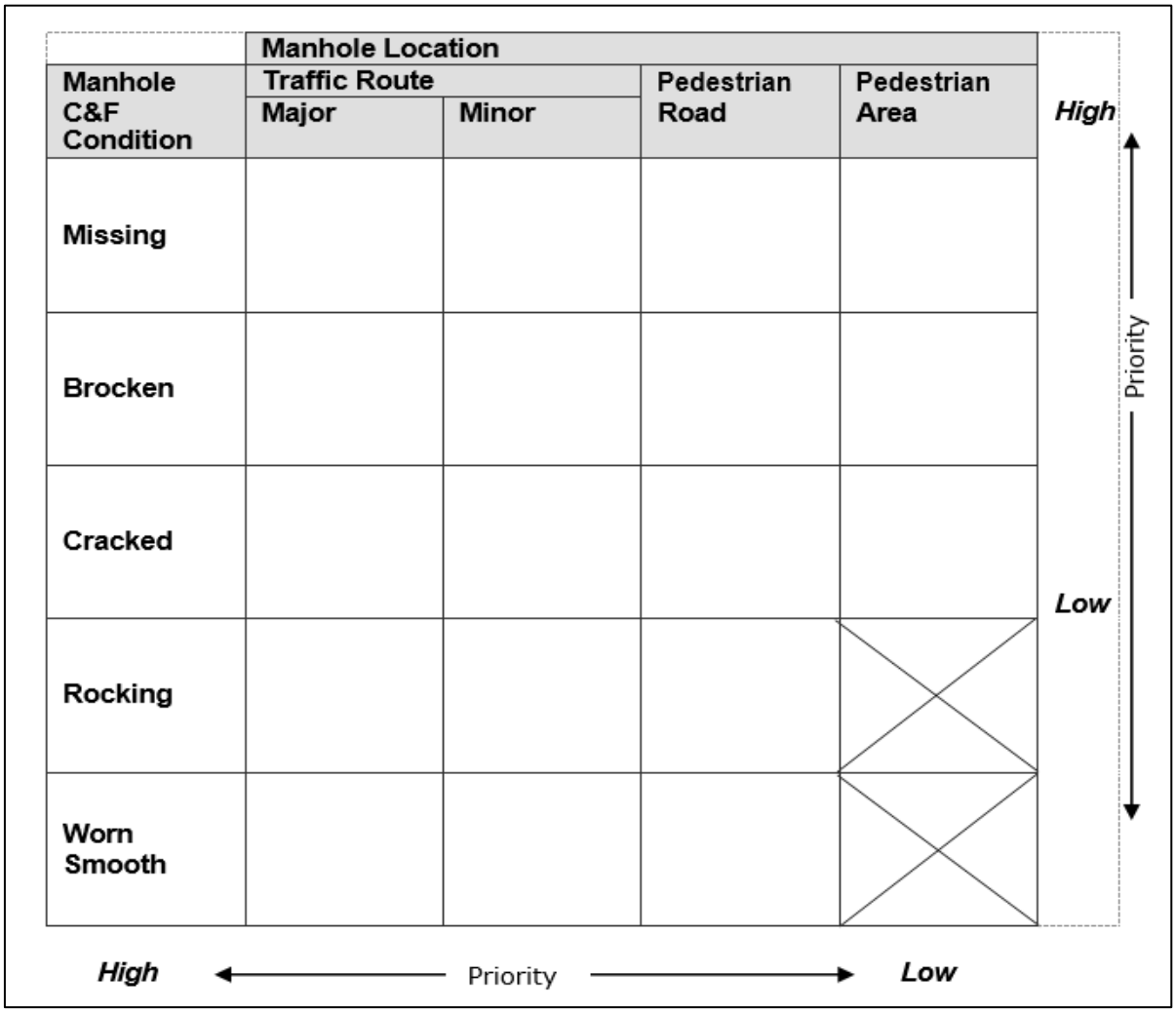


Figure 14: Prioritisation of Repairs

Stocks

A stock of re-useable manhole covers should be maintained to be available for the prompt replacement of covers that go missing. This stock should be cataloged and managed so that a required cover can be readily found.

An adequate stock of new manhole covers frames and step irons should be available for installation. The level of stock of each item should be determined based on demand and re-order periods.

The cover to be used is to be appropriate for the manhole considering the expected traffic loading. The cover is to be lockable.

9.1.3.4 Investigation of Sewer Blockages

Ascertaining the Problem

The problem may be a sewer pipe collapse, a blockage, silt, tree roots, and debris thrown into the system through a missing manhole cover, poorly designed or laid sewers, change in flow velocities, etc.

The symptom might be a long way away from the cause, so a preliminary investigation is required to avoid abortive work.

The first site action to undertake is an investigation to isolate and define the length of the sewer affected by the problem. This involves visiting the site and lifting the manholes in the area to record the levels of silt and water. This should be done in the context and prior knowledge of any downstream pumping regime that may affect the levels.

Planning the Cleaning and Draw-down Operation

Contact with any relevant pumping station, where included within the system, is to be made before visiting the site to ensure that water is at the lowest possible level. The pump attendant should be asked to switch on his pumps to draw down the levels at the station so that there is no possibility of the sewer line backing up due to the station not working or filling its sumps.

Given that the pump attendant can draw down successfully, it is then easier to isolate a problem in a sewer line, since the affected part of the sewer containing the problem is the surcharged part of the line between lower water levels.

Take dips in every manhole to determine the height of the water and silt at each location, thereby establishing the water and silt profile. If there is a sudden difference in the height of the water level between two consecutive manholes, it usually indicates that there is a blockage between the two manholes.

The silt profile gives an idea of the quantity of silt to be removed. Once isolated, a plan of cleaning can be prepared using the following procedure.

9.1.3.5 Sewer Cleaning

Sewer cleaning must always be undertaken by a competent team, under the supervision of a trained and senior supervisor. Safe working and adequate management of traffic are important aspects of the work which require constant attention.

After a length of sewer is cleaned, CCTV can be used to “prove” the cleaning, to survey the condition of the pipe, and to seek locations where groundwater is entering the sewer.

9.1.3.6 Water Main Flushing

Water mains may be flushed as a part of a regular programme to prevent or minimise complaints of dirty water; following a complaint or after any work on water mains that has involved a cut into the main.

Before the flushing operation:

i. The location of the required control valves and discharge point is to be identified on-site and tested as operable;

ii. Customers are to be notified of the possibility that their supply may be affected;

iii. The route that the water will follow after discharge is to be “walked” to ensure that no flooding or other damage will be caused by the expected flow of water.

Sampling

Following the flushing, sufficient water samples are to be taken for bacteriological analysis to demonstrate that the water supplied by the company has remained within quality parameters, per the requirements contained.

9.1.4 Mechanical and Electrical Operations and Maintenance

Handled by contractors

Mechanical and electrical equipment within a treatment works and pumping station including, for a wastewater pumping station, the screens, and grit removal plant should be maintained according to the Manufacturer’s recommendations.

Within the Operational Management Plan, the establishment of a maintenance work planning department is recommended. The work planners will plan the preventative maintenance of the equipment according to the manufacturer's schedules and issue the maintenance schedules to the Branch maintenance staff.

Recommendation: Within the asset management component of the Management Information System a record will be maintained of all maintenance work on an asset.

An Authorisation to Work procedure is required if such a policy, as set out within the Operational Maintenance Plan, is adopted.

9.1.5 Fleet Management

Each driver must inspect the vehicle before he starts the trip. All defects are to be indicated on the trip sheet/ log sheets and informed to the supervisor who decides if the driver should continue to use the vehicle, the s**u**pervisor then should inform the fleet office of the defects to have them repaired.

An inspection report is developed once and month for each vehicle and submitted to fleet management.

9.2 Emergency Preparedness and Response Procedures

A water safety plan is developed for each facility which includes water and wastewater treatment plants along with an incident management protocol to assess risk factors and mitigate/restrict high-risk activities.

10 MAINTENANCE PROCEDURES OVERVIEW

10.1 Overview

The procedure is given in current systems data

i. **Process 1: Identification** – This relates to the identification of an incident or the maintenance that needs to be implemented. Incidents can either be reported by the general public or by the IDM maintenance teams.

ii. **Process 2: Works Order Preparation** – This relates to the processes that take place when preparing the works order. The managers of each region will check which teams are available in the specific area where the incident has been reported. A job card is issued for each reported incident.

iii. **Process 3: Procurement** – This relates to the processes that take place when an external service provider is required to implement the works order.

iv. **Process 4: Implementation** – This relates to the processes that take place when implementing the works order by the Maintenance Team(s) or external service providers.

v. **Process 5: Approval** – This relates to the processes that take place when approving the works once they have been completed. The job card is issued to the region supervisor who will inspect and approve the works.

10.1.1 Maintenance

Maintenance is the work required to care for and preserve the useful life of an asset such as a water pipe, sewer line, or pump. The concept of maintenance is split into two categories: **Planned Preventative and Corrective Maintenance:**

i. **Planned Preventive maintenance (PPM**) is defined as those maintenance activities that are implemented repetitively at regular intervals to prevent a failure. The works carried out consist of such activities as:

- Pipeline integrity checks/condition surveys
- Valve inspection and exercising
- Hydrant inspection and exercising
- Bulk/district meter maintenance and calibration
- Reservoir control inspection and maintenance
- Greasing, oil changing of motors;
- Cleaning dust, mud, and sediments from parts, testing, calibrating, checking, adjusting, and lubricating all moving parts, checking the tightness of connections and cleaning filters;
- Checking gauges, adjusting gland-packing, and repairing or replacing if required;
- Replace worn-out fittings, replace fuses, bulbs, and similar;
- Inspecting all fans, compressors, motor wiring, switches, controls, and protection devices;
- Checking for correct operation;

ii. **Corrective Maintenance** is defined as maintenance works performed to repair failures that have occurred.

To ensure the full asset life of any item of plant and equipment, preventive maintenance should be adopted. Further, to ensure the work is at the correct frequency and to ensure that the correct materials, labour, and tools are available, the maintenance is to be within a policy of planned preventative maintenance. Maintenance procedures and processes as well as detailed activities are highlighted in **section 11**.

10.2 Results

The results from the analysis of the processes are summarised in **Table 9**. The results are provided exclusive of the time required to perform the works on site, as this was considered to be variable for the various works required.

Table 9: Summary of the Time Required for Repairs and Maintenance of Urgent Tasks

Process	Task Stages	Total Time	
		Min	Max
Process 1:	Identification – incident reported	1 hrs	8 hrs
Process 2:	Works order preparation – select available team, obtain required equipment and issue job card	4 hrs	8 hrs
Process 4:	Implementation – implement required works: Team goes to site	1 hrs	5 hrs
	Close valves to isolate area	1 hrs	5 hr
	Expose pipe to identify required repairs	4 hrs	36 hrs
	Implement required reticulation works	8 - 16 hrs	16 - 24 hrs
	Implement required bulk works	12 -36 hrs	36 - 48 hrs
Process 5:	Store Requisition – materials and equipment required are available from the municipal store within the region	2 hrs	4 hrs
			4 hrs
	If materials are not available, source from other regions		24 - 48 hrs
	If no material is available, get a contractor to provide material		2 hrs

The standard turnaround time for urgent work is 48 hours for water maintenance activities and 24 hours for sewer maintenance activities. Maintenance activities that are not deemed urgent will have time frames that are specific to the type of work to be executed. These activities are monitored individually and the time frames cannot be standardised in the same manner as urgent work.

The results of the IDM maintenance processes for urgent work indicate that where the equipment and staff are available within the region, the required works can be implemented within the minimum 48-hour time frame. However, this does not happen often, and repairs and maintenance typically require additional time. Where the equipment or staff are not available, the time required for repair and maintenance can vary significantly. Time delays occur due to a lack of equipment and a shortage of staff within each region which in turn has cost implications. A current maintenance process is a reactive approach rather than a preventative approach due to the availability of equipment and staff.

It is important to understand how frequently each maintenance activity is performed within a day and how often the activity takes longer than 48 hours to implement. A qualitative assessment of the frequency of maintenance events per day has been done below. It is recommended that the IDM update the table below to reflect the current frequency of all maintenance activities. The updated information will highlight the critical problems and causes of time delays.

10.3 Recommendations

It is recommended that the following activities be implemented to improve the maintenance processes and procedures:

- **i.** Formalise the Maintenance Process for Each Region: Each region must ensure that a formal maintenance process is in place. The person responsible for each task and line of communication must be indicated to ensure maintenance activities are implemented effectively and timeously.
- **ii.** Digital Maintenance System: iLembe DM is currently in the process of formalising a digital management system that will ensure that the formal maintenance process is followed and that no steps are skipped. All maintenance activities can be traced and recorded against the assets on the FAR.
- **iii.** Procurement Strategy: Contractors should also be aware of the risks involved and ensure they have the required equipment and staff available to implement maintenance activities for water infrastructure.
- **iv.** Frequency: It is recommended that the frequency of maintenance activities per day be thoroughly investigated. This data will identify the problems encountered daily, the main causes of time delays, and the associated cost implications. These issues can then be addressed and rectified.

11 MAINTENANCE ACTIVITIES PER COMPONENT

Each maintenance activity has been given a unique code based on its category. The list of Maintenance Activities under each category for the water infrastructure within IDM is summarized in **Tables 19 - 21** below.

Table 10: Structures, Premises, and Materials

A. SPM01 – Buildings
B. SPM02 – Chambers
C. SPM03 – Doors and Fixtures
D. SPM04 –Earthworks
E. SPM05 – Finishes and Fittings
F. SPM06 – General Concrete Structures/ Foundations
G. SPM07 – General Steel Works and Steel Structures
H. SPM08 – Floors
I. SPM09 – Manholes
J. SPM10 – Materials and Fabrics
K. SPM11 – Paving
L. SPM12 – Plumbing
M. SPM13 – Poles and Masts
N. SPM14 – Pump Station-Specific Structures
O. SPM15 – Reservoir-Specific Structures
P. SPM16 – Roads
Q. SPM17 – Roofs
R. SPM18 – Walls and Fencing
S. SPM19 – Water Treatment-Specific Structures

Table 11: Plant and Equipment

T. PE01 – Compressors
U. PE02 – Control Panels, Distribution Boxes, and Switchboards
V. PE03 – Dirt Boxes
W. PE04 – Dosing Equipment
X. PE05 – Electrical
Y. PE06 – Electronics
Z. PE07 – Level Controllers and Indicators
AA. PE08 – Lifting Plant and Scales
BB. PE09 – Measuring Devices
CC. PE10 – Mixers
DD. PE11 – Motors and Generators
EE. PE12 – Pumps
FF. PE13 – Rotating Arms
GG. PE14 – Screens
HH. PE15 – Sluice Gates
II. PE16 – Stirrers and Strainers
JJ. PE17 – Tanks
KK. PE18 - Telemetry

Table 12: Water-Specific Infrastructure

LL. WS01 – Boreholes
MM. WS02 – Channels, KI's, and Weirs
NN. WS03 – Meters
OO. WS04 – Pipe Reticulation
PP. WS05 – Valves
QQ. WS06 – Spring Protection
RR. WS07 – Solar Panels

The Maintenance Activities are structured to make customized O&M plans that can be compiled per facility, depending on the components within the facility and as per the facility requirements.

The Maintenance Activities are detailed in **Tables A to RR** below and are structured using the following items:

- Code: Defines the Maintenance Activity Code
- Activity: Provides a summary of the type of work to be performed
- Description: Provides an overview of the type of work typically performed within this task
- Recommended Frequency: Provides a high-level estimate of the frequency of the activity. This frequency is dependent on the risk rating of infrastructure. It is recommended that IDM assigns risk ratings and defines the recommended frequency of each activity (IDM to continuously update)
- Activity Currently Performed: Details who is responsible for implementing the task (IDM to continuously update)
- Activity Performed By: Details the responsible department within IDM and whether the task is currently outsourced to external service providers (IDM to continuously update)

- Issue Job Card: Staff member responsible for issuing Standard Forms (job cards) applicable to the Maintenance Activity (IDM to continuously update)
- Maintenance Inspection: Staff member responsible for completing the Standard Forms applicable to the Maintenance Activity (IDM to continuously update)
- Estimated Time per Activity per Team Member: Estimates the time required for implementing the Maintenance Activity for the following categories, namely “Supervisor”, “Operator” and “Labourer” (IDM to continuously update)
    - 'Supervisor' is deemed to have sufficient experience as well as managerial and technical skills to lead and supervise an O&M team, as well as perform the tasks of an Operator.
    - 'Operator' is deemed to be a skilled worker such as a welder or plumber.
    - A 'Labourer' is deemed to be an unskilled worker to help with manual work.

The Maintenance Activities have been presented in this report based on the data available at the time of writing this report. It is recommended that the IDM updates relevant aspects of the Maintenance Activities based on actual requirements regularly (i.e., annually or biannually).

A. SPM01 Buildings

SPM01	Buildings					Form	SPM01	Supervisor		Operator		Laborer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM01-1	Physical Inspection	Inspect the structure for excessive cracking or deflection, where if present the opinion of a structural engineer will be required and required corrective measures are to be taken. Where there are excessive cracks in a portion of the structure (only) then a detailed assessment of the foundations will need to be performed. Check for surface blemishes or leaching salts. Where there is any exposed steel (rebar) then issue works order to treat the steel accordingly and perform point repair as required	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Area Manager	1	4,00		0,00	1	4,00
SPM01-2	Painting protection coating	Paint walls and fencing using the appropriate method.	Every 10 Years	No	IDM	Manager	Superintendent	1	1,50	0	0,00	1	24,00
SPM01-3	Structural engineer opinion	Structural engineer to inspect and make recommendations	Corrective	No	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM01-4	Foundation assessment	Perform required assessments to verify that the foundations are sound	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM01-5	Repair structure	As per site conditions and the manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	4,00	1	8,00
SPM01-6	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	16,00	1	24,00

B. SPM02 – Chambers

SPM02	Chambers					Form	SPM02	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM02-1	Physical Inspection	Inspect the structure for excessive cracking or deflection, where if present the opinion of a structural engineer will be required and required corrective measures are to be taken. Where there are excessive cracks in a portion of the structure (only) then a detailed assessment of the foundations will need to be performed. Check for surface blemishes or leaching salts. Where there is any exposed steel (rebar) then issue works order to treat the steel accordingly and perform point repair as required	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	4,00
SPM02-2	Structural engineer opinion	Structural engineer to inspect and make recommendations	Corrective	No	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM02-3	Foundation assessment	Perform required assessments to verify that the foundations are sound	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM02-4	Repair structure	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	4,00	1	8,00
SPM02-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	16,00

C. SPM03 – Doors and Fixtures

SPM03	Doors and Fixtures					Form	SPM03	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM03-1	Physical Inspection	Inspect doors to ensure that there are no damaged doors or frames.	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM03-2	Repair doors and fixtures	Repair or replace doors and fixtures as required	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	1,00
SPM03-3	Painting door frames	Paint door frames using the appropriate method.	Every 10 Years	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
SPM03-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

D. SPM04 – Earthworks

SPM04	Earthworks					Form	SPM04	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM04-1	Physical Inspection	Inspect earthworks for sagging, where if present the opinion of an engineer will be required and required corrective measures are to be taken.	Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	4,00
SPM04-2	General grounds maintenance	Perform general landscaping services required to ensure the grounds are maintained during all seasons of the year, including trimming, grass cutting, raking, removal of debris and litter, etc., and clearing of any bushes or trees growing in the proximity of buildings.	Bi-Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Manager	1	0,25	1	8,00	1	8,00

E. SPM05 – Finishes and Fittings

SPM05	Finishes and Fittings					Form	SPM05	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM05-1	Physical Inspection	Inspect finishes and fittings for damage	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM05-2	Repair finishes and fittings	Repair or replace finishes and fittings as required	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	1,00
SPM05-3	Asset Replacement	Remove and replace after the asset has reached its Estimated Useful Life as per Asset	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

		Management Policy, or the asset is damaged and cannot be repaired.											

F. SPM06 – General Concrete Structures/Foundations

SPM06	General Concrete Structures/Foundations					Form	SPM06	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM06-1	Physical Inspection	Inspect the structure for excessive cracking or deflection, where if present the opinion of a structural engineer will be required and required corrective measures are to be taken. Where there are excessive cracks in a portion of the structure (only) then a detailed assessment of the foundations will need to be performed. Check for surface blemishes or leaching salts. Where there is any exposed steel (rebar) then issue works order to treat the steel accordingly and perform point repair as required	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	2	4,00	0	0,00	2	4,00
SPM06-2	Painting protection coating	Paint walls and fencing using the appropriate method.	Every 10 Years	No	IDM	Area Manager	Superintendent	1	1,50	0	0,00	1	24,00
SPM06-3	Structural engineer opinion	Structural engineer to inspect and make recommendations	Corrective	No	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM06-4	Foundation assessment	Perform required assessments to verify that the foundations are sound	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	0	0,00
SPM06-5	Repair structure	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	4,00	1	8,00
SPM06-6	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	16,00	1	24,00

G. SPM07 – General Steel Supporting Structures

SPM07	General Steel Supporting Structures					Form	SPM07	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM07-1	Physical Inspection	Perform a physical inspection of the structure to make sure all bolts are tight, and the general condition of the steel. Check surface protection (paint) is in place and that there is no visible rust. Look for cracking, peeling, fading, and the presence of rust or algae. Note bent or damaged steel, deflection, cracking, and vibration. Pay particular attention to pinned joints at hinges, excessive rust, vibration, missing nuts, or loose plates, and note all such defects for repairs. Check that all bolts are tight and there are no cracks in the welds. Check the steel connections with the concrete and ensure connections are not damaged.	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM07-2	Painting and coating	Prepare the surface, and paint and coat the surface of the structure with appropriate tools and methods	Every 5 Years	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	4,00
SPM07-3	Repair rust	Perform required tasks to treat the rust and ensure structural integrity protection. Where rust is excessive and unrepairable, the issue works in order to perform replacement	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	4,00
SPM07-4	Structural engineer opinion	Structural engineer to inspect and make recommendations	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	0	0,00
SPM07-5	Asset repair	As per site conditions and manufacturer's requirements, including the replacement of steel	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	0	0,00	0	0,00

		members, bolts, welds, concrete (where required), etc.											
SPM07-6	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

H. SPM08 – Floors

SPM08	Floors					Form	SPM08	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM08-1	Cleaning floors	Clean floors using appropriate methods (sweeping, mopping, etc.)	Daily	Yes	IDM	Area Manager	Superintendent	0	0,00	0	0,00	1	0,50
SPM08-2	Physical inspections	Inspect flooring to determine whether there is any deflection, cracks, or other damage and perform required corrective actions	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM08-3	Stripping and resealing	Striping and resealing of vinyl flooring as the top coating becomes worn, especially in high trafficked areas	Annually	No	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00
SPM08-4	Repair flooring	Repair or replace rotten floorboards, missing carpet tiles or torn vinyl using the appropriate methods as required	Corrective	No	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00
SPM08-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	No	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

I. SPM09 – Manholes

SPM09	Manholes					Form	SPM09	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM09-1	Physical Inspection	Perform visible inspection of manholes and confirm that it is not blocked and that the manhole is accessible. Inspect the structure for excessive cracking or deflection, where if present the required corrective measures are to be taken. Where there are excessive cracks in a portion of the structure (only) then a detailed assessment of the foundations will need to be performed. Where there is any exposed steel (rebar) then issue works order to treat the steel accordingly and perform point repair as required	Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM09-2	Clean manholes	Remove foreign debris from manhole chambers and around manholes.	Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
SPM09-3	Unblock Manhole	Unblock the manhole from foreign debris using appropriate tools and methods.	Corrective	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Manager	1	1,00	1	4,00	1	4,00
SPM09-4	Repair structure	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	1	8,00	1	8,00
SPM09-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	16,00

		Policy, or the asset is damaged and cannot be repaired.											

J. SPM10 – Materials and Fabric

SPM10	Materials and Fabrics					Form	SPM10	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM10-1	Physical Inspection	Inspect materials and fabrics for damage or wear and tear, where if present the opinion of an engineer will be required and required corrective measures are to be taken.	Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	4,00
SPM10-2	General maintenance	Perform general maintenance services required to ensure materials and fabrics are maintained during all seasons of the year.	Bi-Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Manager	1	0,25	0	0,00	14	8,00
SPM10-3	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	DM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

K. SPM11 – Paving

SPM11	Paving					Form	SPM11	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM11-1	Clear paved surface	Clean the paved surface from debris (Leaves, sand, or other debris) using appropriate tools (brooms, rakes, handheld leaf blowers, etc.)	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM11-2	Treatment of weeds on paved surfaces between paving	Treat weeds and grass growing on paved surfaces.	Every 2 Months	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	8,00
SPM11-3	Physical Inspection	Inspect paving to determine whether there is any deflection, cracks, or other damage and perform required corrective actions	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM11-4	Repair paving	Repair or replace paving using the appropriate methods as required	Corrective	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	8,00
SPM11-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Manager	1	4,00	0	0,00	1	8,00

L. SPM12 – Plumbing

SPM12	Plumbing					Form	SPM12	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM12-1	Physical Inspection	Perform visible inspection of wet services and fittings to ensure that there are no leaks within the building. Inspect all drains to ensure no dripping water when all taps are closed.	Monthly	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM12-2	Leak Repair	Perform point repair of any leaks or broken fittings, based on the findings recorded.	Corrective	Yes	IDM	Area Manager	Manager	1	1,00	1	4,00	1	4,00
SPM12-3	Service valves	Refer to relevant activities in WS05.	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	1	1,00	1	1,00
SPM12-4	Capture meter reading	Refer to WS03.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM12-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

M. SPM13 – Poles and Masts

SPM13	Poles and Masts					Form	SPM13	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM13-1	Physical Inspection	Inspect the structure for faults or deflection, where if present the opinion of a structural engineer will be required and required corrective measures are to be taken. Where there are excessive faults in a portion of the structure (only) then a detailed assessment of the foundations will need to be performed. Check for surface blemishes or leaching salts. Where there is any exposed steel then issue works order to treat the steel accordingly and perform point repair as required.	Bi-Annually	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
SPM13-2	Painting protection coating	Paint structure using the appropriate method.	Every 10 Years	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	8,00
SPM13-3	Structural engineer opinion	Structural engineer to inspect and make recommendations	Corrective	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	0	0,00
SPM13-4	Foundation assessment	Perform required assessments to verify that the foundations are sound	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	0	0,00
SPM13-5	Repair structure	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	4,00	1	8,00
SPM13-6	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	2,00	1	8,00	1	8,00

N. SPM14 – Pump Station Specific Structures

SPM14	Pump Station Specific Structures					Form	SPM14	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM14-1	Physical Inspection of infrastructure	Check for visible cracks on the structure or visible leaks around the pump station - specifically greener than normal vegetation patches potentially indicating leakage and inspect surrounding pipework for leaks. Check access ladders and similar assets do not have defects or are physically damaged. Check all the manholes covers, overflow pipework, ventilation pipes for visible leaks or physical damage.	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	3	0,50	0	0,00	3	0,50
SPM14-2	Physical Inspection(security)	Check if pump station security measures (such as lights, alarms, or electrical fencing) are in working condition, the fence and sign boards are not damaged, the facility gate can lock.	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM14-3	Test water quality	Perform relevant water quality test for compliance or other (SANS 241)	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	0	0,00
SPM14-4	Service equipment	Refer to relevant activities in WS03, WS04, WS05, PE1-18	As Required	Yes	IDM	Area Manager	Superintendent	1	0,50	1	4,00	1	4,00
SPM14-5	Clean Vegetation	Cut grass within the facility and clear all debris around the pump station site	Monthly	No	IDM	Area Manager	Manager	0	0,00	0	0,00	11	2,00
SPM14-6	Repair structural components	Repair to cracks, joint leaks, as required based on manufacturer requirements	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

SPM14-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

O. SPM15 – Reservoir Specific Structures

SPM15	Reservoir Specific Structures					Form	SPM14	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM15-1	Physical Inspection of infrastructure	Check for visible cracks on the structure or visible leaks around the reservoir - specifically greener than normal vegetation patches potentially indicating leakage and inspect surrounding pipework for leaks. Check access ladders and similar assets do not have defects or are physically damaged. Check all the manholes covers, overflow pipework, ventilation pipes for visible leaks or physical damage.	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	2	0,50	0	0,00	2	0,50
SPM15-2	Physical Inspection(security)	Check if reservoir security measures (such as lights, alarms, or electrical fencing) are in working condition, the fence and sign boards are not damaged, the facility gate can lock.	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM15-3	Test water quality	Perform relevant water quality test for compliance or other (SANS 241)	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	0	0,00
SPM15-4	Service equipment	Refer to relevant activities in WS03, WS04, WS05, PE1-18	As Required	Yes	IDM	Area Manager	Superintendent	1	0,50	1	4,00	1	4,00
SPM15-5	Clean Vegetation	Cut grass within the facility and clear all debris around the reservoir site	Monthly	No	IDM	Area Manager	Manager	0	0,00	0	0,00	5	2,00
SPM15-6	Repair structural components	Repair to cracks, joint leaks, as required based on manufacturer requirements	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

SPM15-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

P. SPM16 – Paved Roads

SPM16	Paved Roads					Form	SPM16	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM16-1	Clear road surface	Clean the road surface from debris (Leaves, sand, or other debris) using appropriate tools (brooms, rakes, handheld leaf blowers, etc.)	Monthly	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	4,00
SPM16-2	Routine road maintenance	Bituminous sealing of cracks wider than 3 mm, patching of potholes by filling with base material and patch with surface dressing, repair of pavement edges	Monthly	No	IDM	Area Manager	Superintendent	1	2,00	1	4,00	1	4,00
SPM16-3	Routine shoulder maintenance	Grass cutting, ditch cleaning, slopes, etc.	Annually	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	2,00
SPM16-4	Road furniture replacement	Replacement of road signs	Corrective	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	4,00
SPM16-5	Resurfacing	Resurfacing the pavement surface with a single bituminous surface dressing and reshaping the surface with asphalt concrete overlay	Every 8 Years	No	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00
SPM16-6	Ad-hoc road maintenance	Ad hoc road maintenance to the paved surface	Corrective	No	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

Q. SPM17 – Roof

SPM17	Roof					Form	SPM17	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM17-1	Physical Inspection	Check for signs of wind damage on the roof (especially on corners) and rectify by using the appropriate method. Check sheeting to confirm that there are no leaks and that the sheeting is watertight. Check for damages in the ceiling, such as gaps through cornicing, mould and stains for normal gypsum board, and peeling paint, loose timber boards and rotting due to water damage for timber ceiling boards. Fix the damage using the appropriate method. Inspect roof gutters and downpipes for blockages and fascia boards for degradation.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM17-2	Ad-hoc roof repair	Reactive maintenance and repairs are based on failure situations such as the roof leaking in rainwater external lighting globe failing, signage fallen down and wind damage to roofing tiles.	Corrective	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	8,00
SPM17-3	Painting roof and ceiling	Paint roof and ceiling board. This is typically done at the same interval as the interior and exterior walls are painted	Every 10 Years	Yes	IDM	Area Manager	Technician	1	2,00	0	0,00	1	8,00
SPM17-4	Repair roof components	As per manufacturer's instructions.	Corrective	Yes	IDM	Area Manager	Manager	1	2,00	1	8,00	1	8,00
SPM17-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

R. SPM18 – Walls and Fencing

SPM18	Walls and Fencing					Form	SPM18	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM18-1	Physical Inspection of walls	Inspect if the concrete perimeter border around a property is not damaged. If damaged, take remedial actions. Inspect for rising damp and spalling and that the walls are watertight at the top. Inspect for excessive deflection, and where required obtain the opinion of a structural engineer. Inspect masonry for damaged or cracked mortar and bricks. If defects are found a spot repointing is required to correct the damage or cracked mortar and bricks. However, if cracks in the bricks are greater than 3 mm wide and appear to go straight through the double brick exterior wall, then it is advised that a thorough inspection be performed by a structural engineer	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM18-2	Physical Inspection of Fencing	Inspect perimeter border around a property and confirm it is not damaged. If damaged, take remedial actions.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM18-3	Clean walls	Use appropriate method to ensure that the walls are maintained adequately to ensure they are clean from all debris or foreign objects	Annually	Yes	IDM	Area Manager	Superintendent	0	0,00	0	0,00	1	2,00
SPM18-4	Painting walls and fencing	Paint walls and fencing using the appropriate method.	Annually	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	3	8,00
SPM18-5	Structural engineer	Structural engineer to inspect and make	Every 10 Years	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	0	0,00

	opinion	recommendations											
SPM18-6	Repair structure	As per site conditions and structural engineer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00
SPM18-7	Asset Replacement	As per manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

S. SPM19 – Water Treatment Specific Structures

SPM19	Water Treatment Specific Structures					Form	SPM18	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
SPM15-1	Physical Inspection of infrastructure	Check for visible cracks on the structure or visible leaks around the water treatment works - specifically greener than normal vegetation patches potentially indicating leakage and inspect surrounding pipework for leaks. Check access ladders and similar assets do not have defects or are physically damaged. Check all the manholes covers, overflow pipework, ventilation pipes for visible leaks or physical damage.	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM15-2	Physical Inspection(security)	Check if water treatment works security measures (such as lights, alarms, or electrical fencing) are in working condition, the fence and sign boards are not damaged, the facility gate can lock.	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
SPM15-3	Test water quality	Perform relevant water quality test for compliance or other (SANS 241)	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	0	0,00
SPM15-4	Service equipment	Refer to relevant activities in WS03, WS04, WS05, PE1-18	As Required	Yes	IDM	Area Manager	Superintendent	1	0,50	1	4,00	1	4,00
SPM15-5	Clean Vegetation	Cut grass within the facility and clear all debris around the water treatment works site	Monthly	No	IDM	Area Manager	Manager	0	0,00	0	0,00	3	2,00

SPM15-6	Repair structural components	Repair to cracks, joint leaks, as required based on manufacturer requirements	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00
SPM15-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

T. Plant and Equipment PE01 – Compressors

PE01	Compressors					Form	PE01	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE01-1	Physical Inspection.	Visual inspection and assessing condition of all components.	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE01-2	Maintain compressor components	Ensure compressor is prepared for maintenance. Manufacturer instructions should be followed.	Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	1,00
PE01-3	Repair compressor components	As per manufacturer's instructions.	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	1,00
PE01-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

PE02	Control Panels, Distribution Boxes and Switchboards					Form	PE02	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE02-1	Physical Inspection of equipment	Ensure that the systems are operational and that the equipment and environment are clean.	Monthly	Yes	IDM	Area Manager	Superintendent	2	1,00	0	0,00	2	1,00

PE02-2	Electrical compliance test	Ensure that all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (Where required).	Annually	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	1,00
PE02-3	Repair Components	Repair the components as identified through inspections, based on manufacturer requirements.	Corrective	Yes	IDM	Area Manager	Manager	1	0,25	0	0,00	1	2,00
PE02-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	8,00

U. PE02 – Control Panels, Distribution Boxes and Switchboards

V. PE03 – Dirt Boxes

PE03	Dirt Boxes					Form	PE03	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE03-1	Physical Inspection	Ensure that components are in working order.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE03-2	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	1,00
PE03-3	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

W. PE04 – Dosing Equipment

PE04	Dosing Equipment					Form	PE04	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE04-1	Physical Inspection of equipment	Visual inspection including assessing the current supply levels, assessing that the dosing equipment is working, assessing condition of electronic and electrical components, assessing pipes and fittings for deterioration and leaks, signage is in place and the need for cleaning.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE04-2	Physical Inspection of Generator	Visual inspection of the generator, including starting generator and testing the system under load and confirm power output on the control panel. Ensure signage is present and visible and access to the generator is secure, with no obstacles blocking the intake or exhaust. Check for adequate ventilation. Check switch is correctly set. Check for oil, fuel or coolant leaks. Check fuel filters for dirt, etc.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	,50
PE04-3	Purchase chemical additives	Purchase the required chemicals for dosing purposes	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE04-4	Test for compliance	Ensure all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (Where required).	**Monthly**	No	IDM	**Water Quality Manager**	Superintendent	1	0,50	0	0,00	1	1,00
PE04-5	Test water quality	Perform relevant water quality test for compliance or other (SANS 241 - **2015**)	**Weekly, fortnightl, annually, monthly**	Yes	IDM	**Water Quality Manager**	Superintendent	1	0,50	0	0,00	1	1,00

			dependant on parameter										
PE04-6	Calibrate equipment	Calibrate equipment based on supplier recommendations	**Annually**	**Yes**	**IDM**	**Water Quality Manager**	**Water Quality Technician**	**1**	2,00	0	0,00	1	2,00
PE04-7	Service Facility	Refer to PE01 - PE18 as required	As Required	Yes	IDM	**Water Quality Manager**	Superintendent	1	4,00	1	4,00	1	4,00
PE04-8	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	**Water Quality Manager**	Superintendent	1	4,00	1	8,00	1	8,00

X. PE05 – Electrical

PE05	Electrical					Form	PE05	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE05-1	Physical Inspection	Ensure that all electrical outlets are in working order and ensure that there are no exposed cables or wires.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE05-2	Compliance	Ensure that all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area	Superintendent	1	0,25	0	0,00	1	0,25
PE05-3	Capture meter reading	Capture the electricity meter reading for the facility for monitoring purposes and ensure that all electricity bills are paid, and where required, the prepaid meter has credit	Monthly	Yes	IDM	Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE05-4	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area	Superintendent	1	4,00	0	0,00	1	8,00
PE05-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Manager	Superintendent	1	4,00	1	8,00	1	8,00

Y. PE06 – Electronics

PE06	Electronics					Form	PE06	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE06-1	Physical Inspection	Ensure that all electronic components are in working order.	Annually	Yes	IDM	Area Manager	Superintendent	0	0,00	1	0,50	0	0,00
PE06-2	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	1,00	0	0,00
PE06-3	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	2,00	0	0,00

Z. PE07 – Level Controllers and Indicators

PE07	Level Controllers and Indicators					Form	PE07	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE07-1	Data integrity inspection	Ensure that computer screens and keyboards are clean, and where data is not retrieved from site, or there are alarms, establish whether the level controllers and indicators are working.	Daily	Yes	IDM	Area Manager	Superintendent	2	0,25	2	0,25	0	0,00
PE07-2	Physical Inspection of equipment	Ensure that the controller and indicator devices and systems are operational, and that the data is being received in the office. Ensure that the equipment and environment are clean.	Monthly	Yes	IDM	Area Manager	Superintendent	1	1,00	1	1,00	1	1,00
PE07-3	Electrical compliance test	Ensure that all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	1	0,50	1	0,50
PE07-4	Replace battery components	Replace PLC memory backup batteries, and UPS battery packs, as required, following required tests are performed to assess the condition. Assess the condition of the devices.	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE07-5	Repair components	Repair the components as identified through inspections, based on manufacturer requirements.	Corrective	Yes	IDM	Area Manager	Manager	1	0,25	1	1,00	0	0,00
PE07-6	System calibration	Confirm that the system is secure, and the data is received and is being utilised in operations. Perform necessary operational tests on the systems to ensure the information is calibrated.	Quarterly	Yes	IDM	Area Manager	Manager	1	1,00	1	1,00	0	0,00

PE07-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

AA.PE08 – Lifting Plant and Scales

PE08	Lifting Plant and Scales					Form	PE08	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE08-1	Physical Inspection of equipment	Visual inspection including assessing that the equipment and all fittings are present and can be used when required.	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE08-2	Crane compliance test	Perform the required Safe Working Load Test for compliance to ensure that the lifting equipment is compliant	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	0	0,00
PE08-3	Electrical compliance test	Ensure that all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	0	0,00
PE08-4	Service motor	Refer to PE11 as required	Every 2 Years	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	2,00
PE08-5	Maintain general steel structure	Refer to SPM07 as required	As Required	Yes	IDM	Area Manager	Superintendent	1	8,00	1	0,25	1	8,00
PE08-6	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	0	0,00	0	0,00
PE08-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	8,00	0	0,00	0	0,00

BB.PE09 – Measuring Devices

PE09	Measuring Devices					Form	PE09	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE09-1	Physical Inspection of equipment	Visual inspection including assessing that the equipment and all fittings are present and can be used when required.	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE09-2	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Manager	1	1,00	0	0,00	1	2,00
PE09-3	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	0	0,00	1	8,00

CC. PE10 – Mixers

PE10	Mixers					Form	PE10	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE10-1	Physical Inspection	Visual inspection of the equipment to confirm that the equipment is running and operating as required. Check to see sufficient materials are available. Assess the need for lubrication of moving parts, the motor is secured to platform, recording energy consumption, assessing condition of electronic and electrical components, assessing pipes and fittings for deterioration and leaks, and the need for cleaning.	Monthly	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE10-2	Calibrate equipment	Calibrate and test equipment as per manufacturer's requirements	Annually	No	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	2,00
PE10-3	Electrical compliance test	Ensure all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (Where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE10-4	Service motor	Refer to PE11 as required	As Required	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE10-5	Repair components	As per manufacturer's instructions	As Required	No	IDM	Area Manager	Superintendent	1	2,00	1	2,00	1	2,00
PE10-6	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	No	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

PE11	Motors and Generators					Form	PE11	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE11-1	Physical Inspection of Motor	Visual inspection including assessing the need for lubrication of moving parts, assessing the need to replace oil and fuel filter (if applicable), replacing fanbelt, the need to rewind the motor, the motor is secured to platform, recording energy consumption, assessing condition of electronic and electrical components, assessing pipes and fittings for deterioration and leaks, and the need for cleaning.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE11-2	Physical Inspection of Generator	Visual inspection of the generator, including starting generator and testing the system under load and confirm power output on the control panel. Ensure signage is present and visible and access to the generator is secure, with no obstacles blocking the intake or exhaust. Check for adequate ventilation. Check switch is correctly set. Check for oil, fuel or coolant leaks. Check fuel filters for dirt, etc.	Monthly	Yes	IDM	Area Manager	Superintendent	2	0,50	0	0,00	2	0,50
PE11-3	Motor rewinding	Rewinding the motor, based on the manufacturer's instructions.	Annually	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,50
PE11-4	Electrical compliance test	Ensure all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00

PE11-5	Generator service	Service the generator, changing the oil, etc. as per the manufacturer's requirements - replacing fuel filters, checking fuel tank for corrosion or impurities, replace engine oil, check wiring for heat or damage; electrolyte levels in batteries - testing voltages; remove and replace air filters; remove, clean and reinstall injectors; fan belt condition, check radiator leaks; remove debris from radiator, etc	Annually	No	IDM	Area Manager	Manager	1	1,00	1	2,00	1	2,00
PE11-6	Generator overhaul	Contact manufacturer and schedule the generator to be overhauled	As Required	No	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00
PE11-7	Service Facility	Refer to SPM01 - SPM19 as required	As Required	No	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00
PE11-8	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00
DD. PE11 – Motors and Generators													

EE.PE12 – Pumps

PE12	Pumps					Form	PE12	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE12-1	Physical Inspection.	Visual inspection including assessing whether there are leaks from flanges or seals, flow and pressure gauges are within parameters, no excessive noise, the need for lubrication of moving parts, checking that pump is secured to platform, recording the energy, flow and pressure, assessing condition of electronic and electrical components, assessing pipes and fittings for deterioration and leaks, and the need for cleaning.	Monthly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE12-2	Maintain pump components	Ensure pump is prepared for maintenance – valves are closed, and electricity is isolated. Clean the intake filters or screens. Check that impeller rotates freely. Lubricate all moving parts and replacement, as per manufacturer instruction. Ensure all bolts are tightened, and no water leakage after maintenance. Manufacturer instruction should be followed when disassembling and assembling.	Quarterly	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	3	2,00	3	2,00	3	2,00
PE12-3	Repair pump components	As per manufacturer's instructions.	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	1	2,00	1	2,00
PE12-4	Service facility	Refer to SPM01 - SPM19 as required.	As Required	Yes	IDM	Area Manager	Superintendent	2	4,00	3	8,00	3	8,00
PE12-5	Energy supply	Refill the energy supply where required (prepaid electricity, diesel, etc.)	Monthly	Yes	IDM	Area Manager	Manager	4	1,00	0	0,00	4	1,00

PE12-6	Service motor	Refer to PE11 as required.	As Required	Yes	IDM	Area Manager	Manager	1	1,00	1	4,00	1	4,00
PE12-7	Service valves	Refer to relevant activities in WSO5	As Required	Yes	IDM	Area Manager	Superintendent	1	2,00	1	2,00	1	2,00
PE12-8	Capture meter reading	Refer to WS03	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE12-9	Service meter	Refer to relevant activities in WS03	As Required	Yes	IDM	Area Manager	Superintendent	1	1,00	1	4,00	1	4,00
PE12-10	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

FF. PE13 – Rotating Arms

PE13	Rotating Arms					Form	PE13	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE13-1	Physical Inspection of Motor	Visual inspection including assessing the need for lubrication of moving parts, assessing the need to replace oil and fuel filter (if applicable), replacing fanbelt, the need to rewind the motor, the motor is secured to platform, recording energy consumption, assessing condition of electronic and electrical components, assessing pipes and fittings for deterioration and leaks, and the need for cleaning.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE13-2	Physical Inspection	Perform a physical inspection of the structure to make sure all bolts are tight, and the general condition of the steel. Check surface protection (paint) is in place and there is no visible rust. Look for cracking, peeling, fading, and presence of rust or algae. Note bent or damaged steel, deflection, cracking, vibration. Pay particular attention to pinned joints at hinges, excessive rust, vibration, missing nuts, or loose plates and note all such defects for repairs. Check that all bolts are tight and there are no cracks in the welds. Check the steel connections with the concrete and ensure connections are not damaged.	Monthly	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	1,00
PE13-3	Asset repair	As per site conditions and manufacturer's	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

		requirements											
PE13-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Manager	1	4,00	1	8,00	1	8,00

GG. PE14 – Screens

PE14	Screens					Form	PE14	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE14-1	Physical Inspection of Screens	Perform visual inspection of the screens to ensure that they are in working condition and remove any debris accumulated on the screens	Weekly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE14-2	Annual Inspection	Visual inspection of the signage is in order. Remove the screen and ensure that no corrosion has taken place and take necessary action. Remove any debris accumulated on the screens.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE14-3	Electrical compliance test	Ensure all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
PE14-4	Service Facility	Refer to SPM01 - SPM19 as required	As Required	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	4,00
PE14-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

HH. PE15 – Sluice Gates

PE15	Sluice Gates					Form	PE15	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE15-1	Physical Inspection of Sluice Gates	Perform visual inspection of the sluice gates to ensure that they are in working condition and remove any debris accumulated on the gates	Weekly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE15-2	Annual Inspection	Ensure that no corrosion has taken place and take necessary action. Remove any debris accumulated on the gates.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE15-3	Repair rust	Perform required tasks to treat the rust and ensure structural integrity protection. Where rust is excessive and unrepairable, issue works order to perform replacement	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	4,00
PE15-4	Service Facility	Refer to SPM01 - SPM19 as required	As Required	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	4,00
PE15-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

II. PE16 – Stirrers and Strainers

PE16	Stirrers and Strainers					Form	PE16	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE16-1	Physical Inspection	Inspect exterior for visible defects or failure and assess the operational status of the stirrer or strainer.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE16-2	Clean Components	Remove foreign debris from the stirrers. Ensure all components are clean.	Quarterly	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
PE16-3	Maintain strainer components	Remove the strainer sieve and remove all debris from the sieve and ensure that the sieve is not damaged.	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
PE16-4	Repair components	As per manufacturer's instructions	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	2,00
PE16-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

JJ. PE17 – Tanks

PE17	Tanks					Form	PE17	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE17-1	Physical Inspection	Inspect exterior for visible defects or failure and assess the operational status of the tank.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
PE17-2	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

KK.PE18 – Telemetry

PE18	Telemetry					Form	PE18	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE18-1	Data integrity inspection	Ensure that computer screens and keyboards are clean, and where data is not retrieved from site, or there are alarms, establish whether the telemetry system is working.	Daily	Yes	IDM	Area Manager	Superintendent	3	0,25	0	0,00	3	0,25
PE18-2	Physical Inspection of equipment	Ensure that the telemetry devices and systems are operational, and that the data is being received in the office. Ensure that the equipment and environment are clean.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,50
PE18-3	Electrical compliance test	Ensure that all electrical installations comply with SANS 10142 with a focus on leads, cables, earthing, and emergency stops are operational (where required).	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE18-4	Replace battery components	Replace PLC memory backup batteries, and UPS battery packs, as required, following required tests are performed to assess the condition. Assess the condition of the telemetry devices.	Bi-Annually	Yes - currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
PE18-5	Repair Telemetry	Repair the telemetry components as identified through inspections, based on manufacturer requirements.	Corrective	Yes	IDM	Area Manager	Manager	1	1,00	0	0,00	1	1,00
PE18-6	System calibration	Confirm that the system is secure, and the data is received and is being utilised in operations. Perform necessary	Quarterly	Yes	IDM	Area Manager	Manager	1	2,00	0	0,00	1	2,00

		operational tests on the systems to ensure the information is calibrated.											
PE18-7	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

PE19 – Solar Panels

PE19	Electronics					Form	PE06	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
PE19-1	Physical Inspection	Ensure that all electronic components are in working order.	Bi-Annually	Yes	IDM	Area Manager	Superintendent	0	0,00	1	0,50	0	0,00
PE19-2	Clean Solar Panel Surface	Wipe of debris build up on surface of panels	Quarterly	Yes	IDM	Area Manager	Superintendent	0	0,00	1	0,50	0	0,00
PE19-3	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	1,00	0	0,00
PE19-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	2,00	0	0,00

LL. Water Specific Infrastructure Boreholes

WS01	Boreholes					Form	WS01	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS01-1	Physical Inspection	Visual inspection of boreholes for signs of leaks. Check cover for damage.	Monthly	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
WS01-2	Test water quality	Perform relevant water quality test for compliance or other (SANS 241)	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
WS01-3	Clean Borehole	Jet boreholes to clean out silt and debris at the bottom of the well.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
WS01-4	Maintain borehole	Maintain borehole shaft and casing. Maintain pump and disinfect well.	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
WS01-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

WS02	Channels and Weirs					Form	WS02	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS02-1	Physical Inspection of infrastructure	Check for visible cracks on the structure or visible leaks around the catchpit. Check access ladders and similar assets do not have defects or are physically damaged. Check all the catchpit covers, grids,	Monthly	Yes – currently done reactively (ad hoc)	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25

		manhole chambers for visible leaks or physical damage.											
WS02-2	Unblock Stormwater Catchpits	Unblock the catchpits and channels from foreign debris using appropriate tools and methods.	Monthly	Yes	IDM	Area Manager	Manager	1	1,00	0	0,00	1	1,00
WS02-3	Repair structural components	Repair to cracks, structural damage, as required based on manufacturer requirements and site conditions	Corrective	Yes	IDM	Area Manager	Manager	1	1,00	0	0,00	1	8,00
WS02-4	Clean Vegetation	Cut grass and clear all debris around the catchpit structure	Bi-Monthly	Yes	IDM	Area Manager	Manager	0	0,00	0	0,00	1	1,00
WS02-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired	Corrective	Yes	IDM	Area Manager	Technician	1	4,00	0	0,00	1	8,00
MM. WS02 – Channels, and Weirs													

NN. WS03 – Meters

WS03	Meters					Form	WS03	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS03-1	Physical Inspection	Inspect exterior for visible defects or failure and assess the operational status of the meter, the visibility of the meter reading, assessment of the need for calibration, and ensure that the meter is visible for monthly reading.	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
WS03-2	Calibrate equipment	When unusual readings are observed or after complaints, the meter must be calibrated by a SABS approved lab. The meter must be replaced with a similar meter and the meter readings of recorded whenever installed or removed.	Corrective	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	1,00
WS03-3	Clean chamber and meter exterior	Remove foreign debris from meter chamber and around meter and ensure that the meter reading is visible.	Quarterly	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,50
WS03-4	Maintain strainer components	For bulk meters, remove the strainer sieve and remove all debris from the sieve and ensure that the sieve is not damaged.	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	1,00
WS03-5	Capture Meter reading	Record the kilolitre component of the meter reading visible from the meter dial and capture any meter factors, as required. Where the meter reading cannot be captured, the reading must be recorded for the system to generate an estimated reading and the meter earmarked for	Monthly	Yes	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25

		repair or replacement. The meter reading is to be captured together with location, meter and customer (if required) identifiers.											
WS03-6	Service valves	Refer to relevant activities in WS04.	As Required	Yes	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	2,00
WS03-7	Repair meter components	As per manufacturer's instructions	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	4,00
WS03-8	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	4,00

OO. WS04 – Pipe Reticulation

WS04	Pipe Reticulation					Form	WS04	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS04-1	Physical Inspection of reticulation and fittings	Perform visible inspection of pipe markers and mechanical fittings are identifiable. Perform visible leak detection by walking the water distribution network and checking inside all valve chambers identifying visible or potential water leaks - specifically greener than normal vegetation patches potentially indicating a leak. Prioritise sections of the network where there are moderate to high water pressure.	Annually	No	IDM	Area Manager	Superintendent	2	4,00	0	0,00	4	8,00
WS04-2	Physical Inspection of markers	Inspect marker posts, beacons, or signage for pipelines or fittings and confirm that they are visible.	Annually	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
WS04-3	Clean chamber and fittings	Remove foreign debris from chambers and around internal pipe and fittings.	Annually	No	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
WS04-4	Flush Pipes	Flush pipes to remove accumulated sediments, especially pipelines with low velocities, to remove sediments or trapped air within the pipeline, or after a pipeline is replaced.	Corrective	Yes	IDM	Area Manager	Superintendent	1	2,00	0	0,00	1	2,00
WS04-5	Leak Repair	Perform point repair, based on the findings recorded.	Corrective	Yes	IDM	Area Manager	Manager	1	1,00	4	8,00	4	8,00

WS04-6	Active Leak Detection	Check for leakage within the water distribution network through appropriate active leak detection methods (such as acoustic, gas, CCTV, or tracer methods).	Bi-Annually	No	IDM	Area Manager	Manager	1	1,00	0	0,00	7	8,00
WS04-7	Cathodic Protection Testing	Test the cathodic protection as per the manufacturer's requirements.	Annually	No	IDM	Area Manager	Superintendent	1	1,00	0	0,00	1	1,00
WS04-8	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

PP.WS05 – Valves

WS05	Valves					Form	WS05	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS05-1	Physical Inspection of exterior	e.g. packing degradation, stem corrosion, leakage, loose bolts/nuts, abnormal noise, etc.	Every 2 Months	No	IDM	Area Manager	Superintendent	2	0,25	0	0,00	2	0,25
WS05-2	Exercise valve	Gradually open and close gate valve hand wheel or lever, or as per manufacturer instruction.	Every 2 Months	No	IDM	Area Manager	Superintendent	2	0,25	0	0,00	2	0,25
WS05-3	Clean chamber and valve exterior	Remove foreign debris from valve chamber and around valve.	Every 2 Months	No	IDM	Area Manager	Superintendent	3	0,50	0	0,00	3	0,50
WS05-4	Maintain valve equipment/ components	Rubber seal change, packing/O-ring renewal, repaint cast iron internal parts, lubricate stem, clean out foreign material, etc. as per manufacturer instruction. Ensure no water leakage after maintenance. If valve disassembling is required, the line should be drained sufficiently for valve to be dismantled in position and the valve internals examined. Manufacturer instruction should be followed when disassembling and assembling valve.	Every 2 Years	Yes	IDM	Area Manager	Superintendent	1	2,00	1	2,00	1	2,00
WS05-5	Repair valve components	As per manufacturer's instructions.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00
WS05-6	Replace valve	Remove and replace entire valve mechanism.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	1	8,00	1	8,00

QQ. Spring Protection

WS06	Springs					Form	WS06	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS06-1	Physical Inspection	Visual inspection of spring eye for signs of leaks. Check cover and any damages.	Monthly	No	IDM	Area Manager	Superintendent	1	0,25	0	0,00	1	0,25
WS06-2	Test water quality	Perform relevant water quality test for compliance or other (SANS 241)	Bi-Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
WS06-3	Clean Silt Chambers	Clean out silt and debris at the bottom of the silt chamber.	Annually	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	0,50
WS06-4	Maintain Spring	Maintain Spring retaining wall, control valves and collection tank. Maintain outlet and disinfect if required	Corrective	Yes	IDM	Area Manager	Superintendent	1	0,50	0	0,00	1	1,00
WS06-5	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	1	4,00	0	0,00	1	8,00

RR. – Solar Panels

WS07	Electronics					Form	PE06	Supervisor		Operator		Labourer	
Code	Activity	Description	Recommended Frequency*	Activity Currently Performed	Activity Performed By	Issue Job Card**	Maintenance Inspection***	No.	hrs	No.	hrs	No.	hrs
WS07-1	Physical Inspection	Ensure that all electronic components are in working order.	Bi-Annually	Yes	IDM	Area Manager	Superintendent	0	0,00	1	0,50	0	0,00
WS07-2	Clean Solar Panel Surface	Remove debris build up on surface of panels	Quarterly	Yes	IDM	Area Manager	Superintendent	0	0,00	1	0,50	0	0,00
WS07-3	Asset repair	As per site conditions and manufacturer's requirements	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	1,00	0	0,00
WS07-4	Asset Replacement	Remove and replace after asset has reached its Estimated Useful Life as per Asset Management Policy, or the asset is damaged and cannot be repaired.	Corrective	Yes	IDM	Area Manager	Superintendent	0	0,00	1	2,00	0	0,00

12 STANDARD OPERATION, MAINTENANCE AND CONTROL FORMS

12.1 Overview

The Standard Operational and Maintenance Forms are provided for each of the Maintenance Activities in **Annexure G.** The Standard Forms consist of two pages, which can be printed double-sided, with the first page containing the information to be completed by the responsible person who "Issues Job Card" as identified in the Maintenance Activities and the second page containing the information to be completed by the responsible person who performs the "Maintenance Inspection" as identified in the Maintenance Activities.

The Standard Forms contain the following details:

The Maintenance Activity name and code in the header of each page

A. Job Card Issue Data

- Ref No: The reference number used for the Maintenance Activity
- Issued by: The name of the person responsible for "Issue Job Card"
- Date Issued: The date when the works were requested
- O&M Region: The name of the operational area or the name of the region, which must be selected (ticked)

B. Infrastructure Group Details

- FAR ID: This refers to the FAR ID as presented on the IDM FAR. This ensures that the maintenance works (including costs) can be tracked against specific assets and the historic trends can be determined.
- GPS Coordinates: The coordinates of where the assets are located.
- Infrastructure type: This refers to the sub-group of each infrastructure group.
- Description: This provides space for the responsible person to add additional details as required for the works

C. Job Card Details

- Activity: This refers to the specific Maintenance Task that needs to be performed
- Additional Comments: This provides space for the responsible person to add additional details as required for the works

D. Site Inspection Data

- Inspector Name: The name of the responsible perform who performed the works on site
- Inspection Date: The date when the works were completed
- Activity Code: This refers to the Maintenance Task that was completed. Where more than one task was assigned, additional references were to be completed by the inspector.

- Comments: This provides space for the responsible person to add comments for the works completed on site
- Photographic Ref. No.: It is recommended that photograph(s) are captured to confirm that the works have been completed. The photographic reference is the name of the photograph that was captured. This ensures that the photographic evidence is not misplaced or lost

E. Inspection Summary

- No further action required: This is to be selected (ticked) if no additional works are to be completed at the facility
- Additional material/equipment required: This is to be selected (ticked) if materials or equipment are required to complete the maintenance works
- Re-visit required: This is to be selected (ticked) if the facility needs to be re-visited to ensure that the maintenance works were complete or where there is concern
- Additional Comments: This provides space for the responsible person to add additional details as required for the works

F. Authorisation

- The authorisation is performed by the responsible person who went to the site, and the person who issued the works order (i.e., Depot Manager)

13 WATER QUALITY MANAGEMENT

The South African Water Quality Guidelines for Domestic Water Use are essentially a user needs specification of the quality of water required for different domestic uses. All WSPs are mandated to abide by these standards in providing the accepted quality, primarily for human consumption but also for bathing and other household uses.

The guidelines apply to any water that is used for domestic purposes, irrespective of its source (municipal supply, borehole, river, etc.) or whether it has been treated.

13.1 Water Supply Systems

13.1.1 Blue Drop Certification Standards and Requirements (2022)

Table 13: Blue Drop Certification Standards and Requirements (2022)

NO.	KEY PERFORMANCE AREA	WEIGHTING	REQUIREMENTS
1	**Capacity Management**	**15%**	• **Process Controllers adequately skilled** • **Availability of Maintenance Capacity** • **Technical/Engineering and scientific skills available in Management**
2	**Drinking Water Quality Risk Management**	**20%**	• **Water Safety Planning according to WHO Standards** • **Operational and Compliance Monitoring as per risk protocol** • **Laboratory Credibility** • **Incident Management Protocol**
3	**Financial Management**	**10%**	• **Water Supply Operations Cost Determination** • **O&M Budget and Expenditure (Adequacy)** • **SCM of Suppliers and Service Providers** • **Refurbishment or Upgrade planned (budget and expenditure)**
4	**Technical Management**	**20%**	• **WTW Design and Supply Capacity (incl. abstraction authorisation)** • **Process Audit/Condition Assessment** • **Reticulation Inspection** • **Asset Management**
5	**Drinking Water Quality Compliance**	**35%**	• **Adequacy of Monitoring and Data** • **Microbiological Compliance** • **Chemical Compliance** • **Risk Defined Compliance** • **Water Treatment Efficiency Index**

13.1.2 Process Audits

A requirement for Process Audits is that they must be conducted by an independent party to ensure the integrity of the audit and there is a separate entity from IDM, hence the independence of the audit would be maintained and compliance with the requirement is ensured.

iLembe District Municipality (IDM) are in the process of conducting Process Audits which are part of the Blue Drop requirements by The Department of Water and Sanitation (DWS).

The Blue Drop Regulation programme seeks to identify and develop the core competencies required for the sector that if strengthened, will gradually and sustainably improve the level of drinking water management in South Africa (DWS, 2022). The iLembe District Municipality is a critical supply system within KwaZulu Natal to the latest 2014 Blue Drop certification results (DWS, 2022).

To maintain Blue Drop status, Water Services Authorities (WSA) and Water Services Providers (WSP) are required to perform a rigorous, in-depth plant audit at each of its water treatment plants on an annual basis. The Process Audit must be conducted by a duly qualified professional person to inform the functionality of the infrastructure. DWS understands that the relationship between Water Services Authorities (WSA) and Water Services Providers (WSP) is crucial to achieving and maintaining the certification (DWS, 2022).

The role of the process audit in the risk management cycle is shown in **Figure 15** below and its position illustrates the risk focus of the Blue Drop process audit.

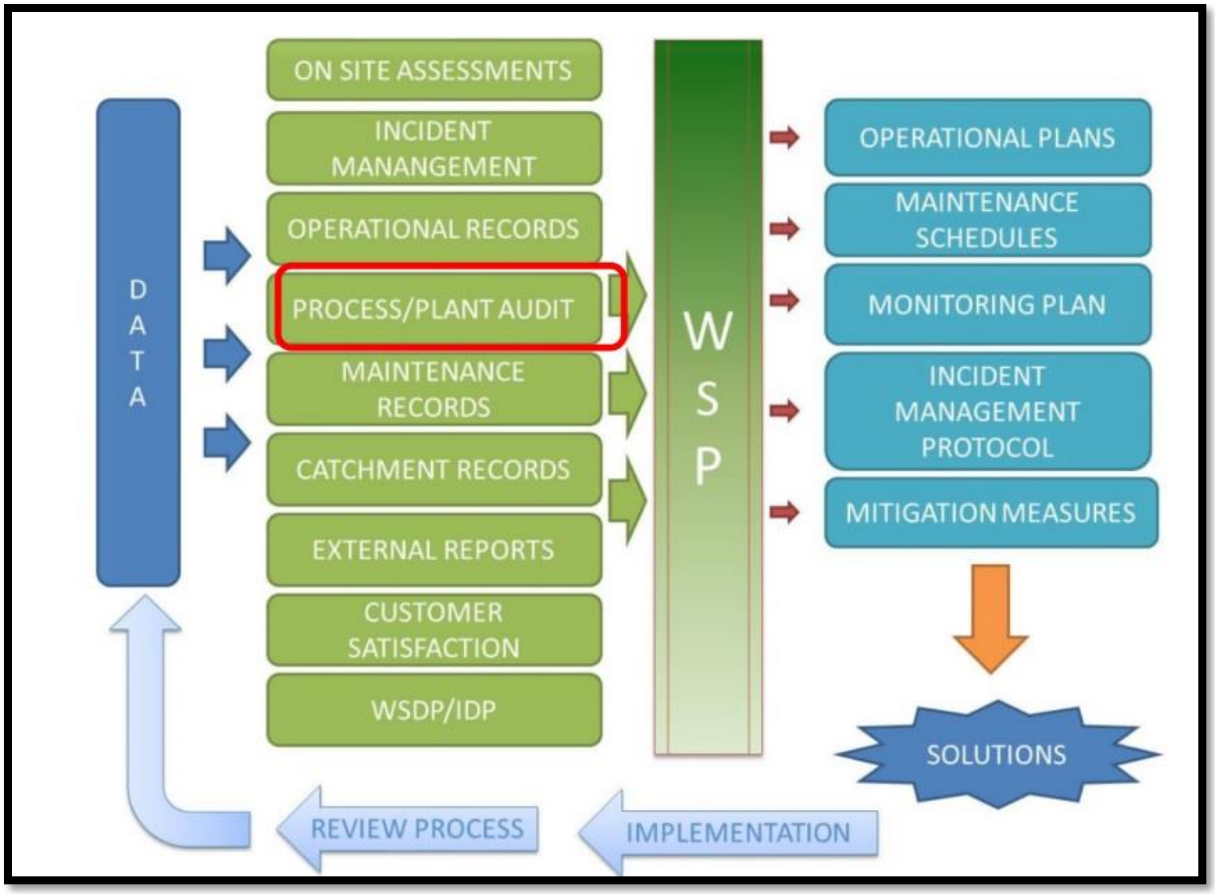


Figure 15: Risk focus of the Blue Drop Process Audit

DWS requires that an annual Process Audit Report on the technical inspection and assessment of a treatment facility be presented on demand and that there is evidence of implementation of the recommendations of the report. According to DWS, the report must cover the following:

- Analysis of raw water quality and trends with a particular focus on problem parameters,
- Analysis of final water quality performance as well as trends,
- An evaluation of the plant's ability to meet current and future water quality requirements,
- Demand analyses based on historic and projected data with a specific focus on the ability of the plant to meet future supply needs,
- Plant efficiencies with a focus on reduced in-plant water losses,
- Performance analyses of the plant's unit processes,
- An evaluation of the condition of the equipment installed at the plant,
- An evaluation of energy efficiency at the plant • An evaluation of the operational competence at the plant and in conclusion
- Recommendations on the process, capacity, infrastructure care, and operational optimisation of the plant. The critical role of the process audit in the risk management process is emphasised in the refusal of the DWS to acknowledge the process audit should:
- the findings not be included in the Water Safety Plan (WSP),
- the assessment not be conducted independently of the plant owner and operator at least every second year.

A critical point to note is that cost saving and process optimisation (other than water losses and power consumption) is not a requirement of the DWS Process Audit. The need for reducing water losses and improving energy efficiency is driven by the understanding that water and power availability are critical risks in the supply of potable water.

13.1.3 Lab Testing and Procedures

All operational testing is done by iLembe DM. Samples are outsourced to contractors and taken to an independent Lab for testing. Once the results are ready, iLembe DM analyses the data and compiles a report per plant for further intervention.

Once a plant has undergone Blue Drop Assessments, the information is captured by the Water Quality Department into the Integrated Regulatory Information System (IRIS). This system will generate a report.

Quarterly Reports are done per plant/system which are submitted to the Infrastructure Technical Portfolio Committee (ITPC). Each system will depict the following information:

1. Summary of results
2. Which system has failed?
3. Presented in Tabular and Graphic form.
4. Compares the standard against actual, and remedial action to be taken

See **Annexure B** for an example of the Lab Testing Report that was completed in June 2022

13.1.4 Log Sheets

In-house water quality testing is done every 2 hours for Raw Water and Final Effluent. **Table 14 & 15** below shows the frequency of testing per plant.

Table 14: WTW Log Sheets

Applicable To iLembe DM Water Treatment Works			
Determinants	**Frequency per shift**	**Raw Water**	**Final Water**
Turbidity	**2,4,8 or daily - dependant on plant requirements**	**x**	**x**
pH	**2,4,8 or daily - dependant on plant requirements**	**x**	**x**
Conductivity	**2,4,8 or daily - dependant on plant requirements**	**x**	**x**
Temperature	**2,4,8 or daily - dependant on plant requirements**	**x**	**x**
Residual Chlorine	**2,4,8 or daily - dependant on plant requirements**		**x**

Table 15: Borehole Log Sheets

Applicable To iLembe DM Borehole Systems			
Determinants	**Frequency per shift**	**Raw Water**	**Final Water**
Turbidity	**Weekly**		**x**
pH	**Weekly**		**x**
Conductivity	**Weekly**		**x**
Temperature	**Weekly**		**x**
Residual Chlorine	**Weekly**		**x**

Annexure C for sampling is attached which show detailed tests and the frequency of test done by specialised contractors.

13.1.5 Water Safety Plans (WSP)

This plan is developed to ensure compliance with Blue Drop requirements by following the International Water Association (IWA) and Department of Water and Sanitation (DWS) best practices and legislation to provide potable drinking water to the public.

The Water Safety Plan is a separate document that is generated for each supply area, water or wastewater system that identifies potential hazards in terms of Low, Medium, and High Risks to assist iLembe DM with preparing a financial budget to mitigate these risks and achieve a Blue Drop of Green Drop status.

Only Sundumbili WTP and Supply System have a WSP. All other WSPs for the other supply systems are currently being developed.

13.1.6 Incident Management Protocols

This plan addresses all the hazards and risks associated with the WSP and provides remedial action with time frames ensuring proper procedures are followed to prevent/correct any failures in the system.

This report is also a separate report that is composed of each water supply area. There are many water supply areas and towns in the iLembe District - each system varies in complexity, and the type of hazard or risk associated.

HAZARDOUS EVENTS INCIDENT RESPONSE PROCEDURE

This refers to preventative actions that need to be taken to prevent potential drinking water quality failures as a result of hazardous events.

Hazardous Event	Possible causes	Consequence	Preventative/Corrective Measures	Required Response Time	Reporting Protocol
Electrical supply interruptions at pump stations	**Load shedding and/or Damaged power lines.**	**Water supply interruptions where distribution water is pumped, disinfectant dosing interruptions, and Flooding.**		**Immediate**	**Manager WSP, Area Managers**
Service Water Supply Interruptions	**Pipeline replacements and/or water quality out of range.**	**Chlorine Dosing Interruptions.**	**Institute emergency HTH/sodium hypo dosing. Increase the frequency of residual chlorine monitoring at plants and networks.**	**Immediate**	**Process Controller**
Pipe Bursts		**Turbidity increases, and bacterial contamination.**	**Ensure correct procedures are implemented to minimize contamination. Monitor residual chlorine and turbidity in affected lines**	**Immediate**	**Area Manager(s)/ Area Foremen**
Tampering with Municipal infrastructure	**unauthorized connections**	**Contamination, turbidity increase, supply interruptions.**	**Investigate reasons and alternatives to unauthorized connections, and involve the community in remedial activities.**	**Within 30 days**	**Manager WSP**
The water Source Dries up	**Drought**	**Water supply interruptions.**	**Notify affected consumers. Institute emergency water supply procedures.**	**Immediate**	**Manager WSP**

DRINKING WATER QUALITY (HAZARD) INCIDENT MANAGEMENT

This refers to actions that need to be taken in response to a drinking water quality failure identified by Microbiological, Chemical, or Physical analysis of water.

Classification of Incident	Water Quality Constituent and Concentration	Required Response Time	Action	Responsible person
Unconfirmed result based on single analysis. (Compliance)	Any determination that exceeds the limits defined in SANS 241-1:2015.	Immediate - ensure the sample is submitted for confirmation within 7 days.	1 Implement appropriate measures to resolve the failure -e.g. boost chlorine, flush lines, etc. 2 Resample point and submit for confirmation	iLembe O&M and Wats Quality team

Classification of Incident	Water Quality Constituent and Concentration	Required Response	Action	Responsible person
Operational Out-of-Range Parameter	Operational Determined that exceeds the limits defined in SANS 241-1:2015 or the defined acceptance criterion. pH, Turbidity, EC, colour, Residual chlorine	Immediate	1 Confirm result (resample) 2 Implement appropriate measures to resolve the failure - Refer to O&M under Troubleshooting.	Area Manager(s) and Wate Quality Department
Alert Level I (Drinking Water Quality Incident - Low Risk)	Determinants Classified as Chronic Health, Operational or Aesthetic that exceed the limits defined in SANS241-2015. E.coli levels between 1-9 count/100ML.	Immediate upon receipt of confirmed result.	1 Identify the source of the hazard and institute corrective action. 2 Institute additional monitoring and or continue monitoring until the incident is confirmed to be resolved.	Plant supervisor an Process Controller.
Alert Level II (Drinking Water Quality Incident - Medium Risk)	Unresolved Alert Level 1 Determinants. E.coli levels between 10-20 count/100ML.	Immediate upon receipt of confirmed result.	1 Out-of-range results relayed to Level I group (phone/sms and confirmation by email). 2 Follow Steps 1 & 2 Per Alert Level I. 3 Draw up a nonconformance report specifying roles and responsibilities and corrective actions to be taken. 4 Assess the communities at risk and the need for an alternate water supply. 5 Monitor the effectiveness of corrective actions. 6 Close off the Non Conformance Report (NCR) and update the risk assessment.	The water Quality team, Area Manager, Foremen an Process Controllers.

Classification of Incident	Water Quality Constituent and Concentration	Required Response Time	Action	Responsible person
Alert Level III (Drinking Water Quality Incident – High Risk)	Unresolved Alert Level II Determ inands. E.coli levels >20 count/100ML. Protozoan Parasites Cyanide (recoverable) as CN' Nitrate as N Nitrite as N Sulphate as SO4 'Alert level III Determinants are classified as Acute health that are deemed to be present at levels that will cause immediate toxic effects.	Immediate upon receipt of confirmed result.	1. Out-of-range results relayed to the Level II group (phone/SMS and confirmation by email). 2. Follow Steps 1 - 5 Per Alert Level II. 3. Issue "Boil Alert" and/or "Do not drink" notifications as required. 4. Phase out additional monitoring once the source of the incident has been identified and rectified and three consecutive results have been within specification. 5. Notify the community of the end of the emergency 6. Close off the Conformance Report and update the risk assessment.	KZ WSP Manager, Are Mangers/ Foreman, Process Controller(s) and iLembe department.

GROUP MEMBERS

Level 1 Group	Level II Group	Level III Group
Foremen/Plant supervisor and Process Controller.	Technical Officer, Foreman, and Plant Supervisor.	KZ WSP Manager, Area Manager/ Foreman, Plant Supervisor. Process Controller(s) and iLembe Communications department

Hazard	Unit	SANS 241:2015				
		Risk	Limit	Associated Risk	IMP Response	Reporting Protocol
pH at 25°C	pH units	Operational	< 5.0 to S 9.7	An indicator of industrial pollution is the use of acids in water sources. If low, potential corrosive water.	Engage failure with Umgeni water and / Cross cross-check against pollution indicators (chlorides, phenols, metals, etc.). For humic acid content monitor colour and Trihalomethanes. Water corrosivity.	Integral Lab, Water Quality Department, Communications Department, WSP Manager, Area Managers and Foremen
Turbidity (operational)	NTU	Operational	< 1	Operational challenges, equipment damage (silt build-up); Industrial pollution. Chlorine masking in distribution.	Confirm the source of turbidity. Institute appropriate control measures. Monitor residual chlorine and E.coli in distribution. Increase Cl dosing as necessary.	Integral Lab, Water Quality Department, Communications Department, WSP Manager, Area Managers and Foremen
Turbidity (aesthetic)	NTU	Aesthetic	<5	Water is unacceptable for consumer use.	Clean reservoirs, and flush pipes. Improve plant operation. Follow procedures according to alert levels.	Integral Lab, Water Quality Department, Communications Department, WSP Manager, Area Managers and Foremen
E.coli	count/100 ML	Acute Health -1	0	Definitive, preferred indicator of Faecal contamination. If human, associated risk of protozoan parasites.	Confirm abs/pres of protozoan parasites.	Integral Lab, Water Quality Department, Communications Department, WSP Manager, Area Managers and Foremen

Water Treatment Work and Reticulation monitoring programme

	Determinants	Treatment Works	Reticulation	
		Weekly	**Fortnightly**	**Monthly**
1	pH	X	X	
2	Color	X		X
3	Turbidity	X	X	
4	Conductivity	X		X
5	Total CI2 (on site)	X	X	
6	Free 02 (on-site)	X	X	
7	Monochloramine	X	X	
8	Nitrate	X	X	
9	Nitrite	X	X	
10	Nitrate Nitrite ratio	X	X	
11	Iron |Fe)	X		X
12	Aluminium (Al)	X	X	
13	HPC	X	X	
14	Total Coliforms	X	X	
15	Fecal Coliforms	X	X	
16	E coli	X	X	

13.1.7 Current Status

There are currently 11 Water treatment Plants that are currently operational and undergo Blue Drop Assessments. Test samples are outsourced to private companies.

Below Table is current failures summarised at each Plant

No.	Area	WTW Name	Physical	Chemical			Micro
			Turbidity	Color	Iron	Aluminium	E.coli
1	KwaDukuza	Umvoti	No Water - Plant Offline – Due to Floods				
2	Mandeni	Ifalethu BH	x				
3		Ethembeni BH					x
4		Hlanganani BH	x				
5		Makwanini BH	x				
6		Sundumbili	x	x			x
7	Maphumulo	Ngcebo	x				
8		Isithundu	x	x		x	
9		Thafamasi BH					x
10		Maqumbi BH					
11		Ntunjambili BH	No Failures				

12	Ndwedwe	Vukile	x				
13		Isiminya	x				
14		Glendale BH	x				x
15		Ntabaskop	x				x
16		Montebello	x				
17		Esidumbini	x		x		
18		Nsuze	x				x

13.2 Wastewater Systems

13.2.1 Green Drop Requirements

The Green Drop process warrants compliance of the Water Service Authorities (WSA) and their Water Service Providers (WSP) by evaluating and assessing the results of the performance of each wastewater treatment work and associated infrastructure. A Municipality will only receive a Green Drop Status if it achieves a minimum score of 90% or higher.

Green Drop audits and certification take place every 2nd year, using the full set of (Green Water Services Audit) GWSA criteria to assess the performance of the wastewater system. Output = Green Drop Report

Progress assessments take place during the Green Drop 'gap' year, using the PAT to assess the cumulative risk status of treatment systems. Output = Green Drop Progress Report

The Standardised Assessment process is based on the following criteria:

Year 1 to Year 3

- Process Controllers, Maintenance, and Management skills
- Wastewater Quality Monitoring
- The Credibility of Wastewater Sampling and Analysis
- Submission of Wastewater Quality Results
- Wastewater Quality Compliance
- Management of Wastewater Quality Failures
- Stormwater and Water Demand Management
- By-laws
- Wastewater Treatment Works Capacity
- Publication of wastewater quality performance
- Wastewater asset management

Year 4 – Key Performance Indicators

- Wastewater Quality, Process Management, and Control
- Wastewater Compliance
- Wastewater Risk Abatement
- Management, Accountability, and Local Regulation
- Wastewater Asset Management

13.2.2 Lab Testing and Procedures

All operational testing is done by iLembe DM. Samples are outsourced to contractors and taken to an independent Lab for testing. Once the results are ready, iLembe DM analyses the data and compiles a report per plant for further intervention.

Once a plant has undergone **Green** Drop Assessments, the information is captured by the Water Quality Department onto the Integrated Regulatory Information System (IRIS).

Quarterly Reports are done per plant/system which are submitted to the Infrastructure Technical Portfolio Committee (ITPC). Each system will depict the following information:

1. Summary of results
2. Which system has failed?
3. Presented in Tabular and Graphic form.
4. Compares the standard against actual, and remedial action to be taken.

See **Annexure E** for Log Sheets that were completed in June 2022

In-house testing is done every 2 hours for Raw Water and Final Effluent. **Table 16** below shows the frequency of testing per plant.

Table 16: Frequency of Testing

Determinants	Frequency	Raw water	Final Water
pH	2,4,8 or daily - dependent on plant requirements	x	x
Ammonia as N	2,4,8 or daily - dependant on plant requirements	x	x
Settleability test	2,4,8 or daily - dependant on plant requirements		x
Dissolved Oxygen	2,4,8 or daily - dependant on plant requirements		x
Residual Chlorine	2,4,8 or daily - dependant on plant requirements		x
Conductivity	2,4,8 or daily - dependant on plant requirements	x	x

13.2.3 Wastewater Risk Abatement Plan

To mitigate potential risks associated with wastewater systems, DWS has recommended the development of a Wastewater Risk Abatement Plan (WWRAP). The primary objectives of a WWRAP are to:

- Prevent contamination during the transport of wastewater, storage, and disposal of sludge
- Reduce or remove contamination through the treatment processes.
- Minimize contamination of the resource onto which the treated effluent is returned to

The WWRAP is similar in scope to a Water Safety Plan, and contains the following three key components:

1. System assessments
2. Identifying control measures
3. Management plans

The approach adopted when developing a WWRAP comprises the following sequential steps:

i. Assemble project team/key stakeholders
ii. Document and describe the present wastewater treatment system.
iii. Assess the wastewater treatment system including reticulation and pump stations.
iv. Undertake a hazard assessment
v. Identify control measures
vi. Verify the WWRAP is operational
vii. Develop supporting programmes
viii. Establish document and communication procedures
ix. Review of the WWRAP

Site visits, physical verification, and testing must be done systematically at each wastewater treatment plant/system. **Annexure F** shows the proposed WWRAPS Improvement Plan Costing Matrix for various Wastewater Treatment Plants within the iLembe DM. Risks are categorised from Low-Medium-High where priority is given to high-risk factors.

13.2.4 Current Status

All Wastewater treatment plants are non-compliant. Urgent remedial action is required as all WWTW had a very poor effluent quality which is harmful to receiving streams. The majority of the WWTW has been affected by the April 2022 floods. Detailed possible causes, cost implications, and recommendations are detailed in **Annexure D**. The business Plan has been escalated from 2021

14 OPERATIONS AND MAINTENANCE BUDGETING REQUIREMENTS

Regrettably, IDM for many years underfunded maintenance and repairs. This has been coupled with widespread evident expectation (or wishful optimism) on the part of many decision-makers that infrastructure can continue to provide sterling service despite specified periodic maintenance not being done. Moreover, new infrastructure is regularly brought into service with little attention paid to the need to maintain it thereafter.

14.1 Historic Repairs and Maintenance Spend

This section looks at how much money IDM has budgeted for repairs and maintenance, as a percentage of total fixed assets (property, plant, and equipment). For every R10 spent on building/replacing infrastructure, R0.80 should be spent every year on repairs and maintenance.

Treasury has laid down that municipalities shall budget for maintenance and repair an annual sum equivalent to 8% of the "carrying value" of "property, plants and equipment and investment property".

Based on expenditure reports and AFS provided by IDM, it is indicated that historic budgets related to repairs and maintenance were in the order of R 47 – R 126 million per annum, as indicated in **Table 17** below.

Table 17: Historic Spend on Repairs and Maintenance

Historical Asset Value	Total Assets PPE	Actual Expenditure on R&M	R&M versus Total PPE Assets (%)
FAR 2020/21	R 2 182 523 256,29	R 56 071 931,00	2.6%
FAR 2021/22	R 2 282 831 814,62	R 47 608 849,00	2.1%
FAR 2022/23	R 2 345 294 942,70	R 126 445 000,00	5.39%

From the table above, it must be noted that the National Treasury states in the 2017 Budget Review that "municipalities must adhere to financial norms and ratios that require them to spend at least 8% of the value of their assets on maintenance." Currently, IDM is spending on average 3.3% of the value of the assets (PPE) on maintenance which is 4.7% below the norm of 8% as set out by the National treasury.

It can be further seen that from the 2021/22 FY IDM has improved on their repairs and maintenance expenditure which allows for infrastructure to deliver adequate services to the communities they serve.

14.2 Estimated Budget for Repairs and Maintenance for the 2022/23 FY

The Estimated Repairs and Maintenance costs will be taken as a percentage of PPE (Carrying Value) based on the following guidelines as set out:

1. The “National Infrastructure Maintenance Strategy (NIMS): Infrastructure Maintenance Budgeting Guideline”
2. The CIDB’s “National Immovable Asset Maintenance Standard for immovable assets under the custodianship of National and Provincial Departments of Works”
3. Treasury’s own Infrastructure Development Management System (IDMS), the context of which is new infrastructure only, also refers to the budget guidelines of the NIMS (Treasury, 2018).

14.2.1 Approach

The maintenance budget percentages reflected in **Table 18** below are estimates of the minimum maintenance budget which should be provided annually concerning the current day replacement cost of the infrastructure, to provide a reasonable basis for ongoing service delivery.

The specific technology used within a particular infrastructure may have a significant impact on the maintenance costs and will need to be taken into account when assessing the specific maintenance budget requirements of a particular infrastructure.

In using Table 18: Infrastructure Budgeting Guidelines **Table 18** it should be noted that the maintenance cycle for each asset is not static each year. Typically, the maintenance cycle requires the following components:

1. Normal annual maintenance;
2. Emergency maintenance - for example, a burst water pipe as a result of a severe storm.
3. Periodic refurbishment - for example resurfacing of a road every 5 to 7 years to ensure that it will last its design life of twenty years.

The purpose of this table is to provide first-order macro budgeting, to commence the maintenance budgeting process.

Type of infrastructure	Minimum Average Annual Maintenance Budget as % of Replacement Cost	Maximum Average Annual Maintenance Budget as % of Replacement Cost	Key Assumptions	Replacement or Major Rehabilitation over and above the Annual Maintenance Budget requires a specific capital budget
Bulk water storage	4%	8%	Mostly for the periodic repair of electrical and mechanical works, storm damage repair, routine maintenance, and periodic maintenance	every 30 to 50 years
Water treatment works	4%	8%	Mostly for electrical and mechanical equipment	every 20 to 30 years
Water reticulation	4%	8%	Mostly for telemetry and pumping equipment, emergency leak repair and ongoing leak repair due to degradation, storm damage repair	every 20 to 30 years
Sewage treatment works	4%	8%	Mostly for electrical and mechanical equipment, storm damage, and periodic maintenance.	every 20 to 30 years
Sewer reticulation	4%	8%	Mostly for pumping equipment, emergency leak repair, and ongoing leak repair due to degradation, blockage removal, storm damage repair,	every 20 to 30 years
Operational buildings	4%	6%	Mostly for emergency repair, storm damage repair, and periodic maintenance (e.g., repainting and cosmetic upgrades every 5 to 10 years).	every 30 to 50 years

Table 18: Infrastructure Budgeting Guidelines

Table 19 shows the estimated budget for repairs and maintenance of water and waste water-related infrastructure obtained from the FAR (2022/23 FY). All maintenance activities are shown in the next section of the report.

Table 19: Average Annual Maintenance Budget for 2023/24

Type of infrastructure	Current Asset Value	Replacement Costs	Minimum Average Annual Maintenance Budget as % of Replacement Cost	Maximum Average Annual Maintenance Budget as % of Replacement Cost
Bulk water storage	R558 648 766,41	R1 246 264 635,49	R49 850 585,42	R99 701 170,84
Water treatment works	R486 256 357,72	R1 142 432 433,12	R45 697 297,32	R91 394 594,65
Water reticulation	R818 241 819,82	R1 825 386 530,46	R73 015 461,22	R146 030 922,44
Sewage treatment works	R72 181 374,59	R174 040 359,89	R6 961 614,40	R13 923 228,79
Sewer reticulation	R283 729 008,04	R294 039 104,72	R11 761 564,19	R23 523 128,38
	R2 219 057 326,58	**R4 682 163 063,68**	**R187 286 522,55**	**R374 573 045,09**

The annual maintenance cost for repairs and maintenance presented in **Table 19** covers the estimated budget for material, equipment, and annual labour costs.

The total Current Asset Value (PPE – water and wastewater infrastructure only) specified on the Fixed Asset Register for the 2022/23 Financial Year up until July 2023 is R 2 219 057 326.58. It is evident that for the IDM to meet the requirements from the National Treasury of 8% (minimum 4%) spent on repairs and maintenance (Circular 71), significantly more budget needs to be allocated to repairs and maintenance. This amounts to a maintenance cost of **R 187 286 522.55** which is an approximate increase of 112.4% of the current allocated budget of **R 88 864 000,00** for repairs and maintenance for the 2023/24 financial year. All Assets that are recommended to be replaced are shown in **Annexure I.**

14.3 Estimated Budget for Operational Costs for the 2022/23 FY

All operations costs are based on information supplied by the IDM finance department. It must be noted that all costs should be taken as an estimated budget requirement for the next Financial Year (2023/2024) required by IDM as there may be unforeseen breakdowns or downfalls which will impose further expenditure to achieve compliance and functionality for various water and wastewater infrastructure.

14.3.1 Staffing costs

The cost below shown in **Table 20** is based on the staff complement supplied by IDM. All Wage Rates are current and remuneration which includes overtime, subsidies, bonuses, medical aid, and provident fund which are factored into the estimated staffing costs.

Table 20: Estimated Staff Compliment costs for the 2022/23 FY

Designation	No. of personal	Salary per month	Salary per annum	Total
Administration officer	2	R 29 866,73	R 358 400,70	R 716 801,41
Area manager	4	R 87 504,75	R 1 050 057,05	R 4 200 228,21
Artisan (electrical	2	R 41 210,37	R 494 524,39	R 989 048,79
Artisan assistant	137	R 20 557,86	R 246 694,35	R 33 797 125,56
Artisan plumber	50	R 41 512,39	R 498 148,64	R 24 907 432,10
Assistant heavy duty	5	R 14 255,28	R 171 063,33	R 855 316,65
Assistant driver	18	R 16 692,94	R 200 315,30	R 3 605 675,38
Community development	2	R 45 647,50	R 547 769,96	R 1 095 539,92
District engineer	2	R 131 336,97	R 1 576 043,63	R 3 152 087,27
Excavator operator	1	R 13 016,01	R 156 192,17	R 156 192,17
General worker	10	R 15 071,61	R 180 859,27	R 1 808 592,72
Handyman plumber	14	R 29 329,94	R 351 959,31	R 4 927 430,38
Heavy duty driver	29	R 40 813,50	R 489 762,01	R 14 203 098,36
Project Manager	1	R 119 935,09	R 1 439 221,14	R 1 439 221,14
Manager (water service)	4	R 135 053,42	R 1 620 641,00	R 6 482 563,99
Manager water quality	1	R 120 009,08	R 1 440 109,00	R 1 440 109,00
Principal clerk	5	R 27 424,53	R 329 094,40	R 1 645 471,98
Process control	39	R 33 788,03	R 405 456,42	R 15 812 800,34
Senior clerk	2	R 28 912,05	R 346 944,60	R 693 889,21
Senior technician	4	R 64 706,06	R 776 472,77	R 3 105 891,07
Superintendent	11	R 67 542,39	R 810 508,70	R 8 915 595,70
Technician biochemistry	1	R 44 859,86	R 538 318,36	R 538 318,36
Technician chemistry	1	R 49 777,05	R 597 324,59	R 597 324,59
TLB operator	5	R 5 971,71	R 71 660,47	R 358 302,36
			Total Staffing Costs	**R 135 444 056,63**

14.3.2 General Operating Expenses

General costs were estimated with guidance from IDM AFS for the 2023/24 FY which include Electricity, Water, Training, Security, License Renewals and Certification, Vehicle Running Costs, Consumables, and Depreciation are detailed in **Table 21** below.

Operating Expenses	Costs	
Electricity and Water Costs	R	39 692 918,79
Training	R	467 473,42
Security	R	36 839 100,10
Licencing and Membership Fees	R	2 966 959,83
Licensing of Vehicles	R	273 272,12
Vehicle Hire	R	505 563,82
Fuel and Oil	R	19 899 917,74
Plant Hire	R	21 609 075,40
Analysis of Water and Waste effluents	R	5 878 964,30
Consumables	R	6 711 992,31
Printing and Stationary	R	221 749,51
Personal Protective Equipment	R	2 818 017,39
Telephone Costs	R	205 890,67
Operational Costs for R&M	R	8 624 799,28
Depreciation	R	156 999 791,82
Total Estimated General Operating costs for the 2023/24 FY	**R**	**303 715 486,51**

Table 21: Estimated General Operating costs for the 2023/24 FY.

The total Operations and Maintenance costs required by IDM for the 2023/24 Financial Year sum up to the following costs in **Table 22** below:

Table 22: Total Operations and Maintenance Costs

Estimated Annual Average Maintenance Costs	**187286522,6**
Estimated Staff Compliment Costs	R135 444 056,63
Estimated General Operating Costs	R303 715 486,51
The Total Operations and Maintenance costs for the 2023/24 FY	**R626 446 065,69**
Projected Operations and Maintenance costs for the 2024/25 FY	***R676 561 750,95***

14.4 Recommendations

Maintenance and repair of infrastructure need political and institutional will on the part of those responsible for the infrastructure. IDM needs systems and skills for setting annual budgets for maintenance and repair taking into account major variables, particularly, for each infrastructure component:

- The type of infrastructure (e.g., Reservoir, culvert, retaining wall, pump, excavator, substation, buildings);
- Current age.
- Current condition.
- Current workload (e.g., of a road, how heavily is it trafficked?); and
- The expected remaining useful life under normal operating conditions and a maintenance regime that has conformed to manufacturers' specifications as opposed to;
- The estimated remaining useful life under the actual (or predicted, if this could be different) operating conditions and the actual (or predicted) maintenance regime.

14.4.1 Best O&M Practices

- Attention is to be gained from senior management by increasing their understanding of efficient operation as part of asset management. Efficiency reduces operating costs and maintains comfort.
- Replace old equipment and systems with new, efficient technologies. Operate energy-consuming equipment (pumps, motors) efficiently. Optimize energy cost savings by efficiently operating existing equipment and reducing inappropriate or premature capital outlay.
- Motivate O&M staff by continually giving them feedback through monthly reports.
- Utilize skilled staff members whose primary focus is developing and implementing the asset management plan with an equal emphasis on efficient operations.
- Develop an individual training plan and budget for each facility staff member using in-house resources as well as outside classes, conferences, and seminars that focus on efficient building operations.
- Increase the quality of the service provided by the service contractor.
- Increase service contractor accountability for both maintenance and efficient operation.
- Promote continuity of information to reduce training time for new staff and ensure that efficient operating strategies are maintained during staff turnovers or absences.
- Identify the most immediate and cost-effective O&M tune-up activities that will lead to efficient operations and meet management and user needs.
- Generate a master list of O&M improvements to assist management in budgeting and decision-making.
- Document current O&M conditions as a baseline for comparing to future improvements.

15 CONCLUSIONS AND RECOMMENDATIONS

This section provides conclusions and recommendations on the project completed.

15.1 Recommendations

15.1.1 Asset Management

Good asset management is critical in any business environment and more so in the public sector, particularly as some of the significant assets are infrastructure assets with long life span and enormous capital outlay that are vital to providing a foundation for economic activity. These assets assist communities in their daily lives by providing basic services. The need to operate and maintain these assets relies on the knowledge of the location as well as the conditional assessment which will allow the Municipality to carry out preventative maintenance on certain assets should they require any form of repairs or upgrades.

All assets are owned and controlled by IDM staff however some of the issues have been picked up during physical verification and assessments of each site:

- Some Assets like control panels and valves do not have municipal barcodes or unique numbers on assets, making it difficult to distinguish any two assets with the same description in the same location.
- Most of the assets are in fair condition.
- Many pump stations and reservoirs are subject to theft and vandalism due to some assets being placed in locations that take security a longer response time.

List of considerations:

- Movement of Assets to be recorded, each Wastewater Plant/Pump Station and Municipal building to have an inventory list and to be checked regularly.
- All changes to the Inventory list must be jotted down immediately.
- Regular maintenance and checks of all plants and equipment to provide sustainability and ensure it runs at optimum capacity.

15.1.2 Reducing O&M Costs

15.1.2.1 Energy Efficiency

The energy efficiency of all WTP and WWTWs is of increasing interest, not only due to economic but also due to environmental aspects. Hence, the optimisation of energy consumption and generation in these plants is very important. Based on our analysis and cost estimates shows that electricity costs make up 10 – 15% of the total O&M costs per plant.

The Various Plants wanting to reduce energy can first benchmark their energy use, by performing an energy audit to see how they can operate more efficiently, and finally, implement the audit's recommendations.

These plants can start by replacing older, less efficient pumps & motors and motor systems, installing variable frequency drives, switching to energy-efficient lighting and controls, and upgrading ventilation systems.

- Changing the way each plant operates is another way to save energy:

- Manage the electrical load by reducing peak demand
- Shift to off-peak hours and improve the power factors of motors and pumps
- Switch to sustainable solid treatment, transportation, and end-use

15.1.2.2 Choosing the Right Pumps and Motors to Save on Energy Costs

Select the most efficient pump type for the application

The average pump efficiency is below 40% and 10% of pumps are 10% efficient or less. Oversizing often comes in the design phase since the practice of adding multiple safety factors is quite common. This means that both pressure and flow parameters for the pump design may be 25% more than the actual system operation. The specifying engineer may need to work closely with the pump manufacturer or distributor to optimally select the pump, in addition to its size, speed, power requirements, and type of drive, as well as the mechanical seal and ancillary equipment.

Right-size the pump

Right-sizing the pump represents a significant economic opportunity to reduce energy consumption. This is important because centrifugal pumps can consume up to 60% of motor energy at a WWTP, and also have the highest process equipment maintenance cost. When engineers add too much of a safety factor during the design phase, the pump can be oversized, resulting in higher energy and maintenance costs.

Trim the impeller

The impeller should not be trimmed any smaller than the minimum diameter shown on the manufacturer's pump curve. This is typically about 75% of a pump's maximum impeller diameter. Pump curves and affinity rules (which are valid for a maximum of approximately 5% change in diameter) can both provide information on impeller trim changes and the affected performance. In practice, impeller trimming is typically used to avoid throttling losses associated with control valves.

Minimize system pressure drop

A key way to reduce pressure drop is through pipe-sizing optimization. Hydraulic friction loss creates a reduction in pressure from one end of a straight pipe to another. Factors such as the flow rate, pipe size (diameter), overall pipe length, pipe characteristics (surface roughness, material, etc.), and properties of the fluid being pumped all influence the system pressure drop.

Implement proper control valves

Control valves are typically used to control flow and/or pressure. They can help to reduce energy losses over non-controlled systems such as irrigation systems with a fixed-speed pump and multiple locations with different distances and elevations. The main functions of control valves are throttling flow or bypassing flow. Throttling reduces the flow but increases the pressure. You can minimize excess pressure by bypassing excess flow back to the reservoir or another location.

Implement variable speed drives (VSDs)

Drivers are used for either fixed-speed or variable-speed operation. For many applications, you can save energy by implementing variable speed drives. With a variable speed drive, the rotational speed of the pump is adjusted to achieve the desired head and flow necessary for the process application. A VSD can often be added to an existing pump motor system to slow the pump down to meet the actual requirements versus the theoretical requirements that were calculated at the start of the project. Once installed, the VSD can accommodate changing system demands, including many potential future expansion plans. This method often results in the highest energy efficiency with the lowest life cycle costs.

Maintain pumping systems effectively

Effective pump maintenance allows facilities to keep their pumps operating efficiently. Regular maintenance may reveal deteriorations in efficiency and capacity, which can occur long before a pump fails. Wear ring and rotor erosion, for example, can be costly problems that reduce efficiency by 10% or more. Most maintenance activities can be classified as either preventive or predictive. Preventive maintenance addresses routine system needs such as lubrication, periodic adjustments, and removal of contaminants. Predictive maintenance focuses on tests and inspections that detect deteriorating conditions. Sometimes called “condition assessment” or “condition monitoring,” it has become easier to conduct with modern testing methods and equipment. This can help minimize unplanned equipment outages, which can be very costly.

Use higher efficiency/proper pump seals

Sealing systems impact efficiency, and mechanical friction losses are only the beginning. Leaks from static and dynamic seals waste fluid and can contaminate the environment. Leaks between the pump suction to the pump discharge reduce pump volumetric efficiency. Dynamic seals consume energy from the mechanical friction between the static and moving parts. Potential sealing system savings can exceed the energy savings obtained from switching to variable frequency drives, trimming impellers, or re-sizing pumps in many applications.

Use multiple pumps

When multiple pumps operate as part of a parallel pumping system, there are opportunities for significant energy savings. A multiple-pump parallel system works best when each pump is run individually, not concurrently, most or all of the time. Running multiple pumps simultaneously is appropriate as dictated by the flow requirements specific to the application and duty cycle.

Eliminate unnecessary uses

One of the simplest, but often overlooked, measures to save energy is to eliminate unnecessary use. Pumping system efficiency measures include shutting down unnecessary pumps and using pressure switches to control the number of pumps in service when flow-rate requirements vary. Each pump system is different and there are many opportunities to save energy.

15.1.2.3 Staff Cost Reductions

Staffing Costs take up 40% of the total O&M costs per plant which can be reduced significantly by utilizing the following recommendations;

- Negotiate market-related staff costs in terms of SALGA benchmarks.
- To use multi-skilled staff by ensuring that staff is utilised efficiently and effectively to carry out various duties and job functions critical to the job of a process controller, a senior process controller, basic repairs and maintenance, and even a general assistant.
- Reducing overhead costs in terms of optimising senior management costs, traveling costs in terms of the number of vehicles, and fuel costs.
- Fair remuneration to staff is critical in the essential services water sector. Salaries must be harmonized across the sector to ensure staff retention and motivation.

15.1.2.4 Automation and Reducing Sub-Contracting Costs

- Automate all processes where possible, this will reduce operating costs in terms of staffing as well as eliminate human error and optimize efficiency.
- All maintenance personnel must be effectively trained to carry out all tasks that are not “specialised” in terms of mechanical and electrical refurbishment. They must have a piece of general knowledge and experience to carry out work in-house rather than outsourcing small work.
- Stringent regulations in terms of sub-contracting should be insisted on when making negotiations to carry out any work to obtain the best value for money.

15.1.2.5 Sludge Management

Sludge management in wastewater treatment is key to achieving a Return on Investment, where funding is being cut. Reducing costs, whether through reductions in CAPEX or OPEX is a primary consideration for local municipalities. By focusing on wastewater sludge processing, it is possible to significantly improve the return on investment. Slydgemanagement plana

15.1.2.6 The Role of Grit Removal in Reducing Costs

One of the basic considerations, which is now coming to the fore, is grit removal. Ensuring the best possible removal of primary sludge, and associated grit, can significantly reduce maintenance costs and increase returns.

This is because grit creates several important and costly downstream issues. The 50 to 70% of grit that is not trapped by traditional grit removal solutions:

- Damages downstream assets, particularly expensive pumps.
- Increases wear and tear of products, reducing their overall lifetime.
- Increases the risk that equipment will fail unexpectedly.

Grit also settles out at points in the process where flows slow, blocking pipes and channels and reducing the volume available in downstream treatment processes.

The impact of this can be seen in increased aeration costs and reduced treatment effectiveness and efficiency. The costs of downtime and early replacement of vital assets must also be factored in.

15.1.2.7 Improving the settle-ability Of Sludge in a WWTW

Reducing solids handling costs is crucial when improving the settling ability of sludge. The removal of unnecessary detritus and gross solids at the earliest possible stage reduces the impact on the downstream treatment train. By acting to remove these elements early on and improving the settling ability of sludge at the primary stage, there will be less wear and tear on equipment and a higher quality of sludge going to the digester.

Improving downstream treatment efficiency is vital because of the significant amounts of energy involved in maintaining inefficient processes. Estimates suggest that both water and wastewater treatment plants account for 40% of the total energy consumed by municipal governments.

This further notes that by incorporating energy efficiency practices, IDM can save 15 to 30% of their energy use, Reducing costs, with payback at the scale of a few months to years.

Undoubtedly, there are several different aspects to achieving energy efficiency, but grit removal and sludge screening improvements can be important contributors to this potential saving.

15.1.2.8 Choosing a Grit Removal System

Various factors must be considered when choosing a grit removal system, including:

- The amount and characteristics of the grit at the plant in question.
- The potential effects on downstream processes.
- Factors such as head loss, available space, removal efficiency, and cost.
- The grit removal system chosen for a treatment plant should balance these characteristics.

Primary scrapers play an important part in ensuring that the quality of sludge going to the digester is as high as possible; an effective primary settlement tank scraper system will increase the amount of carbon-rich early sludge that is fed to the digester.

Sludge screening provides an opportunity to capture grit in sludge brought onto the main site by tankers from smaller treatment works. These may not have effective (or any) grit removal systems.

Securing these improvements enables digesters to work more efficiently, producing more energy, and reducing maintenance, issues that are key to improving ROI and increasing profits.

15.1.2.9 Water Quality and Flow Monitoring

- Hold weekly plant, lab, and management meetings to discuss failures and plan remediation
- Continuous Inspections
- Improve turnaround times for repairs
- Build flexibility in the design of the facilities experiencing variable flows and water quality to avoid any crisis that may occur
- Eliminate stormwater ingress and potable water losses to the sewer system. It depletes the available capacity of your wastewater treatment facility

16 PROJECT SIGN-OFF

We hereby confirm that the project has been conducted successfully and that the deliverables were received in good order:

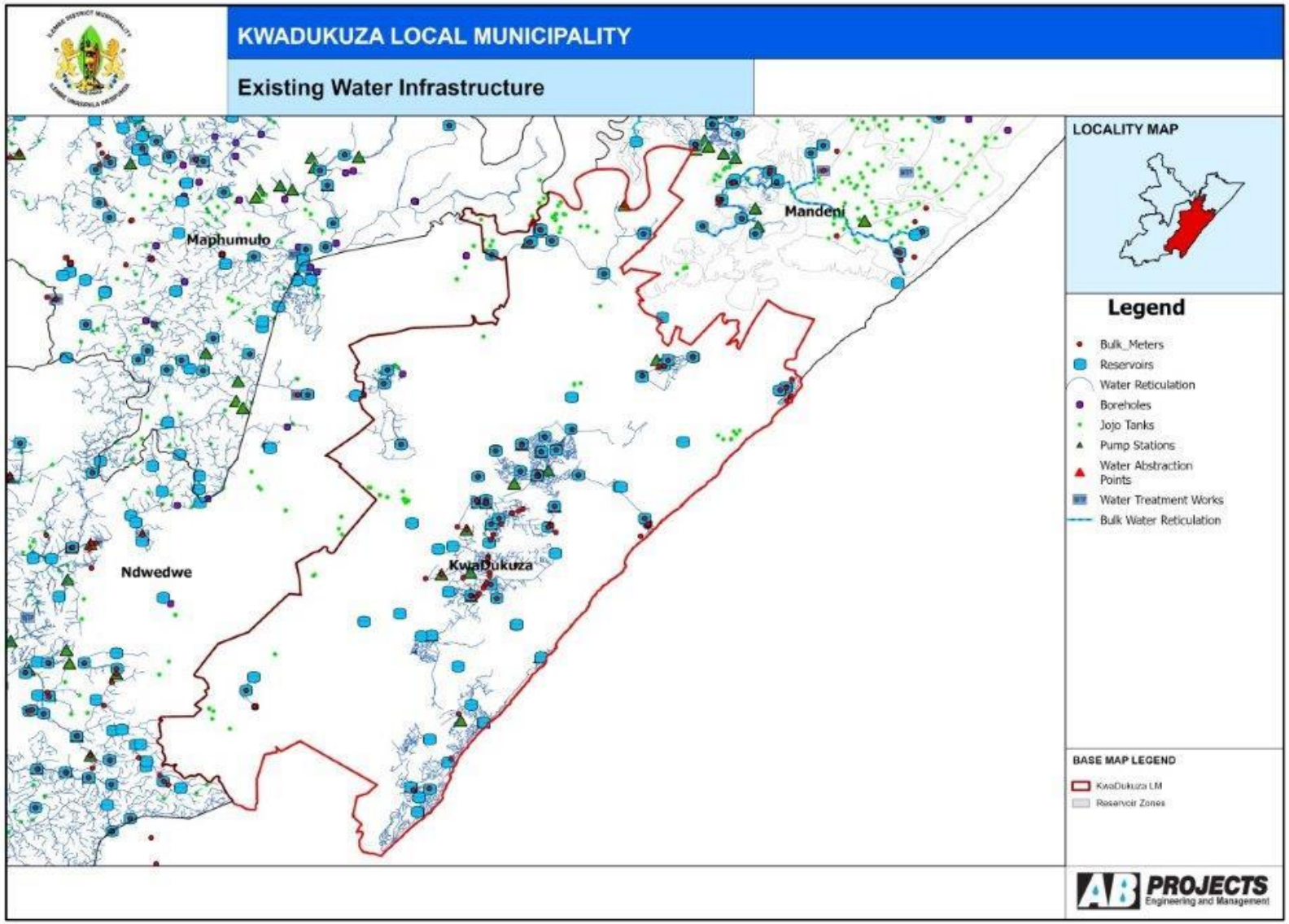
Client:	Signature:	
	Full Name:	
	Organisation:	
	Designation:	
	Date:	
Consultant's Project Leader:	Signature:	
	Full Name:	
	Organisation:	
	Designation:	
	Date:	

ANNEXURE A - GIS DATA (INFRASTRUCTURE MAPS FOR EACH LOCAL MUNICIPALITY

The Current GIS Data is lacking some of the old bulk pipelines and reticulation networks.

IDM Must include Sanitation GIS Maps as there is no available information currently.

The Water Maps are shown for the four local municipalities however this information needs to be updated continuously.


KWADUKUZA LOCAL MUNICIPALITY
Existing Water Infrastructure
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LOCALITY MAP
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Reservoirs
Water Reticulation
Boreholes
Jojo Tanks
Pump Stations
Water Abstraction Points
Water Treatment Works
Bulk Water Reticulation
BASE MAP LEGEND
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Reservoir Zones
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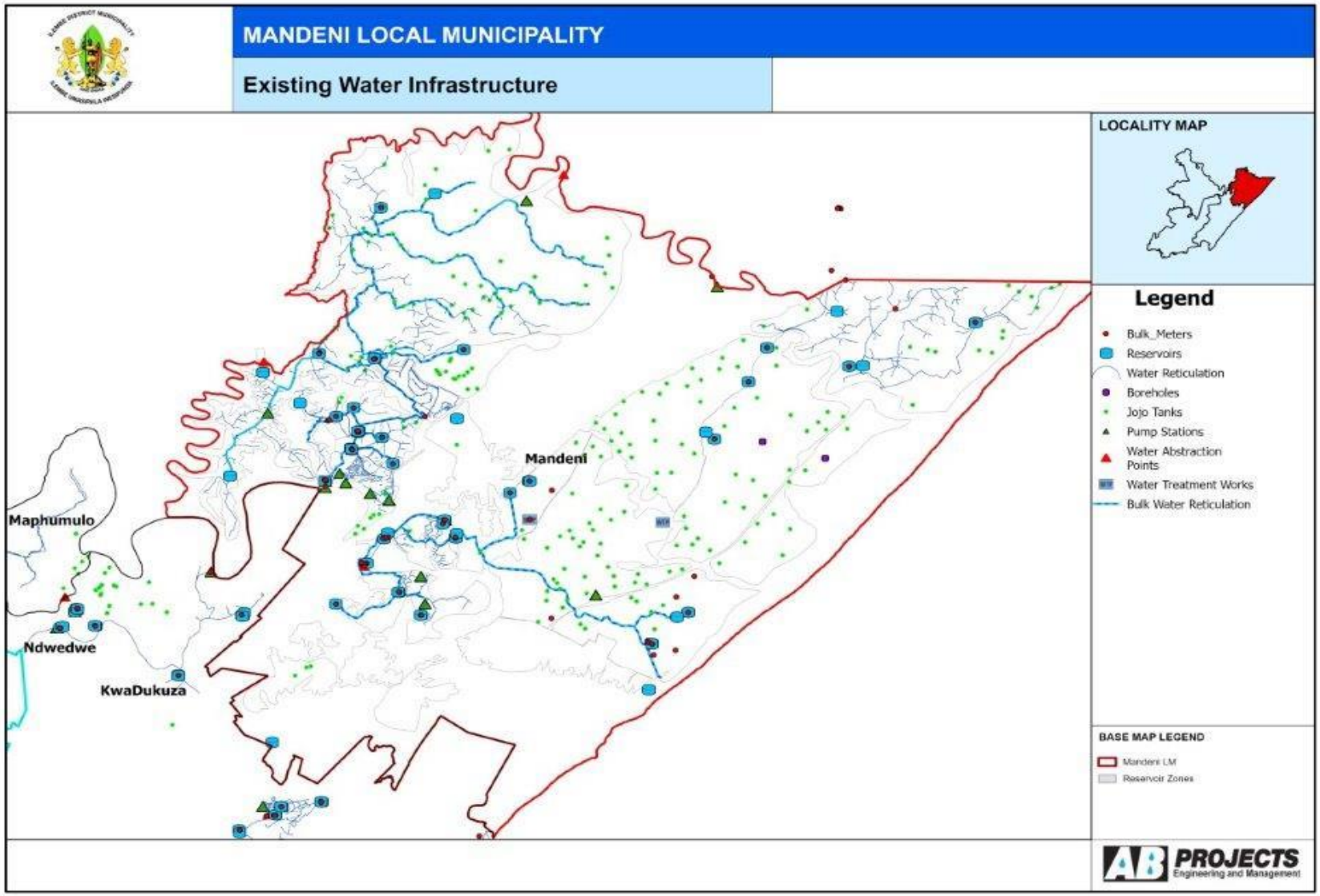
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Existing Water Infrastructure
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Water Abstraction Points
Water Treatment Works
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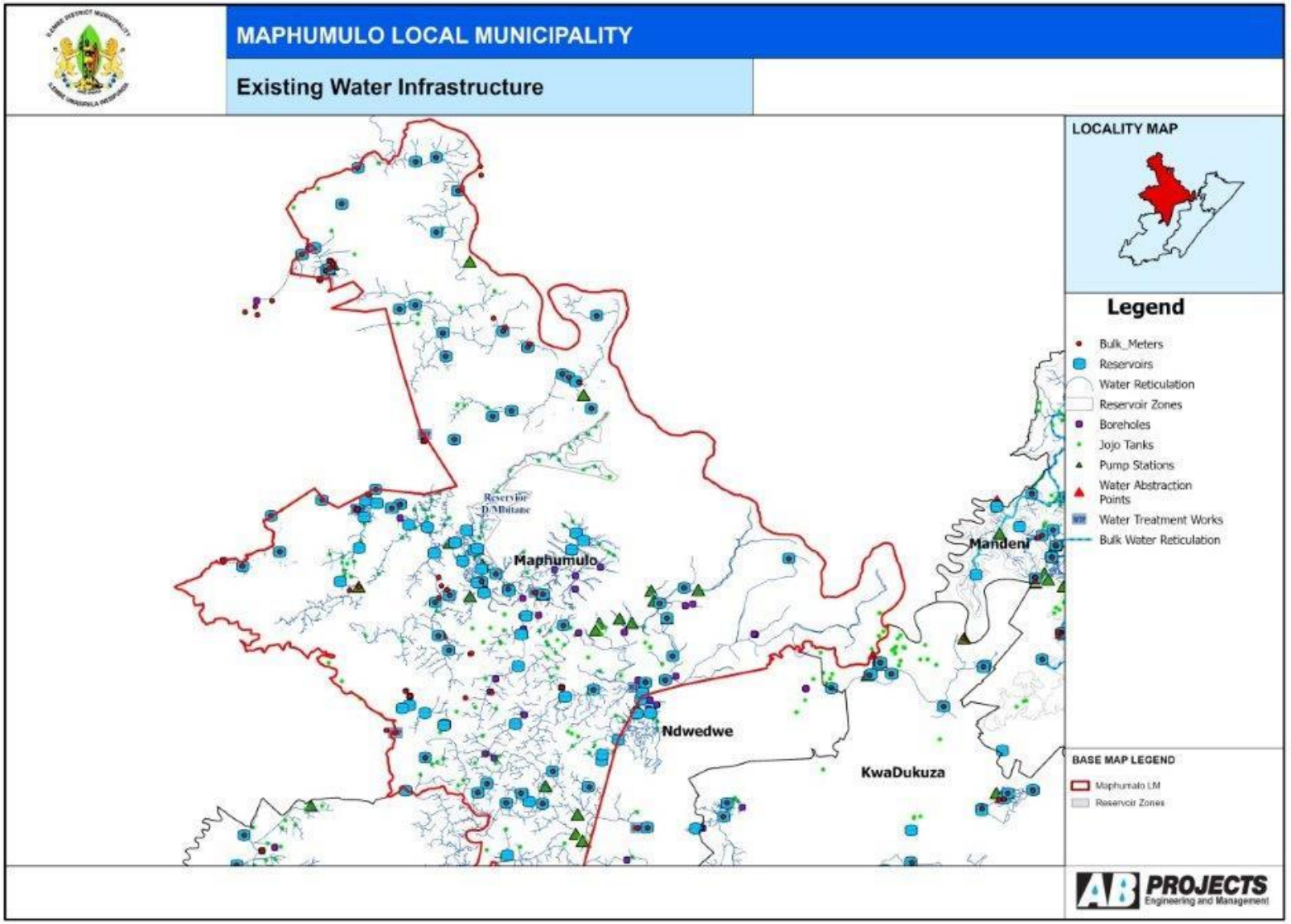
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Water Abstraction Points
Water Treatment Works
Bulk Water Reticulation
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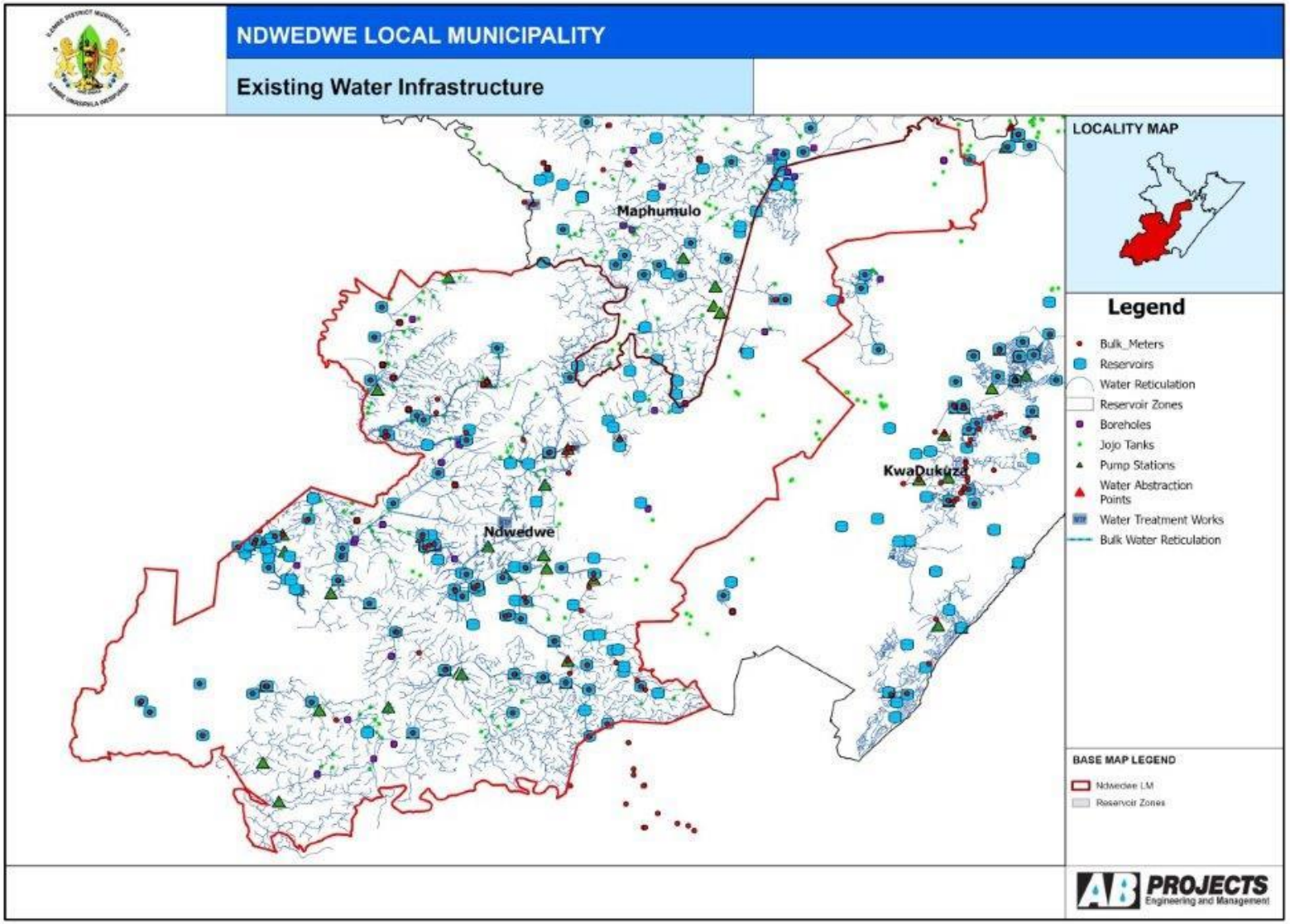
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Existing Water Infrastructure
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ANNEXURE B – WATER SUPPLY SYSTEMS - LAB TESTING REPORTS

Local Municipality	Water Treatment Work*	Failures	Possible Cause*	Recommendations	Implications	Comments
KwaDukuza LM	Lower Tugela WTW Bulk Water	Turbidity, E. coli, and Faecal conforms. Total conforms and HPC.	Poor flocculation, filtration, and disinfection process.	Minor adjustments to flocculation, filtration, and disinfection will eliminate these failures.	People may develop gastrointestinal diseases because of viruses that attach themselves to the solids that shield the virus from disinfection.	-
	Hazelmere-Groutville Supply System	No Failures	None	Excellent Water Quality Keep up the good work	None	•
	Ifalethu BH	Turbidity	Poor Borehole water There are no other treatment processes on site	Supply dean water from the alternate water supply as borehole water is not fit for human consumption.	People may develop gastrointestinal diseases because of viruses that attach themselves to the colloidal solids which shield the virus from disinfection.	•
	Ethembenl BH	E coli, Faeca' conforms. Total coliforms and HPC	Poor Borehole water, there are no other treatment processes at the site	Supply dean water from the alternate water supply as borehole water is not fit for human consumption	People may develop gastrointestinal diseases because of viruses that attach themselves to the colloidal sold which shield the virus from disinfection.	
ManrteniLM	Hlangananl BH	Turbidity. Total conforms and HPC	Poor Borehole water, there are no other treatment processes at the site	Supply dean water from the alternate water supply as borehole water is not fit for human consumption	People may develop gastrointestinal diseases because of viruses that attach themselves to the colloidal solid* which shields the virus from disinfection.	-
	Makwanini BH	Turbidity, Total conforms, and HPC.	Poor Borehole water, there are no other treatment processes on site	Supply dean water from the alternate water supply as borehole water is not fit for human consumption	People may develop gastrointestinal diseases because of viruses that attach themselves to the conodal solids which shield the virus from disinfection.	-
	Sundumbili WTW	Turbidity. Color, E. coli, Faecal conforms Total. coliforms and HPC	Poor flocculant and disinfection process Micro failure was an isolated incident on 20/04/2022	Minor adjustments to flocculation and disinfection will eliminate these failures.	Consuming water with E. coli causes bloody diarrhea and severe vomiting or kidney failure among kids.	-
Maphumulo LM	Ngcebo WTW	Turbidity Color, Faecal coliforms, Total conforms and HPC	Poor flocculation and disinfection process	Minor adjustments to flocculation and disinfection will eliminate these failures	Consuming water with Ecoil causes bloody diarrhea and severe vomiting or kidney failure among kids.	•
	Islthundu WTW	Turbidity Colour E.coli Faecal coliform, and Aluminium	WTW not fully manned Poor filtration unit, needs to be refurbished Poly dosing pumps no! working (Decatron pumps)	Refurbish filters and poly dosing pumps	People may develop gastrointestinal diseases because of viruses that attach themselves to the colloidal solids which shield the virus from disinfection.	•

		Chemical Compliance			Microbiological Compliance			Physical and Aesthetic Compliance 2		
Area	**Site**	**APRIL**	**MAY**	**JUNE**	**APRIL |" MAY J JUNE**			**APRIL I MAY |**		**JUNE**
Kwadukuza LM	**Umvoti WTW**	Plant Offline								
Mandeni LM	**SundumbiH WTW**	100.00	100.00	100.00	66.00	95.00	87.50	95.14	94.29	89.29
Maphumulo LM	**Ngcebo WTW**	100.00	100.00	100.00	75.00	100.00	95.00	92.86	96.43	97.14
	isithundu WTW	100.00	100.00	100.00	93.75	93.75	81.25	57.14	71.43	75.00
	Thafamasi BH	100.00	100.00	100.00	75.00	49.75	95.00	100.00	100.00	100.00
	Ntunjambili WTW	100.00	100.00	100.00	93.75	100.00	95.00	100.00	100.00	100.00
	Maqumbi T WTW	100.00	100.00	100.00	50.00	50.00	56.25	100.00	94.29	92.86
	Vukile WTW	100.00	100.00	100.00	> 100.00	100.00	95.00	78.57	82.14	77.14
Ndwedwe LM	**tsiminyaWTW**	Plant Offline								
	Glendale Sugar Mill WTW	100.00	100.00	100.00	56.25	50.00	81.25	96.43	100.00	100.00
	Ntabaskop WTW	Plant Offline		100.00	Plant Offline		0.00	Plant Offline		85.71
	Montebell WTW	100.00	100.00	100.00	93.75	100.00	100.00	82.14	85.71	86.43
	Esidumbini WTW	80.00	93.20	96.00	75.00	66.00	30.00	85.71	85.71	80.00
	Nsuze WTW	100.00	100.00	100.00	77.33	100.00	100.00	95.14	85.71	91.43
	Average	98.18	99.38	99.67	77.80	82.23	76.35	89.38	90.52	89.58
		Quarterly Average		**99.08**	**Quarterly Average**		**78.79**	**Quarterly Average**		**89.83**

ANNEXURE C – WATER SUPPLY SYSTEMS - SAMPLING AND WATER QUALITY TESTING LOGS

Water Quality Testing- Onsite (WTW/BH) done by the Process Controllers

Applicable To iLembe DM Water Treatment Works			
Determinants	**Frequency per shift**	**Raw Water**	**Final Water**
Turbidity	2,4,8 or daily - dependant on plant requirements	x	x
pH/Temperature	2,4,8 or daily - dependant on plant requirements	x	x
Conductivity	2,4,8 or daily - dependant on plant requirements	x	x
Temperature	2,4,8 or daily - dependant on plant requirements	x	x
Residual Chlorine	2,4,8 or daily - dependant on plant requirements		x

Applicable To iLembe DM Borehole Systems			
Determinants	**Frequency per shift**	**Raw Water**	**Final Water**
Turbidity	Weekly	Where Possible	x
pH/Temperature	Weekly	Where Possible	x
Conductivity	Weekly	Where Possible	x
Temperature	Weekly	Where Possible	x
Residual Chlorine	Weekly	Where Possible	x

ANNEXURE D – WASTEWATER SYSTEMS - DETAILED POSSIBLE CAUSES, COST IMPLICATIONS, AND RECOMMENDATIONS

Wastewater Risk Abatement Plans (WWRAPs) have been done in November 2022 for each wastewater treatment plant which included conditional assessments of the infrastructure and processes of the plant. Detailed costing is provided in the Tables below for each plant. Sundumbili WWTP has been assessed separately and is shown in tables below.

The detailed causes are provided in detail with cost implications for 3 Years. This Total Value has been escalated in the summary table showing the cost implication for the 23/24FY.

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 1														
				Wastewater Treatment Plants										
Ref. No.	Item Description	Improvement Plan	Priority	Darnall	Gledhow	Stanger	Melville	Montebello	Mphumulo	Ntunjambili	Vukile	Mandeni	Tugela
:5	Power failures	Install a generator	1		R500 000.00	R1 200 000.00	R500 000.00		R750 000.00	R500 000.00		R600 000.00	R600 000.00
)7													
)3	Inlet screening failure/blockage: Lack of Operational Staff												
C6	Failure of alarms and monitoring equipment	Upgrade pumpstation	1	R100 000.00									
		Install alarm system at the pump station.	1		R25 000.00	R50 000.00							
D1	Reduced or unknown treatment capacity related to non metering	Repair/Replace inflow meter	1	R150 000.00		R120 000.00						R80 000.00	
		Install inflow meter.	1		R100 000.00		R100 000.00				R50 000.00		
D2	Lack of calibration and maintenance of inflow meters resulting in incorrect/ inaccurate flow measurement	Calibrate inflow meter	1	R50 000.00		R20 000.00		R50 000.00	R50 000.00	R50 000.00			R20 000.00
D3	Inlet screening failure/blockage: Lack of Operational Staff	Install mechanical screen.	1	R750 000.00		R800 000.00		R350 000.00	R450 000.00			R500 000.00	R400 000.00
D9	Legal Permit for on site screening disposal	Investigate the requirements for screening disposal permit. Engage with DCLM.	1	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00
:2	Lack of desludging: Process Control related	Ensure septics tanks are desludged annually.	1				R60 000.00						
:3	Mechanical equipment failure	Upgrade primary settling tank.	1		R700 000.00								
G2	Access control	Install fencing/barrier e.g. barb wire. Also flood lights and signage.	1						R100 000.00				
		Vegetation needs to be removed so as to gain access to ponds.	1									R50 000.00	R15 000.00
G6	Overgrown with vegetation	Clear vegetation on maturation ponds.	1										R60 000.00
:4	Lack of solids wasting: Process Control related	Obtain lab equipment.	1			R120 000.00							
t1	Disinfectant not dosed: Process Control						R100 000.00				R100 000.00		
t5	Disinfection effectiveness - under or over dosing				R100 000.00						R60 000.00		R100 000.00
!3	Inefficient or inadequate opertational monitoring			R120 000.00								R100 000.00	
3	Inadequate drying beds	Replace sand on the drying beds.	1				R30 000.00						
4	Low sludge retention time/sludge age									R30 000.00			
J9	Does the treatment plant have a permit/licence?	Engage with DWS to obtain general authorisation permit.	1	R100 000.00			R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	R50 000.00	
Total Cost (per plant)				R1 320 000.00	R1 475 000.00	R2 360 000.00	R890 000.00	R500 000.00	R1 450 000.00	R680 000.00	R310 000.00	R1 430 000.00	R1 245 000.00
Grand Total Cost				R11 660 000.00									

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 2													
				Wastewater Treatment Plants									
Ref. No.	Item Description	Improvement Plan	Priority	Darnall	Gledhow	Stanger	Melville	Montebello	Mphumulo	Ntunjambili	Vukile	Mandeni	Tugela
C9	Unsafe - Due to no guard railing on pumps	Repair/Replace railings.	2			R100 000.00							
C10	Unsafe - Due to no railing on the sump or sewage tanks	Repair/Replace railings.	2			R100 000.00							
D4	Inlet screening failure/blockage: Lack of Maintenance	Repair/Replace the damaged screens	2									R100 000.00	
D5	De-gritting failure: Lack of Operational Staff	Upgrade Head of Works, install degritting channels.	2		R400 000.00			R300 000.00					
D6	De-gritting failure: Lack of Maintenance	Improve the condition of the degritting channel, by applying some coating to protect it.	2			R120 000.00							
D8	Screening disposal area availability	Screenings should be disposed offsite, engage with DCLM.	2		R20 000.00	R100 000.00	R10 000.00						
F1	Biological loading exceeds design limits	Repair power supply to the aerator.	2	R150 000.00									
		Repair the two aerators that are not working.	2			R600 000.00							
F5	Lack of solids wasting: Equipment related	Repair faulty desludging valves.	2			R120 000.00							
		Replace sludge wasting pumps	2					R100 000.00					
F6	Secondary settling tanks not able to achieve solids separation (solids overflowing)	Unblock scum valves and siphon valves.	2			R100 000.00							
		Automate the plant or hire a night shift staff	2					R250 000.00					
G2	Access control	Install fencing/barrier e.g. barb wire. Also flood lights and signage.	1						R100 000.00				
		Vegetation needs to be removed so as to gain access to ponds.	1									R50 000.00	R15 000.00
G1	Biological loading exceeds design limits	Line ponds	2					R1 200 000.00	R1 400 000.00				R1 000 000.00
G5	Pontential seepage into ground										R1 500 000.00		
G7	Sludge build up in the pond	Remove sludge build up in ponds	2					R200 000.00			R60 000.00		
H5	Disinfection effectiveness - under or over dosing	Install an automatic chlorine dosing control system.	2	R500 000.00									
		Service and calibrate lab equipment	2					R30 000.00	R60 000.00	R50 000.00			
H7	Are safety standards maintained in the storage facility.	Provide storage facility for sodium hypo containers.	2		R150 000.00								
		Install extractor fan at storage room	2					R15 000.00	R25 000.00	R25 000.00			R10 000.00
I1	Storage capacity adequacy	Install more drying beds	2				R250 000.00						
I6	Control of dry sludge stockpiles	Classify sludge	2							R50 000.00			
J11	Are operators qualified and classified as Operators/Process Controllers in terms of the DWA standard?	Provide adequate training for process controller.	2				R60 000.00						
J15	Unsafe-Are annual medicals conducted on all the site employees	Review annual medicals of emplyees	2					R10 000.00	R10 000.00	R10 000.00	R10 000.00	R10 000.00	R10 000.00
Total Cost (per plant)				R650 000.00	R570 000.00	R1 240 000.00	R320 000.00	R2 105 000.00	R1 595 000.00	R135 000.00	R1 570 000.00	R160 000.00	R1 035 000.00
Grand Total Cost (all plants)				R9 380 000.00									

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 3												
				Wastewater Treatment Plants								
Ref. No.	Item Description	Improvement Plan	Priority	Darnall	Gledhow	Stanger	Melville	Montebello	Mphumulo	Ntunjambili	Vukile	Mandeni	Tugela
A3	Sewage leakages/discharges due to lack of maintenance	Acquire another jetting machine.	3			R500 000.00							
C7	Overflow or flooding of pumpstation	Investigate alternative measure to prevent bypass form ending up in river.	3			R100 000.00							
F10	Unsafe - Due to no railing on the open channesl and tanks	Repair/Replace railings.	3									R100 000.00	
Total Cost (per plant)				R0.00	R0.00	R600 000.00	R0.00	R0.00	R0.00	R0.00	R0.00	R100 000.00	R0.00
Grand Total Cost (all plants)				R700 000.00									

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 1				
Ref. No.	Item Description	Improvement Plan	Priority	Sundumbili WWTW
:1	Plant infrastructure poses significant operational challenges.	Quotes for repair of Bio filters has been done.	1	R250 000.00
15	Electrical Panels unlocked/vandalized/poor condition - risk of injury, process interruptions.	Practice OHS compliance standards.	1	R100 000.00
)3	Operation compromised due to non-optimized treatment processes.	Replace /repair nozzles and pipes	1	R50 000.00
3	Civil structures in poor condition - risk of spillages, collapse, contamination	refurbish civil structures	1	R500 000.00
:2	Ponds sludge up - risk of reduced capacity, poor performance, short circuiting	budget to remove sludge in 2019/2020 fin year	1	R600 000.00
:4	Vegetation ingress - risk of infrastructure failure, short circuiting, capacity reduction	Clear vegetation at ponds.	1	R50 000.00
Total Cost				R1 550 000.00

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 2				
Ref. No.	Item Description	Improvement Plan	Priority	Sundumbili WWTW
C3	Residences in close proximity to chlorine dosing/cylinder storage. Risk of chlorine exposure.	Replace gate	2	R25 000.00
G2	Mechanical equipment aged/poorly maintained - risk of breakdown	Repair aged equipment	2	R800 000.00
I2	Sludge poorly conditioned/not tested - infection and odour risk, fly nuisance.	Test and Classify sludge	2	R25 000.00
K3	Civil condition poor, risk of leakage, failure	Refurbish maturation ponds	2	R800 000.00
Total Cost				R1 650 000.00

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX - YEAR 3				
Ref. No.	Item Description	Improvement Plan	Priority	Sundumbili WWTW
C2	Maturation Ponds and other process units unfenced - risk of drowning	Repair broken fence	3	R250 000.00
Total Cost				R250 000.00

Table 23: Summary - WWRAP Cost Implication 23/24FY

Plant Name	Estimated Cost - Year 1	Estimated Cost - Year 2	Estimated Cost - Year 3	Estimated Cost - Total
Sundumbili	R1,550,000.00	R1,650,000.00	R250,000.00	R3,450,000.00
Darnall	R1,320,000.00	R650,000.00		R1,970,000.00
Gledhow	R1,475,000.00	R570,000.00		R2,045,000.00
Stanger	R2,360,000.00	R1,240,000.00	R600,000.00	R4,200,000.00
Melville	R890,000.00	R320,000.00		R1,210,000.00
Montebello	R500,000.00	R2,105,000.00		R2,605,000.00
Mphumulo	R1,450,000.00	R1,495,000.00		R2,945,000.00
Ntunjambili	R680,000.00	R385,000.00		R1,065,000.00
Vukile	R310,000.00	R1,570,000.00		R1,880,000.00
Mandeni	R1,430,000.00	R110,000.00	R100,000.00	R1,640,000.00
Tugela	R1,245,000.00	R1,020,000.00		R2,265,000.00
Grand Total Cost	**R13,210,000.00**	**R11,115,000.00**	**R950,000.00**	**R25,275,000.00**

ANNEXURE E1 – WASTEWATER SYSTEMS – LOG SHEETS (JUNE 2022)

Wastewater Quality Testing- Onsite done by the Process Controllers

Determinants	Frequency	Raw water	Final Water
pH	2 Hourly	x	x
Ammonia as N	2 Hourly	x	x
Settleability test	2 Hourly		x
Dissolved Oxygen	2 Hourly		x
Residual Chlorine	2 Hourly		x
Conductivity	2 Hourly	x	x

ANNEXURE E2 – WASTEWATER SYSTEMS – MAINTENANCE LOG SHEETS

		FREQUENCY						
	OPERATIONAL AND PREVENTIVE MAINTENANCE	**DAILY**	**WEEKLY**	**MONTHLY**	**3 MONTHS**	**6 MONTHS**	**YEARLY**	**AS NECESSARY**
1	**PRE-TREATMENT**							
1.1	clean inlet, screens and properly dispose of screenings.	**X**						
1.2	check the inflow meter (Record Readings) and float well.	**X**						
1.3	Remove and dispose of rags and accumulation from comminutor and	**X**						
	bar screens							
1.4	Check for rocks or metal objects in the comminutor channel.	**X**						
1.5	Observe the flow and cutting action of	**X**						
	comminutor							
2	**INLET PUMP STATIONS**							
2.1	Remove debris	**X**						
2.2	check pump operation	**X**						
2.3	clean floats, bubblers, or other control devices		**X**					
2.4	Lubricate pump							**X**
2.5	Check exhaust fan	**X**						
2.6	Check dehumidifier	**X**						
2.7	Check alarms	**X**						
2.8	Check sump pumps		**X**					
3	**COMMINUTING DEVICES**							
3.1	Check comminutor blades		**X**					
3.2	Sharpen comminutors blades when							**X**
	cutting edge is worn 1/8 inch							
3.3	check oil level		**X**					

3.4	Grease if called for in manufacturer's instructions.							**X**
4	**CHLORINATORS**							
4.1	Check solution level in self-contained solution crook.	**X**						
4.2	Check the sodium hypochlorite tank	**X**						
4.3	Check feed rate	**X**						
4.4	Change sodium hypochlorite lank							**X**
4.5	Check dosing pump	**X**						
5	**FLOW MEASURING DEVICES**							
5.1	Check and clean floats	**X**						
5.2	Verify accuracy				**X**			
6	**VALVES AND GATES**							
6.1	Check to see if set correctly	**X**						
6.2	Check electrical controls	**X**						
6.3	Check control housing			**X**				
6.4	Check for unprotected electrical connections.	**X**						
7	**AERATION BASIN**							
7.1	Visually check the aeration system for even air distribution (There should be no dead spots)	**X**						
7.2	Raise and clean rags from elixirs	**X**						
7.3	Check blower delivery temperature	**X**						
7.4	Check for air leaks around the base and fittings of the blower	**X**						
7.5	Check blower belts for wear and tension		**X**					
7.6	Check blower motor and bearings for excessive heat.	**X**						
7.7	Check the aeration system	**X**						

	for unusual noises or vibrations.							
7.8	Check operating pressure and or vacuum.	X						
7.9	Check state of the filter.		X					
7.1	Check the blower state of the filter and related load loss		X					
7.11	Log running time for mechanical aeration	X						
7.12	check amperage on the mechanical system.				X			
8	**TREATMENT ZONE**							
8.1	Check to see if sludge collection pipes are not blocked					X		
8.2	Remove any floating material on top of liners			X				
8.3	Check sludge volume	X						
8.4	Check sludge pumps.	X						
8.5	Check the media			X				
9	**CHLORINE CONTACT TANK**							
9.1	Remove any floating material on top of contact tank	X						
9.2	Remove sludge from sodium hypochlorite tank when needed.					X		
9.3	Visual check of baffles for proper placement to ensure proper chlorine contact time.	X						
10	**TERTIARY TREATMENT**							
10.1	Clean screen on micro-strainer	X						
10.2	Lubricate micro strainer							X
10.3	Check backwash pumps	X						
10.4	Check backwash surge chamber pumps	X						
10.5	Check media						X	

11	**PUMPS AND MOTORS**							
11.1	Check for blockages in sludge pump			**X**				
11.2	Check pumps for clogging or near clogging condition.			**X**				
11.3	Lubricate pump bearings							**X**
11.4	Check pump bearings temperature							**X**
11.5	Drain pump lubricants, wash oil wells and bearings with kerosene.	**X**						
11.6	Check pump bearings for wear							**X**
11.7	Check alignment of pump and motor flange with straight edge						**X**	
11.8	Check motors for heating	**X**						
11.9	Replace pump shaft sleeves			**X**				
11.1	Examine pump wearing rings (Manufacturer should specify what is excessive)						**X**	**X**
11.1	Clean water seal piping						**X**	
11.1	Inspect foot valves and check valves					**X**		
11.1								

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	**PRE-TREATMENT**	**MON:**	**TUE:**	**WED:**	**THUR:**	**FRI:**	**SAT:**	**SUN:**
1.1	Clean inlet, screens, and property disposal screenings.							
1.2	Check the inflow meter (Recaro Readings) and float well.							
1.3	Remove and dispose of rags and accumulation from comminutor and bar screens							
1.4	Check for rocks or metal objects in the comminutor channel.							
1.5	Observe flow and cutting action of comminutor							

Signatures:

Supervisor: _____ **Date:**_____

Water Quality Technician: _____ **Date: _____**

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	INLET PUMP STATIONS	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Remove debris							
1.2	check pump operation							
1.3	clean floats, bubblers, or other control devices							
1.4	Lubricate pump							
1.5	Check exhaust fan							
1.6	Check dehumidifier							
1.7	Check alarms							
1.8	Check sump pumps							

Signatures:

Supervisor: _____ **Date:**_____

Water Quality Technician: _____ **Date:** _____

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY) DATES						
1	AERATION BASIN	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Remove debris							
1.2	check pump operation							
1.3	clean floats, bubblers, or other control devices							
1.4	Lubricate pump							
1 5	Check exhaust fan							
1.6	Check dehumidifier							
1 7	Check alarms							
1 8	Check sump pumps							
2	TREATMENT ZONE							
2 1	Check to see if sludge collection pipes are not blocked							
2.2	Remove any floating material (Monthly)							
23	Check sludge volume							
24	Check sludge pumps.							
25	Check the media (Monthly)							

Signatures:

Supervisor: _____ **Date:**_____

Water Quality Technician: _____ **Date:** _____

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	CHLORINATORS	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Check solution level in self-contained solution							
1.2	Check the sodium hypochlorite tank							
1.3	Check feed rate							
1.4	Change sodium hypochlorite tank							
1.5	Check dosing pump							
2	CHLORINE CONTACT TANK							
2.1	Remove any floating material on top of contact tank							
2.2	Remove sludge from sodium hypochlorite tank when needed.	AS AND WHEN REQUIRED						
2.3	Visual check of baffles for proper placement to ensure proper chlorine							

Signatures:

Supervisor: _____ **Date:**_____

Water Quality Technician: _____ **Date:** _____

Month:_____

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	CHLORINATORS	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Check solution level in self-contained solution crok.							
1.2	Check sodium hypochlorite tank							
1.3	Check feed rate							
1.4	Change sodium hypochlorite tank							
1.5	Check dosing pump							
2	CHLORINE CONTACT TANK							
2.1	Remove any floating material on top of contact tank							
2.2	Remove sludge from sodium hypochlorite tank when needed.	AS AND WHEN REQUIRED						
2.3	Visual check of baffles for proper placement to ensure proper chlorine contact time.							

Signatures:

Supervisor: _____ **Date:**_____

Water Quality Technician: _____ **Date:** _____

ANNEXURE F – WWRAP'S IMPROVEMENT PLAN COSTING MATRIX

WWRAP'S IMPROVEMENT PLAN COSTING MATRIX													
				Wastewater Treatment Plants									
Ref. No.	**Item Description**	**Improvement Plan**	**Priority**	**Darnall**	**Gledhow**	**Stanger**	**Melville**	**Montebello**	**Mphumulo**	**Ntunjambili**	**Vukile**	**Mandeni**	**Tugela**
A3	Sewage leakages/discharges due to lack of maintenance	Acquire another jetting machine.	3			R500 000,00							
C5	Power failures	Install a generator	1		R500 000,00	R1 200 000,00	R500 000,00		R750 000,00	R500 000,00		R600 000,00	R600 000,00
D7													
D3	Inlet screening failure/blockage: Lack of Operational Staff												
C6	Failure of alarms and monitoring equipment	Upgrade pump station	1	R100 000,00									
		Install an alarm system at the pump station.	1		R25 000,00	R50 000,00							
C7	Overflow or flooding of the pump station	Investigate alternative measures to prevent bypass from ending up in the river.	3			R100 000,00							
C9	Unsafe - Due to no guard railing on pumps	Repair/Replace railings.	2			R100 000,00							
C10	Unsafe - Due to no railing on the sump or sewage tanks	Repair/Replace railings.	2			R100 000,00							
D1	Reduced or unknown treatment capacity related to nonmetering	Repair/Replace inflow meter	1	R150 000,00		R120 000,00						R80 000,00	
		Install inflow meter.	1		R100 000,00		R100 000,00				R50 000,00		
D2	Lack of calibration and maintenance of inflow meters resulting in incorrect/ inaccurate flow measurement	Calibrate inflow meter	1	R50 000,00		R20 000,00		R50 000,00	R50 000,00	R50 000,00			R20 000,00
D3	Inlet screening failure/blockage: Lack of Operational Staff	Install mechanical screen.	1	R750 000,00		R800 000,00		R350 000,00	R450 000,00			R500 000,00	R400 000,00
D4	Inlet screening failure/blockage: Lack of Maintenance	Repair/Replace the damaged screens	2									R100 000,00	
D5	De-gritting failure: Lack of Operational Staff	Upgrade Head of Works, and install degritting channels.	2		R400 000,00			R300 000,00					
D6	De-gritting failure: Lack of Maintenance	Improve the condition of the degritting channel, by applying some coating to protect it.	2			R120 000,00							
D8	Screening disposal area availability	Screenings should be disposed of offsite, engage with DCLM.	2		R20 000,00	R100 000,00	R10 000,00						
D9	Legal Permit for on-site screening disposal	Investigate the requirements for screening disposal permits. Engage with DCLM.	1	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00
E2	Lack of desludging: Process Control related	Ensure septics tanks are desludged annually.	1				R60 000,00						
E3	Mechanical equipment failure	Upgrade primary settling tank.	1		R700 000,00								
F1	Biological loading exceeds design limits	Repair the power supply to the aerator.	2	R150 000,00									
		Repair the two aerators	2			R600 000,00							

		that are not working.											
F5	Lack of solids wasting: Equipment related	Repair faulty desludging valves.	2			R120 000,00							
		Replace sludge-wasting pumps	2					R100 000,00					
F6	Secondary settling tanks are not able to achieve solids separation (solids overflowing)	Unblock scum valves and siphon valves.	2			R100 000,00							
		Automate the plant or hire a night-shift staff	2					R250 000,00					
F10	Unsafe - Due to no railing on the open channels and tanks	Repair/Replace railings.	3									R100 000,00	
G2	Access control	Install fencing/barrier e.g. barbed wire. Also, flood lights and signage.	1						R100 000,00				
		Vegetation needs to be removed to gain access to ponds.	1									R50 000,00	R15 000,00
G1	Biological loading exceeds design limits	Line ponds	2					R1 200 000,00	R1 400 000,00				R1 000 000,00
G5	Potential seepage into the ground										R1 500 000,00		
		Clear and revive maturation ponds for use.	1							R250 000,00			
G6	Overgrown with vegetation	Clear vegetation on maturation ponds.	1										R60 000,00
G7	Sludge builds up in the pond	Remove sludge build-up in ponds	2					R200 000,00			R60 000,00		
F4	Lack of solids wasting: Process control-related	Obtain lab equipment.	1			R120 000,00							
H1	Disinfectant not dosed: Process Control						R100 000,00				R100 000,00		
H5	Disinfection effectiveness - under or overdosing				R100 000,00						R60 000,00		R100 000,00
J3	Inefficient or inadequate operational monitoring			R120 000,00								R100 000,00	
H5	Disinfection effectiveness - under or overdosing	Install an automatic chlorine dosing control system.	2	R500 000,00									
		Service and calibrate lab equipment	2					R30 000,00	R60 000,00	R50 000,00			
H7	Are safety standards maintained in the storage facility?	Provide storage facility for sodium hypo containers.	2		R150 000,00								
		Install an extractor fan in the storage room	2					R15 000,00	R25 000,00	R25 000,00			R10 000,00
I1	Storage capacity adequacy	Install more drying beds	2				R250 000,00						
I3	Inadequate drying beds	Replace sand on the drying beds.	1				R30 000,00						
I4	Low sludge retention time/sludge age									R30 000,00			
I6	Control of dry sludge stockpiles	Classify sludge	2							R50 000,00			
J9	Does the treatment plant have a permit/license?	Engage with DWS to obtain a general authorisation permit.	1	R100 000,00			R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	R50 000,00	

J11	Are operators qualified and classified as Operators/Process Controllers in terms of the DWA standard?	Provide adequate training for the process controller.	2				R60 000,00						
J15	Unsafe-Are annual medicals conducted on all the site employees	Review annual medicals of employees	2					R10 000,00	R10 000,00	R10 000,00	R10 000,00	R10 000,00	R10 000,00
Total Cost (per plant)				R1 970 000,00	R2 045 000,00	R4 200 000,00	R1 210 000,00	R2 605 000,00	R2 945 000,00	R1 065 000,00	R1 880 000,00	R1 640 000,00	R2 265 000,00
Grand Total Cost (all plants)				R21,825,000.00									

ANNEXURE G – STANDARD OPERATIONAL AND MAINTENANCE FORMS (A – H)

A. JOB CARD TEMPLATE

ILEMBE DISTRICT MUNICIPALITY

DOC NO: _____

JOB CARD	DATE	TIME	COMPLAINT RECEIVED BY
LOCATION (ADDRESS AND TELEPHONE NUMBER)		VOTE NUMBER	JOB NUMBER

JOB REQUEST	TO DEPARTMENT	ALLOCATED TO	BREAKDOWN	
			MAINTENANCE SCHEDULE	
PLEASE DO THE FOLLOWING:			OTHER MAINTENANCE	
			REVENUE	
			CAPITAL	
			ESTIMATED TIME	

CONSUMERS COMPLAINT	TO BE CHARGED		NAME AND ADDRESS OF LIABLE PARTY	SIGNATURE
	YES	NO		
WE ACCEPT LEGAL LIABILITY FOR COSTS SHOULD THE FAILURE ON MY/OUR SIDE				

B. Recommended Maintenance Intervals for Network Components

JOB REPORT	DETAILS OF WORK DONE	DATE		TIME	
		KM IN		TIME IN	
		KMS OUT		TIME OUT	
		CORRECTED KMS		CORRECTED KMS	
				VEHICLE REG NO	
DETAILS OF TIME DELAY					

REG NO	QTY	MATERIAL REQUIRED	LABOUR	O/T HOURS	TOTAL HOURS
			NAMES		
			JOB DONE BY	APPROVED BY FOREMAN	
			TO BE COMPLETED BY PLANNING PM RECORDS		
			YES	NO	
			COST	HISTORY	

ITEM NO	MAINTENANCE ACTION	DAILY	WEEKLY	MONTHLY	ANNUALLY	OTHER
1	Pipelines					
1.1	Check for leakages in system (block by block)			□		
1.2	Check and clean Chambers, Check chamber lock			□		
1.3	Take stock of spares (materials for pipe repairs)			□		
1.4	Flush entire system					□
1.5	Check marker posts and beacon (Check/Form- Proof)				□	
1.6	Refurbish marker posts and beacons					□
2	Standpipes (communal and public buildings)					
2.1	Check for leakages	□				
2.2	Clean standpipe slab and surroundings		□			
2.3	Clean soak away		□			
2.4	Maintain standpipe equipment/accessories		□			
2.5	Read meters and clean meter chambers			□		
2.6	Replace biptap				□	
3	Bulk Meters					
3.1	Reading of bulk meters			□		
3.2	Clean of chambers			□		
3.3	Check for leakages			□		
3.4	Calibration of meters				□	
3.5	Replacement of registering unit					□
3.6	Replacement entire meter					□
3.7	Check and empty all strainers protecting the bulk meters			□		
4	Consumer Meters					
4.1	Reading of meters			□		
4.2	Cleaning of meter chamber			□		
4.3	Check for leakages			□		
4.4	Check for tampering					□

4.5	Check meter accuracy					□
4.6	Replacement of the entire meter					
5	Valves					
5.1	Open and close isolating valves			□		
5.2	Check functionality of scour valves			□		
5.3	Check functionality of air valves			□		
5.4	Check functionality of pressure reducing valves			□		
5.5	Service pressure management valves {pressure controllers} every two years					□
5.6	Maintain valve equipment/accessories				□	
5.7	Replacement of valves					□
5.8	Clean valve chambers. Check the cover lock			□		
6	Fire Hydrants					
6.1	Check for leakages			□		
6.2	Check and if required refurbish beacon/marker				□	
6.3	Check functionality of hydrants			□	□	
6.4	Test flow rate of hydrants				□	
6.5	Maintain hydrant equipment/accessories				□	
6.6	Replacement of fire hydrants					□
7.	Record Keeping and reporting	□	□	□	□	

C. Reservoir Checklist

Item	Frequency	Date and Notes
Gate, gate lock and fence in good condition	Daily	
Water meters in running and in good condition	Daily	
Leaks on pipe routes	Daily	
Valve settings correct	Daily	
Leakage on reservoir outer walls	Daily	
Leakage from underfloor drainage	Daily	
Water level indicator working correctly	Weekly	
Grass cut, bushes removed and terrain clean	Weekly	
Water meter strainers cleaned	Monthly	
Take water meter readings	Monthly	
Chambers clean and in good condition	Monthly	
Chambers lids oiled and locks in good condition	Monthly	
Exercise all valves	Monthly	
Valves cleaned and corrosion free	Monthly	
Signs on gate and fence clearly readable and in good condition	Monthly	
Check water quality	Monthly	
Grease movable parts on valves	Every three months	
Drain, clean and check reservoir	Annually	

D. Pump Station Maintenance Log

Municipality: _____ Pump Station Name: _____

Location: _____ View: _____

Maintenance Repair Log:

Date of Visit	Date Pump Removed	Nature of Fault/ Comment	Service/ Repair	Recommissioning Date	Signature

E. Weekly Maintenance Checklist for Pump Stations

	Checked		Remarks
1. Submersible Pumps	Yes	No	
1.1 Check for blockages and items snagged on impeller and remove			
1.2 Start the pump and check full load current			Full load current Amps
1.3 Check pressure gauge readings			Delivery pressure kPa
1.4 Lift Pump and check operation of quick coupling (if fitted)			
1.5 Remove pump and clean off deposits with high pressure water jet (6 monthly)			
2. Centrifugal Pumps			
2.1 Check oil levels of the pump			
2.2 Check Condition of the gland packing and adjust			
2.3 Check tightness of base plate mounting bolts			
2.4 Check pump for abnormal vibration			
2.5 Check pump for abnormal temperature			
2.6 Listen for any abnormal noises			
2.7 Start the pump and check for full load current			Full load current Amps
2.8 Check pressure gauge readings			Delivery pressure kPa
2.9 Check the alignment on the motor shaft-pump shaft coupling (monthly)			
2.10 Check the condition of the coupling and coupling guard			
2.11 Check operation of the non-return valve			
2.12 Check operation of the motor cooling fan			
3. Electrical Switchgear			
3.1 Check operation of starters, contactors			
3.2 Check operation of over/under voltage protection mechanism			
3.3 Check operation of overload mechanism and circuit breakers			
3.4 Start the pump and check operation of ammeters and voltmeters			
3.5 Check proper operation of all panel lamps			
3.6 Check operation of overhead lighting			
3.7 Check operation of sump level control system			
3.8 Check operation of telemetry			

system (if fitted)			
3.9 Check condition of electrical motor bearings			

Operator/Artisan on Duty…… Signature:……

F. Weekly Maintenance Checklist for Fire Hydrants

Municipality: _____ Pump Station Name/No: _____

Monthly Schedule for: _____ Operator/Artisan: _____

Hydrant Inspection Report	
Hydrant Number	
Location	
Pressure	
Flow	
Time Flushed Min	
Water used	
Paint	
Caps	
Stems	
O-Ring	
Top Nut	
Valve	
Valve Marker	
Condition of Water	
Remarks.	

Operator/Artisan on Duty…… Signature:……

G. Weekly Maintenance Checklist for Valves

Municipality: _____ Pump Station Name/No: _____

Monthly Schedule for: _____ Operator/Artisan: _____

Control valve maintenance checklist			
Valve type: Size & class: Tag number: Manufacturer: Location:			
No.	Check	Done	Comment
1	Check for valve marker		
2	Check for the tag number		
3	Is the valve accessible		
4	Check for leaks at the valve		
5	Check for leaks in flanges		
6	Check for body leaks		
7	Check for air leakage		
8	Condition of valve stem and bolts		

Operator/Artisan on Duty…… Signature:……

H. Weekly Maintenance Checklist for Bulk Meters

Municipality: _____ Pump Station Name/No: _____

Monthly Schedule for: _____ Operator/Artisan: _____

Bulk meter maintenance checklist			
Meter type: Size: Meter number: Tag number: Manufacturer: Location:			
No.	Check	Done	Comment
1	Check meter chamber condition		
2	Is the chamber locked		
3	Are the chamber stairs intact		
4	Is the meter turning		
5	Check for body leaks		
6	Check for leaks in flanges		
7	Check for air leakage		
8	Condition of meter body and bolts		
9	Is there a strainer		

Operator/Artisan on Duty…… Signature:……

ANNEXURE H – OPERATIONAL AND PREVENTIVE MAINTENANCE PLAN

		FREQUENCY						
	OPERATIONAL AND PREVENTIVE MAINTENANCE	DAILY	WEEKLY	MONTHLY	3 MONTHS	6 MONTHS	YEARLY	AS NECESSARY
1	PRE-TREATMENT							
1.1	clean inlet, screens and properly dispose of screenings.	X						
1.2	check inflow meter (Record Readings) and float well.	X						
1.3	Remove and dispose of rags and accumulation from comminutor and bar screens	X						
1.4	Check for rocks or metal objects in the comminutor channel.	X						
1.5	Observe flow and cutting action of comminutor	X						
I 2	INLET PUMP STATIONS							
2.1	Remove debris	X						
2.2	check pump operation	X						
2.3	clean floats, bubblers or other control devices		X					
2.4	Lubricate pump							X
2.5	Check exhaust fan	X						
2.6	Check dehumidifier	X						
2.7	Check aiarms	X						
2.8	Check sump pumps		X					
3	COMMINUTING DEVICES							
3.1	Check comminutor blades		X					
3.2	Sharpen comminutors blades when cutting edge is worn 1/8 inch							X
3.3	check oil level		X					
3.4	Grease if called for in manufacturers instructions instructions							X
4	CHLORINATORS							
4.1	Check solution level in self-contained solution crok.	X						
4.2	Check sodium hypochlorite tank	X						
4.3	Check feed rate	X						
4.4	Change sodium hypochlorite tank							X
4.5	Check dosing pump	X						
5	FLOW MEASURING DEVICES							
5.1	Check and clean floats	X						
5.2	Verify accuracy				X			
6	VALVES AND GATES							
6.1	Check to see if set correctly	X						
6.2	Check electrical controls	X						
6.3	Check control housing			X				
6.4	Check for unprotected electrical connections.	X						
7	AERATION BASIN							
7.1	Visually check aeration system for even air distribution (There should be no dead spots)	X						
7.2	Raise and clean rags from lixors	X						

7.3	Check blower delivery temperature	X						
7.4	Check for air leaks around base and fittings of blower	X						
7.5	Check blower belts for wear and tension		X					
7.6	Check blower motor and bearings for excessive heat.	X						
7.7	Check aeration system for unusual noises or vibrations.	X						
7.8	Check operating pressure and or vacuum.	X						
7.9	Check state of the filter.		X					
7.10	Check blower state of the filter and related load loss		X					
7.11	Log running time for mechanical aeration	X						
7.12	check amperage on the mechanical system.				X			
8	TREATMENT ZONE							
8.1	Check to see if sludge collection pipes are not blocked					X		
8.2	Remove any floating material on top of liners			X				
8.3	Check sludge volume	X						
8.4	Check sludge pumps.	X						
8.5	Check the media			X				
9	CHLORINE CONTACT TANK							
9.1	Remove any floating material on top of contact tank	X						
9.2	Remove sludge from sodium hypochlorite tank when needed.					X		
9.3	Visual check of baffles for proper placement to ensure proper chlorine contact time.	X						
10	TERTIARY TREATMENT							
10.1	Clean screen on mico-strainer	X						
10.2	Lubricate mico strainer							X
10.3	Check backwash pumps	X						
10.4	Check backwash surge chamber pumps	X						
10.5	Check media						X	
11	PUMPS AND MOTORS							
11.1	Check for blockages in sludge pump			X				
11.2	Check pumps for clogging or near clogging condition.			X				
11.3	Lubricate pump bearings							X
11.4	Check pump bearings temparature							X
11.5	Drain pump lubricants, wash oil wells and bearings with kerosene.	X						
11.6	Check pump bearings for wear							X
11.7	Check alignment of pump and motor flange with straight edge						X	
11.8	Check motors for heating	X						
11.9	Replace pump shaft sleeves			X				
11.10	Examine pump wearing rings (Manufacturer should specify what is excessive)						X	X
11.1	Clean water seal piping						X	
11.1	Inspect foot valves and check valves					X		
11.1								

Month:,_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	**INLET PUMP STATIONS**	**MON:**	**TUE:**	**WED:**	**THUR:**	**FRI:**	**SAT:**	**SUN:**
1.1	**Remove debris**							
1.2	**check pump operation**							
1.3	**clean floats, bubblers, or other control devices**							
1.4	**Lubricate pump**							
1.5	**Check exhaust fan**							
1.6	**Check dehumidifier**							
1.7	**Check alarms**							
1.8	**Check sump pumps**							

Signatures:

Supervisor:_____Date_____

Water Quality Technician:_____Date_____

Month:,_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	PRE-TREATMENT	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	clean inlet, screens and property dispose screenings.							
1.2	check inflow meter (Recaro Readings) and float well.							
1.3	Remove and dispose of rags and accumulation from comminutor and bar screens							
1.4	Check for rocks or metal objects in comminutor channel.							
1.5	Observe flow and cutting action of comminutor							

Signatures:

Supervisor:_____Date_____

Water Quality Technician:_____Date_____

Month:,_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	AERATION BASIN	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Remove debris							
1.2	check pump operation							
■1.3	clean floats, bubblers or other control devices							
1 *4*	Lubricate pump							
1 5	Check exhaust fan							
1.6	Check dehumidifier							
1 7	Check alarms							
1 8	Check sump pumps							
2	TREATMENT ZONE							
2 1	Check to see if sludge collection pipes are not blocked							
2.2	Remove any floating matenal on top of I ners (Monthly)							
23	Check sludge volume							
24	Check sludge pumps.							
25	Check the media (Monthly)							

Signatures:

Supervisor:_____Date_____

Water Quality Technician:_____Date_____

Month:,_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	CHLORINATORS	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Check solution level in self contained solution crok.							
1.2	Check sodium hypochlorite tank							
1.3	Check feed rate							
1.4	Change sodium hypochlorite tank							
1.5	Check dosing pump							
2	CHLORINE CONTACT TANK							
2.1	Remove any floating material on top of contact tank							
2.2	Remove sludge from sodium hypochlorite tank when needed.	AS AND WHEN REQUIRED						
2.3	Visual check of baffles for proper placement to ensure proper chlorine contact time.							

Signatures:

Supervisor:_____Date_____

Water Quality Technician:_____Da

Month:_____

ITEM	OPERATIONAL AND PREVENTIVE MAINTENANCE	FREQUENCY (DAILY/WEEKLY)						
		DATES						
1	CHLORINATORS	MON:	TUE:	WED:	THUR:	FRI:	SAT:	SUN:
1.1	Check solution level in self contained solution crok.							
1.2	Check sodium hypochlorite tank							
1.3	Check feed rate							
1.4	Change sodium hypochlorite tank							
1.5	Check dosing pump							
2	CHLORINE CONTACT TANK							
2.1	Remove any floating material on top of contact tank							
2.2	Remove sludge from sodium hypochlorite tank when needed.	AS AND WHEN REQUIRED						
2.3	Visual check of baffles for proper placement to ensure proper chlorine contact time.							

Signatures:

Supervisor:_____Date_____

Water Quality Technician:_____Date_____

ANNEXURE I – LOCATIONS OF WATER AND SANITATION PUMP STATIONS, WATER AND WASTEWATER TREATMENT PLANTS

WASTEWATER TREATMENT WORKS

LOCATIONS OF WASTEWATER TREATMENT WORKS (WWTW)	Co-ordinates (X)	Co-ordinates (y)
DARNALL WASTEWATER TREATMENT WORKS (WWTW)	-29.2784	31.3664
GLEDHOW WWTW	-29.3666	31.28905
SUNDHUMBILI SEWER PLANT WWTW	-29.1235	31.41118
TUGELA SEWER PLANT	-29.1749	31.42069
STANGER WASTEWATER TREATMENT WORKS	-29.3376	31.3064
VUKILE SEWEGE PLANT	-29.1477	31.0747
SHAKASKRAAL SEWAGE TREATMENT WORKS	-29.449	31.22218
MONTEBELLO SEWER TREATMENT PLANT	-29.4405	30.8101
FRASERS SEWAGE TREATMENT WORKS	-29.5404	31.19358
MPHUMULO HOSPITAL SEWEGE WORKS	-29.1454	31.0431
NTUNJAMBILI SEWEGE WORKS	-28.9422	30.94801
MANDINI WWTW	-29.1711	31.42444
MELLVILLE SEWER TREATMENT WORKS	31.41021	-29.1244
SHEFFIELD SEWERAGE TREATMENT WORKS	-29.4557	31.25348
NTUNJAMBILI SEWEGE WORKS (WWTW)	-28.9417	30.94826
AMATIKULU SEWER PLANT	-29.1252	31.57864
SUNDHUMBILI SEWER PLANT WWTW (SUNDUMBILI WWTW)	-29.1253	31.41023
Darnall Sewerage Works	0	0
TS/140/2014	0	0
Melville Sewer Treatment Works		

WATER TREATMENT WORKS

Water Treatment Plants (IDM)	Co-ordinates (X)	Co-ordinates (y)
SUNDUMBILI WATER TREATMENT PLANT	-29.1351	31.37836
TUGELA WATER TREATMENT PLANT	-29.1684	31.3921
MPHUMULO HOSPITAL WATER TREATMENT PLANT	-29.1442	31.0403
MONTEBELLO WATER TREATMENT PLANT	-29.4403	30.80569
ESIDUMBINI WATER TREATMENT PLANT	-29.3795	31.00999
VUKILE WATER TREATMENT PLANT	-29.1439	31.0721
NTUNJAMBILI WTP	-28.9454	30.94557
UMVOTI WATER TREATMENT WORKS	-29.3535	31.2441
GOGOVUMA WATER TREATMENT WORKS/PLANT	-29.3119	31.04559
OCHENI WTW SPRING PROTECTION EYE NO.2	-29.1447	31.01688
GLENDALE WATER TREATMENT PLANT	-29.2886	31.13477
MANDENI WATER TREATMENT PLANT	-29.1582	31.40195
MAYELISWENI WATER TREATMENT PLANT	-29.438	30.81529
SIMENYA WATER TREATMENT PLANT	-29.4704	30.9428
MASIBAMBISANE WATER TREATMENT PLANT	-29.138	31.038
NGCEBO WTW	-28.8976	31.02481
LAMELA PACKAGE PLANT	-29.2711	31.35898
HLIMBITWA NO.2 PURIFICATION PLANT	-29.1797	31.01893
HLIMBITWA NO.1 PURIFICATION PLANT	-29.1246	30.88088
BULWER FARM OLD WATER TREATMENT WORKS	-29.1884	31.2827
ISITHUNDU PACKAGE PLANT	-29.2299	30.98616
Nsuze Water Treatment Works	-29.3115	31.04645
WATER FALL WATER TREATMENT PLANT	-29.3747	31.03916
GOGOVUMA WATER TREATMENT PLANT (Assets where moved to either Esidumbini or Mayelisweni WTW; Only Fen	-29.3119	31.04559
Ndulinde Water Supply Scheme Phase 1	0	0
GOGOVUMA WATER TREATMENT PLANT	-29.3117	31.04588
Waterfall WTW		
Esidumbini Water Treatment Works		
Esidumbini Water Treatment		
HLIMBITHWA NO.1 PURIFICATION PLANT (WTW)	-29.1249	30.88101
VUKILE WATER TREATMENT PLANT (@ VUKILE ABSTRACTION)		
HLIMBITWA NO.2 PURIFICATION PLANT (HLIMBITHWA WTW)	-29 179 589	31 018 937

ANNEXURE K – ASSETS THAT NEED TO BE REPLACED FOR 2022/2023FY AND 2023/2024 FY.

Table 24: Assets that are nearing the end of their useful life

Barcode	Description	Acquisition Date	Purch Price	Replacement Cost	Remain Useful Life Days(20211130)	Type
'M101678	Self Primming Dual Pump Set 1	20030701	R29 598,99	R58 866,47	213	Sanitation Infrastructure
'M101679	Self Primming Dual Pump Set 2	20030701	R29 598,99	R58 866,47	213	Sanitation Infrastructure
'M101900	Sludge Pump	20030701	R44 209,01	R87 922,88	213	Sanitation Infrastructure
'M103025	Control Panel	20150202	R1 816 415,43	R2 513 374,03	64	Water Supply Infrastructure
'M103064	Electrical Components	20150202	R1 816 415,43	R2 513 374,03	64	Water Supply Infrastructure
'M103806	Safety Shower	20030701	R2 331,55	R4 636,99	213	Water Supply Infrastructure
'M111336	Distribution Box	20100630	R6 146,99	R10 148,07	213	Water Supply Infrastructure
'M111779	Control Panel	20100630	R2 187 921,95	R3 612 040,35	213	Water Supply Infrastructure
A000648	Electrical Motor 1	20030701	R45 306,28	R90 105,13	213	Sanitation Infrastructure
'M100841	Plumbing	20030701	R9 061,26	R18 021,03	213	Sanitation Infrastructure
'A000015	Motor 2 (4.4KW)	20030701	R4 462,05	R8 874,13	213	Water Supply Infrastructure
'A000013	Motor 1 (5.5KW)	20030701	R4 462,05	R8 874,13	213	Water Supply Infrastructure
'M103649	Outlet Meter	20030701	R1 925,54	R3 829,51	213	Water Supply Infrastructure
'M103681	Inlet Meter	20030701	R1 925,54	R3 829,51	213	Water Supply Infrastructure
'M103644	Meter	20030701	R1 892,83	R3 764,46	213	Water Supply Infrastructure
'M103645	Meter / Gauge	20030701	R1 892,83	R3 764,46	213	Water Supply Infrastructure
'M103673	Meter	20030701	R1 892,83	R3 764,46	213	Water Supply Infrastructure
'A000017	Motor 1	20030701	R9 464,13	R18 822,26	213	Water Supply Infrastructure
'A000019	Motor 2	20030701	R9 464,13	R18 822,26	213	Water Supply Infrastructure
'M107314	Telemetry	20030701	R16 038,03	R31 896,43	213	Water Supply Infrastructure
'M103491	Water Meter	20030701	R1 000,00	R1 988,80	213	Water Supply Infrastructure
'M107422	Meter / Gauge	20030701	R16 878,35	R33 567,66	213	Water Supply Infrastructure
'M103191	Distribution Box	20161025	R14 133,47	R18 919,06		Water Supply Infrastructure
'M111791	Control Pannel	20141001	R3 247 775,39	R4 693 360,22		Water Supply Infrastructure
'M111785	Control Panel	20141119	R2 312 903,47	R3 342 376,80		Water Supply Infrastructure
'M111578	Distribution Box	20060630	R38 103,98	R73 094,86	213	Water Supply Infrastructure
'M111579	Distribution Box	20060630	R38 103,98	R73 094,86	213	Water Supply Infrastructure
'M111777	Electrical Components	20141130	R1 265 626,44	R1 828 956,77		Water Supply Infrastructure
'M102997	Switchgear	20150202	R1 816 415,43	R2 513 374,03	64	Water Supply Infrastructure
'M100521	Self Primming Dual Pump Set 2	20030701	R5 454,51	R10 847,93	213	Sanitation Infrastructure
'M103512	Flood Light	20030701	R1 021,12	R2 030,80	213	Water Supply Infrastructure
'M103704	Meter / Gauge	20030701	R2 042,24	R4 061,61	213	Water Supply Infrastructure
'M107570	Telemetry	20030701	R19 401,24	R38 585,19	213	Water Supply Infrastructure

A000853	Motor 1	20030701	R29 612,41	R58 893,16	213	Water Supply Infrastructure
'A000413	Motor 2	20030701	R59 224,83	R117 786,34	213	Water Supply Infrastructure
'M106883	Submersible Pump 2.2Kw	20030701	R13 886,89	R27 618,25	213	Water Supply Infrastructure
'M103702	Meter / Gauge	20030701	R2 152,47	R4 280,83	213	Water Supply Infrastructure
'M103723	Outlet Meter	20030701	R2 083,03	R4 142,73	213	Water Supply Infrastructure
'M107657	Telemetry	20030701	R19 094,48	R37 975,10	213	Water Supply Infrastructure
'M103694	Telemetry	20030701	R2 098,01	R4 172,52	213	Water Supply Infrastructure
'M103735	Water Meter	20030701	R2 307,81	R4 589,77	213	Water Supply Infrastructure
'M103734	Meter / Gauge	20030701	R2 307,81	R4 589,77	213	Water Supply Infrastructure
'M103942	Chamber Structure	20030701	R2 622,51	R5 215,65	213	Water Supply Infrastructure
'M103941	Manhole	20030701	R2 622,51	R5 215,65	213	Water Supply Infrastructure
'M104430	Water Meter	20030701	R5 140,12	R10 222,67	213	Water Supply Infrastructure
'M103532	Outlet Meter	20030701	R1 144,87	R2 276,92	213	Water Supply Infrastructure
'M103531	Meter / Gauge	20030701	R1 144,87	R2 276,92	213	Water Supply Infrastructure
'M103540	Meter / Gauge	20030701	R1 144,87	R2 276,92	213	Water Supply Infrastructure
'M103731	Water Meter	20030701	R2 289,75	R4 553,85	213	Water Supply Infrastructure
'M104357	Manhole	20030701	R4 961,12	R9 866,68	213	Water Supply Infrastructure
'M106805	Telemetry	20030701	R13 356,87	R26 564,14	213	Water Supply Infrastructure
'M103738	Flow Meter	20030701	R2 367,57	R4 708,62	213	Water Supply Infrastructure
'M103758	Meter / Gauge	20030701	R2 367,57	R4 708,62	213	Water Supply Infrastructure
'M103759	Meter / Gauge	20030701	R2 367,57	R4 708,62	213	Water Supply Infrastructure
'M104037	Meter / Gauge	20030701	R2 367,57	R4 708,62	213	Water Supply Infrastructure
'M104599	Plumbing	20030701	R3 551,35	R7 062,92	213	Water Supply Infrastructure
'M109539	Telemetry	20030701	R120 272,54	R239 198,03	213	Water Supply Infrastructure
'M103746	Water Meter	20030701	R2 430,26	R4 833,30	213	Water Supply Infrastructure
'M104702	Manhole	20030701	R6 075,65	R12 083,25	213	Water Supply Infrastructure
'M107572	Telemetry	20030701	R19 442,07	R38 666,39	213	Water Supply Infrastructure
'M104012	Water Meter	20030701	R2 285,85	R4 546,10	213	Water Supply Infrastructure
'M103604	Outlet Meter	20030701	R1 604,42	R3 190,87	213	Water Supply Infrastructure
'M103602	Meter / Gauge	20030701	R1 604,42	R3 190,87	213	Water Supply Infrastructure
'M103603	Outlet Meter	20030701	R1 604,42	R3 190,87	213	Water Supply Infrastructure
'M103691	Outlet Meter	20030701	R2 065,01	R4 106,89	213	Water Supply Infrastructure
'M100305	Telemetry	20030701	R1 352,90	R2 690,65	213	Sanitation Infrastructure
'M100354	Digestor Mcc	20030701	R2 769,83	R5 508,64	213	Sanitation Infrastructure
'M100380	Luminaire	20030701	R3 518,43	R6 997,45	213	Sanitation Infrastructure
'M100381	Luminaire	20030701	R3 518,43	R6 997,45	213	Sanitation Infrastructure
'M100382	Luminaire	20030701	R3 518,43	R6 997,45	213	Sanitation Infrastructure
'A000709	Motor 1	20030701	R6 912,06	R13 746,70	213	Sanitation Infrastructure

'A000708	Motor 2	20030701	R6 912,06	R13 746,70	213	Sanitation Infrastructure
'M101643	Motor	20030701	R27 214,51	R54 124,22	213	Sanitation Infrastructure
'M101697	Motor	20030701	R28 691,87	R57 062,39	213	Sanitation Infrastructure
'M101721	Motor	20030701	R27 497,14	R54 686,31	213	Sanitation Infrastructure
'M101684	Motor 1	20030701	R30 141,75	R59 945,91	213	Sanitation Infrastructure
'M101790	Flow Meter	20030701	R35 650,74	R70 902,19	213	Sanitation Infrastructure
'M101813	Grease Pump 1	20030701	R36 509,79	R72 610,67	213	Sanitation Infrastructure
'M101814	Grease Pump 2	20030701	R36 509,79	R72 610,67	213	Sanitation Infrastructure
'M101966	Motor 2	20030701	R47 716,28	R94 898,14	213	Sanitation Infrastructure
'M102019	Motor 2	20030701	R49 258,94	R97 966,18	213	Sanitation Infrastructure
'M102083	Motor 1	20030701	R61 983,02	R123 271,83	213	Sanitation Infrastructure
'M102318	Screw Pump 1	20030701	R175 358,47	R348 752,93	213	Sanitation Infrastructure
'M102319	Screw Pump 2	20030701	R175 358,47	R348 752,93	213	Sanitation Infrastructure
'M103242	Distribution Box	20170331	R44 819,21	R57 041,41	121	Water Supply Infrastructure
'M101276	Motor 1	20030701	R16 904,30	R33 619,27	213	Sanitation Infrastructure
'M101277	Motor 2	20030701	R16 904,30	R33 619,27	213	Sanitation Infrastructure
'A000558	Motor	20030701	R22 539,07	R44 825,70	213	Sanitation Infrastructure
'M103895	Gauge	20030701	R2 792,17	R5 553,07	213	Water Supply Infrastructure
'M104211	Telemetry	20030701	R4 467,46	R8 884,88	213	Water Supply Infrastructure
'M104656	Outlet Meter	20030701	R5 584,33	R11 106,12	213	Water Supply Infrastructure
'M103554	Luminaire	20030701	R1 285,90	R2 557,40	213	Water Supply Infrastructure
'M103560	Luminaire	20030701	R1 285,90	R2 557,40	213	Water Supply Infrastructure
'M103582	Luminaire	20030701	R1 285,90	R2 557,40	213	Water Supply Infrastructure
'M103583	Luminaire	20030701	R1 285,90	R2 557,40	213	Water Supply Infrastructure
'M107358	Submersible Pump 1	20030701	R17 145,28	R34 098,53	213	Water Supply Infrastructure
'M107359	Submersible Pump 2	20030701	R17 145,28	R34 098,53	213	Water Supply Infrastructure
'M107067	High Lift Pumps Small 90Kw 1	20030701	R15 081,30	R29 993,69	213	Water Supply Infrastructure
'M107129	High Lift Pumps Small 90Kw 2	20030701	R15 626,41	R31 077,80	213	Water Supply Infrastructure
'M108795	Submersible Pump 2	20030701	R43 608,58	R86 728,74	213	Water Supply Infrastructure
'M108796	Submersible Pump 1	20030701	R43 608,58	R86 728,74	213	Water Supply Infrastructure
'M105775	Flow Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105774	Flow Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105777	Gauge	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105907	Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105909	Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105910	Flow Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105908	Meter / Gauge	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure

'M105911	Gauge	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105912	Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105913	Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M105914	Flow Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M106120	Minor Structure Fabric	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M106121	Minor Structure Fabric	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M106122	Meter	20030701	R9 085,12	R18 068,49	213	Water Supply Infrastructure
'M107065	High Lift Pumps Big 500Kw 1	20030701	R15 081,30	R29 993,69	213	Water Supply Infrastructure
'M107066	High Lift Pumps Big 500Kw 2	20030701	R15 081,30	R29 993,69	213	Water Supply Infrastructure
'M107130	High Lift Pumps Small 90Kw 4	20030701	R15 626,41	R31 077,80	213	Water Supply Infrastructure
'M108024	Circulation Pump 1	20030701	R21 804,29	R43 364,37	213	Water Supply Infrastructure
'M108025	Circulation Pump 2	20030701	R21 804,29	R43 364,37	213	Water Supply Infrastructure
'M108588	Backwash Pump 1	20030701	R36 340,48	R72 273,95	213	Water Supply Infrastructure
'A000363	Pump 4	20070630	R14 509,97	R27 364,35	212	Water Supply Infrastructure
'M102169	Submersible Pump 2	20040630	R53 647,32	R103 646,62	213	Sanitation Infrastructure
'M103745	Water Meter	20030701	R2 298,56	R4 571,38	213	Water Supply Infrastructure
'M103720	Telemetry	20030701	R2 081,29	R4 139,27	213	Water Supply Infrastructure
'M108401	Borehole Pump	20030701	R30 078,10	R59 819,33	213	Water Supply Infrastructure
'M103721	Water Meter	20030701	R2 081,29	R4 139,27	213	Water Supply Infrastructure
'M103722	Meter / Gauge	20030701	R2 081,29	R4 139,27	213	Water Supply Infrastructure
'M103509	Manhole Cover	20030701	R922,23	R1 834,13	213	Water Supply Infrastructure
'M103617	Meter / Gauge	20030701	R1 613,89	R3 209,70	213	Water Supply Infrastructure
TOTAL REPLACEMENT VALUE				R25 115 042,31		

The Assets tabled above is a list of assets that are nearing its end of useful life. The Total amount of R25 115 042.31 is the current replacement cost of these assets. This value is incorporated in the estimated budget for the 2023/2024 operations and maintenance cost.

Table 25: Impaired Assets for 22/23FY with current replacement cost

Parent Asset No	Description	Reporting Class	Date in use	End date	UL days	UL used	CRC - CURRENT REPLACEMENT COST
8882	Pipe	Water Infrastructure	2016-06-18	2026-06-29	3663	2203	R28 691,57
16095	90mm dia upvc class 12	Water Infrastructure	2019-10-07	2026-06-29	2457	997	R716 894,42
16184	Grundfos CR32-B Motor 2	Water Infrastructure	2019-08-26	2034-06-29	5421	1039	R222 847,46
6284	Fence Fabric	Water Infrastructure	2016-05-09	2059-06-29	15756	2243	R189 055,91
16185	Grundfos CR32-B Pump 2	Water Infrastructure	2019-08-26	2029-06-29	3595	1039	R179 536,78
2332	Water Pump Station A Asset - Elect	Water Infrastructure	2017-08-03	2034-06-29	6174	1792	R227 300,36
16005	Borehole lined	Water Infrastructure	2015-09-08	2056-06-29	14905	2487	R89 740,35
16949	Gledhow PS- Pump 1	Waste water Infrastructure	2020-12-10	2029-06-29	3123	567	R65 358,72
8852	Manhole	Water Infrastructure	2016-06-18	2039-06-29	8411	2203	R100 245,60
16209	Motor 1 Grundfos 11kw	Water Infrastructure	2019-11-27	2036-06-29	6059	946	R53 946,15
14023	Motor 1	Waste water Infrastructure	2015-02-04	2059-06-29	16216	2703	R145 742,08
15653	Earth Walls Oxidation Ponds 4	Waste water Infrastructure	2008-06-30	2065-09-07	20888	5113	R206 170,20
8857	Pump	Water Infrastructure	2016-06-18	2059-06-29	15716	2203	R44 698,24
15998	Borehole pump	Water Infrastructure	2015-09-08	2056-06-29	14905	2487	R157 422,90
14024	Pump 2	Waste water Infrastructure	2015-02-04	2059-06-29	16216	2703	R224 161,64
6436	Nkwambase Resevoir	Water Infrastructure	2008-06-30	2036-06-29	10226	5113	R986 629,47
13900	Palisade Concrete Fence	Waste water Infrastructure	2015-08-31	2035-12-09	7405	2495	R34 983,05
2126	Reservoir	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R1 690,12
13899	Palisade Concrete Fence	Waste water Infrastructure	2015-08-31	2034-11-26	7027	2495	R34 983,05
15192	Humus Pump Motor 2 15 kw 380V	Waste water Infrastructure	2019-11-15	2032-06-29	4610	958	R25 379,62
8871	Shaft & Casing	Water Infrastructure	2016-06-18	2036-06-29	7316	2203	R9 508,50
13889	Fence Gate	Waste water Infrastructure	2015-08-31	2034-11-14	7015	2495	R26 976,02
13865	Fence Gate	Waste water Infrastructure	2015-08-31	2034-11-09	7010	2495	R18 437,53
15995	Borehole lined	Water Infrastructure	2015-09-08	2027-06-29	4312	2487	R102 362,73
13922	Pumpstation Sump	Waste water Infrastructure	2014-07-31	2039-10-07	9199	2891	R52 272,92
8890	Shaft & Casing	Water Infrastructure	2016-06-18	2026-06-29	3663	2203	R9 508,50
3977	Outlet Pipe	Water Infrastructure	2009-06-30	2059-06-29	18261	4748	R1 662,21
3897	Pipe	Water Infrastructure	2006-06-30	2059-06-29	19357	5844	R1 338,60
285	Shaft & Casing	Water Infrastructure	2012-06-30	2059-06-29	17165	3652	R776,06
5118	Chamber Structure 18	Water Infrastructure	2015-08-27	2059-06-29	16012	2499	R3 150,89
8839	Manhole	Water Infrastructure	2016-06-18	2039-06-29	8411	2203	R930,90
416	Foundation	Water Infrastructure	2009-06-30	2056-06-29	17166	4748	R3 550,55
418	Foundation	Water Infrastructure	2009-06-30	2056-06-29	17166	4748	R3 550,55
4868	Fence Gate 17	Water Infrastructure	2015-08-27	2059-06-29	16012	2499	R2 461,02

4869	Fence Gate	Water Infrastructure	2015-08-27	2059-06-29	16012	2499	R2 461,02
1901	Walls	Water Infrastructure	2009-06-30	2060-06-29	18627	4748	R12 459,96
4258	Steel Ladder	Water Infrastructure	2015-08-27	2056-06-29	14917	2499	R1 399,10
297	Fence Gate	Water Infrastructure	2012-06-30	2059-06-29	17165	3652	R1 226,16
3190	Fence Gate	Water Infrastructure	2014-11-10	2032-06-29	6441	2789	R740,38
2635	Fence Gate	Water Infrastructure	2009-06-30	2059-06-29	18261	4748	R656,15
4298	Roof	Water Infrastructure	2015-08-27	2056-06-29	14917	2499	R1 439,62
395	Chamber Structure	Water Infrastructure	2004-06-30	2056-06-29	18992	6574	R776,06
2401	Fence Fabric razor wire	Water Infrastructure	2015-08-27	2026-06-29	3959	2499	R145,23
13511	Sump 2	Waste water Infrastructure	2009-06-30	2053-06-30	16071	4748	R3 132,62
396	Foundation	Water Infrastructure	2009-06-30	2056-06-29	17166	4748	R3 550,55
3859	Pipe	Water Infrastructure	2006-06-30	2034-06-29	10226	5844	R1 338,60
281	Block Foundation	Water Infrastructure	2012-06-30	2028-06-29	5843	3652	R776,06
5844	Crane	Water Infrastructure	2015-08-27	2059-06-29	16012	2499	R24 270,55
12973	Valve 2	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R549,38
14264	Hand Rails	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R1 150,19
6991	Inlet/Outlet Valve 1	Water Infrastructure	2009-06-30	2046-06-29	13513	4748	R1 371,11
1426	Chamber Structure	Water Infrastructure	2009-06-30	2059-06-29	18261	4748	R2 686,95
2807	Manhole	Water Infrastructure	2015-08-27	2024-06-29	3229	2499	R520,26
420	1.8M Bob Wire Fence	Water Infrastructure	2009-06-30	2056-06-29	17166	4748	R1 722,83
326	Valve 2	Water Infrastructure	2012-06-30	2034-06-29	8034	3652	R1 396,90
6916	Inlet/Outlet Valve 5	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 246,47
14176	Walkway	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R1 150,19
379	CHAMBER STRUCTURE	Water Infrastructure	2009-06-30	2056-06-29	17166	4748	R2 677,20
8832	Electrical Components	Water Infrastructure	2016-06-18	2030-06-29	5124	2203	R2 568,22
6973	Inlet/Outlet Valve 5	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R1 246,47
1329	Cover Material	Water Infrastructure	2006-06-30	2059-06-29	19357	5844	R1 518,49
13001	Fence	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R917,66
195	Outlet Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R523,96
6917	Inlet/Outlet Valve 6	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R1 246,47
13002	Manhole	Waste water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 067,45
8865	Manhole	Water Infrastructure	2016-06-18	2023-06-29	2567	2203	R930,90
3955	Inlet Pipe	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 662,21
4256	Steel Ladder	Water Infrastructure	2015-08-27	2029-06-29	5055	2499	R1 399,10
13015	Valve 1	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R1 068,41
1254	Inlet Pipe	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R928,05
12972	Valve 1	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R549,38
1639	Chamber Structure	Water Infrastructure	2009-06-30	2058-06-29	17896	4748	R4 740,49

6839	Inlet/Outlet Valve 4	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R1 246,47
191	Telemerty	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R537,39
244	Borehole Casing	Water Infrastructure	2009-06-30	2033-06-30	8766	4748	R944,88
13016	Valve 2	Waste water Infrastructure	2009-06-30	2031-06-29	8034	4748	R1 068,41
5264	Fence Fabric 16	Water Infrastructure	2015-08-27	2036-06-29	7612	2499	R4 049,29
6874	Inlet/Outlet Valve 2	Water Infrastructure	2009-06-30	2031-06-29	8034	4748	R1 129,62
7190	Automatic Air Release Valve	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 916,88
12996	Fence Gate	Waste water Infrastructure	2006-06-30	2026-06-29	7304	5844	R756,63
1521	Roof	Water Infrastructure	2015-08-27	2029-06-29	5055	2499	R1 439,62
6902	Inlet/Outlet Valve 3	Water Infrastructure	2009-06-30	2031-06-29	8034	4748	R1 215,31
231	Supporting Structure	Water Infrastructure	2012-06-30	2024-06-29	4382	3652	R776,06
1766	Chamber Structure	Water Infrastructure	2012-06-30	2059-06-29	17165	3652	R5 326,97
12969	Luminaire	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R640,47
13608	Walls	Waste water Infrastructure	2009-06-30	2043-06-30	12418	4748	R4 815,63
3068	Valve	Water Infrastructure	2006-06-30	2034-06-29	10226	5844	R1 338,60
6901	Inlet/Outlet Valve 2	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 215,31
13400	Tank Containment Structure	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R2 134,90
1840	Meter / Gauge	Water Infrastructure	2015-08-27	2039-06-29	8707	2499	R5 288,22
3964	Foundation	Water Infrastructure	2015-08-27	2026-06-29	3959	2499	R1 117,41
1085	Inlet Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R928,05
5187	Foundation 17	Water Infrastructure	2015-08-27	2036-06-29	7612	2499	R3 437,93
12985	Fence Gate	Waste water Infrastructure	2006-06-30	2026-06-29	7304	5844	R917,66
2730	Wire Fence	Water Infrastructure	2003-07-01	2045-02-03	15193	6939	R1 532,52
5386	Fence Fabric	Water Infrastructure	2015-08-27	2036-06-29	7612	2499	R5 809,26
13208	Valve 1	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R1 748,13
13249	Valve 1	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R1 820,14
13250	Valve 2	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R1 820,14
2858	Telemetry	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 186,29
7187	Valve	Water Infrastructure	2009-06-30	2031-06-29	8034	4748	R1 723,50
6939	Inlet/Outlet Valve 1	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R1 215,31
1427	Tank Containment Structure	Water Infrastructure	2012-06-30	2056-06-29	16070	3652	R5 326,97
1688	Internal Finishes & Fittings	Water Infrastructure	2015-08-27	2029-06-29	5055	2499	R2 522,86
1764	Chamber Structure	Water Infrastructure	2012-06-30	2029-06-29	6208	3652	R3 995,23
6903	Inlet/Outlet Valve 3	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R1 215,31
6904	Inlet/Outlet Valve 4	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R1 215,31
6940	Telemerty	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R1 723,50
13037	Gate Valve 2	Waste water Infrastructure	2009-06-30	2026-06-30	6209	4748	R1 200,71
4888	Structural Fabric	Water Infrastructure	2015-08-27	2029-06-29	5055	2499	R2 498,01

325	Valve 1	Water Infrastructure	2012-06-30	2024-06-29	4382	3652	R1 396,90
3127	Valve	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 662,21
1335	Telemerty	Water Infrastructure	2006-06-30	2059-06-29	19357	5844	R3 217,16
15055	Humus Tank	Waste water Infrastructure	2006-06-30	2045-08-26	14302	5844	R10 791,07
7044	Valve	Water Infrastructure	2006-06-30	2034-06-29	10226	5844	R1 918,30
7189	Automatic Air Release Valve	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 916,88
6894	Steel Ladder	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 723,50
323	Valve	Water Infrastructure	2012-06-30	2024-06-29	4382	3652	R1 552,11
13019	Gate Valve 1	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R1 200,71
8082	Foundation	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R13 633,21
8898	Electrical Components	Water Infrastructure	2016-06-18	2025-06-29	3298	2203	R2 568,22
7253	Tank Jojo	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R2 648,74
13184	Chamber Structure	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 025,86
13185	Chamber Structure	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 025,86
333	Switch Gear	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R1 577,28
13145	Chamber Structure	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 025,86
13135	Non Return Valve 1	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 025,86
13136	Non Return Valve 2	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 025,86
2840	Inlet Valve	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R1 337,62
5303	Foundation 18	Water Infrastructure	2015-08-27	2036-06-29	7612	2499	R4 386,92
12965	Fence Gate	Waste water Infrastructure	2006-06-30	2033-06-30	9862	5844	R2 161,80
13638	Foundation	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R4 815,63
1328	Cover Material	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R1 690,12
1056	Supporting Structure	Water Infrastructure	2012-06-30	2059-06-29	17165	3652	R6 208,43
8452	Pump 1	Water Infrastructure	2015-07-02	2032-06-29	6207	2555	R45 804,29
14526	Sludge Digestor - Secondary 01 - Submersible Pump	Waste water Infrastructure	2009-06-30	2040-08-26	11380	4748	R3 619,48
13510	Sump 1	Waste water Infrastructure	2009-06-30	2029-06-29	7304	4748	R3 132,62
14040	Tank Structure	Waste water Infrastructure	2009-06-30	2045-08-26	13206	4748	R3 738,12
1765	Chamber Structure	Water Infrastructure	2012-06-30	2034-06-29	8034	3652	R5 326,97
13018	Submersible Pump2 - To Delete	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R3 009,77
13233	Valve 2	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R1 748,13
14698	Gearbox Rotating Bridge	Waste water Infrastructure	2009-06-30	2040-08-26	11380	4748	R5 750,94
13251	Valve 3	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R1 820,14
4335	Pumpset 01 - Zinkwazi Res	Water Infrastructure	2009-06-30	2034-06-29	9130	4748	R3 231,63
4887	Internal Finishes & Fittings	Water Infrastructure	2015-08-27	2024-06-29	3229	2499	R2 522,86
13107	Pump 2	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R3 009,77
13393	Elect Motor 1	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R3 071,19

13394	Elect Motor 2	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R3 071,19
14525	Sludge Digestor - Secondary 02- Submersible Pump	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R3 619,48
4889	Structural Fabric	Water Infrastructure	2015-08-27	2024-06-29	3229	2499	R2 498,01
6977	Supporting Structure	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R1 918,30
7461	Paving	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R2 585,25
7119	Meter / Gauge	Water Infrastructure	2006-06-30	2039-06-29	12052	5844	R3 836,60
1736	Spring Protect Eye	Water Infrastructure	2012-06-30	2029-06-29	6208	3652	R4 131,77
12961	Control Panel	Waste water Infrastructure	2003-07-01	2024-02-19	7538	6939	R2 021,50
5008	Foundation	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R4 155,53
8597	Secondary Clarifier	Water Infrastructure	2008-06-30	2058-06-29	18261	5113	R214 450,72
13248	Chamber Structure	Waste water Infrastructure	2006-06-30	2023-06-30	6209	5844	R2 376,20
13436	Palisade Concrete Fence	Waste water Infrastructure	2006-06-30	2024-06-29	6574	5844	R2 860,03
1900	Roof	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R12 459,96
542	Meter / Gauge 13	Water Infrastructure	2010-02-20	2059-06-29	18026	4513	R9 528,81
13524	Control Panel	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R4 736,37
4355	Chamber Structure	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R3 324,42
13422	Electrical	Waste water Infrastructure	2009-06-30	2033-06-30	8766	4748	R4 815,63
8881	Motor	Water Infrastructure	2016-06-18	2025-06-29	3298	2203	R33 027,22
1680	Fence Gate	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R5 259,66
13535	Steel Screen	Waste water Infrastructure	2006-06-30	2023-06-30	6209	5844	R3 564,30
13385	Pump 1	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R3 009,77
13386	Submersible Pump1	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R3 009,77
14962	Humus Tank	Waste water Infrastructure	2009-06-30	2045-08-26	13206	4748	R9 764,81
1174	Motor 1 (5.5KW)	Water Infrastructure	2003-07-01	2060-01-19	20656	6939	R8 874,13
7794	Motor (Back Wash) 15Kw - Gec 1	Water Infrastructure	2009-06-30	2034-06-29	9130	4748	R6 934,54
14710	Recycle Pump	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R7 072,18
1908	Foundation	Water Infrastructure	2015-08-27	2029-06-29	5055	2499	R7 611,10
7522	Chlorine Tank	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R3 895,20
13607	Roof	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R4 815,63
8880	Pump	Water Infrastructure	2016-06-18	2025-06-29	3298	2203	R44 698,24
7994	Walls	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R13 633,21
13754	Palisade Concrete Fence	Waste water Infrastructure	2006-06-30	2039-07-16	12069	5844	R12 160,72
13576	Internal Finishes & Fittings	Waste water Infrastructure	2009-06-30	2023-06-30	5113	4748	R4 815,63
5403	Inlet pipe	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R8 954,69
1620	Chamber Structure	Water Infrastructure	2006-04-13	2032-06-29	9574	5922	R6 694,89
8116	2M Concrete Palisade Fence	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R18 696,98
7989	Internal Finishes & Fittings	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R13 633,21

480	Hand Pump	Water Infrastructure	2006-06-30	2034-06-29	10226	5844	R9 196,44
482	Hand Pump	Water Infrastructure	2006-06-30	2034-06-29	10226	5844	R9 196,44
1918	Foundation	Water Infrastructure	2009-06-30	2034-06-29	9130	4748	R12 459,96
5375	Telemetric System	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R12 876,21
13696	Valve 3	Waste water Infrastructure	2003-07-01	2066-06-17	22997	6939	R16 845,83
13964	Concrete Palisase (Fence)	Waste water Infrastructure	2009-06-30	2065-08-26	20511	4748	R174 789,99
13770	Chamber Structure	Waste water Infrastructure	2009-06-30	2032-07-31	8432	4748	R12 607,30
13852	Tank Containment Structure	Waste water Infrastructure	2009-06-30	2034-08-25	9187	4748	R23 132,44
7971	Back Wash Motor 3	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R12 535,37
1865	Perimeter Fence	Water Infrastructure	2010-06-30	2029-06-29	6939	4383	R12 079,82
8087	Fence Gate	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R18 696,98
5372	Motor 37KW 2	Water Infrastructure	2006-06-30	2059-06-29	19357	5844	R20 010,74
15311	Humus Non Return Valve 1	Waste water Infrastructure	2006-06-30	2065-09-07	21619	5844	R43 164,27
14768	Motor 1	Waste water Infrastructure	2006-06-30	2045-08-26	14302	5844	R13 993,81
15300	Humus Outlet Valve 1	Waste water Infrastructure	2006-06-30	2065-09-07	21619	5844	R43 164,27
15301	Humus Outlet Valve 2	Waste water Infrastructure	2006-06-30	2065-09-07	21619	5844	R43 164,27
14957	Raw Sewer Pump 1	Waste water Infrastructure	2006-06-30	2065-08-26	21607	5844	R22 739,93
13762	Chamber Structure	Waste water Infrastructure	2009-06-30	2029-07-30	7335	4748	R12 018,40
15192	Humus Pump House	Waste water Infrastructure	2006-06-30	2040-08-30	12480	5844	R25 379,62
13771	Palisade Concrete Fence	Waste water Infrastructure	2006-06-30	2032-07-31	9528	5844	R13 588,26
15624	Clarifier Tank	Waste water Infrastructure	2006-06-30	2065-09-07	21619	5844	R122 445,82
1771	Chlorination Tank	Water Infrastructure	2006-06-30	2039-06-29	12052	5844	R12 754,65
13499	Sump Pump	Waste water Infrastructure	2003-07-01	2040-03-30	13422	6939	R14 051,73
1159	Motor 2 (4.4KW)	Water Infrastructure	2003-07-01	2030-01-19	9699	6939	R8 874,13
1770	Chlorination Tank	Water Infrastructure	2006-06-30	2038-06-29	11687	5844	R12 754,65
1888	Chamber Structure	Water Infrastructure	2006-06-30	2058-06-29	18992	5844	R23 119,81
13649	Motor 1	Waste water Infrastructure	2006-06-30	2030-07-01	8767	5844	R10 809,02
548	Steel Ladder	Water Infrastructure	2010-02-20	2024-06-29	5243	4513	R10 722,15
404	Meter / Gauge 12	Water Infrastructure	2010-02-20	2025-06-29	5608	4513	R13 508,90
13661	Pump Motor 2	Waste water Infrastructure	2006-06-30	2030-07-07	8773	5844	R10 968,85
5464	Manhole	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R16 733,18
8856	Motor	Water Infrastructure	2016-06-18	2024-06-29	2933	2203	R44 698,24
1787	2M Concrete Palisade Fence	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R9 844,66
481	Hand Pump	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R9 196,44
13694	Valve 2	Waste water Infrastructure	2003-07-01	2046-06-17	15692	6939	R16 845,83
1966	2.2M Concrete Palisade Fence	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R20 271,41
5270	Pump 1	Water Infrastructure	2006-06-30	2036-06-29	10957	5844	R14 452,21
5271	Pump 2	Water Infrastructure	2006-06-30	2036-06-29	10957	5844	R14 452,21

493	Submersible Borehole Pump	Water Infrastructure	2006-04-13	2042-06-29	13226	5922	R16 488,45
15996	Borehole pump	Water Infrastructure	2015-09-08	2029-06-29	5043	2487	R90 774,50
5644	Water Containment Structure 11	Water Infrastructure	2015-08-27	2024-06-29	3229	2499	R12 539,66
5583	Salweir Pump 2	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R23 725,99
1907	Telemetric System	Water Infrastructure	2006-06-30	2059-06-29	19357	5844	R27 345,86
15299	Humus Inlet Valve 2	Waste water Infrastructure	2006-06-30	2053-09-05	17234	5844	R43 164,27
13795	Cover Material	Waste water Infrastructure	2003-07-01	2024-06-29	7669	6939	R14 481,41
2326	Motor 45kw	Water Infrastructure	2017-08-01	2032-06-29	5446	1794	R66 792,93
14871	Sludge Pump And Motor 1	Waste water Infrastructure	2006-06-30	2035-08-26	10649	5844	R16 960,27
13772	Sewer Sump & Concrete Slab	Waste water Infrastructure	2006-06-30	2032-08-02	9530	5844	R17 875,16
7996	Roof	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R13 633,21
7868	Dosing Pump	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R11 685,61
545	Control Panel	Water Infrastructure	2010-02-20	2024-06-29	5243	4513	R10 999,65
5371	Motor 37KW 1	Water Infrastructure	2006-06-30	2036-06-29	10957	5844	R20 010,74
1693	Control Panel	Water Infrastructure	2003-07-01	2041-01-19	13717	6939	R23 589,16
15004	Aerator Motor 3	Waste water Infrastructure	2006-06-30	2045-08-26	14302	5844	R27 136,43
1932	Pump 2	Water Infrastructure	2008-06-30	2040-06-29	11687	5113	R26 601,93
4508	Pump 1	Water Infrastructure	2003-07-01	2030-02-03	9714	6939	R16 602,40
13683	Valve 2	Waste water Infrastructure	2003-07-01	2031-06-17	10213	6939	R16 396,30
573	Manhole	Water Infrastructure	2010-01-20	2038-06-29	10387	4544	R25 632,32
1555	Pump 5.5Kw 1	Water Infrastructure	2003-07-01	2040-01-19	13351	6939	R23 109,70
1556	Pump 5.5Kw 2	Water Infrastructure	2003-07-01	2040-01-19	13351	6939	R23 109,70
13695	Valve 1	Waste water Infrastructure	2003-07-01	2031-06-17	10213	6939	R16 845,83
8457	Pump 2	Water Infrastructure	2015-07-08	2026-06-29	4009	2549	R46 120,59
15997	Borehole lined	Water Infrastructure	2015-09-08	2059-06-29	16000	2487	R177 519,45
14958	Raw Sewer Pump 2	Waste water Infrastructure	2006-06-30	2035-08-26	10649	5844	R22 739,93
455	Submersible Pump	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R17 035,00
13966	Inlet Screen(Rake & Bar)	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R131 694,33
13648	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2059-06-09	20432	6939	R43 389,97
13912	Standby Generator	Waste water Infrastructure	2006-06-30	2030-08-26	8823	5844	R56 206,88
13682	Valve 1	Waste water Infrastructure	2003-07-01	2026-06-17	8387	6939	R16 396,30
4608	Submersible Pump 2.2Kw	Water Infrastructure	2003-07-01	2030-02-03	9714	6939	R18 588,99
13665	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2059-06-11	20434	6939	R45 513,55
13868	Sewer Pump 2	Waste water Infrastructure	2006-06-30	2065-08-26	21607	5844	R61 351,18
13712	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2066-06-17	22997	6939	R56 152,77
13713	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2066-06-17	22997	6939	R56 152,77
1950	Pump House Building	Water Infrastructure	2017-12-15	2032-06-29	5310	1658	R109 324,93
14022	Pump 1	Waste water Infrastructure	2015-02-04	2039-06-29	8911	2703	R224 161,66

7668	High Lift Pumps Small 90Kw 1	Water Infrastructure	2003-07-01	2030-02-03	9714	6939	R20 917,51
15298	Humus Inlet Valve 1	Waste water Infrastructure	2006-06-30	2038-09-02	11752	5844	R43 164,27
13829	Chamber Structure	Waste water Infrastructure	2006-06-30	2034-08-25	10283	5844	R32 611,83
8128	11Kw Booster Pumps Control Panel	Water Infrastructure	2009-06-30	2031-06-29	8034	4748	R29 663,52
5645	Telemetry	Water Infrastructure	2009-06-30	2038-06-29	10591	4748	R37 212,19
1938	Containment Structure	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R23 119,81
1362	Cover Material	Water Infrastructure	2009-06-30	2059-06-29	18261	4748	R63 586,39
1952	Pump 1	Water Infrastructure	2010-06-30	2029-06-29	6939	4383	R32 212,84
1951	Pump House Building	Water Infrastructure	2010-06-30	2029-06-29	6939	4383	R32 212,84
550	Submersible Pump	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R23 121,30
15992	Borehole pump	Water Infrastructure	2015-09-08	2029-06-29	5043	2487	R152 291,89
15152	Humus Pump 15Kw 1	Waste water Infrastructure	2006-06-30	2040-08-30	12480	5844	R43 164,27
5753	Motor 110Kw 2	Water Infrastructure	2009-06-30	2032-06-29	8400	4748	R40 425,96
8172	Submerged Pump 1	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R25 070,75
13856	Control Panel	Waste water Infrastructure	2006-06-30	2045-08-26	14302	5844	R53 335,78
5984	Inlet Pipe	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R56 540,78
4486	Pump Ksb 75Kw 2	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R23 513,06
13693	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2046-06-17	15692	6939	R51 287,71
8568	Tank Containment Structure	Water Infrastructure	2009-06-30	2058-06-29	17896	4748	R168 934,09
427	Submersible Pump	Water Infrastructure	2003-07-01	2025-01-19	7873	6939	R24 094,43
1981	Motor 1	Water Infrastructure	2010-06-30	2029-06-29	6939	4383	R40 266,05
7983	Submersible Pump 1	Water Infrastructure	2003-07-01	2030-02-19	9730	6939	R29 993,69
13705	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2046-06-17	15692	6939	R54 654,35
13706	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2046-06-17	15692	6939	R54 654,35
698	Reticulation (Pipeline)	Water Infrastructure	2013-12-17	2031-06-29	6403	3117	R69 786,41
6025	Overflow Pipe	Water Infrastructure	2009-06-30	2027-06-29	6573	4748	R71 051,67
15127	Humus Pump 15Kw 2	Waste water Infrastructure	2006-06-30	2035-08-30	10653	5844	R43 164,27
15130	Humus Pump Motor 1	Waste water Infrastructure	2006-06-30	2035-08-30	10653	5844	R43 164,27
15987	Borehole lined	Water Infrastructure	2015-09-08	2026-06-29	3947	2487	R177 519,45
15312	Humus Tank Effluent - Sump	Waste water Infrastructure	2006-06-30	2030-09-07	8835	5844	R43 164,27
1905	Pump House Building	Water Infrastructure	2017-08-01	2032-06-29	5446	1794	R170 469,74
15302	Humus Non Return Valve 2	Waste water Infrastructure	2006-06-30	2030-09-07	8835	5844	R43 164,27
1988	Walls	Water Infrastructure	2008-06-30	2029-06-29	7669	5113	R34 749,27
14025	Motor 2	Waste water Infrastructure	2015-02-04	2029-06-29	5259	2703	R145 742,08
15270	Humus Tank	Waste water Infrastructure	2009-06-30	2030-08-30	7731	4748	R43 164,27
13647	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2036-05-08	12000	6939	R43 389,97
8007	2M Concrete Palisade Fence	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R125 211,46
13866	1.8M Diamond Mesh Fence	Waste water Infrastructure	2006-06-30	2035-08-26	10649	5844	R53 446,04

8454	Clarifier Tank 01	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R58 934,45
8455	Clarifier Tank 02	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R58 934,45
8456	Clarifier Tank 03	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R58 934,45
473	Submersible Pump	Water Infrastructure	2003-07-01	2030-01-19	9699	6939	R35 264,13
16006	Borehole pump	Water Infrastructure	2015-09-08	2036-06-29	7600	2487	R189 985,95
13867	Sewer Pump 1	Waste water Infrastructure	2006-06-30	2040-08-26	12476	5844	R61 351,18
13782	Sludge Pump	Waste water Infrastructure	2003-07-01	2066-06-17	22997	6939	R87 922,88
1953	Container(Office/Storage)	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R42 036,03
13975	Back-Up Generator	Waste water Infrastructure	2003-07-01	2062-06-29	21548	6939	R360 420,52
7683	High Lift Pumps Small 90Kw 4	Water Infrastructure	2003-07-01	2025-02-18	7903	6939	R31 077,80
6086	Concrete Palisade Fence	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R89 379,29
13894	Turo T9125Hp4Lbsa Pump 1	Waste water Infrastructure	2009-06-30	2035-08-26	9553	4748	R69 778,10
13287	Electrical Motor 2	Waste water Infrastructure	2003-07-01	2059-03-16	20347	6939	R90 105,13
5759	Tank Containment Structure (Fixed Size)	Water Infrastructure	2012-06-30	2024-06-29	4382	3652	R37 834,77
575	Motor	Water Infrastructure	2010-02-20	2024-06-29	5243	4513	R35 509,27
7981	Submersible Pump 3	Water Infrastructure	2003-07-01	2035-02-19	11556	6939	R58 374,45
2042	75Mm Hdpe Pipe	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R37 767,35
13692	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2031-06-17	10213	6939	R51 287,71
2053	Foundation	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R50 443,23
13644	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2026-04-12	8321	6939	R42 006,06
6299	Matholamnyama Resevoir	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R254 743,99
2004	Walls	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R50 443,23
5479	Pump Sump	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R40 012,69
1976	Roof	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R50 443,23
13666	Submersible Sewer Pumps 2	Waste water Infrastructure	2003-07-01	2026-06-17	8387	6939	R45 513,55
2088	Motor 1	Water Infrastructure	2011-01-20	2024-06-29	4909	4179	R46 825,32
13643	Submersible Sewer Pumps 1	Waste water Infrastructure	2003-07-01	2024-06-29	7669	6939	R42 006,06
6124	Mayelisweni Reservoir	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R85 731,43
2039	Control Panel	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R65 932,53
585	Steel Ladder	Water Infrastructure	2010-01-20	2031-06-29	7830	4544	R68 931,23
6077	Water Containment Structure	Water Infrastructure	2015-08-27	2024-06-29	3229	2499	R60 187,31
5846	Fence Gate	Water Infrastructure	2008-06-30	2029-06-29	7669	5113	R63 059,90
15271	Humus Tank	Waste water Infrastructure	2009-06-30	2022-08-30	4809	4748	R43 164,27
8267	Filter Pump 2	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R50 687,07
7682	High Lift Pumps Small 90Kw 2	Water Infrastructure	2003-07-01	2030-02-03	9714	6939	R58 374,45
15991	Borehole lined	Water Infrastructure	2015-09-08	2024-06-29	3217	2487	R171 733,42
2082	Bulk Water Meter 2	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R80 055,44

15630	Contact Tank	Waste water Infrastructure	2003-07-01	2032-06-29	10591	6939	R119 799,33
13845	Chamber Structure	Waste water Infrastructure	2003-07-01	2027-06-29	8764	6939	R59 746,56
8483	Chlorine Dosing Pump 2	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R117 254,31
599	Shaft & Casing	Water Infrastructure	2010-01-20	2059-06-29	18057	4544	R261 814,17
13887	Chamber Structure	Waste water Infrastructure	2003-07-01	2042-06-29	14243	6939	R109 308,70
13995	820m uPVC Gravity Pipline	Waste water Infrastructure	2015-08-31	2032-12-14	6315	2495	R424 816,52
6108	Mayelisweni Reservoir	Water Infrastructure	2006-06-30	2031-06-29	9130	5844	R85 731,43
15652	Earth Walls Oxidation Ponds 3	Waste water Infrastructure	2008-06-30	2030-09-07	8104	5113	R206 170,20
7982	Submersible Pump 2	Water Infrastructure	2003-07-01	2024-02-19	7538	6939	R58 374,45
2081	Bulk Water Meter 1	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R80 055,44
8638	Backwash Pump No 3	Water Infrastructure	2013-09-06	2024-06-29	3949	3219	R255 389,42
13834	Submersible Pump	Waste water Infrastructure	2003-07-01	2029-06-29	9495	6939	R87 922,88
2085	Motor 2	Water Infrastructure	2010-06-30	2026-06-29	5843	4383	R89 894,18
2212	Inlet Valve	Water Infrastructure	2009-06-30	2034-06-29	9130	4748	R208 399,79
6106	Mayelisweni Reservoir	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R85 731,43
6107	Mayelisweni Reservoir	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R85 731,43
6119	Mayelisweni Reservoir	Water Infrastructure	2006-06-30	2024-06-29	6574	5844	R85 731,43
13784	Old Abadoned Electric Motor	Waste water Infrastructure	2003-07-01	2026-06-17	8387	6939	R90 105,13
6321	Reservoir	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R334 441,93
13785	Electrical Motor 1	Waste water Infrastructure	2003-07-01	2024-06-29	7669	6939	R90 105,13
6535	Reservoir	Water Infrastructure	2010-06-30	2036-06-29	9496	4383	R4 070 763,55
8386	Sand Filter	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R110 794,65
8387	Sand Filter	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R110 794,65
8388	Sand Filter	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R110 794,65
6267	Reservoir	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R240 489,66
587	Chamber Structure 10	Water Infrastructure	2010-01-20	2024-06-29	5274	4544	R103 492,05
6244	Dirt Box	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R235 551,06
13883	Distribution Chamber	Waste water Infrastructure	2003-07-01	2024-06-29	7669	6939	R103 438,68
6093	Pump 2	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R164 600,32
2137	Pump 2	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R164 740,00
2136	Pump 1	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R148 714,70
2213	Outlet Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R161 858,99
6067	Cover Material	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R153 935,07
8836	Control Panel	Water Infrastructure	2016-06-18	2026-06-29	3663	2203	R245 834,30
6318	Matholamnyama Resevoir	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R262 595,10
6413	Tank Structure	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 068 476,48
6068	Cover Material	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R153 935,07
6314	Reservoir	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R340 051,03

2200	Walls	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R172 160,97
2183	Motor 2	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R210 154,00
8598	Valve 1	Water Infrastructure	2012-06-30	2024-06-29	4382	3652	R236 609,51
6388	2M Concrete Palisade Fence	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R906 728,78
6252	Dirt Box	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R253 741,48
6211	Chamber Structure	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R233 070,85
6180	Inlet Pipe	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R262 595,10
604	Pump and moto	Water Infrastructure	2008-09-03	2029-06-29	7604	5048	R443 014,37
6290	Inlet Valve	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R413 606,87
609	Pump	Water Infrastructure	2010-01-20	2056-06-29	16962	4544	R997 932,91
6246	Meter / Gauge	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R364 279,93
13997	Pump House Building	Waste water Infrastructure	2006-06-30	2035-08-26	10649	5844	R811 919,52
6332	Reservoir	Water Infrastructure	2006-06-30	2029-06-29	8400	5844	R408 321,78
6277	Steel Ladder	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R413 967,00
602	Pump	Water Infrastructure	2009-07-17	2024-06-29	5461	4731	R412 892,59
6260	KSB Pump 2	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R337 060,98
14017	Control Panel	Waste water Infrastructure	2015-08-31	2063-12-16	17639	2495	R2 078 743,56
6275	KSB Motor 1 250KW	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R415 121,51
6337	Reservoir	Water Infrastructure	2008-06-30	2024-06-29	5843	5113	R402 957,64
6259	KSB Pump 1	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R433 979,23
2278	Walls	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R462 048,15
6397	Foundation	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R826 542,17
2275	Chamber Structure	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R522 404,04
6349	Inlet Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R609 705,19
8613	Telemerty	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R478 496,43
8653	Sand Filter	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R741 365,85
6389	Water Containment Structure	Water Infrastructure	2009-03-17	2024-06-29	5583	4853	R729 265,62
6410	Steel Reservoir	Water Infrastructure	2008-06-30	2031-06-29	8399	5113	R903 037,64
6465	Reservoir	Water Infrastructure	2010-06-30	2039-06-29	10591	4383	R2 023 085,25
6365	Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R785 724,55
6375	PRV Valve	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R885 279,31
8883	Pipe	Water Infrastructure	2016-06-18	2034-06-29	6585	2203	R1 875 525,27
6508	Concrete Palisade Fence	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R3 136 120,82
6424	Level Control	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 914 976,99
6452	Reservoir	Water Infrastructure	2009-06-30	2029-06-29	7304	4748	R1 947 600,35
6467	Concrete Reservoir	Water Infrastructure	2009-06-30	2039-06-29	10956	4748	R1 684 400,70
610	Motor	Water Infrastructure	2010-01-20	2024-06-29	5274	4544	R997 932,91
14013	Structural Fabric	Waste water Infrastructure	2015-02-04	2024-06-29	3433	2703	R1 349 221,20

6427	Fence Gate	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R1 565 390,32
608	Fence Gate	Water Infrastructure	2009-06-30	2024-06-29	5478	4748	R1 204 215,19
8735	Pressure Sand Filter Tanks	Water Infrastructure	2012-06-30	2033-06-30	7670	3652	R3 910 604,56
7945	Reservoir 01	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R3 366 465,14
8092	Reservoir 02	Water Infrastructure	2009-06-30	2036-06-29	9861	4748	R3 366 465,14
8703	Steel Sand Filter	Water Infrastructure	2006-06-30	2026-06-29	7304	5844	R2 875 802,45
8435	Reservoir 03	Water Infrastructure	2009-06-30	2026-06-29	6208	4748	R3 366 465,12
14021	Sewer Pump Station Asset - Civil	Waste water Infrastructure	2015-03-31	2030-09-07	5639	2648	R12 445 335,58
8771	Water	Water Infrastructure	2009-06-12	2029-06-29	7322	4766	R12 402 376,11
8781	Pipeline	Water Infrastructure	2009-06-10	2029-06-29	7324	4768	R19 800 622,23
TOTAL CURRENT REPLACEMENT COST							R119 771 948,02

The Total current replacement cost of assets that have been impaired amounts to **R119 771 948,02.** These assets have not reached their full useful life due to lack of maintenance, theft and damage to assets.

Proper maintenance, security and control measures will ensure that the lifespan of an asset will be reached. Scheduled maintenance will allow an to be used longer than its estimated useful life.