Dr. JS Moroka Local Municipality

WATER SERVICES DEVELOPMENT PLAN

FINAL Rev.0

OCTOBER 2022

COMPILED BY:
AFI Consult (Pty) Ltd
PO Box 25905
Monument Park
0105
Tel No. 012 346 1848

Plan • Design • Implement

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immuno-Deficiency Syndrome
CMA	Catchment Management Area
CMIP	Consolidated Municipal Infrastructure Programme
CWB	Convertible Water Borne (Toilet)
DOC	Disaster Operation Centre
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EHS	Effective Health Services
FBW	Free Basic Water
FSC	Full Storage Capacity
HOD	Head of Department
HR	Human Resources
IDP	Integrated Development Plan
IWRM	Integrated Water Resources Management
IWRMP	Integrated Water Resources Management Plan
LED	Local Economic Development
LEDF	Local Economic Development Forum
LoS	Level of Service
MAMSL	Meter Above Average Sea Level
OHS	Occupation Health and Safety
N/A	Not Applicable
NDM	Nkangala District Municipality
NSDF	National Spatial Development Framework
PHS	Public Health Services
PMU	Project Management Unit
RDP	Reconstruction and Development Plan
Dr JSM LM	Dr JS Moroka Local Municipality
WC	Water Conservation
WDM	Water Demand Management
WRQMP	Water Resources Quality Management Plan
WSA	Water Service Authority
WSDP	Water Services Development Plan
WTW	Water Treatment Works
W2RAP	Wastewater Risk Abatement Plan
WWTW	Wastewater Treatment Works

1 ADMINISTRATION

1.1 Water Service Authority

Dr JS Moroka Local Municipality

1.2 Status of Water Services Development Plan

Status:	Final Rev.0
Reference date:	October 2022
Last review of WSDP obtained:	March 2014

1.3 Water Services Development Plan Drafting Team

Dr JS Moroka Local Municipality
Private Bag X4012
Siyabuswa
0472

Tel: 013 973 1101
Fax: 013 973 0974

Position (From IDP Organograms)	**Name and Surname**	**Interaction Signature** *(N/A for no interaction)*
Municipal Manager	Ms MM Mathebela	
Executive Mayor	Cllr NS Mtshweni	
The Chief – and Deputy Chief Financial Officer posts are vacant		
Divisional Manager Budget Planning and Reporting	Ms S J Masanabo	
Divisional Manager: Sanitation AND WSDP Contact	Mr FN Shabangu	
Divisional Manager: Water and Quality Control (Water Treatment & Distribution) AND WSDP Contact	Mr FLL Masombuka	
Divisional Manager Project Management Unit	Ms T M Rammutla	

1.4 Professional Service Provider

AFI Consult (Pty) Ltd
Irene Corporate Corner
21 Via Latina Ring, 1st Floor
Irene, Pretoria

Tel: 012 346 1848

B Lundie:	Project Leader
K Coomans:	Project Engineer
E Jooste:	Engineer
PG Roos:	Engineer

1.5 Approval Process Followed

Consultation	Process and Communication Application	Date	Comments
Users	Public Advertisement	To be coordinated.	DrJSMLM
Catchment Management Agency Olifants Water Management Area	Notify CMA and submit WSDP for review, comment and / or approval.	To be coordinated.	DrJSMLM
Neighbouring Authorities Nkangala DM Thembisile Hani LM Greater Sekhukhune DM Elias Motsoaledi LM Ephraim Mogale LM Waterberg DM Modimolle-Mookgopong LM Bela-Bela LM City of Tshwane MM	NDM initiated project and coordinates the project and communications. Neighbouring authorities (DM's and LM's) to be notified of WSDP and review, comment and / or approval.	Monthly reporting. To be coordinated.	DrJSMLM DrJSMLM
Provinces	To be notified.	To be coordinated.	DrJSMLM
DWS	Review WSDP as part of IRS approval for the Western Highveld Bulk Water Supply Scheme. Electronic submission on the DWS WSDP website.	To be coordinated. To be undertaken.	DrJSMLM

1.6 Comments

To be received.

1.7 Adoption Record

To be taken.

1.8 Project Management Function

Description	Yes	No	N/A	Comment
Is there budget?	Yes			Operational budget
Are there by-laws?	Yes		N/A	
Is there infrastructure?	Yes		N/A	
Personnel available?	Yes			The municipality has a 9-person strong Project Management Unit

1.9 DWS Asset Transfer Agreement

Description	Yes	No	N/A	Comment
Has the transfer agreement been signed?	Yes			
Effective date of agreement i.e., date signed	Yes	28 December 2004, Council Resolution: R274.11.2002D; November 2002		
Is there budget?			N/A	
Are there by-laws?			N/A	
Is there infrastructure?			N/A	
Personnel available?			N/A	

1.10 General

Description	Yes	No
Does the WSA have a service level policy for water?	Yes	Free Basic Services and Indigent Support Policy
If no, when will such a policy be in place?	N/A	
Does the WSA have a service level policy for sanitation?	Yes	
If no, when will such a policy be in place?	N/A	
Does the WSA have a community participation plan for selection of service levels?	Yes	IDP Process
If no, when will such a policy be in place?	N/A	

Water- and Sanitation Services Levels:

The "Guidelines for the Human Settlement Planning and Design" compiled under the patronage of the Department of Housing by CSIR Building and Construction Technology (Red Book).

1.11 Sector Integration

The water and wastewater divisions depend on support from complementing divisions within the municipal administration, which include:

Municipal Divisions	Name of Appropriate Manager
Technical Services	tbc
Office of the Municipal Manager: Compliance	
Compliance Risk Management	Mr M Maloka
Organizational Performance Management Systems	Mr L G Baloyi
Office of the Speaker: Public Participation	Mr B S Magoele
Office of the MM: Information & Communication Technology	Mr B J Sindane
Administration & Corporate Services	
Human Resource Management & Development	Mr T Thobejane
• Individual Performance Management Development System	
Records & Archives (management post vacant)	Mr G K Mashishi (officer)
Communications	Ms C M Ramatsetse
Finance	
Budget Planning & Reporting	Ms S J Masanabo
Supply Chain Management	Ms B S Mokgetle (officer)
Assets Management	Vacant – accountants and clerks
Revenue	Mr D J Ntuli
Expenditure	Ms P B Motlapema
Financial Reporting & Compliance	Vacant
Technical Services	
Project Management Unit	Ms T M Rammutla
Electrical	Mr H J Mahlangu
Fleet (Transport)	Vacant – only officers and other staff
Sanitation	Mr F N Shabangu
• Wastewater	
Water & Quality Control	Mr F L L Masombuka
• Water Services (Water Treatment)	
• Bulk Water Distribution Management	
• Water & Quality Control	Mostly vacant

Municipal Divisions	Name of Appropriate Manager
Community Development Services	
Security and By-Law Enforcement	Mostly vacant
Development & Planning	
Town & Regional Planning, Human Settlements	Vacant – only technicians, inspectors, and officers
Integrated Development Planning	Mr M M Mathebe
Asset Management (other)	tbc

The municipal IDP 2022/23 to 2026/27 indicated that the Technical Services consists of a total of 98 posts, of which 61 posts are filled and 37 posts are vacant.

2 SETTLEMENT DEMOGRAPHIC AND PUBLIC AMENITIES

2.1 Dr JS Moroka Municipal Geography

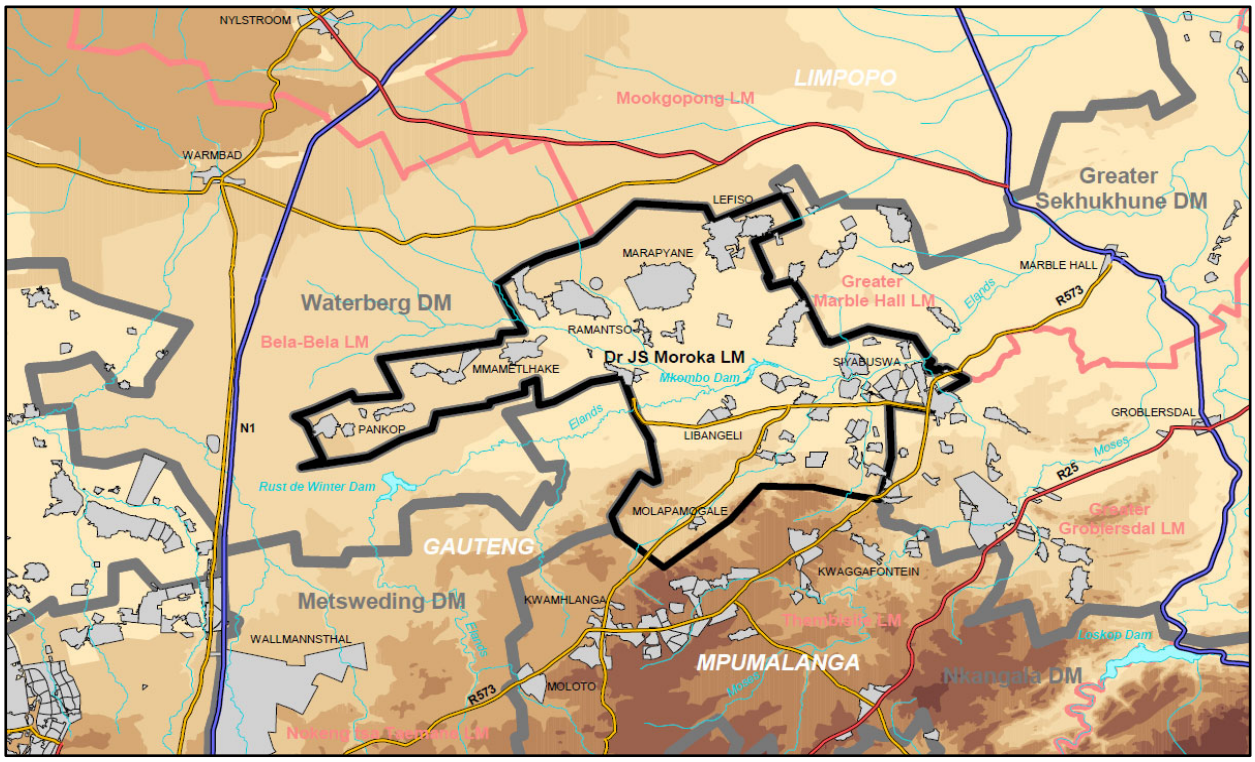


Figure 2.1: Geography of DR J.S. MOROKA LM

Dr J.S. Moroka Local Municipality is located in the north-western corner of Mpumalanga. The geographical area of the municipality is approximately 1,416 square kilometres and it has an altitude of 933m to 950m above sea level. The local climate generally has warm summers (ranging between 29.1ºC and 35ºC) and moderate winters (ranging between 2.1ºC and 6.0ºC).

The annual rainfall varies between 500mm and 650mm. A vast amount of land is covered by the savannah veld, and the area is characterized by flat to gently sloping Bushveld / Savannah vegetation in the north and central parts, and mountainous area to the south.

Cultivated areas (permanent and temporary dry and irrigated land) cover less than 15% of the municipal urban area, however, the municipality has areas with high agricultural potential, due to stable soil and geological conditions that renders it to suitable to agricultural development.

The municipality is bordered by the following municipalities:

- Thembisile Hani Local Municipality (in Nkangala DM);
- Elias Motsoaledi Local Municipality (in Greater Sekhukhune DM);
- Ephraim Mogale Local Municipality (in Greater Sekhukhune DM);
- Modimole - Mookgopong Local Municipality (in Waterberg DM);
- Bela Bela Local Municipality (in Waterberg LM); and
- City of Tshwane Metropolitan Municipality.

The municipality consists of 3 Magisterial Districts, and 31 wards, as follows:

Mdutjana Magisterial District	Wards 1 - 14
Mbibane Magisterial District	Wards 15 - 22
Mathanjana Magisterial District	Wards 23 - 31

The towns and settlements within the municipal boundaries are mainly rural, and consists of approximately 75 sub-places or settlements, with some 13 proclaimed townships. The towns and

settlements are reflected in Table 2.3 here below.

The municipal headquarters are located in Siyabuswa, and the municipality has offices in each magisterial district.

2.2 Current and Projected Population forecast for Dr JS Moroka LM

A feasible growth was selected in order to determine the future water demand. The following reports were considered in the analysis of growth rate figures, both at municipal- and ward level:

- StatsSA Census 2011;
- StatsSA Community Survey 2016;
- CSIR Green Book 2019;
- Dr JS Moroka Local Municipality 2022/2023 – 2026/2027 IDP; and
- Nkangala District Municipality 2020/2021 IDP.

Previous reports, utilised in the previous WDSP Review Reports and which advised in population growth rates included the following reports:

- StatsSA for the period between 1996 – 2011;
- Dr JS Moroka Local Municipality for the period between 1996 -2007; and
- Nkangala District Municipality for the period between 1996 - 2010.

The StatsSA Census 2021 should be consulted as soon as it becomes available to review the population growth figures.

2.2.1 Population trends

The historical growth rate figures provided by the previous reports culminated in the growth rate figures shown in table 2.1 here below.

Table 2.1: Growth rate figures given by StatsSA and IDP

Period	Growth Rate (%) per annum	Reference
1996-2001	-1.23	StatsSA – Census 2001
2001-2011	0.26	StatsSA – Census 2011
2011-2016	-0.3	StatsSA – Community Survey 2016

The growth rate for Dr JS Moroka LM is 0.26% for the period 2001 to 2011, but the 2016 Community Survey and 2019 CSIR Green Book report indicates contracted growth. The household growth rate, however, is recorded 0.07% for the period of 2011-2016. The following growth rates were selected for the purposes of this report:

- Population: -0.30% per annum; and
- Households: 0.07% per annum.

Table 2.2: Population and household projections for Dr JSM LM

Dr JSM LM	Census	Community Survey	Growth Rate per annum	Projection		
	2011	2016		2022	2032	2042
Population	249 705	246 016	-0.30%	241 661	234 573	227 694
Households	62 162	62 367	0.07%	62 614	63 028	63 444

The 2022/23-2026/27 Dr JSM LM IDP notes a population estimate for 2021 of 231 695 and 2030 of 227 585. Similarly, it notes a household estimate for 2021 of 62 382 and 2030 of 58 355.

2.2.2 Current and Projected Population at Settlement Level

Population and household projection at settlement level is computed using a negative growth rate of -0.3% and growth rate of 0.07% (Community Survey 2016) respectively and whose results are shown in table 2.3.

Table 2.3: Population projection at Settlement Level for Dr JS Moroka LM

Ward (2021)	Sub Place / Settlement	Census		Projected Population									
		2011		2022		2027		2032		2037		2042	
		Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH
1	Phaala	7118	1770	6889	1783	6787	1789	6687	1795	6588	1801	6491	1807
2	Kgobokwane SP	1901	461	1840	464	1813	466	1786	467	1759	469	1733	471
	Maganagobuswa SP	6199	1760	5999	1773	5911	1779	5823	1785	5737	1791	5653	1796
	Toitskraal	669	169	647	170	638	171	628	171	619	172	610	172
3	Siyabuswa A	6326	1408	6122	1418	6032	1422	5943	1427	5855	1432	5768	1437
	Siyabuswa E	1371	495	1327	499	1307	500	1288	502	1269	504	1250	505
4	Maganagobuswa SP	1718	488	1663	491	1638	493	1614	495	1590	496	1567	498
	Siyabuswa A	6326	1408	6122	1418	6032	1422	5943	1427	5855	1432	5768	1437
5	Siyabuswa B	7808	2008	7556	2023	7445	2029	7335	2036	7226	2043	7120	2049
6	Mogononeng SP	1340	341	1297	343	1278	345	1259	346	1240	347	1222	348
	Siyabuswa C	6547	1709	6336	1721	6242	1727	6150	1733	6059	1739	5970	1744
	Siyabuswa D	1386	406	1341	409	1322	410	1302	412	1283	413	1264	414
7	Ramokgeletsane SP	2921	697	2827	702	2785	704	2744	707	2703	709	2664	711
	Thabana SP	4329	952	4190	959	4128	962	4067	965	4007	968	3947	972
8	Mapoch SP	7153	1651	6922	1663	6820	1669	6719	1674	6620	1680	6522	1686
9	Kameelrivier B (Ga Morwe)	4921	1109	4762	1117	4692	1121	4622	1124	4554	1128	4487	1132
	Mapoch SP	2016	466	1951	469	1923	470	1894	472	1866	474	1839	475
10	Kameelrivier B (Ga Morwe)	4100	924	3968	931	3910	934	3852	937	3795	940	3739	943
	Waterval A	5167	1175	5000	1184	4926	1188	4854	1192	4782	1196	4711	1200

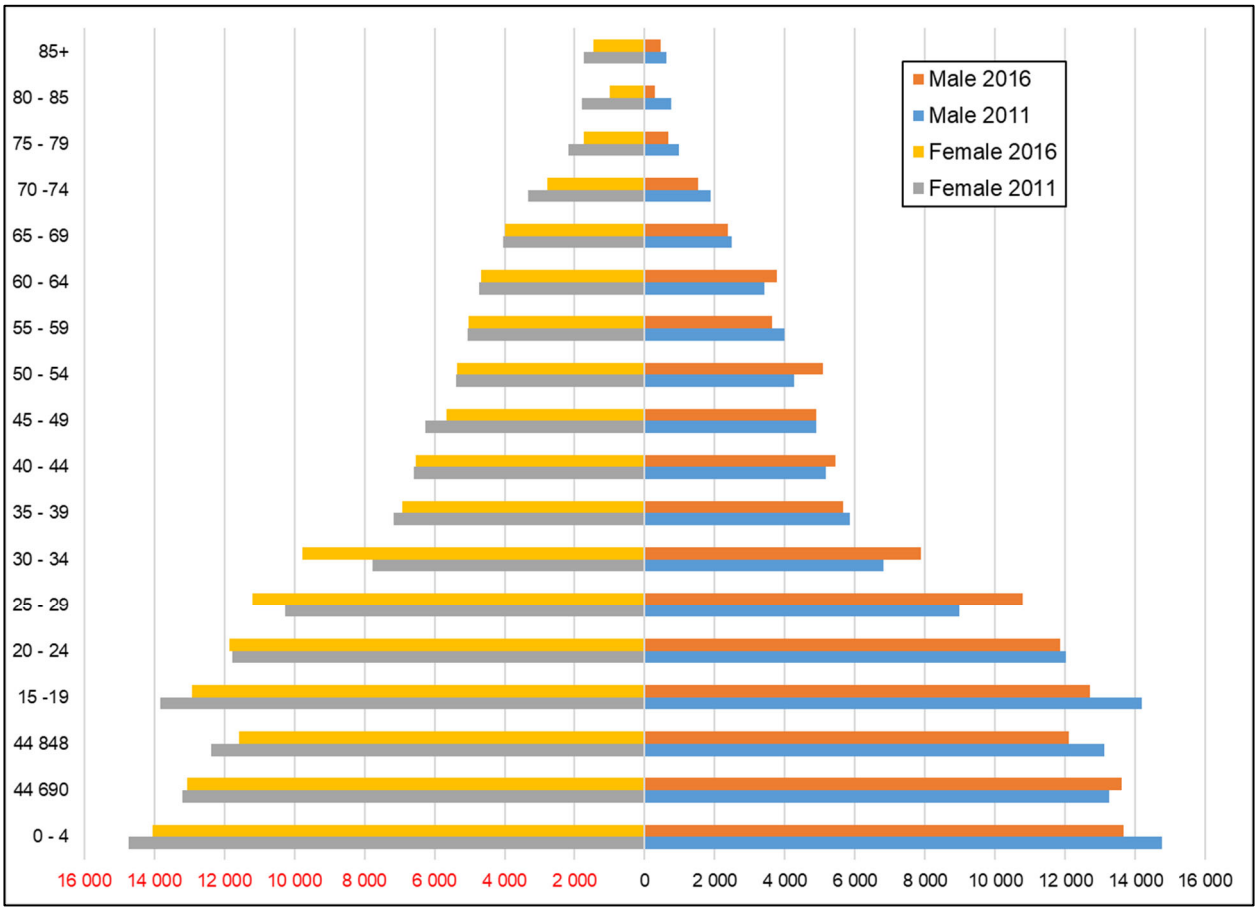
Ward (2021)	Sub Place / Settlement	Census		Projected Population									
		2011		2022		2027		2032		2037		2042	
		Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH
11	Magola SP	3219	726	3115	731	3069	734	3024	736	2979	739	2935	741
	Waterval A	2067	470	2000	474	1971	475	1941	477	1913	478	1885	480
	Waterval B (Metsemadiba)	2455	514	2376	518	2341	519	2306	521	2272	523	2239	525
12	Marothobolong SP	2956	689	2861	694	2819	696	2777	699	2736	701	2695	703
	Matshiding SP	5484	1297	5307	1306	5229	1311	5152	1315	5076	1319	5001	1324
	Moteti SP	416	108	403	109	397	109	391	110	385	110	379	110
	Waterval A	148	34	143	34	141	34	139	34	137	34	135	34
13	Morwe SP	759	208	735	210	724	210	713	211	702	212	692	212
	Pieterskraal A	3113	707	3013	712	2968	714	2924	717	2881	719	2839	722
	Pieterskraal B	3182	681	3079	686	3034	688	2989	690	2945	693	2902	695
14	Wolwekraal SP (Borolo)	7426	1600	7187	1612	7081	1617	6976	1622	6873	1628	6771	1633
15	Kameelpoort SP	1535	378	1486	381	1464	382	1442	383	1421	385	1400	386
	Leeufontein A	1369	444	1325	447	1305	449	1286	450	1267	452	1248	453
	Leeufontein B	2732	655	2644	660	2605	662	2566	664	2529	666	2491	669
	Leeufontein C	4056	941	3925	948	3867	951	3810	954	3754	957	3698	960
16	Vaalbank SP	7532	1781	7289	1794	7182	1800	7075	1806	6971	1812	6868	1818
17	Allemansdrift A	1306	294	1264	296	1245	297	1227	298	1209	299	1191	300
	Allemansdrift B	2170	437	2100	440	2069	442	2039	443	2008	445	1979	446
	Vaalbank SP	5282	1249	5112	1258	5036	1262	4962	1266	4889	1271	4816	1275
18	Allemansdrift C	7830	1779	7578	1792	7466	1798	7356	1804	7247	1810	7140	1816
19	Allemansdrift D (Ukukhanya)	2745	701	2657	706	2617	708	2579	711	2541	713	2503	715
	Kameelrivier A (Madubaduba)	5206	1294	5038	1303	4964	1308	4891	1312	4818	1316	4747	1321
	Makometsane SP	1735	431	1679	434	1654	436	1630	437	1606	438	1582	440
20	Senotlelo SP	6773	1716	6555	1728	6458	1734	6363	1740	6269	1746	6176	1751

Ward (2021)	Sub Place / Settlement	Census		Projected Population									
		2011		2022		2027		2032		2037		2042	
		Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH
21	Koedoespoort SP	3407	805	3297	811	3249	814	3201	816	3153	819	3107	822
	Troya	4432	938	4289	945	4226	948	4163	951	4102	954	4041	957
22	Ga Maria SP (Ditlhokwe)	2181	559	2111	563	2080	565	2049	567	2019	569	1989	571
	Lefiso SP	3614	877	3498	883	3446	886	3395	889	3345	892	3295	895
	Lefiswane SP	4847	1303	4691	1312	4622	1317	4553	1321	4486	1326	4420	1330
23	Marapyane SP	5142	1549	4977	1561	4903	1566	4831	1571	4759	1576	4689	1581
24	Greenside SP (Mmaduma)	406	124	393	125	387	125	381	126	376	126	370	127
	Marapyane SP	5744	1731	5559	1743	5476	1749	5395	1755	5316	1760	5237	1766
25	Seabe SP	7683	2067	7436	2082	7326	2089	7217	2096	7111	2103	7006	2110
26	Dihekeng SP	654	171	633	172	624	173	614	173	605	174	596	175
	Loding SP	3908	924	3782	931	3726	934	3671	937	3617	940	3564	943
	Moletji SP	166	62	161	62	158	63	156	63	154	63	151	63
	Ramantsho SP	138	52	134	52	132	53	130	53	128	53	126	53
	Sekgogo SP	455	155	440	156	434	157	427	157	421	158	415	158
	Semohlase SP	95	45	92	45	91	45	89	46	88	46	87	46
27	Leseleseleng SP	1763	398	1706	401	1681	402	1656	404	1632	405	1608	406
	Moretele SP	5614	1367	5433	1377	5353	1381	5274	1386	5196	1391	5119	1395
	Terateng	4036	941	3906	948	3848	951	3791	954	3735	957	3680	960
28	Dierefeng	308	85	298	86	294	86	289	86	285	86	281	87
	Makgareng	1075	262	1040	264	1025	265	1010	266	995	267	980	267
	Nokaneng SP	6079	1671	5883	1683	5796	1689	5711	1694	5626	1700	5543	1705
29	Mmamethlake SP	7888	2352	7634	2369	7521	2377	7410	2385	7301	2393	7193	2401

Ward (2021)	Sub Place / Settlement	Census		Projected Population									
		2011		2022		2027		2032		2037		2042	
		Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH	Pop	HH
30	New Stands	1117	297	1081	299	1065	300	1049	301	1034	302	1019	303
	Phaphamang	1578	377	1527	380	1505	381	1482	382	1460	384	1439	385
	Phola Park	1325	344	1282	347	1263	348	1245	349	1226	350	1208	351
	Rankaile	1967	541	1904	545	1876	547	1848	549	1821	550	1794	552
	Ratlhagana	1596	451	1545	454	1522	456	1499	457	1477	459	1455	460
	Rebone	811	214	785	216	773	216	762	217	751	218	740	218
	Thabeng	1155	305	1118	307	1101	308	1085	309	1069	310	1053	311
31	Mantlole	683	191	661	192	651	193	642	194	632	194	623	195
	Masobje (Masobye)	8227	2205	7962	2221	7844	2228	7728	2236	7614	2243	7502	2250
None	Dr JS Moroka NU	800	269	774	271	763	272	752	273	740	274	729	275
	Total	**249705**	**62162**	**241661**	**62614**	**238091**	**62820**	**234573**	**63028**	**231108**	**63235**	**227694**	**63444**

2.3 Age and Gender Profile

Figure 2.2: Age and Gender Profile for Dr JS Moroka LM (Census 2011 and Community Survey 2016)



2.4 Employment Profile

Table 2.4: Employment Profile (ages 15 – 64) (StatsSA)

Description	Census 2011
Employed	33,844
Unemployed	29,539
Discouraged Work Seeker	10,321
Not Economically Active	74,753
Total	**148,457**
Employment Rate	22.8%

2.5 Monthly Household Income

Table 2.5: Monthly Household Income for Dr JS Moroka LM

Income	Percentage
No income	15.9%
R1 - R4,800	5.8%
R4,801 - R9,600	9.8%
R9,601 - R19,600	24.5%
R19,601 - R38,200	21.9%
R38,201 - R76,4000	11.3%
R76,401 - R153,800	6.2%
R153,801 - R307,600	3.2%
R307,601 - R614,400	1.1%
R614,001 - R1,228,800	0.1%
R1,228,801 - R2,457,600	0.1%
R2,457,601+	0.1%

From the table above it is clear that just less than 21.7% of households earns no income and less than R42,000 per year, or R3,500 per month, which qualifies for a housing subsidy. To qualify on the First Low Income Subsidy Programme (FLISP), a monthly income of between R3,500 and R22,000 is required. Just over 34.3% of households in the municipality will qualify for same. It appears that some 56% of income-earning households qualify for some form of housing subsidy.

2.6 Economics

The table 2.6 below provides data on the growth rate in each sector. Construction has been a driver of growth between 2001 and 2004. All other sectors have performed below the national growth rate. Despite this the growth in trade, transport and agriculture are encouraging. Of concern is the decline in government and community services.

Table 2.6: Economic Growth Rates of Dr JS Moroka LM 1996 – 2004 (Dr JS Moraka LM LED Strategy Review)

Sector	1996-1999	1998-2001	2001-2004	1998-2004
Agriculture	-0.2	-1.5	1.8	0.1
Mining	7.1	4.9	0.4	2.6
Manufacturing	1.6	2.5	1.1	1.8
Electricity	3.6	-6.2	-2.8	-4.5
Construction	5.0	-3.5	5.7	1.0
Trade	2.4	4.9	3.4	4.1
Transport	5.5	3.5	2.4	3.0
Finance	10.5	-1.5	1.1	-0.2
Community Services	0.3	-0.2	-1.2	-0.7
Government Services		-0.5	-1.0	-0.7
Average	**1.7**	**-0.7**	**0.7**	**0.7**

2.7 Spatial Development Framework

The latest Annual Report (2020/2021) from the Dr JSM LM expressed the requirement that the Spatial Development Framework needs to be reviewed, since it was not seen as credible anymore. This section needs to be reviewed once the reviewed SDF is published.

The western side (Masobe to Marapyane) of the municipality has poor development patterns as a result of Settlements established in terms of proclamation R188.PTO (Permission to Occupy) certificates or quitrent certificates issued to heads of households recognizing these rights. However, in most of the area, traditional rights do not have any form of certificate and are not registered in any way. Most of the land is allocated by traditional authorities with no systematic record keeping resulting in overlapping and conflicting land rights/uses.

On the eastern region (Siyabuswa and Libangeni) proper planning processes are followed and the Townships are premeditated, and development is coordinated within the three Magisterial Districts i.e., Mathanjana, Mbibane and Mdutjana.

Two settlements established in terms of proclamation R293 in the Municipal area (Siyabuswa and Libangeni) have gone through a tenure upgrading process to clarify land rights and enable residents to get freehold title to their properties.

Sixty-seven claims, distributed over 23 individual properties, have been submitted to the Land Claims Commission in Dr JS Moroka area. The entire central part of the Dr JS Moroka municipal area is under land claims. There are a fairly large number of claims on the farm Allemansdrift 162 JR as well as De Beersput 152 JR, Kameelpoort 202JR and Troya 151 JR. According to the NDM Land Audit, the land claimed in the Thembisile, and Dr JS Moroka municipal areas are mainly associated with cattle and game farming, some crop farming and on the two nature reserves.

Land claims on land within or adjacent to built-up areas are presently constraining the Municipality when it wants to develop an area. Claimants believe that if the land is further developed it will prejudice their claim, and if the land is built up the value of their claim is higher. The Municipality's approach is that where a claim is on vacant land (this could be rural land, or land adjacent to a built-up area in a village), then they need to work closely with the claimants to ensure they are not prejudiced, and that development can occur in a way that is acceptable to both parties.

The municipal area is generally a large services priority upgrading area, and development spending should primarily be aimed at providing inhabitants with the constitutionally mandated minimum levels of services and community infrastructure. This being the case, development spending is envisioned to gravitate towards, and along the proposed development initiatives within the municipality as well as initiatives set for the greater area as it connects with the following development initiatives:

- National Development Plan;
- National Outcomes Approach;
- Regional Industrial Development Strategy;
- Green Paper on Land Reform;
- National Integrated Sustainable Rural Development Strategy;
- National Comprehensive Rural Development Programme;
- National Transportation Master Plan 2050;
- Mpumalanga Vision 2030;
- Mpumalanga Provincial Growth Path;
- Mpumalanga Provincial Spatial Development Framework;
- Mpumalanga Infrastructure Master Plan;
- Mpumalanga Human Settlement Master Plan;
- Mpumalanga Tourism Growth Strategy; and
- Nkangala Spatial Development Framework.

3 SERVICE LEVELS PROFILE

The status quo for the services rendered to individual households is critical to the determination of the backlog figures and strategic analysis. Data from the latest census and community survey were considered.

3.1 Water Profile

3.1.1 Domestic

The domestic water services infrastructure supply level profile is shown in table 3.1.

Table 3.1: Water Services Infrastructure Supply Level Profile (Census 2011)

Description	Totals - Households	%
Piped (tap) water inside dwelling/institution	8827	14%
Piped (tap) water inside yard	34645	56%
Piped (tap) water on community stand: distance less than 200m from dwelling/institution	3744	6%
Piped (tap) water on community stand: distance between 200m and 500m from dwelling/institution	654	1%
Piped (tap) water on community stand: distance between 500m and 1000m (1km) from dwelling /institution	424	1%
Piped (tap) water on community stand: distance greater than 1000m (1km) from dwelling/institution	115	0%
Borehole in yard	0	0%
Rain-water tank in yard	0	0%
Water vendor-carrier/tanker	0	0%
stagnant water - dam/pool	0	0%
Flowing water/spring/stream/river	0	0%
No access to piped (tap) water	13751	22%
Total	**62160**	**100%**

The domestic water reliability profile is shown in table 3.2.

Table 3.2: Water Reliability Profile

Description	Totals - Households
Water Supply System	1
Total Number of Households having Reliable Service	47216
Total Number of Households having NOT Reliable Service	14944
System Total Number of Households NOT having Reliable Service due to: Functionality (O&M and Management)	0
Total Number of Households having NOT Reliable Service due to: Resource	0
Total Number of Households having NOT Reliable Service due to: Infrastructure	14944
Total Number of Households having NOT Reliable Service due to: Resource - Conservation & Demand Management	0
Total Number of Households having NOT Reliable Service due to: Resource - New Source	0
Total Number of Households having NOT Reliable Service due to: Infrastructure - UPGRADE/REFURBISHMENT	0
Total Number of Households having NOT Reliable Service due to: Infrastructure - EXTENSION	0
Total Number of Households having NOT Reliable Service due to: Infrastructure - NEW SCHEME	0
Total Number of Households having NOT Reliable Service due to: Infrastructure - REPLACE OLD	0

3.1.2 Educational

The educational water services infrastructure supply level profile is shown in table 3.3.

Table 3.3: Educational Plan

Description	Number of Facilities	Facilities with Adequate services	Facilities with No services	Facilities with Inadequate services
Primary Schools	49	Unknown	Unknown	Unknown
Secondary Schools	45	Unknown	Unknown	Unknown
Tertiary				
Combined	1	Unknown	Unknown	Unknown
Special Needs				
Other	102	Unknown	Unknown	Unknown
Total	**197**			

3.1.3 Health

The health water services infrastructure supply level profile is shown in table 3.4.

Table 3.4: Health Plan

Description	Number of Facilities	Facilities with Adequate services	Facilities with No services	Facilities with Inadequate services
Hospitals	1	1		1
Health Centres				
Clinics	31	27		4
Other				
Total	**32**	**28**		**5**

3.2 Sanitation Profile

3.2.1 Domestic

The domestic sanitation services infrastructure supply level profile is shown in table 3.5.

Table 3.5: Sanitation Service Infrastructure Supply Level Profile (Census 2011)

Description	Totals - Households	%
None	1216	2%
Flush Toilet (Connected to Sewerage System)	8237	13%
Flush Toilet (with Septic Tank)	1107	2%
Chemical Toilet	367	1%
Pit Toilet with Ventilation	15668	25%
Pit Toilet without Ventilation	35192	57%
Bucket Toilet	223	0.36%
Other	155	0.25%
Total	**62165**	**100%**

The bucket toilets as reflected on above does not necessarily mean that the municipality is having bucket toilets. During the survey some of the households, especially in the western part of the municipality, indicated that since their toilets are separate from house structure, they utilise buckets during the night and empty it in the morning.

The domestic sanitation reliability profile is shown in table 3.6.

Table 3.6: Sanitation Reliability Profile

Description	Totals - Households
Household requiring VIP Refurbishment	0
Household requiring Existing Scheme Refurbishment	0
Household NOT having reliable service due to Functionality	0
Household NOT having reliable service due to Resource - Water Security	0
Infrastructure to be upgraded: Pit to VIP	35192
Infrastructure to be upgraded: Bucket to Waterborne	0
Infrastructure to be upgraded: None to Waterborne	0
Infrastructure to be upgraded: Buckets to VIP	0
Infrastructure to be upgraded: None to VIP	1216

3.2.2 Educational

The educational sanitation services infrastructure supply level profile is shown in table 3.7.

Table 3.7: Educational Plan

Description	Number of Facilities	Facilities with Adequate services	Facilities with No services	Facilities with Inadequate services
Primary Schools	49	Unknown	Unknown	Unknown
Secondary Schools	45	Unknown	Unknown	Unknown
Tertiary				
Combined	1	Unknown	Unknown	Unknown
Special Needs				
Other	102	Unknown	Unknown	Unknown
Total	**197**			

3.2.3 Health

The health sanitation service infrastructure supply level profile is shown in table 3.8.

Table 3.8: Health Plan

Description	Number of Facilities	Facilities with Adequate services	Facilities with No services	Facilities with Inadequate services
Hospitals	1	1		1
Health Centres				
Clinics	31	27		4
Other				
Total	**32**	**28**		**5**

3.3 Direct Backlog (Water and Sanitation)

The direct backlog is shown in table 3.9.

Table 3.9: Direct Backlog (Water and Sanitation)

Description	Totals
Direct settlement backlog water households. Total household of settlement with a water need	14944
Direct settlement backlog water population. Total population of settlement with a water need	58879
Direct settlement backlog sanitation households. Total household of settlement with a sanitation need	36786
Direct settlement backlog sanitation population. Total population of settlement with a sanitation need	144937

4 WATER & SANITATION SERVICES ASSET MANAGEMENT

4.1 Water Services

4.1.1 Introduction

Dr JS Moroka is both the water service authority (WSA) and a water service provider (WSP) with a population of 249705 and 62162 households according to Stats SA - Census 2011. According to a community survey done in 2016 (Stats SA), despite the improvements to provide piped water to more households, there is still a large backlog in terms of access to piped water within the Municipality.

The Municipality has a 60 Mℓ/day capacity purification plant (Weltevreden WTP) and 60 listed boreholes that supplies potable water to the municipality and surrounding areas.

The western part of the municipality does not have bulk/potable water supply infrastructure and villages in these areas relies on underground-water (boreholes). Borehole supply however is mostly affected by broken down equipment, theft, and vandalism. This results in inadequate water supply to these communities. The Mathanjana Magisterial District is earmarked to be supplied by the proposed Western Highveld BWSS, currently in design and implementation readiness phase.

4.1.2 Situation Assessment

4.1.2.1 Coverage of Water Services

The 2011 data obtained from the Census show the following coverage of water services:

- Pipe tap water inside dwelling: 8827 households (14%);
- Pipe tap water inside yard: 34645 households (56%);
- Piped tap water on community stands distances less than 200m: 3744 households (6%); and
- Piped tap water on community stands distances more than 200m or no access to water is combined at: 14944 (24%).

To have 100% coverage of water services in Dr JS Moroka LM, a minimum walking distance of 200m to the nearest public standpipe has been assumed. Therefore, the backlog on water services in Dr JS Moroka LM is 14944 households (24%) of the total households.

4.1.2.2 Cost Implication of Backlog eradication

The cost implication for the backlog eradication has been arrived at taking into consideration of the following required infrastructure:

- Water reticulation for additional coverage

The required total cost for the below would be in the range of R747,2 million as outlined in the table 4.1 given below.

Table 4.1: Cost of Backlog Eradication

Description	Households (hh)	Estimated Cost (R)	
		Per hh	Total
Water Reticulation	14,944	R50 000.00	R747,200,000.00

4.1.2.3 Water Challenges Identified per Ward

Major water related challenges within Dr JS Moroka LM are outlined within table 4.2 below.

Table 4.2: Water Challenges (Source: 2022/23-2026/27 Dr JSM LM IDP)

Ward	Village Name	Challenges
1	Ga-Phaahla	Stormwater drainage
2	Kgapamadi/ Section I and C	Water reticulation
	Section A	Fencing of municipal steel water tanks
	Toitskraal	Water reticulation and replacement of asbestos pipes to PVC pipes
3	Siyabuswa "A" (Langothi,Majezini,Sweet corner sections)	Replacement of asbestos pipe
4	Siyabuswa "A" Part of ward 4	Removal of asbestos pipes
7	Thabana/Ramokgeletsane	Water reticulation
8	Mrhesha/Mrhawni and Mghababa section	Water infrastructure
10	Meetsemadiba	Supply of water and upgrading of existing water infrastructure
11	Entire ward	Provision of water
12	Matshiding	Water reticulation and bulk supply
14	Maphotla new extension	Water reticulation at Maphotla new stands
15	Digwale	Water reticulation
	Molapoamogale new stands	Bulk water supply
	Digwale RDP	Water connection and borehole AT Creche
	Wolwekraal	Bulk water supply and reticulation
17	Libangeni Mbongo	Bulk water supply
19	Makometsane/Madubaduba/Ukukhanya	Removal of asbestos pipe/Water reticulation/Steel tanks/8 boreholes
	Moripe garden	Water reticulation
20	Senotlelo	Additional boreholes and connection of electricity & Water reticulation
21	Lefisoane/Kabete	Fixing of old borehole
	Kabete	Installation of borehole
	Troya	Water Reticulation
23	Part of Marapyane	Revitalizing of all water systems available
24	Part of Marapyane	Water reticulation and house connection
	Part of Seabe	House connection on some few house
	Mmaduma	House connection on some few house
25	Part of Seabe	Water reticulation at Itsoseng
		Water reticulation Terateng
		Water reticulation Masopeng
26	Loding/Dihekeng/Nokaneng between Loding and Sehoko	Borehole/Storage tank and electricity connection
27	Leseleseleng	Water reticulation
28	Part of Mmamethlake	Water reticulation, purification, Rejuvenation of borehole
	Magareng	
	Dierefeng	
	Part of Nokaneng	

Ward	Village Name	Challenges
29	Mmametlhake	Water supply through pipes be extended
	Phake Rathlagane	Water reticulation repair
		Boreholes and machines repairing
	Mmametlhake and Phake	Water tankers
30	Khutsong/Rebone Extension /Rankaile and Mantlole	Water reticulation
31	Masobye	Bulk supply
		Water reticulation
		House water connection

Critical water challenges (2022/23-2026/27 Dr JSM LM IDP) are summarised as:

- Old infrastructure;
- Drought;
- Flat rate application;
- Lack of financial resources;
- Illegal connections;
- Informal and scattered settlements; and
- Poor workmanship.

4.1.3 Existing Infrastructure

DR JSM LM possesses a well-developed bulk water supply network system. The system supplies water to some areas in the following municipalities as well, namely Thembisile Hani Local Municipality, Elias Motsoaledi Municipality & Ephraim Mogale Municipality. Schematic layouts of the existing infrastructure are shown in **Appendix A**.

Table 4.3: Summary of bulk supply system (Existing)

Component	Unit	Weltevreden WTP				
		Walkraal	Bloedfontein	Kameelrivier	Weltevreden (Kuilen)	Sub-totals
Estimated Demand (AADD) - 2022	Mℓ/day	22.34	7.80	4.76	2.96	37.86
Estimated Demand (SDDww) - 2022	Mℓ/day	33.91	11.84	7.23	4.49	57.47
Water Supply (Historical Average Supply) [1]	Mℓ/day	38.8	9.26	6.45	5.49	60.00
Bulk Pipelines	km	66.6	112.44	45.07	16.12	240.22
		Raw Water: 28.44				28.44
Reticulation Pipelines	km	620.37				620.37
Pumping Stations	No of PS	5	3	3	3	14
	Total kW	1265	945	225	2100	4535
	Raw water PS	Weltevreden (506kW); Mtombo (160kW) & Valschfontein Booster (300kW)				966
Major Distribution Reservoirs (Excl. Towers up to 200kl)	No of Reservoirs – Dr JS Moroka	14	5	7	2	28
	Total Storage(Mℓ) – Dr JS Moroka	31.34	36.7	23.27	6.77	98.8 + 20 (WTW) = 118.8
Boreholes [2]	No of Boreholes	11	40	9	0	60
	Functional	7	12	6	0	25
	Total Supply – Functional Only (Mℓ/day)	0.51	1.49	0.10	0	2.1

Notes:

- [1] - Historical average supply to the sub systems.
- [2] - Borehole information was provided by Dr JSM LM.

4.1.3.1 Groundwater infrastructure

The far western and northern portions of the area rely mostly on water from boreholes. The details of the infrastructure have been updated as received from Dr JS Moroka LM. Most of the boreholes are electrified, while several are hand operated, and some are diesel powered. Vandalism towards boreholes is a major issue.

Water and Sanitation Services South Africa did borehole testing and water quality test for all the listed boreholes in 2014. It is reported that updated water quality tests are scheduled to be performed within 2023 as part of the Blue- and Green Drop Assessments.

Table 4.4: List of boreholes

Item No.	Village	Ward	Supply Area	Borehole Number	Power Supply	Status: Working (Y/N)		Yield (l/s)	Comments	Latitude	Longitude
1	Kameelrivier	9	Walkraal	W18	Electrical	Y		No data		25º1'33.31	28º38'16.37
2	Kameelrivier	9	Walkraal	W18(i)	Electrical	Y				25º07'33.5	28º58'50.8
3	Maphotla	14	Walkraal	W02	Electrical	Y		0.2	Contribute to Jojo tank		
4	Maphotla	14	Walkraal		Electrical		N				
5	Madubaduba	19	Kameelrivier		Electrical	Y			To reticulation		
6	Majakaneng	13	Kameelrivier		Electrical	Y			To Jojo tank		
7	Majakaneng	13	Kameelrivier		Diesel		N				
8	Masobe	31	Bloedfontein	MAS 01	Electrical		N	1.3		25º10'09.25	28º24'56.98
9	Masobe	31	Bloedfontein	MAS 02	Electrical		N	1.3		25º10'0.25	28º25'0.10
10	Masobe	31	Bloedfontein	MAS 03	Electrical	Y		2		25º08'56.79	28º25'15.35
11	Masobe	31	Bloedfontein	MAS 04	Electrical	Y		2.5		25º08'50.29	28º25'17.96
12	Masobe	31	Bloedfontein	MAS 07	Electrical		N	1.3		25º09'58.78	28º24'18.51
13	Mantlole	30	Bloedfontein	BH 01	Electrical	Y		No data			
14	Mantlole	30	Bloedfontein	BH 02	Electrical		N				
15	Mantlole	30	Bloedfontein	BH 03	Electrical		N				
16	Mantlole	30	Bloedfontein	BH 04	Electrical		N				
17	Rankaile	30	Bloedfontein	PRD 01	Electrical	Y		3.6	Steel tank	25º09'19.34	28º27'30.70
18	Phaake	30	Bloedfontein	BH 01	Electrical		N		All contributing to Package Plant		
19	Phaake	30	Bloedfontein	BH 02	Electrical		N			25º09'23.78	28º27'21.68
20	Phaake	30	Bloedfontein	BH 03	Electrical		N			25º08'54.61	28º28'59.59
21	Phaake	30	Bloedfontein	BH 04	Electrical		N			25º08'57.53	28º28'33.32
22	Mmametlhake	29	Bloedfontein	BH 01	Electrical		N	No data	They all contributing to steel tank		
23	Mmametlhake		Bloedfontein	BH 02	Electrical		N				

Item No.	Village	Ward	Supply Area	Borehole Number	Power Supply	Status: Working (Y/N)		Yield (l/s)	Comments	Latitude	Longitude
24	Mmametlhake	29	Bloedfontein	BH 03	Electrical	Y					
25	Mmametlhake	29	Bloedfontein	BH 04	Electrical		N				
26	Mmametlhake	29	Bloedfontein	BH 05	Electrical		N				
27	Mmametlhake	29	Bloedfontein	BH 06	Electrical	Y					
28	Mmametlhake	29	Bloedfontein	BH 07	Electrical		N				
29	Mmametlhake	29	Bloedfontein	BH 08	Electrical		N				
30	Nokaneng	28	Bloedfontein	Nok 01	Electrical	Y		7.6	Contributing to steel tank	25º04'12.4	28º37'51.4
31	Nokaneng	28	Bloedfontein	Nok 02	Electrical		N	0.2		25º5'7.30	28º37'30.32
32	Nokaneng	28	Bloedfontein	Nok 03	Electrical		N			25º05'9.93	28º37'30.79
33	Seabe	25	Bloedfontein	TRT 01	Electrical		N	0.6		25º0'26.91	28º40'20.54
34	Seabe	25	Bloedfontein	TRT 02	Electrical	Y		1.6	Contributing to Water tank	25º0'2.13	28º40'31.12
35	Seabe	25	Bloedfontein	BH	Diesel	Y					
36	Katjibane	27	Bloedfontein	KAT 02	Electrical			1.9	Each has its own elevated Tank	24º59'182	28º38'012
37	Katjibane	27	Bloedfontein	KAT 03	Electrical					25º00'07.6	28º37'31.0
38	Katjibane	27	Bloedfontein	KAT 04	Electrical	Y				S25º00'35.4	E28º38'03.2
39	Katjibane	27	Bloedfontein	KAT 05	Electrical		N	3.1		25º1'20.93	28º37'50.96
40	Katjibane	27	Bloedfontein	KAT 06	Electrical					25º1'33.31	28º38'16.37
41	Katjibane	27	Bloedfontein	KAT 07	Electrical			2.3		24º01'37.85	28º38'6.00
42	Marapyane	23	Bloedfontein	BH 01	Electrical		N		Each has its own storage Tank		
43	Marapyane	23	Bloedfontein	BH 02	Electrical		N				
44	Kameelpoort	15	Kameelrivier	KMP 01	Electrical	Y		1.2		25º16'46.78	28º49'56.30
45	Kameelpoort	15	Kameelrivier	KMP 02	Electrical	Y					

Item No.	Village	Ward	Supply Area	Borehole Number	Power Supply	Status: Working (Y/N)		Yield (l/s)	Comments	Latitude	Longitude
46	Kameelpoort	15	Kameelrivier	BH 01	Electrical	Y			Contaminated		
47	Kameelpoort	15	Kameelrivier	BH 02	Electrical		N		Not accessible (Locked)		
48	Kameelpoort	15	Kameelrivier	BH 03	Electrical		N		Not accessible (Locked)		
49	Waterval A	10	Walkraal	WAT A01	Electrical	Y		2	reticulation		
50	Waterval A	10	Walkraal	WAT A02	Electrical	Y		2.6		25º11'7.86	28º59'59.93
51	Waterval B	10	Walkraal	WAT B01	Electrical	Y		1.1	To Jojo tanks	25º10'12.0	29º06'14.0
52	Waterval B	10	Walkraal	WAT B02	Electrical		N	1.2			
53	Waterval C	11	Walkraal	WAT C01	Electrical		N				
54	Waterval C	11	Walkraal	WAT C02	Electrical	Y				25º11'33.1	29º02'11.7
55	Waterval C	11	Walkraal	WAT CO2(i)	Electrical			no data			
56	Loding	26	Bloedfontein	Lod 01	Electrical				Each has its own steel tank	25º06'02.5	28º45'32.1
57	Loding	26	Bloedfontein	Lod 02	Electrical				Two package plant		
58	Pieterskraal	13	Kameelrivier		Diesel	Y		no data			
59	Semohlase/Moletji	26	Bloedfontein	SEM 01	Electrical	Y			Contribute to steel tank	25º05'02.3	28º42'43.7
60	Mmaduma	24	Bloedfontein	BH	Electrical	Y			Contribute to steel tank		
					Total	**25**	**28**	**1.98 l/s 10.26 Ml/day**	**Potential Average yield**		

A total of 60 boreholes are noted with only 25 functional, however it is reported that the municipality has approximately 200 boreholes (To be confirmed). The borehole yields of the listed boreholes range 0.2 ℓ/s to 7.6 ℓ/s which has the potential to a combined potential average yield of 10.2 Mℓ/day.

4.1.3.2 Surface water and treatment infrastructure

The existing surface water sources for include the following:

- Mtombo Balancing Dam;
- Rhenosterkop (Mkhombo) Dam; and
- Weltevreden Weir.

The above water sources are within the boundaries of Dr. JS Moroka Local Municipality. These sources are supplied and supplemented from the Loskop Dam and Rust de Winter Dam situated in the Mpumalanga and Limpopo Province respectively.

Allocation from the Loskop dam is reported at 2,55 Mm^3/a (±6,9 Mℓ/day), the yield from the Mkhombo dam is reported from 8.1 up to 11.7 Mm^3/a (22,2 to 32 Mℓ/day) (2022 Western Highveld BWSS Feasibility Report) and the yield from the Weltevreden Weir is reported to 9.65 (26.4 Mℓ/day) (2009 WDSP).

Raw water is abstracted from the Weltevreden Weir and pumped to the Weltevreden Water Treatment Works (WTW) and distributed to the subsystems.

Details on each of the above water sources and water treatment works are given in tables 4.5 and 4.6 below.

Table 4.5: Existing surface water infrastructure

Dam	Unit	Loskop	Mtombo Balancing Dam	Weltevreden Weir	Rhenosterkop (Mkhombo) Dam	Rust de Winter
Longitude	(0.'.")	25.25.05	29.07.08	28.59.30	28.55.00	28.31.01
Latitude	(0.'.")	29.21.32	25.06.19	25.06.30	25.05.45	25.14.01
River		Olifants	Loskop canal	Elands	Elands	Elands
Dam Type		Concrete Gravity	Embankment	Concrete buttress	Massive buttress	Concrete faced rock fill embankment
Year completed	Year	1939	1978	1980	1984	1934
Max height (FSL - RBL)	m	54	2.95	±2.6	32	24.1
Full Supply Level (FSL)	mAMSL	1,001.61	938	907.63	942	1,035.1
Storage capacity at FSL	million m3	348	0.05	0.2	204.591	26.943
Dead Storage	million m³	Unknown	Unknown	Unknown	1.234	0.265
Historical firm yield (HFY)	million m³/a	451	2.55 (Allocation)	6.95	8.1-10.7	9.8
Outlet capacity with water at FSL	m3/s	Left: 10.2 Right: 3.5	Unknown	6 high-capacity pumps feeding into 2 x 700 mm pipes	Scour valves: 7,8 Sediment valves: 50	1.388

Table 4.6: Existing water treatment works infrastructure

	Component Name	Weltevreden Water Treatment Works
General Information	Total volume of water treated per day (Mℓ)	60 Mℓ/d Capacity
	Operating hours per day	24
	How often is water quality monitored?	Daily
	Is abstraction recorded?	Yes
	Is the abstraction registered with DWS?	Yes
	Previous vandalism or theft?	Yes – Periodic, Vandalism and cable theft
Functionality	Describe the physical condition. How well is the infrastructure maintained?	Pump breakdowns is a major issue
	Are spare parts readily available?	No
	Number of breakages/ failures per year?	Multiple
	What needs to be refurbished?	None
	What needs to be replaced?	Pumps

Table 4.6: Existing water treatment works infrastructure (Continued)

Institutional status	Current operator	Dr JSM LM
Assets Assessment	Date Constructed	1984; 2001/2002 Refurbished
	Estimated Replacement Value	R 1050M
	Annual Operating Cost	R 11.5M
	Annual Maintenance Cost	R 9.5M
Type and capacity	Type of works (Processes)	Conventional: Flocculation / Sedimentation / Filtration
	Water source	Rhenosterkop (Mkhombo) Dam / Abstraction from Weltevreden Weir, supplemented by Mtombo transfer system (Pipeline in construction) from Loskop Dam
	Design Capacity (Peak)	Peak 60 Mℓ/d
	How much capacity is still available for development?	None

4.1.3.3 Pumping stations infrastructure

There are 14 Pump Stations supplying water to all the various subsystems of Walkraal, Bloedfontein, Kameelrivier, and Weltevreden whose details on pumping capacity and demand is outlined in the tables given below.

Table 4.7: Existing Pump Stations

General Information	Mtombo Raw Water	Valschfontein (Raw Water Booster)	Weltevreden Raw Water (Weir)	Weltevreden High Lift - Weltevreden Sub-system	Matjiesgoed-kuil
Current owner and operator	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM
Date constructed	1987	1994	1983	1992	1983
Number of pumps	1	1	5	1	2
Pumping head (m)	35	0	10	69	48
Potential Discharge rate (m³/h)	873	290	3283	270	50.4
Discharge rate (Mℓ/day)	20.9	6.96	78.79	6.48	1.21
Pump station Kilowatt / motor speed	1x160kW	300kW	2x55kW, 3x132kW	1x110kW	Unknown
Type of power supply	Electrical	Electrical	Electrical	Electrical	Electrical
Type of superstructure (Concrete, brick, etc.)	Brick	Brick	Steel cage	Brick	Brick
Operating hours per day	24	24	24	24	24
Number of standby pumps	0	0	3	0	1
Physical Condition	Average	Average	Good	Good	Good

Table 4.7: Existing Pump Stations (Continued)

General Information	Weltevreden High Lift - Kameelrivier Sub-system	Kameelrivier	Leeuwfontein B	Weltevreden High Lift - Bloedfontein Sub-system	Spitspunt
Current owner and operator	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM
Date constructed	1983	1983	1992	1983	1986
Number of pumps	1	2	2	4 (2+2)	2
Pumping head (m)	59	156	39	148	66
Discharge rate (m³/h)	270	75	17	324	108
Discharge rate (Mℓ/day)	6.48	1.80	0.41	7.78	2.59
Pump station Kilowatt / motor speed	1x110kW	2x110kW	5.5	4x110kW	2x37kW
Type of power supply	Electrical	Electrical	Electrical	Electrical	Electrical
Type of superstructure (Concrete, brick, etc.)	Concrete	Brick	Brick	Brick	Brick
Operating hours per day	24	16	5	24	7
Number of standby pumps	0	1	1	2	1
Physical Condition	Average	Good	Good	Good	Good

Table 4.7: Existing Pump Stations (Continued)

General Information	Lefiso1	Segokgo1	Weltevreden High Lift - Walkraal Sub-system	Walkraal pump station	Kabete Booster PS
Current owner and operator	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM	Dr JSM LM
Date constructed	1983 (2015 Refurb)	1997	1983	1983	2015
Number of pumps	2	2	4+3	3	Unknown
Pumping head (m)	±15	43	118	100	±40
Discharge rate (m³/h)	50.4	7	1563	1485	417
Discharge rate (Mℓ/day)	1.21	0.17	37.51	35.64	10.01
Pump station Kilowatt / motor speed	Unknown	4	4x315kW, 3x160kW	760	760
Type of power supply	Electrical	Electrical	Electrical	Electrical	Electrical
Type of superstructure (Concrete, brick, etc.)	Brick	Brick	Concrete	Brick	Brick
Operating hours per day	Variable	Not operational	24	24	24
Number of standby pumps	1	1	4	1	Unknown
Physical Condition	Good	Good	Average	Good	Good

4.1.3.4 Bulk pipeline infrastructure

Maintenance is done on a reactive basis only and infrastructure has deteriorated. Currently all air valves are in a bad state of neglect. Servitudes are not cleaned and access to pipelines is sometimes very difficult.

Refurbishment & replacement is needed to prevent water losses within the bulk system to provide more communities within the municipality with more efficiency. It is estimated that Dr JS Moroka LM is losing more than 25% of its water due to old and deteriorated infrastructure.

Asbestos pipeline replacement needs to be prioritised as it is prone to bursts and leakages and was banned in March 2008 as it is a concern of health hazard to the end user.

Table 4.8: Bulk pipelines (Raw Water Supply)

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 01	Mtombo Balancing Dam through raw pumps to Weltevreden RW Weir	1983	AC	450	CID/6	1600
		1983	AC	450	CID/12	8400
		1983	AC	450	CID/12	3850
					Total	**13850**
PLW 01 New	Mtombo Balancing Dam through raw pumps to Weltevreden RW Weir	2022	Unknown	Unknown	Unknown	14000
					Total	**In Construction**
PLW 02	Mtombo Balancing Dam to Valschfontein Booster P/S	1983	AC	500	CID/12	6325
					Total	**6325**
PLW 03	Valschfontein Booster P/S to Weltevreden Raw Water Weir	1983	AC	500	CID/18	7558
					Total	**7558**
PLW 04	Raw Water P/S to Weltevreden Water Treatment Plant	Unknown	steel	700	6mm/A	704.56
					Total	**704.56**
					Grand Total	**28437.56**

Table 4.9: Bulk pipelines: List of pipelines in the Walkraal Sub Supply Area

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 038	Weltevrede Water Treatment Works to Walkraal 1&2 Reservoirs	Unknown	steel	700	6mm/A	9031.48
					Total	**9031.48**
PLW 040	Walkraal 1 & 2 Reservoir to Siyabuswa Reservoir	1980	AC	500	CID/18	3304.3
		1985			**Total**	**3304.3**
PLW 062	Siyabuswa Reservoir to Node 6203 online to T-off to Siyabuswa B T/s	1983	AC	600	CID/18	1162.5
		Unknown	Steel	600	4.5mm/B	107.5
		1983	AC	600	CID/18	650
					Total	**1920**
PLW 063	Node 6203 online To Siyabuswa B to T-off To Siyabuswa B T/S	1983	AC	400	CID/18	935
					Total	**935**
PLW 064	T-off to Siyabuswa B to Siyabuswa B Township	1983	AC	300		1386.8
					Total	**1386.8**
PLW 065	T-off to Siyabuswa B to Siyabuswa A Township	1983	AC	300	CID/18	845
					Total	**845**
PLW62 - PLW65	Proposed to be replaced in 2022 (Detailed Design Stage)	2022	HDPE	500	Class 16	6700
					Total	**6700**
PLB 038	Zoetmelksfontein A&B Reservoirs to Klipplaatdrift V3 Reservoir	1983	AC	250	CID/18	971.8
		1983	AC	250	CID/24	620
		1983	AC	250	CID/30	860
		1983	AC	250	CID/36	1340
		Unknown	Steel	250	4.5mm/B	660
		1983	AC	250	CID/36	2285
					Total	**6736.8**
PLB 040	T-off to Kikvorschfontein to Klipplaatdrift 1&2 Reservoir	1983	AC	150	CID/18	473
		1983	AC	150	CID/24	1557
		1983	AC	150	CID/30	2267.7
					Total	**4297.7**
PLW091	Klipplaatdrift 1&2 res to Twoline	Unknown	uPVC	160	Unknown	Not Available
PLW 041	Klipplaatdrift V3 Reservoir to Pieterskraal B Reservoir	1983	AC	259	CID/18	3720.1
					Total	**3720.1**
PLW 042	Klipplaatdrift V3 Reservoir to Waterval B Township (Mabhoko)	1983	AC	250	CID/18	3557.7
		1983	AC	200	CID/18	1689.1
					Total	**5246.8**
PLW 043	Klipplaatdrift V3 Reservoir to Klipplaatdrift B Township	1983	AC	150	COD/C	1800
					Total	**1800**
PLW 044	Pieterskraal B Reservoir to Pieterskraal A Reservoir	1983	AC	250	CID/18	1029
		Unknown	Steel	250	4.5mm/B	220
		1983	AC	250	CID/18	1514.3
					Total	**2763.3**
PLW 045	Pieterskraal B Reservoir to T-Off to Waterval	1983	AC	250	CID/18	1409.1
					Total	**1409.1**
PLW 046	T-off to Waterval to Wolwekraal Reservoir	1983	AC	200	CID/18	500
					Total	500
PLW 047	Klipplaatdrift Res T-off to T off / Wolwekraal & Pieterskraal B Res	1983	AC	200	CID/18	4003.8
					Total	**4003.8**
PLW 048	Klipplaatdrift Res/Waterval B Township T-off to Waterval A1&A2 Res	1983	AC	150	COD/D	2192.8
		Unknown	Steel	150	4.5mm/B	160
		1983	AC	150	COD/D	2166
					Total	**4518.8**

Table 4.9: Bulk pipelines: List of pipelines in the Walkraal Sub Supply Area (Continued)

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 049	Klipplaatdrift Res/Waterval B Township T-off to Waterval B Res	1983	AC	150	COD/D	1575
					Total	1575
PLW050	Waterval A1&A2 Reservoir to Two-line Township	Unknown	PVC	160	Not Available	2556
		2011	PVC	200	Class 20	2200
					Total	**4756**
PLW 051	Waterval A1&A2 Reservoir to Klipplaatdrift A Township	1983	AC	150	COD/C	1812.6
					Total	1812.6
PLW 052	Wolwekraal Reservoir to Kameelrivier A Township	1983	AC	250	COD/C	3977
		1983	AC	200	CID/18	2058.1
					Total	**6035.1**
					Grand Total	**66597.68**

Table 4.10: Total of pipelines in the Bloedfontein Sub Supply Area supplied from the Weltevreden Water Treatment Works

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 090	Weltevreden Water treatment Works to Bloedfontein Reservoir	Unknown	GRP	400	GRP/25	4496.9
		Unknown	GRP	400	GRP/16	6740
					Total	**11236.9**
PLW 05	Weltevreden Water Treatment Plant to Node 0502 In pipeline	Unknown	Steel	350	4mm/C	4475
PLW 06	Node 0502 in Bloedfontein Pipeline to Bloedfontein Reservoir	1983	AC	350	CID/30	2200
		1983	AC	350	CID/24	2420
		1983	AC	350	CID/18	2142.5
						11237.5
PLW 090 & 05/06	Weltevreden Water Treatment Plant to Bloedfontein Reservoir				**Total**	**22474.4**
PLW 07	Bloedfontein Reservoir to T-off to Bloedfontein township	1983	AC	300	CID/18	1870
					Total	**1870**
PLW 08	T-off to Bloedfontein township to Allemansdrift C	1983	AC	250	CID/18	5980
		Unknown	Steel	250	4.5mm/B	50
		Unknown	PVC	250	uPVC/12	40
		1983	AC	250	CID/18	1104.8
					Total	**7174.8**
PLW 09	Bloedfontein Reservoir to second Moutse 1 T-off	1983	AC	350	CID/18	329.2
		1983	AC	350	CID/18	874.8
PLW 010	Second Moutse 1 T-off to T-off to Leeuwkuil	1983	AC	300	CID/18	3995
PLW 011	T-off To Leeuwkuil to T-off to Spitspunt Booster Pump station	1983	AC	250	CID/18	2187.6
PLW 09 - 011	Bloedfontein Reservoir to T-off to Spitspunt Booster				**Total**	**7386.6**
PLW 09A	Parallel (second) pipeline from Bloedfontein Reservoir to Spitspunt T-off	Unknown	PVC	400	Not Available	7386
					Total	**7386**

Table 4.10: Total of pipelines in the Bloedfontein Sub Supply Area supplied from the Weltevreden Water Treatment Works (Continued)

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 09A-011	Bloedfontein Reservoir to T-off to Spitspunt Booster				**Total**	**14772.6**
PLW 012	T-off to Spitspunt Booster to the T-off to Kabete	2015	HDPE	315	Not Available	5955.8
					Total	**5955.8**
PLW 013	T-off at Kabete to Loding Tank	2015	HDPE	315	Not Available	16220.2
					Total	**16220.2**
PLW 01W	Roodekoppies via Sekgogo Booster Pump Station to Semohlase Elevated Tower	Unknown	PVC	90	uPVC/9	5947
					Total	**5947**
PLW 014	T-off to De Beersput to De Beersput Township	1983	AC	150	CID/18	2056.9
					Total	**2056.9**
PLW 015	T-off to Spitspunt Booster to Spitspunt Booster Pump Station	1983	AC	200	CID/18	2300
					Total	**2300**
PLW 016	Spitspunt Booster Pump Station to Spitspunt Reservoir	1983	AC	200	CID/18	4138
					Total	**4138**
PLW 017	Spitspunt Reservoir to Marapyane Township	1983	AC	300	CID/18	2640
		1983	AC	200	CID/18	2706.7
		Unknown	PVC	200	Unknown	4337
					Total	**9683.7**
PLW 075	T- off to Lefiso township to Lefiso Water Tanks	Unknown	PVC	110	Unknown	1639
					Total	**1639**
PLW 018	Spitspunt Reservoir to T-Off to Spitspunt Township	1983	AC	200	CID/18	2706.7
					Total	**2706.7**
PLW 019	T-off From Spitspunt Township to T-off to Driefontein Township	1983	AC	150	COD/C	1631
		Unknown	PVC	150	uPVC/9	100
		1983	AC	150	COD/C	2090
					Total	**3821**
PLW 021	T-off to Spitspunt-to-Spitspunt Township	1983	AC	100	COD/C	1023.9
					Total	**1023.9**
PL	T- off at Ga-Matipule to Marapyane Reservoir	2019	HDPE	315	Class 12	4592
						4592
PL	Marapyane Reservoir to Mmaduma (Greenside)	2019	HDPE	250	Class 12	6063
						6063
					Grand Total	**112439**

Table 4.11: List of pipelines in the Weltevreden / Kuilen Sub Supply Area supplied from the Weltevreden Water Treatment Works

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 034	Weltevreden Water Treatment Works to Weltevreden Reservoir Proposed to be replaced in 2022 (Detailed Design Stage)	1983	AC	300	CID/24	805.7
		Unknown	Steel	300	4.5mm/B	66.4
		1983	AC	300	CID/24	687.9
		Unknown	Steel	300	4.5mm/B	174.3
		1983	AC	300	CID/24	2615.7
		2022	HDPE	324	PE 100 SDR 11 (PN16)	4350
					Total	**4350**
PLW 35	Weltevreden Reservoir to Vrieskraal Reservoir	1983	AC	150	COD/C	5230
					Total	**5230**
PLW 36	Vrieskraal Reservoir to Siyabuswa A Township	1983	AC	150	COD/C	4898.8
					Total	**4898.8**
PLW 37	Matjiesgoed Booster pump to Matjiesgoedkuil Reservoir	1983	AC	150	COD/C	1639
					Total	**1639**
					Grand Total	**16117.8**

Table 4.12: List of pipelines in the Kameelrivier Sub Supply Area supplied from the Weltevreden Water Treatment Works

Pipeline No.	Component/Scheme name (ID)	Date constructed*	Pipe material	Diameter	Pipe Class	Total Length (m)
PLW 058	Weltevreden Water Treatment Works to Kameelrivier Reservoir	1983	AC	300	CID/24	3448
					Total	**3448**
PLW 59	Kameelrivier Booster Pump Station to old Leeuwfontein Booster P/S	1983	AC	250	CID/36	4550
		1983	AC	250	CID/30	3120
		Unknown	Steel	250	4.5mm/B	80
PLW 60	Old Leeuwfontein Booster to Leeuwfontein Reservoir	1983	AC	250	CID/30	614.2
		1983	AC	250	CID/24	3345.8
PLW 059/60	Kameelrivier Booster P/S to Leeuwfontein Reservoir Total				**Total**	**11710**
PLW 61	Kameelrivier Reservoir to Kameelrivier B Township	1983	AC	250	CID/18	820
					Total	**820**
PLW 053/087	Leeuwfontein Reservoir to Pieterskraal A Reservoir	1983	AC	250	CID/18	350
		1983	AC	250	CID/24	780
		1983	AC	250	CID/30	740
		Unknown	Steel	250	Unknown	100
		1983	AC	250	CID/30	600
		1983	AC	250	CID/24	1320
		1983	AC	250	CID/18	464
		Unknown	Steel	250	4.5mm/B	255.5
PLW 053/087	Leeuwfontein Reservoir to Pieterskraal A Reservoir Total				**Total**	**4609.5**
PLW 054	Leeuwfontein Reservoir to PRV on Leeuwfontein/Vaalbank Reservoir line	1983	AC	250	CID/18	2380
PLW 055	P.R.V on Leeuwfontein/Vaalbank Line to Vaalbank Reservoir	1983	AC	250	CID/18	3683.8
		Unknown	PVC	160	uPVC/9	1199.2
PLW 54/55	Leeuwfontein Reservoir to Vaalbank Reservoir Total				**Total**	**7263**
PLW 056	Vaalbank Reservoir to Allemansdrift B Township	1983	AC	200	COD/C	1300
					Total	**1300**
PLW 057	Leeuwfontein Reservoir to Wolwekraal (Morwe) Township	Unknown	PVC	160	uPVC/9	938.2
		Unknown	PVC	110	uPVC/9	401
		1983	AC	100	COD/C	1750
					Total	**3089.2**
PLW 86	Leeuwfontein Reservoir to Leeuwfontein C Township	Unknown	PVC	110	uPVC/9	193
					Total	**193**
PLW 88	Leeuwfontein Reservoir to Leeuwfontein A, B Township	Unknown	PVC	160	uPVC/9	894
					Total	**894**
PLW 89	Leeuwfontein Reservoir via Leeuwfontein B Booster Pump Station to Steel Storage tank	1983	AC	250	CID/18	1068
		1983	AC	200	CID/18	174
		1983	AC	75	COD/C	498
					Total	**1740**
PLW	Kameelrivier Reservoir to Klipplaatdrift V3	2014	Unknown	Unknown	Unknown	**10000**
					Total	**10000**
					Grand Total	**45066.7**

* Date Constructed as per 2014 WSDP.

Total length of bulk pipelines in Dr JS Moroka LM is approximately **240.22 km**.

4.1.3.5 Ground and elevated storage (Reservoirs)

Table 4.13: Reservoirs within Dr JS Moroka LM

Item No.	Component name (no ID)	Date constructed	Reservoir Type	Floor level (mAMSL)	Height (m)	Reservoir capacity (kl)	Describe the physical condition
1	Bloedfontein	1986	Ground	1030.9	12.7	16000	Fair-Good
2	Spitspunt	1989	Ground	1048.1	8	2700	Fair-Good
3	Marapyane	2019	Ground	1011	9.5	10000	Not Operational
4	Seabe	2004	Ground	1020	-	6000	Not Operational
5	Lefiso	Unknown	Ground	1046	Unknown	2000	Good
6	Kameelrivier A	2015	Ground	964	-	5000	Fair-Good
7	Kameelrivier	1982	Ground	960.3	9.75	6000	Fair-Good
8	Leeuwfontein	1982	Ground	1074.9	9.75	6000	Fair-Good
9	Digwale	2006	Ground	1028	6	5000	Good
10	Pieterskraal A	1983	Ground	1045	5	770	Fair-Good
11	Vaalbank Old	1981	Ground	997	2.7	500	Fair-Good
12	Vaalbank New	2012	Ground	Unknown	Unknown	Unknown	Good
13	Siyabuswa	1983	Ground	976	11	12000	Fair-Good
14	Maganaubuswa	2004	Ground	Unknown	Unknown	2000	Fair-Good
15	Klipplaatdrift 1	1979	Ground	1091	5	800	Good
16	Klipplaatdrift 2	1979	Ground	1091	5	800	Fair-Good
17	Waterval A1	1978	Ground	1017	5.9	800	Fair-Good
18	Waterval A2	1979	Ground	1017	5.9	800	Fair-Good
19	Waterval A3 (Makola)	2011	Ground	1020	6.5	2000	Good
20	Waterval B1	1978	Ground	979	5	800	
21	Waterval B2	1978	Ground	979	5	800	Fair-Good
22	Wolwekraal 1 (Skimming)	1982	Ground	993	5	770	Fair-Good
23	Wolwekraal 2 (Skimming)	Unknown	Ground	993	Unknown	4000	Good
24	Unknown (Between V3 and WatervalB1, B2)	2012	Ground	Unknown	Unknown	Unknown	Good
25	Klipplaatdrift (V3)	1993	Ground	1065	5.45	5000	Fair-Good
26	Pieterskraal B	1983	Ground	1048.5	7.6	770	Fair-Good
27	Weltevreden Clear Water Tank 1	1983	Ground	Not Available	3	10000	Fair-Good
28	Weltevreden Clear Water Tank 2	1998	Ground	915.92	Not Available	10000	Fair-Good
29	Vrieskraal	1982	Ground	956	5	770	Fair-Good
30	Weltevreden	1982	Ground	975.4	9.7	6000	Fair-Good

Table 4.14: Elevated Storage

Item No.	Component name (no ID)	Date constructed	Height above Ground level	Dimension height	Dimension width	Tower capacity
1	Katjibane Elevated Tank (Served by borehole W11)	2001	17	3.6	4.8 x 6.0	100
2	Katjibane Elevated Tank (Served by borehole W12)	2001	15	2.4	7.2 x 7.2	116
3	Katjibane Elevated Tank (Served by borehole W18)	2001	15.4	2.4	6.0 x 6.0	80
4	Katjibane Elevated Tank (Served by borehole W17)	2001	15	2.4	6.0 x 6.0	80
5	Katjibane (Kalkfontein) Elevated Tank	Unknown	Unknown	Unknown	Unknown	50
6	Leeuwfontein B Elevated Tank	1993	1	4.8	6.0 x 7.2	198
7	Lefiso Elevated Tank 1	1998	20.5	3.6	6.0 x 6.0	120
8	Lefiso Elevated Tank 2	2015	Unknown	4.8	9.7 x 7.3	320
9	Matjiesgoedkuil Elevated Tank	1994	10.1	3.6	9.6 x 6.0	193
10	Pieterskraal Elevated Tank	1999	12	4.8	7.2 x 7.2	238
11	Ratopokwane (Witlaagte) Elevated Tank 1	1993	10.2	4.8	6.0 x 7.2	198
12	Ratopokwane (Witlaagte) Elevated Tank 2	2015	Unknown	Unknown	9.7 x 7.3	350
13	Rhenosterkop Elevated Tank	Unknown	17.3	4.8	6.0 x 6.0	166
14	Semohlase Elevated Tank	1995	12.2	2.4	3.6 x 4.8	38
15	Siyabuswa Elevated Tank	1992	11.2	2.4	3.6 x 3.6	30
16	Vrieskraal Elevated Tank	1998	11.9	3.6	6.0 x 7.2	146
17	Vrieskraal Elevated Tank	Unknown	23	3.6	4.8 x 4.8	78
18	Waterval A Elevated Tank	1998	Unknown	3.6	3.6 x 4.8	58
19	Weltevreden WTP Elevated Tank	1984	Decommissioned	Decommissioned	Decommissioned	Decommissioned
20	Workshop Elevated Tank (Weltevreden)	1991	17.2	3.6	4.8 x 6.0	98
21	Kabete Tank	2015	Unknown	3.6	7.3 x 7.3	200
22	Ga-Matipule Tank	2015	Unknown	3.6	10.9 x 9.7	2x400
23	Dihekeng Tank	2015	Unknown	3.6	7.3 x 7.3	200
24	Loding Tank	2015	Unknown	3.6	10.9 x 9.7	400
25	Marapyane Tank	2019	Unknown	3.6	6.1 x 4.8	108
26	Mmaduma (Greenside) Tank	±2005	Unknown	Unknown	Unknown	300
27	Masobye Tank 1	Unknown	Unknown	Unknown	Unknown	144
28	Masobye Tank 2	2017	12	Unknown	Unknown	550
29	Mmametlhake Tank	2014	Unknown	Unknown	Unknown	196
30	Mogononong Tank	2018	Unknown	Unknown	Unknown	400
31	Sehokho Tank	2015	Unknown	Unknown	Unknown	150
32	Nokaneng Tank	2015	Unknown	Unknown	14.6 x 14.6	576
33	Phake Tank 1	Unknown	Unknown	Unknown	Unknown	144
34	Phake Tank 2	±2018	Unknown	Unknown	Unknown	Unknown
35	Rankaile Tank	±2008	Unknown	Unknown	Unknown	24
36	Mantlole Tank	±2010	Unknown	Unknown	Unknown	300

The list of elevated water tanks presented above is the current infrastructure that is present in Dr JS Moroka LM.

4.1.4 Telemetry system

A telemetry system was in place throughout the regional bulk water supply system with SCADA at Ekandustria and Weltevreden WTW. This system has, however, collapsed due to vandalism, theft, and a lack of maintenance.

A tender for a service provider for the repair and maintenance of the system for a period of 3-years was advertised in 2015. It remains unclear if a service provider was appointed and the system repaired and maintained as the project was again listed in the 2016-2017 IDP with budgetary allocations for the period 2016/2017 to 2018/2019. The latest report from municipal officials indicated that the status quo as per the latter information remains.

4.1.5 Associated Services

Associated service entails the following:

- Pipe materials for the water reticulation for all settlements in Dr JSM LM

Details on the pipe materials for the reticulation networks are shown in table 4.15 to 4.16.

Table 4.15: Common Pipe Material for Water Reticulation

Subsystem	Type of Settlement	Water Reticulation Pipe Material (most common)			
		AC/FC	uPVC	Steel	HDPE
Weltevreden	Semi Urban	√	√	N/A	√
Kameelrivier	Semi Urban	√	√	N/A	N/A
Bloedfontein	Semi Urban	√	√	N/A	√
Walkraal	Semi Urban	√	√	N/A	N/A

Table 4.16: Pipe Lengths per Diameter for Water Reticulation

Community	Total Pipe Length (m) for pipe per Diameter											
	50	63	75	90	100-110	125	150-160	200	250	300-315	400	500
Siyabuswa A			28,359		18,690		1,394	2,506	1,468	84		
Siyabuswa B			29,329		7,555		3,625	465	2,493	1,856	433	151
Siyabuswa D			5,090		277		1,336	461				
Digwale			21,018	4439	11,492	2,079	4,850			94		
Kameelpoort		10,065	5,571		10		295					
Kameelrivier A			5,302	20,016	11,080		243	548				
Kameelrivier B		19,989	37,520	5,904				3,332				
Lefiso			8,167		11,427		1079	885				
Maganagobuswa	1,097	15,512	13,094	1,399	594	1,141	4,093					
Maphotla			37,339	1,160	10,899		2,631	1,661	1,023	1,030		
Marapyane			31,987		31,058		2,337					
Mmametlhake			16,872		7,485		6,449					
Senotlelo					21,607		1,551	1,305		209		
Vaalbank			21,003		13,932		8,066					
Ga Maria			15,727									
Allemansdrift C			4,774	2,022								
Nokaneng			598	2,511	287							
Phake			7,469									
Mantlole	241	261	204	1,946	2,023							
Rankaile			11,881		645							
Loding & Segokgo			17,311	3,214	1,743							
Total (m)	**1,338**	**45,827**	**318,615**	**42,611**	**150,804**	**3,220**	**37,949**	**11,163**	**4,984**	**3,273**	**433**	**151**

Total length of water reticulation pipelines in Dr JS Moroka LM is approximately **620.4 km**.

4.2 Sanitation

4.2.1 Introduction

The Municipality is mostly rural and has only one functional wastewater treatment works situated in Siyabuswa area. Another wastewater treatment facility is a 50Kl oxidation pond system which is in Libangeni but no longer functional or receiving wastewater. The Libangeni works treated wastewater from the Libangeni Police station.

The principal objective of wastewater treatment is generally to allow human and industrial effluents to be disposed of without causing harm to human health or environment.

The Siyabuswa WWTW is in the process of being refurbished to its original design capacity of 10Ml/day with the addition of a phase (Anaerobic). This refurbishment is at approximately 90% complete. The Libangeni Oxidation Pond works is also being upgraded to a formal 2Ml/day treatment works approximately 3,2km west of the existing works.

The aim of the municipality in providing the services are set out in the National Sanitation Policy are the following:

- To improve the health and quality of life of the entire population to protect the environment to place the responsibility for household sanitation provision with the family or household to integrate the development of a community in the provision of sanitation.

4.2.2 Situation Assessment

4.2.2.1 Coverage of Sanitation Services

The 2016 data obtained from a community survey show the following coverage of sanitation services:

- None: 1216 households (1.94%);
- Flush toilets (connected to sewerage system): 8237 households (13.26%);
- Flush toilets (with septic tank): 1107 households (1.78%);
- Chemical toilet: 367 households (0.59%);
- Pit toilet with ventilation (VIP): 15668 households (25.23%);
- Pit toilet without ventilation: 35192 households (56.63%);
- Bucket toilet: 223 households (0.36%); and
- Other: 155 households (0.25%).

It is reported that most pit toilets have been upgraded to Converted Water Borne toilets (CWB's).

To have 100% coverage of sanitation services in Dr JS Moroka LM, a minimum Sanitation standard for a HH is a VIP toilet, has been assumed whose total required coverage is shown in the table 4.18 given below

Table 4.18: Backlog eradication of Sanitation Infrastructure

Description	Households	Backlog % Of Dr JS Moroka
Pit toilet without ventilation	35,192	56.63
Bucket toilet	223	0.34
Other & None	1,371	2.20
TOTAL for Dr JS Moroka	**36,786**	**59.17**

4.2.2.2 Cost Implication of Backlog eradication

The cost implication for the backlog eradication has been arrived at taking into consideration of the following required infrastructure:

- Construction of VIP Toilets
- Construction of new sewer reticulation network for dwellings having flush toilets with septic tanks

The required total cost for the above would be in the range of R413,670,000.00 million as outlined

in the table 4.19 given below.

Table 4.19: Cost of Backlog Eradication of Sanitation services

Backlog Eradication: Sanitation Development		Estimated Cost	
Description	**Households**	**Per Household**	**Total**
Construction of VIP Toilets	36,359	R10,000.00	R363,590,000.00
New Sewer Reticulation for dwelling having flush toilets with septic tanks	1,147	R5,000.00	R50,080,000.00

4.2.2.3 Sanitation Challenges Identified per Ward

Major sanitation related challenges within Dr JS Moroka LM are outlined within table 4.20 below.

Table 4.20: Water Challenges (Source: 2022/23-2026/27 Dr JSM LM IDP)

Sanitation Challenges		
Ward	**Village Name**	**Challenges**
01	Ga-Phaahla	Sewer drainage system
02	Part of Kgapamadi Makopanong Section A to section C	CWB Toilets CWB Toilets
04	Part of Makopanong ward 4	CWB toilets
06	Mogononong/Siyabuswa C	Sewer system at Mogononong and Part of Siyabuswa C
07	Ramokgeletsane Section D	CWB Toilets
08	Mthambothini	CWB Toilets to outstanding households
09	Part of Ga Morwe	200 households need CWB toilets and sewer system
10	All villages	Construction of CWB Toilets
11	All villages	Construction of CWB Toilets
12	Marothobolong Manyebethwane	Sewer reticulation and CWB toilets
13	Borolo	Allocation of CWB Toilets
14	Maphotla	Construction of CWB
15	Molapoamogale/Digwale	Toilets for new stands
16	All 4 sections in ward 16	CWB Toilets (additional units) All 4 sections
17	Mbongo	CWB Toilets
18	Maphanga	Construction of CWB Toilets
19	Madubaduba Makometsane Ukukhanya	CWB Toilets (100 units) CWB Toilets (50 units) CWB Toilets (50 units)
20	Senotlelo	Construction of 1200 CWB toilets
21	Troya Kabete	CWB toilets (100 units) CWB toilets (50 units)
22	Part of Lefisoane/Lefiso/Ga-maria	CWB Toilets
23	Part of Marapyane Part of Seabe Mmaduma	CWB Toilets for the whole village
24	Part of Marapyane	CWB toilets urgently needed CWB toilets for fewer houses Half the village in need of CWB toilets
25	Part of Seabe & Nokaneng	CWB toilets

Sanitation Challenges		
Ward	**Village Name**	**Challenges**
26	Loding, Sehoko, Dihekeng & Part Nokaneng	CWB Toilets
27	Phomolong	Construction of CWB Toilets
28	Part of Mmametlhake, Masakeng & new stands Part of Nokaneng	CWB Toilets CWB Toilets
30	Khutsong/Rebone Extension /Rankaile and Mantlole	CWB Toilets
31	Masobye Green side and Itsoseng section	CWB toilets

4.2.3 Existing Infrastructure

Table 4.21: Wastewater Treatment Works

General Information	WWTW 01	WWTW 02
Component/scheme name	Siyabuswa (Refurbishment at 90% complete – 5+5=10Mℓ)	Vaalbank (Construction of new Works in Process -2Mℓ)
Classification	Class C	Class E
Current owner & operator	Dr JS Moroka LM	Dr JS Moroka LM
Asset Assessment		
Date constructed	1982, Refurbished 2022	Unknown, Upgrade 2022
Type & capacity		
Type of Works (description)	Activated sludge	Activated sludge
Sludge disposal	Drying beds	Drying beds
Design Capacity (Mℓ/day)	10 (90% complete)	2 (Upgrade in Process)
Operation		
How often is effluent quality monitored?	Based on classification - Partial	TBC
Functionality		
Describe the physical condition	New - Refurbished	New
How well is the infrastructure maintained?	Refurbishment in process	New
What needs to be refurbished?	Nothing	Nothing

4.2.4 Associated services

Associated service entails the following:

- Pipe materials for the sewerage reticulation for all settlements in Dr JSM LM

Details on the pipe materials for the sewerage reticulation networks within Dr JSM LM are shown in table 4.22.

Table 4.22: Common Pipe Material for Sewer Reticulation

Subsystem	Type of Settlement	Sewer Reticulation Pipe Material (most common)			
		VC	uPVC	AC	HDPE
Weltevreden	Semi Urban	√	√	√	N/A
Kameelrivier	Semi Urban	√	√	√	N/A
Bloedfontein	Semi Urban	N/A	N/A	N/A	N/A
Walkraal	Semi Urban	N/A	N/A	N/A	N/A

No further details on the sewer reticulation regarding pipe diameters or lengths is available.

4.3 Adequacy Analysis of Water Infrastructure

4.3.1 Objectives Service Delivery of Water and Sanitation Services

The objective of the Municipality is to promote the best interest of the communities and to ensure fair treatment of all our stakeholders. Amongst other things the objectives and responsibilities are:

- Allow a range of different methods of service provision, and level of service.
- Control and management of water quality and supply from the catchment to the customer.
- To provide safe drinking water by maintaining the current blue drop status Implementation of the water loss and water demand management.
- To provide service that is efficient and financially sustainable.
- To achieve the requirements set by regulators.
- To reduce water losses in both bulk and reticulation from 25% to 15%.

4.3.2 Operational Responsibilities/Output

The responsibility of the municipality is to provide basic level of service to all the communities. However, this depends largely on the institutional capacity. Now the actual and potential levels of institutional capacity and support for operation and maintenance are weak. This is evident in the

O&M the lack thereof results in:

- Infrastructure deterioration / Old infrastructure;
- Huge water losses within the deteriorated system;
- Breakdowns of pumps within the system; and
- Lack of training and understanding of water services provisioning as a whole and ability to identify key factors that attribute to sustainable water services delivery.

The completion and implementation of asset register will help this department to develop a maintenance plan to meet the operation and maintenance requirements and to optimize the day-to-day provision of water service.

4.3.3 Strategies

- To continuously identify best water quality boreholes with good yield to supplement the current available water network to improve water pressure in peak demands will ensure that the current intermitted water supply experienced during summer is minimized.
- By using MIG funds and other available grants to reduce the current water supply backlogs experienced in the western parts of the Municipality.
- To implement water Conservation and Water Demand Strategies to address issues of water loses and upgrade deteriorated infrastructure.
- Operations and Maintenance Plan need to be put in place to move away from the current (reactive maintenance) maintenance strategy.
- Reduce Blue-drop Risk Rating and improve compliance.

4.3.4 Water Demands

Table 4.23: Theoretical Estimated Daily Demands (Mℓ/day)

Supply Area	2022	2027	2032	2037	2042
Walkraal	22.34	24.45	27.02	29.85	32.75
Bloedfontein	7.80	8.55	9.25	9.91	10.57
Kameelrivier	4.76	5.11	5.48	5.85	6.23
Weltevreden	2.96	3.18	3.41	3.65	3.89
Total (AADD)	**37.86**	**41.29**	**45.15**	**49.25**	**53.44**
Total (GAADD = AADD+15%)	**43.54**	**47.48**	**51.92**	**56.64**	**61.46**
Total (SDDpl = GAADD x 1.2)	**52.25**	**56.98**	**62.31**	**67.97**	**73.75**
Total (SDDww = GAADD x 1.2 + 10%)	**57.47**	**62.68**	**68.54**	**74.76**	**81.12**

The above table 4.23 reflects the theoretical estimated current and future demands for the scheme (Dr JS Moroka LM and partially supplied neighbouring municipalities, Elias Motsoaledi, Ephraim Mogale and Thembisile Hani Local Municipalities). The estimated consumption per person is based on the level of service and future projected improvements in level of service.

4.3.5 Water Resources

A projected water balance for the surface water sources in shown in table 4.24.

Table 4.24: Surface Sources (Mℓ/day)

Description	2022	2027	2032	2037	2042
Demand (AADD) (Mm³/a)	13.82	15.07	16.48	17.98	19.51
Yield (Mm³/a)					
Allocation from Loskop Dam (Mtombo Balancing Dam)	2.55	2.55	2.55	2.55	2.55
Mkhombo Dam (Weltevreden Weir) - Reported maximum firm yield	9.45	9.45	9.45	9.45	9.45
Total (Mm³/a)	**12.00**	**12.00**	**12.00**	**12.00**	**12.00**
Surplus/Deficit (Mm³/a)	**-1.82**	**-3.07**	**-4.48**	**-5.98**	**-7.51**

The current and future projected demand are significantly higher than the allocation and yield of the surface water sources. This is a major cause for concern.

4.3.6 Water Treatment – Weltevreden WTW

The raw water purification process involves screening, coagulation, flocculation sedimentation and filtration and disinfection which are depicted in figure 4.1 below:

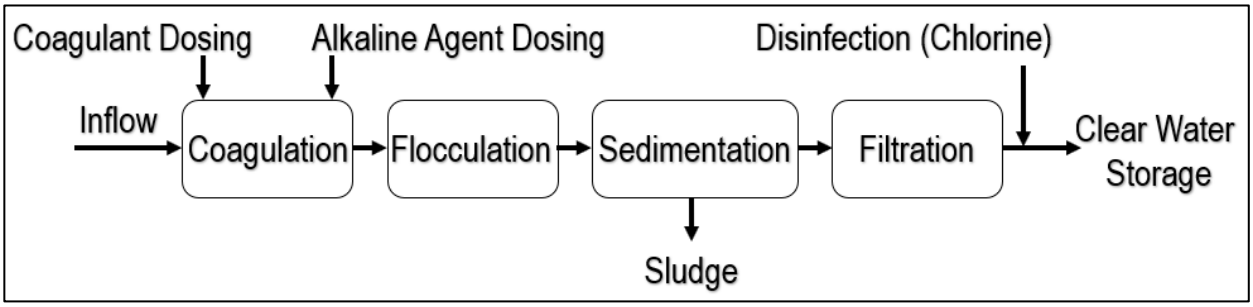


Fig 4.1 Weltevreden WTW treatment process

The raw water treatment process is achieved by the following treatment components:

- Receiving well;
- Mixing well;
- Coagulant dosing/alkaline dosing;
- Flocculation basin;
- Sedimentation basin;
- Rapid sand filters; and
- Disinfection process.

Table 4.25: Capacity Adequacy Analysis of the Weltevreden WTW

Weltevreden WTP	Existing Capacity (Mℓ/day)	Estimated Required Capacity (Mℓ/day)				
		2022	2027	2032	2037	2042
Demand (SDDww) (Mℓ/day)	60	57.47	62.68	68.54	74.76	81.12
Surplus/Deficit (Mℓ/day)		**2.53**	**-2.68**	**-8.54**	**-14.76**	**-21.12**

From future projected demands the treatment works will experience a capacity deficit from 2027,

which highlights the need for additional treatment capacity should the demand increase as projected. Additional schemes such as the Western Highveld BWSS will alleviate the need for additional treatment capacity or upgrades at the Weltevreden WTW.

4.3.6.1 Quality of treated water from Weltevreden WTP

Previously Conducted test results shown the parameters are within acceptable standards as per SANS 241-2006 maximum recommended values after the treatment process as shown from the test results of treated water.

4.3.7 Pumping Stations

Table 4.26: Adequacy Analysis of the Pump Stations

Pump Station	Existing Capacity	Required Flow (Mℓ/day)				
		2022	2027	2032	2037	2042
Mtombo Raw Water	20.95	6.96	6.96	6.96	6.96	6.96
	Capacity vs. Required	**13.99**	**13.99**	**13.99**	**13.99**	**13.99**
Valschfontein (Raw Water Booster)	6.96	6.96	6.96	6.96	6.96	6.96
	Capacity vs. Required	0.00	0.00	0.00	0.00	0.00
Weltevreden Raw Water	78.79	57.47	62.69	68.54	74.77	81.12
	Capacity vs. Required	**21.32**	**16.11**	**10.25**	**4.03**	**-2.33**
Weltevreden High Lift - Weltevreden Sub-system	6.48	4.09	4.39	4.71	5.03	5.37
	Capacity vs. Required	**2.39**	**2.09**	**1.77**	**1.45**	**1.11**
Matjiesgoedkuil	1.21	1.78	1.90	2.04	2.17	2.31
	Capacity vs. Required	**-0.57**	**-0.70**	**-0.83**	**-0.96**	**-1.10**
Weltevreden High Lift - Kameelrivier Sub-system	6.48	6.57	7.06	7.56	8.07	8.60
	Capacity vs. Required	**-0.09**	**-0.58**	**-1.08**	**-1.59**	**-2.12**
Kameelrivier	3.96	4.97	5.34	5.72	6.10	6.50
	Capacity vs. Required	**-1.01**	**-1.38**	**-1.76**	**-2.14**	**-2.54**
Leeuwfontein B	0.41	0.11	0.12	0.13	0.14	0.14
	Capacity vs. Required	**0.30**	**0.29**	**0.28**	**0.27**	**0.26**
Weltevreden High Lift - Bloedfontein Sub-system	7.78	7.80	8.55	9.25	9.91	10.57
	Capacity vs. Required	**-0.03**	**-0.78**	**-1.47**	**-2.13**	**-2.79**
Spitspunt	2.60	1.40	1.55	1.67	1.79	1.91
	Capacity vs. Required	**1.20**	**1.05**	**0.93**	**0.81**	**0.69**
Lefiso1	1.00	0.44	0.48	0.52	0.56	0.60
	Capacity vs. Required	**0.56**	**0.52**	**0.48**	**0.44**	**0.40**
Segokgo1 (Not Operational)	0.17	0.18	0.20	0.22	0.24	0.25
	Capacity vs. Required	**-0.01**	**-0.03**	**-0.05**	**-0.07**	**-0.08**
Weltevreden High Lift - Walkraal Sub-system	37.51	30.83	33.73	37.28	41.19	45.20
	Capacity vs. Required	**6.68**	**3.78**	**0.23**	**-3.68**	**-7.69**
Walkraal pump station	35.64	16.25	18.66	21.31	24.25	27.27
	Capacity vs. Required	**19.39**	**16.98**	**14.33**	**11.39**	**8.37**

Findings:

Most pump stations shown above has sufficient capacity to supply the demand for the various subsystems if all pumps within the pumpstations is in a working order. Upgrading will be required for:

- Matjiesgoedkuil and Kameelrivier has immediate capacity upgrading requirements;
- Weltevreden High Lift – Kameelrivier Sub-System will have insufficient capacity in 2032 if the demand increases as projected.
- Weltevreden Raw Water and Weltevreden High Lift – Walkraal Sub-System will have insufficient capacity in 2037 and 2042 respectively if the demand increase as projected.

4.3.8 Bulk Supply Pipelines

Table 4.26.1: Adequacy Analysis of the Pipelines of the Weltevreden (Kuilen) Subsystem

Pipeline	Existing Capacity (Mℓ/day)	Estimated Required Flow (Mℓ/day)				
		2022	2027	2032	2037	2042
PLW 034	7.33	1.80	1.92	2.06	2.19	2.33
	Capacity vs. Required	**5.53**	**5.40**	**5.27**	**5.14**	**5.00**
PLW 037	0.61	1.62	1.74	1.85	1.97	2.10
	Capacity vs. Required	**-1.01**	**-1.13**	**-1.24**	**-1.36**	**-1.49**
PLW 035	0.61	0.44	0.48	0.51	0.52	0.59
	Capacity vs. Required	**0.17**	**0.13**	**0.10**	**0.09**	**0.03**

Table 4.26.2: Adequacy Analysis of the Pipelines of the Bloedfontein Subsystem

Pipeline	Existing Capacity (Mℓ/day)	Estimated Required Flow (Mℓ/day)				
		2022	2027	2032	2037	2042
PLW 090	13.03	8.31	9.74	10.52	11.26	12.01
	Capacity vs. Required	**4.72**	**3.29**	**2.51**	**1.77**	**1.02**
PLW 07	2.44	2.06	2.22	2.39	2.54	2.71
	Capacity vs. Required	**0.39**	**0.22**	**0.06**	**-0.10**	**-0.26**
PLW 09	4.43	1.31	1.41	1.52	1.62	1.73
	Capacity vs. Required	**3.12**	**3.02**	**2.92**	**2.81**	**2.70**
PLW 012	1.09	0.34	0.37	0.40	0.42	0.45
	Capacity vs. Required	**0.75**	**0.72**	**0.69**	**0.66**	**0.64**
PLW 013	6.79	0.97	1.05	1.12	1.20	1.28
	Capacity vs. Required	**5.82**	**5.74**	**5.67**	**5.59**	**5.51**
PLW 09	4.34	2.51	3.80	4.10	4.37	4.65
	Capacity vs. Required	**1.84**	**0.55**	**0.24**	**-0.03**	**-0.30**
PLW 015	1.09	0.00	0.00	0.00	0.01	0.01
	Capacity vs. Required	**1.08**	**1.08**	**1.08**	**1.08**	**1.08**
PLW 09A	4.34	1.88	2.04	2.20	2.33	2.46
	Capacity vs. Required	**2.46**	**2.31**	**2.14**	**2.01**	**1.88**
PLW 023	2.44	1.88	2.04	2.20	2.33	2.46
	Capacity vs. Required	**0.56**	**0.41**	**0.24**	**0.11**	**-0.02**
PLW 027	1.09	0.90	0.98	1.06	1.15	1.23
	Capacity vs. Required	**0.19**	**0.11**	**0.02**	**-0.06**	**-0.15**
PLW 031	0.61	0.47	0.51	0.55	0.60	0.64
	Capacity vs. Required	**0.14**	**0.10**	**0.06**	**0.01**	**-0.03**
PLW 09	4.34	0.32	0.35	0.37	0.40	0.43
	Capacity vs. Required	**4.02**	**4.00**	**3.97**	**3.94**	**3.92**
PLW 030	1.70	0.32	0.35	0.37	0.40	0.43
	Capacity vs. Required	**1.38**	**1.35**	**1.32**	**1.30**	**1.27**
PLW 029	1.09	0.32	0.35	0.37	0.40	0.43
	Capacity vs. Required	**0.77**	**0.74**	**0.71**	**0.69**	**0.66**
PLW 032	0.70	0.32	0.35	0.37	0.40	0.43
	Capacity vs. Required	**0.38**	**0.35**	**0.32**	**0.29**	**0.27**

Table 4.26.3: Adequacy Analysis of the Pipelines of the Kameelrivier Subsystem

Pipeline	Existing Capacity (Mℓ/day)	Estimated Required Flow (Mℓ/day)				
		2022	2027	2032	2037	2042
PLW 058	7.33	4.97	5.24	5.70	6.08	6.47
	Capacity vs. Required	**2.36**	**2.09**	**1.63**	**1.25**	**0.86**
PLW 061	1.70	1.08	1.15	1.22	1.30	1.38
	Capacity vs. Required	**0.62**	**0.55**	**0.47**	**0.40**	**0.32**
PLW 059	5.09	3.08	4.18	4.47	4.78	5.09
	Capacity vs. Required	**2.01**	**0.91**	**0.62**	**0.31**	**0.00**
PLW 059	1.70	1.64	1.76	1.88	2.00	2.13
	Capacity vs. Required	**0.06**	**-0.06**	**-0.18**	**-0.31**	**-0.43**
PLW 057	0.70	1.54	1.66	1.78	1.90	2.02
	Capacity vs. Required	**-0.84**	**-0.96**	**-1.08**	**-1.20**	**-1.33**
PLW 053/087	1.70	0.29	0.31	0.34	0.36	0.39
	Capacity vs. Required	**1.41**	**1.38**	**1.36**	**1.33**	**1.31**
PLW 089	1.70	0.28	0.30	0.32	0.34	0.37
	Capacity vs. Required	**1.42**	**1.40**	**1.38**	**1.35**	**1.33**
PLW 088	0.70	0.44	0.47	0.50	0.54	0.57
	Capacity vs. Required	**0.26**	**0.23**	**0.19**	**0.16**	**0.12**

Table 4.26.4: Adequacy Analysis of the Pipelines of the Walkraal Subsystem

Pipeline	Existing Capacity (Mℓ/day)	Estimated Required Flow (Mℓ/day)				
		2022	2027	2032	2037	2042
PLW 038	39.90	25.21	27.88	30.80	34.02	37.32
	Capacity vs. Required	**14.69**	**12.02**	**9.10**	**5.88**	**2.58**
PLW 039	29.32	19.27	21.80	24.57	27.63	30.77
	Capacity vs. Required	**10.04**	**7.52**	**4.75**	**1.69**	**-1.45**
PLW 040	6.79	5.94	6.08	6.23	6.39	6.54
	Capacity vs. Required	**0.85**	**0.70**	**0.55**	**0.40**	**0.24**
PLW 062	9.77	5.94	6.08	6.23	6.39	6.54
	Capacity vs. Required	**3.84**	**3.69**	**3.54**	**3.39**	**3.23**
PLW 063	4.34	5.94	6.08	6.23	6.39	6.54
	Capacity vs. Required	**-1.59**	**-1.74**	**-1.89**	**-2.04**	**-2.20**
PLB 041	3.33	3.44	3.91	4.44	5.00	5.56
	Capacity vs. Required	**-0.11**	**-0.59**	**-1.11**	**-1.68**	**-2.23**
PLB 042A	3.33	3.44	3.91	4.44	5.00	5.56
	Capacity vs. Required	**-0.11**	**-0.59**	**-1.11**	**-1.68**	**-2.23**
PLB 048A	2.44	3.44	3.91	4.44	5.00	5.56
	Capacity vs. Required	**-1.00**	**-1.47**	**-1.99**	**-2.56**	**-3.11**
PLB 041	3.33	4.57	5.17	5.81	6.51	7.09
	Capacity vs. Required	**-1.24**	**-1.85**	**-2.49**	**-3.19**	**-3.77**
PLB 044	1.70	4.57	5.17	5.81	6.51	7.09
	Capacity vs. Required	**-2.87**	**-3.48**	**-4.12**	**-4.82**	**-5.40**
PLB 040	0.61	1.61	1.73	1.86	1.99	2.12
	Capacity vs. Required	**-1.00**	**-1.12**	**-1.25**	**-1.38**	**-1.51**
PLW 037	29.32	7.27	8.43	9.75	11.25	12.95
	Capacity vs. Required	**22.05**	**20.89**	**19.57**	**18.07**	**16.36**

Table 4.26.4: Adequacy Analysis of the Pipelines of the Walkraal Subsystem (Continued)

Pipeline	Existing Capacity (Mℓ/day)	Estimated Required Flow (Mℓ/day)				
		2022			2022	
PLB 038	1.70	1.42	1.52	1.63	1.74	1.85
	Capacity vs. Required	**0.28**	**0.17**	**0.07**	**-0.05**	**-0.16**
PLB 038	1.70	1.61	1.73	1.86	1.99	2.12
	Capacity vs. Required	**0.09**	**-0.04**	**-0.17**	**-0.30**	**-0.43**
PLW 043	0.61	0.31	0.33	0.36	0.38	0.41
	Capacity vs. Required	**0.30**	**0.28**	**0.25**	**0.23**	**0.21**
PLW 042	1.09	0.31	0.33	0.36	0.38	0.41
	Capacity vs. Required	**0.78**	**0.75**	**0.73**	**0.71**	**0.68**
PLW 04	1.70	1.11	1.19	1.27	1.36	1.45
	Capacity vs. Required	**0.59**	**0.51**	**0.42**	**0.34**	**0.25**
PLW 046	1.09	0.76	0.82	0.88	0.94	1.00
	Capacity vs. Required	**0.32**	**0.27**	**0.21**	**0.15**	**0.08**
PLW 052	1.70	0.76	0.82	0.88	0.94	1.00
	Capacity vs. Required	**0.93**	**0.88**	**0.82**	**0.76**	**0.69**

Findings:

Pipelines to be upgraded due to insufficient demands is the following:

Weltevreden (Kuilen) Subsystem

- PLW037 Matjiesgoed Booster pump to Matjiesgoedkuil Reservoir has insufficient capacity and requires upgrading.

Kameelrivier Subsystem

- PLW059 Kameelrivier Booster Pump Station to old Leeuwfontein Booster P/S and PLW057 Leeuwfontein Reservoir to Wolwekraal (Morwe) Township has insufficient capacity and requires upgrading.

Walkraal Subsystem

- PLW063, PLB041, PLB042A, PLB048A, PLB044, PLB040 and PLB038 has insufficient capacity and requires upgrading.

4.3.9 Storage

DWS design criteria formula has been used to compute the required storage volumes of service reservoirs supplying Settlements of Dr JS Moroka LM. The resulting storage for the period between 2022 - 2042 projected storage volumes have been compared with the existing storage volumes to establish the useful life and adequacy of the storage volume.

Table 4.27: Adequacy Analysis of the Pump Stations of Dr JS Moroka LM

Reservoir	Existing Storage Capacity (Mℓ/day)	Estimated Required Storage (2 x AADD) (Mℓ)				
		2022	2027	2032	2037	2042
Bloedfontein	16.00	12.724	13.999	15.156	16.245	17.329
	Capacity vs. Required	**3.28**	**2.00**	**0.84**	**-0.24**	**-1.33**
Spitspunt	2.70	3.68	4.23	4.66	5.08	5.49
	Capacity vs. Required	**-0.98**	**-1.53**	**-1.96**	**-2.38**	**-2.79**
Marapyane	10.00	0.00	0.00	0.00	0.00	0.00
	Capacity vs. Required	**10.00**	**10.00**	**10.00**	**10.00**	**10.00**

Table 4.27: Adequacy Analysis of the Pump Stations of Dr JS Moroka LM (Continued)

Reservoir	Existing Storage Capacity (Mℓ/day)	Estimated Required Storage (2 x AADD) (Mℓ)				
		2022	2027	2032	2037	2042
Seabe	6.00	0.00	0.00	0.00	0.00	0.00
	Capacity vs. Required	**6.00**	**6.00**	**6.00**	**6.00**	**6.00**
Lefiso	2.00	0.33	0.41	0.47	0.53	0.57
	Capacity vs. Required	**1.67**	**1.59**	**1.53**	**1.47**	**1.43**
Kameelrivier A	5.00	3.77	4.30	4.60	4.91	5.23
	Capacity vs. Required	**1.23**	**0.70**	**0.40**	**0.09**	**-0.23**
Kameelrivier	6.00	3.77	4.30	4.60	4.91	5.23
	Capacity vs. Required	**2.23**	**1.70**	**1.40**	**1.09**	**0.77**
Leeuwfontein	6.00	5.32	5.75	6.20	6.66	7.13
	Capacity vs. Required	**0.68**	**0.25**	**-0.20**	**-0.66**	**-1.13**
Digwale	5.00	Unknown	Unknown	Unknown	Unknown	Unknown
	Capacity vs. Required	Unknown	Unknown	Unknown	Unknown	Unknown
Pieterskraal A	0.77	0.46	0.50	0.54	0.58	0.62
	Capacity vs. Required	**0.31**	**0.27**	**0.23**	**0.19**	**0.15**
Vaalbank Old	0.50	Unknown	Unknown	Unknown	Unknown	Unknown
	Capacity vs. Required	Unknown	Unknown	Unknown	Unknown	Unknown
Vaalbank New	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	Capacity vs. Required	Unknown	Unknown	Unknown	Unknown	Unknown
Siyabuswa	12.00	9.06	9.28	9.51	9.74	9.98
	Capacity vs. Required	**2.94**	**2.72**	**2.49**	**2.26**	**2.02**
Maganaubuswa	2.00	1.61	1.73	1.86	1.99	2.12
	Capacity vs. Required	**0.39**	**0.27**	**0.14**	**0.01**	**-0.12**
Klipplaatdrift 1	0.80	N/A	N/A	N/A	N/A	N/A
	Capacity vs. Required	N/A	N/A	N/A	N/A	N/A
Klipplaatdrift 2	0.80	N/A	N/A	N/A	N/A	N/A
	Capacity vs. Required	N/A	N/A	N/A	N/A	N/A
Waterval A1	0.80	1.50	1.63	1.76	1.90	2.04
Waterval A2	0.80					
Waterval A3 (Makola)	2.00					
Waterval B1	0.80					
Waterval B2	0.80					
	Capacity vs. Required	**3.70**	**3.57**	**3.44**	**3.30**	**3.16**
Wolwekraal 1 (Skimming)	0.77	0.57	0.62	0.66	0.71	0.76
	Capacity vs. Required	**0.20**	**0.15**	**0.11**	**0.06**	**0.01**
Wolwekraal 2 (Skimming)	4.00	0.57	0.62	0.66	0.71	0.76
	Capacity vs. Required	**3.43**	**3.38**	**3.34**	**3.29**	**3.24**
Unknown (Between V3 and Waterval B1, B2)	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
	Capacity vs. Required	Unknown	Unknown	Unknown	Unknown	Unknown
Klipplaatdrift (V3)	5.00	2.11	2.28	2.46	2.64	2.82
	Capacity vs. Required	**2.89**	**2.72**	**2.54**	**2.36**	**2.18**
Pieterskraal B	0.77	0.51	0.55	0.59	0.63	0.67
	Capacity vs. Required	**0.26**	**0.22**	**0.18**	**0.14**	**0.10**
Vrieskraal	0.77	0.88	0.95	1.02	1.08	1.15
	Capacity vs. Required	**-0.11**	**-0.18**	**-0.25**	**-0.31**	**-0.38**

Reservoir	Existing Storage Capacity (Mℓ/day)	Estimated Required Storage (2 x AADD) (Mℓ)				
		2022	2027	2032	2037	2042
Weltevreden	6.00	3.04	3.26	3.49	3.73	3.97
	Capacity vs. Required	**2.96**	**2.74**	**2.51**	**2.27**	**2.03**

Findings:

- Storage capacity at Vrieskraal and Spitspunt reservoirs is inadequate and additional storage capacity is required.
- Storage capacity at Leeuwfontein Old reservoir will become inadequate for the demand within the next 10 years and additional storage is available at Leeuwfontein New but capacity is unknown.
- Storage capacity at Bloedfontein reservoir will become inadequate for the demand within the next 15 years and additional storage capacity is needed.

4.4 Adequacy Analysis of Sanitation Infrastructure

4.4.1 Objectives

One of the most key obligations of the Municipality is to provide dignified sanitation systems, amongst others:

- Sanitation systems that is reliable, acceptable, affordable, and sustainable.
- The operations and maintenance strategy, or policy, will have to be developed for emptying pit latrines to ensure a longer lifespan and a safe environment.
- The discharge of untreated wastewater into the nearby Elands River as well as without a general authorization as provided for in the General Authorization will be catered for by appointment of a professional service provider.
- From the Municipal 31 wards, 100 pit latrines will be built to reduce the current backlog as provided for in the WSDP document.
- Refurbish the only sewer Works to a point of compliance of national quality standards.
- The municipal grey water will have to be managed effectively and efficiently as required and provide by both the National water Act and Water Services Act by appointing highly competed, knowledgeable and experience personnel either on permanent or temporally basis to ensure compliance.

4.4.2 Adequacy Analysis of Siyabuswa WWTW

4.4.2.1 Siyabuswa Wastewater Treatment Works

The existing Siyabuswa wastewater treatment Works has a 10 Mℓ/day design capacity and are in the process of being refurbished to restore the design capacity.

Figure 4.1: Siyabuswa WWTW

4.4.2.2 Treatment process

Siyabuswa Wastewater Treatment Works consists of two x 5 Mℓ/day modules utilising the following unit operation and processes to achieve the desired degree of treatment.

- Preliminary treatment
- Primary sedimentation
- Secondary treatment
- Disinfection and
- Sludge treatment.

The Works are currently being refurbished to its original design capacity with the addition of an Anaerobic treatment phase which will restore the facility to a fully operating plant with compliant effluent.

4.4.2.3 Operation procedure

Siyabuswa wastewater treatment plant is an activated sludge plant which operates with continuous recycling of large concentrations of activated sludge. The activated sludge is in suspension in the aeration tanks which must be settled out of the mixed liquor in the clarifier to produce two streams. The overflow from the clarifier is the clear treated effluent from the process, and the underflow, which contains the settled sludge solids, is the sludge return or recycle stream.

4.4.3 Quality of Treated wastewater from Siyabuswa WWTW

Previously conducted test results shown high concentration levels of COD, Free and saline ammonia and Phosphorous of the treated effluent which are above the SANS 241-2006 maximum recommended values after the treatment process as shown from the test results of treated wastewater. At the same time there is no trace of residual chlorine, an indication that the treatment process is ineffective in eliminating COD, ammonia, coliform bacteria, and total coliform bacteria.

The analysis projected below was calculated only on the current number of households (HH) that is connected to the sewer system and the projected 1200 house connections that is listed within the 2022/2023 to 2026/2027 IDP a growth rate is being incorporated to show reasonable projected figures.

Table 4.29: Adequacy Analysis of Existing capacity of Siyabuswa WWTW for the period 2022 - 2042

Location of the WWTP: SIYABUSWA	Existing Capacity	Net Capacity(Mℓ/day)				
Longitude: 29°03'55.28"E						
Latitude: 25°05'55.40"S		**2022**	**2027**	**2032**	**2037**	**2042**
Wastewater Generation (Mℓ/day)	10	11.94	13.04	14.14	15.23	16.33
Surplus/Deficit (Mℓ/day)		**-1.94**	**-3.04**	**-4.14**	**-5.23**	**-6.33**

4.4.4 Adequacy Analysis of Libangeni (Vaalbank) WWTP

4.4.4.1 Libangeni (Vaalbank) WWTP

The existing Vaal bank wastewater treatment plant has a 0.05Mℓ/day capacity but is in the process of being upgraded to a 2Ml/day plant at a new location. See figures below of the old Libangeni WWTP and the new Libangeni WWTP that is under construction. The Libangeni retention pond was solely used to treat the wastewater from the Vaalbank SAPS.

Figure 4.2: Old Libangeni 0.05Ml/day Retention Pond

Figure 4.3: New Libangeni 2Ml/day WWTW

4.4.4.2 Treatment process

The upgraded Libangeni (Vaalbank) Wastewater Treatment Work is in the process of being constructed. The treatment process is to be confirmed.

4.4.4.2.1 Disinfection

Disinfection is not done at the existing Libangeni (Vaalbank) WWTW. The upgraded 2Ml/day plant will have a disinfection process included.

4.4.4.2.2 Dewatering of sludge

There is no treatment of sludge at the existing Libangeni (Vaalbank) WWTW.

4.4.4.2.3 Quality of Treated wastewater from Vaalbank (Libangeni) Wastewater Treatment Works

There are no test results of treated wastewater at the existing Libangeni (Vaalbank) WWTW.

4.5 Water and Sanitation Infrastructure Profile

Water and Sanitation Infrastructure profile covers the following:

- Coverage of water and sanitation infrastructure;
- Backlog eradication of water and sanitation services;
- Asset Register Monitoring Programme;
- Disaster Management Plan;
- Water Quality Plan;
- Management of Untreated Effluent;
- Total Number of complaints for various Infrastructure;
- Total number of complaints for Sanitation Infrastructure;
- Security Problems of water and Sanitation Infrastructure;
- Registration with DWA of water abstraction;

- Recording of water abstraction;
- Safety Inspection Performed;
- Average Operating hours of WPP & WWTP;
- illegal connections of water reticulation network & sewer reticulation network;
- Storage factors of service reservoirs;
- % Control of Effluents from WWTW;
- Permitted Effluent from WWTW;
- Solid waste disposal at WWTW(m^3/day);
- Sludge produced per day at WWTW(Tons/day);
- % Time effluent chlorinated from WWTW;
- Functionality of Water and Sanitation Infrastructure;
- Institutional Status;
- Asset Assessment Spectrum; and
- Type and Capacity of Water and Sanitation Infrastructure.

4.6 Registered Asset Monitoring (O&M Plan)

These are the physical components of the system include: pipe, valves, tanks, pumps, wells, hydrants, treatment facilities. The assets that make up a water or wastewater system generally ages and deteriorates over time. This deterioration causes the desired services delivery outcome to be achieve. Costs of operation and maintenance will increase as the assets age and a O&M plan is of utmost importance.

Dr JS Moroka LM has in place an Asset Register which was approved by the Council and gazetted. In addition, the municipality needs the personnel and budget for implementation of the above O&M Plan and personnel needs to be trained to operate these various systems. This will enable Dr JS Moroka Local to better maintain and repair all water and sanitation assets such as boreholes, pump stations, Water Treatment Works, Wastewater Treatment Plants, sewer reticulation, water reticulation, reservoirs etc.

4.7 Disaster Management Plan

Most common disasters that may occur in the provision of water and sanitation services include discharge of poorly treated wastewater into the environment which have aquifers that are sources of borehole water supply. It is therefore important for any municipality to have disaster management plans in case danger of contamination of groundwater occurs. Among the infrastructure for which the disaster management plans need to be in place include the following:

- Groundwater sources infrastructure (Broken down equipment to be fixed);
- Surface water sources infrastructure;
- Water Treatment Works (Supply to Weltevreden WTP is insufficient); and
- Water Pump Stations (Currently numerous pumps are broken down);

Dr JS Moroka does experience breakages at most of the Water and Sanitation Infrastructure which are not recorded. The most affected Infrastructure include water pump stations, sewage pump stations, Water Treatment Works, Wastewater Treatment Works, and Boreholes. See the following tables 4.48 – 4.58 that will provide information regarding the following:

- Asset Register Monitoring Programme;
- Disaster Management Plan;
- Management of Untreated Effluent;
- Security Problems of water and Sanitation Infrastructure;
- Registration with DWA of water abstraction;
- Recording of water abstraction;
- Safety Inspection Performed;
- Authorization compliance of WTP & WWTP;
- Functionality of Water and Sanitation Infrastructure; and
- Control of Operation of Water and Sanitation Infrastructure.

Table 4.29 Asset Register Monitoring Programme

Subsystem	Asset Register Monitoring Programme(Y/N)										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Weltevreden	N	N	N	N	N	N	N	N	N	N	N
Kameelrivier	N	N	N	N	N	N	N	N	N	N	N
Bloedfontein	N	N	N	N	N	N	N	N	N	N	N
Walkraal	N	N	N	N	N	N	N	N	N	N	N

Table 4.30: Disaster Management Plan

Subsystem	Water Safety Plan (Y/N)										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Weltevreden	N	N	N	N	N	N	N	N	N	N	N
Kameelrivier	N	N	N	N	N	N	N	N	N	N	N
Bloedfontein	N	N	N	N	N	N	N	N	N	N	N
Walkraal	N	N	N	N	N	N	N	N	N	N	N

Table 4.31: Management of Untreated Effluent

Subsystem	Management Plan of Untreated Effluent (Y/N)					
	Groundwater	Surface Water	Water Treatment Works	Water Pump stations	Sewer Pump Stations	Wastewater Treatment Works
Weltevreden	N	N	N	N	N	N
Kameelrivier	N	N	N	N	N	N
Bloedfontein	N	N	N	N	N	N
Walkraal	N	N	N	N	N	N

Table 4.32: Security Problems of Water and Sanitation Infrastructure

Subsystem	(R: Regular), (P: Periodic), (S: Sporadic), (N: None)										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Weltevreden	S	S	S	S	S	S	S	S	S	S	S
Kameelrivier	S	S	S	S	S	S	S	S	S	S	S
Bloedfontein	S	S	S	S	S	S	S	S	S	S	S
Walkraal	S	S	S	S	S	S	S	S	S	S	S

Table 4.33: Registration with DWS of Water Abstraction

Subsystem	Registration of Abstraction with DWS (Y/N)	
	Groundwater	Surface Water
Weltevreden	Y	Y
Kameelrivier	Y	Y
Bloedfontein	Y	Y
Walkraal	Y	Y

Table 4.34: Recording of Water Abstraction

Subsystem	Recording of Abstraction with DWS (Y/N)	
	Groundwater	Surface Water
Weltevreden	Y	Y
Kameelrivier	Y	Y
Bloedfontein	Y	Y
Walkraal	Y	Y

Table 4.35: Safety Inspection Performed

Subsystem	(R: Regular), (P: Periodic), (S: Sporadic), (N: None)										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Weltevreden	S	S	S	S	S	S	S	S	S	S	S
Kameelrivier	S	S	S	S	S	S	S	S	S	S	S
Bloedfontein	S	S	S	S	S	S	S	S	S	S	S
Walkraal	S	S	S	S	S	S	S	S	S	S	S

Table 4.36: Authorization compliance of WPP & WWTW

Description	Type of Treatment Plant	Authorisation Compliance (Y/N)	
Siyabuswa WWTW	Activated Sludge	Y	Y
Vaalbank WWTW	Oxidation Pond	N/A	N/A

Table 4.37: Functionality of Water and Sanitation Infrastructure

Subsystem	(D: Dysfunctional), (O: Operational), (P: Prime condition), (V: Vandalised)										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Bulk Pipelines	O	D	D	D	NA	O	NA	O	O	NA	NA
Weltevreden WTW	NA	D	O	D	NA	O	NA	O	D	NA	NA
Siyabuswa WWTW	NA	NA	O	O	O	O	O	NA	NA	O	O
Water Pump Stations	O	O	NA	O	NA	O	NA	O	O	NA	NA

Table 4.38: % Control of Operation of Water and Sanitation Infrastructure

Subsystem	% Control of WSA										
	Groundwater	Surface Water	Water Treatment Works	Water Pump Stations	Sewer Pump Stations	Water Bulk Pipelines	Sewer Bulk Pipelines	Reservoirs	Water Reticulation	Sewer Reticulation	Wastewater Treatment Works
Weltevreden	100	100	100	100	100	100	100	100	100	100	100
Kameelrivier	100	100	100	100	100	100	100	100	100	100	100
Bloedfontein	100	100	100	100	100	100	100	100	100	100	100
Walkraal	100	100	100	100	100	100	100	100	100	100	100

5 OPERATION AND MAINTENANCE

5.1.1 Situation Assessment

DR JSM LM possesses a well-developed bulk water supply network. Schematic layouts of the existing infrastructure are shown in Appendix A. The water infrastructure, within their area of jurisdiction, of the historic Kwa Ndebele Homeland has been transferred to Dr JSM LM from the DWS as per the agreement signed on 28 December 2004.

Budgets are not ring fenced and the estimated operation and maintenance costs as indicated in the tables below reflect the values as indicated in the Transfer Agreement between DWS and the Dr JSM LM. The estimated total value of the infrastructure is as follows:

Table 5.1.1 (a): Summary of Asset Values and Costs

Value: R million			Operation and Maintenance Cost: R million		
Replacement Cost [1]	Depreciated Present Value (2022)	Refurbishment Cost (2022)	O&M[2]	Bulk Water Purchase	Total
332.27	69.20	23.16	13.66	TBC	13.66

Note:
1 - Values from the Transfer Agreement 2004.
2 - The calculated O&M costs are based on typical a percentage allowance for each infrastructure component as prescribed by DWS.

The breakdown of the summary as given above is shown below as extracted from the Transfer Agreement:

Table 5.1.1 (b): Breakdown of Asset Values (R million)

Description	Replacement Cost (2004)	Replacement Cost (2022)	Depreciated Present Value (2022)	Refurbishment Cost (2022)
Boreholes	3.82	11.87	0.68	0.08
Surface Water	20.24	62.88	5.61	0.00
Water Treatment Works	27.48	85.37	6.15	0.91
Pumping Stations	44.68	138.81	7.92	0.91
Bulk pipelines	78.00	242.32	18.61	4.82
Reservoirs and tanks	61.85	192.15	15.77	0.11
Community Reticulation	83.92	260.71	12.72	9.84
Bulk Outfall Sewer	0.02	0.06	0.01	0.00
Sewage Treatment Plants	12.25 5	38.07	1.74	6.49
Total	**332.27**	**1 032.23**	**69.20**	**23.16**

5.1.2 Status of Operation and Maintenance of Dr JS Moroka LM

There is generally a lack of planned and maintenance of the water services infrastructure in the Municipality. Maintenance is carried out on a reactive basis. The lack of strategic Operational and Maintenance planning for the medium to long term is common.

This problem is compounded by lack of an asset management plan. As part of the WSA initiative, Dr JS Moroka LM has embarked on the development of a water infrastructure asset management plan which was recently completed.

5.1.3 Resources Available to Perform the Function of Operation and Maintenance.

In order for any water service authority to have a successful operation and maintenance, there is need to have the right resources which include the following:

- Right staff to conduct the operation and maintenance activities
- External resources to supplement the staff for the water service provider
- Tools and equipment i.e., transport and maintenance tools, communication etc. and the

budget to meet all the costs needed to implement the activities of operation and maintenance.

5.1.4 Information on the Water and Sanitation Infrastructure

To have an effective delivery of service in Operation and Maintenance, there is need to have in place the necessary information that will aid in quick response each time there is break down of any of the infrastructure. The information required include the following:

- Operational manuals of all electromechanical equipment such pumps, electric motors etc.
- Asset Register of all the assets such pipelines, pump stations, WTP, WWTP etc.
- As-built information of all the infrastructure
- Tools and equipment
- Contingency and safety plans

The information gathered so far indicate that the asset register has yet to be developed, and the as built drawings are not in place. The green drop report highlights the need for the municipality the need for flow monitoring at Siyabuswa WWTW, an indication that information is not being recorded.

5.1.5 Water Supply and Wastewater Quality

5.1.5.1 Water Source Quality Monitoring

Water sources for Dr JS Moroka LM include groundwater (boreholes) and Weltevreden weir, Loskop Dam, Rhenosterkop Dam and Rust de Winter Dam. Weltevreden Water Treatment Plant, the only Water Treatment Plant, supplies potable water to Dr JS Moroka LM. The main aim of quality monitoring is to prevent contamination of water source and therefore it is mandatory that the surroundings of the water source and intake facilities are kept clean and with a fence which is kept locked, and that "Contamination Prohibited" notices be posted.

5.1.5.2 Wastewater Quality Monitoring

Dr JS Moroka LM is currently managing two (2) WWTW's namely:-

- Siyabuswa WWTW; and
- Vaalbank (Libangeni) Oxidation Ponds.

The main aim of quality monitoring of the effluent from the WWTW's is to prevent contamination of the environment i.e., contamination of watercourses and groundwater sources.

5.1.5.3 Blue Drop Risk Rating and Status

The Blue Drop assessment focuses on the entire value chain (source, pumping, treatment, reticulation network) of the drinking water business within the municipal (or other) water services business, the Blue Drop Risk Rating (BDRR) assessment focuses on critical risk areas within water services provision. The latter approach is a form of risk-based regulation which allows the municipality to identify and prioritise the critical risk areas within its drinking water process and to take corrective measures to abate these.

The latest (2021) Blue Drop Risk Rating for Dr JS Moroka LM is indicated below:

Municipal BDRR Score: 37.2%

Assessment Areas	Weltervreden
BULK / WSP	
A: Total Design Capacity (Ml/d)	60
B: % Operational Capacity in terms of design	48.3%
C1a: % Microbiological Compliance	100%
C1b: % Microbiological Monitoring Compliance	0.9%
C2a: % Chemical Compliance	91.1%
C2b: % Chemical Monitoring Compliance	20.6%
D: % Technical Skills	100%
E: % Water Safety Plan Status	9.1%
%BDRR/BDRR max	37.2%

WSA Overview

The Weltervreden WSS falls in the low-risk category.

Criteria A – The design capacity for the Weltervreden WSS is 60 Ml/day.

Criteria B – The Weltervreden WSS indicated the operational capacity of 48.3%, which is within its design capacity. This is an indication of the presence of flow management and of Treatment Works Classification.

Criteria C – The Weltervreden WSS achieved excellent Microbiological compliance. It achieved poor Chemical compliance and non-compliance with Microbiological Monitoring compliance and Chemical Monitoring compliance, and this must be addressed by the WSA as this presents serious health risk due to chemical failures and insufficient number of sampling sites to verify quality of water.

Criteria D – The Weltervreden WSS achieved excellent compliance (100%) for technical skills which is an indication of adequate presence of relevant process controllers, supervisors, and maintenance teams.

Criteria E – There is low compliance (9.1%) for Water Safety Planning and development of risk-based water quality monitoring programmes as outlined in SANS 241: 2015 presented for Weltervreden WSS.

The Regulator encourages the WSA and WSP to urgently implement the following recommendations to ensure delivery of safe drinking water for all consumers:

- ✓ Ca: Implementation of corrective measures in the event of microbiological and chemical failures to always ensure delivery of safe drinking water.
- ✓ Cb: Implementation of monitoring programmes with sufficient samples based on population size as outlined in SANS 241: 2015.
- ✓ E: Development of Water Safety Plan as per SANS 241: 2015 and WHO guidelines including risk assessment of entire supply system, water quality evaluation based on full SANS 241: 2015 analysis of raw and final water, development of risk-based monitoring programmes, and implementation of mitigating measures to address all medium and high risks.

The overall Municipal Blue Drop score for 2012 was 92.64%, which is an improvement if compared to the 2011 score of 84.42%. Details on the overall regulatory Impression are outlined below.

5.1.5.3.1 Regulatory Impression (2012)

The level of commitment shown by the Dr JSM LM in improving their performance in drinking water quality (DWQ) management, has convinced the Department that this water services authority can regain the Blue Drop certification that was obtained in 2010.

The municipality is performing well in most of the Blue Drop requirements and is encouraged to maintain the current level of enthusiasm. Special attention needs to be given to the recurring failures in microbiological compliance since this is where most points were dropped during this assessment cycle.

5.1.5.3.2 Technical Inspection Report (2012)

Weltevreden WTW: 82%

The Weltevreden WTW was assessed to verify the Blue Drop findings of Dr JSM LM.

Overall, the impression gained from the site visit was good as the plant was clean, well maintained, had adequate safety equipment and signage and was well secured. All relevant documents were present, including log sheets and maintenance records. Operational

monitoring was taking place on a regular basis and all monitoring equipment was calibrated and in working condition. Chemical storage and handling were adequate although at the time no lime was being dosed.

There are several areas that require attention, and these include:

- The classification certificate was not displayed at plant;
- Jar tests to determine the coagulant dosage are conducted by the chemical suppliers. The municipality is encouraged to obtain Jar test equipment and train process controllers to determine and adjust the coagulant dosage daily instead of depending on service providers to perform this vital function;
- There was inadequate flocculation leading to carry-over of flocks from the sedimentation unit to the filters. As a result, the final water does not comply with SANS 241. This highlights the need to conduct routine Jar tests and adjust the coagulant dosage daily;
- The standby chlorine booster pump was not working: the municipality must always ensure backups for all critical equipment;
- There was a lack of housekeeping in the sand filters and the walls were dirty. The lack of adequate housekeeping could lead to a decrease in the final water quality; and
- The sludge dams must be cleaned, and the supernatant should be recycled to the head of the works instead of being dumped in the river. This will reduce water losses and reduce the pollution risk to the receiving river.

5.1.5.3.3 Findings:

Other areas that require urgent attention by the Municipality are:

- The Water Safety need to be developed, the plan should include Risk Assessments of catchment, treatment works and reticulation. The Risk Assessment should indicate that the treatment facility can treat the water from raw water quality to DWQ complying with SANS 241.
- Process Control, Maintenance & Management Skills
- Monitoring Programme
- Credibility of Sample Analyses
- Submission of Results
- Drinking Water Quality Compliance
- Performance Publication
- Asset Management

5.1.5.4 Green Drop Status

Water Service Institution	Dr JS Moroka LM	
Water Service Providers	Dr JS Moroka LM	
Municipal Green Drop Score		VROOM Impression (Towards restoring functionality): 1. Electrical cables 2. Disinfection 3. Clarification 4. Aeration 5. Recycle pump VROOM Estimate: - R50,000,000
2021 Green Drop Score	42%↓	
2013 Green Drop Score	46%	
2011 Green Drop Score	59%	
2009 Green Drop Score	35%	

Key Performance Area	Unit	Siyabuswa
Green Drop Score (2021)		42%
2013 Green Drop Score		46%
2011 Green Drop Score		59%
2009 Green Drop Score		40%
System Design Capacity	Ml/d	10
Design Capacity Utilisation (%)		NI
Resource Discharged into		Elands River
Wastewater Risk Rating (CRR % of CRR_{max})		Siyabuswa
CRR (2011)	%	63.6%
CRR (2013)	%	59.0%
CRR (2021)	%	77.3%

Technical Site Assessment: Siyabuswa WWTW 31%

The overall Municipal Green Drop score for 2021 is 42%, which is a decrease from 2013's is 46% and 2011's 59%.

5.1.5.4.1 Regulatory Impression (2013 Green Drop Report)

The Dr J.S. Moroka Local Municipality received a municipal Green Drop score of 45.6%. The team was well prepared for the assessment, although not all the information was present. However, the extent to which the team managed to give feedback in terms of the available evidence was impressive and the Inspectors appreciated the positive attitude, as well as the honest and frank evaluation on the status of the plants and the difficulties experienced to meet compliance standards.

Regrettably, the Libangeni system continues to under-perform and little has been done to improve the status since the 2011 assessment. The CRR risk ratings of the treatment facilities place them in medium risk positions. Currently no compliance monitoring undertaken at Libangeni, resulting in 0% compliance. The W2RAP specifically is focusing on the treatment system only. The municipality is encouraged to note the scores against each KPA coupled with the findings below, in order to develop a GDIP that focus on the achievement of a higher GD score during the 2014/15 audit cycle.

Green Drop findings:

- Both plants are registered and process controllers at the Siyabuswa plant are classified according to the regulation on the Green Drop System;
- The O&M requires an amendment to be fully compliant on the Green Drop sub criterion. The municipality is encouraged to update the O& M manual accordingly;
- One (1) of 2 treatment facilities exceed its hydraulic design capacity, which in turn compromises the effluent quality compliance;
- Two (2) of 2 plants do not meet effluent quality standards for discharge, which weighs

heavily towards the reduced scoring;
- Analysis data is submitted on the GDS, the municipality is encouraged to submit all data monthly on to the GDS;
- Both systems effluent quality is not complying in terms of the set standards (all chemical, microbiological and physical)
- The Municipal Manager has endorsed the W2RAP document on the 16th of November 2012, with indications that implementation will be pursued shortly.
- The Municipality do not have bylaws in place. The Department urges the municipality to pursue the development of bylaws It is Imperative for the WSA to note the impact of inadequate enforcement of industrial effluent on the system/s and lack of inspections at local package plants contributed to counteract the score. Firm commitment of resources from management is crucial to implement such.

5.1.5.4.2 Site Inspection Report (2013)

Siyabuswa 78%

The following observations were made for the plant:

- The water services works is well fenced with access control; the plant classification certificate is displayed on the wall.
- The process flow diagram and the O&M manual are available for Process controller's ease of reference.
- Process monitoring equipment's are functional, and results are recorded in the daily logbook.
- The garden is well kept and clean, grass is also well kept and general workers are used to clean the place
- Inlet screens are in place, there is a mechanical and fine screen, the mechanical is not working and currently the manual screens are in use. Flow meters are available for inlet flow and flow rates are recorded.
- Only three aerators in the activated sludge process are functional out of 12 aerators. This is indicative of a need to deal with maintenance issues and improve on turnaround time. Management support is highly needed for improved maintenance issues.
- Gas chlorine is used for disinfection, the process controllers are trained for safe chlorine handling course.

5.1.5.5 Operation and Maintenance Analysis Tables (WSDP 2014)

Table 5.1.5.5 (a): Resources of Operation of Water and Sanitation Infrastructure

Type of Infrastructure	Availability of Resources for Operation (Y/N)				
	Staff	External Resources	Spare Parts	Tools & Equipment	Budget
Existing Groundwater Infrastructure	Y	Y	Y	Y	Y
Existing Surface Water Infrastructure	Y	Y	Y	Y	Y
Existing WWTW Infrastructure	Y	Y	Y	Y	Y
Existing WTW Infrastructure	Y	Y	Y	Y	Y
Existing Pump Station Infrastructure	Y	Y	Y	Y	Y
Existing Bulk Pipeline Infrastructure	Y	Y	Y	Y	Y
Existing Tower & Reservoir Infrastructure	Y	Y	Y	Y	Y
Existing Reticulation Infrastructure	Y	Y	Y	Y	Y

Table 5.1.5.5 (b): Information Available for Operation

Type of Infrastructure	Availability of Information for Operation (Y/N)				
	Manuals Available	Asset Register	As Built Info	Tools & Equipment	Contingency & Safety Plan
Existing Groundwater Infrastructure	N	N	N	N	N
Existing Surface Water Infrastructure	N	N	N	N	N
Existing WWTW Infrastructure	N	N	N	N	N
Existing WTW Infrastructure	N	N	N	N	N
Existing Pump Station Infrastructure	N	N	N	N	N
Existing Bulk Pipeline Infrastructure	N	N	N	N	N
Existing Tower & Reservoir Infrastructure	N	N	N	N	N
Existing Reticulation Infrastructure	N	N	N	N	N

Table 5.1.5.5 (c): Information Available for Manual

Type of Infrastructure	Availability of Information for Maintenance (Y/N)				
	Manuals Available	Asset Register	As Built Info	Tools & Equipment	Contingency & Safety Plan
Existing Groundwater Infrastructure	N	N	Y	Y	N
Existing Surface Water Infrastructure	N	N	Y	Y	N
Existing WWTW Infrastructure	N	N	N	Y	N
Existing WTW Infrastructure	N	N	N	Y	N
Existing Pump Station Infrastructure	N	N	Y	Y	N
Existing Bulk Pipeline Infrastructure	N	N	Y	Y	N
Existing Tower & Reservoir Infrastructure	N	N	Y	Y	N
Existing Reticulation Infrastructure	N	N	Y	Y	N

Table 5.1.5.5 (d): Information Available of Activity Control Management for Operation

Type of Infrastructure	Availability of Activity Control & Management: Operation (Y/N)				
	Procedures	Record Keeping in Place	Quality Control Procedures	Risk Management	Reporting (Data Analysis & Report Generation)
Existing Groundwater Infrastructure	N	N	Y	N	N
Existing Surface Water Infrastructure	N	N	Y	N	N
Existing WWTW Infrastructure	N	N	Y	N	N
Existing WTW Infrastructure	N	N	Y	N	N
Existing Pump Station Infrastructure	N	N	Y	N	N
Existing Bulk Pipeline Infrastructure	N	N	Y	N	N
Existing Tower & Reservoir Infrastructure	N	N	Y	N	N
Existing Reticulation Infrastructure	N	N	Y	N	N

Table 5.1.5.5 (e): Information available for Activity Control Management for Maintenance

Type of Infrastructure	Availability of Activity Control & Management: Maintenance (Y/N)				
	Procedures	Record Keeping in Place	Quality Control Procedures	Risk Management	Reporting (Data Analysis & Report Generation)
Existing Groundwater Infrastructure	Y	N	N	N	N
Existing Surface Water Infrastructure	Y	N	N	N	N
Existing WWTW Infrastructure	Y	N	N	N	N
Existing WTW Infrastructure	Y	N	N	N	N
Existing Pump Station Infrastructure	Y	N	N	N	N
Existing Bulk Pipeline Infrastructure	Y	N	N	N	N
Existing Tower & Reservoir Infrastructure	Y	N	N	N	N
Existing Reticulation Infrastructure	Y	N	N	N	N

Table 5.1.5.5 (f): Water Supply Quality Monitoring Procedures

Subsystem	Water Supply and Quality (Y/N)				
	Incident Management Protocol	Process Control	Monitoring Programme	Water Sample Analysis	Failure Response Management
Bulk water Supply	Y	Y	Y	Y	Y
Boreholes	Y	Y	Y	Y	Y
Weltevreden WTP	Y	Y	Y	Y	Y

Table 5.1.5.5 (g): Wastewater Quality Monitoring Procedures

Subsystem	Wastewater Supply and Quality (Y/N)				
	Incident Management Protocol	Process Control	Monitoring Programme	Water Sample Analysis	Failure Response Management
Siyabuswa WWTW	Y	Y	Y	Y	Y
Vaalbank Oxidation Ponds	Y	Y	Y	Y	Y

6 WATER CONSERVATION AND DEMAND MANAGEMENT

The National Water Audit (NWA) required the WSA to prepare Water Conservation and Water Demand Management (WC / WDM) strategies to achieve more efficient use of water. Acceptable losses in a reasonably well managed system are between 20 and 25%. However, Dr JSM LM does not currently have a formalized WC/WDM strategy and business plan for implementation of set targets to reduce water losses. Currently there are no major initiatives, other than reactive leakage control and consumer use management in the areas which have metered yard or house connections.

An external service provider has been appointed and is in the process of developing a WC/WDM strategy and business plan.

Although there is potential for the Municipality to implement WC/WDM measure to reduce the current system losses and improve use efficiency by consumers, the following key findings summarize the impeding factors:

- Lack of data to undertake comprehensive water balance assessment per water supply scheme;
- Lack of data on water network operating procedures;
- Lack of Water Demand Management educational programmes;
- Lack of water loss management programmes; and
- Lack of meter testing and replacement programmes.

The priority for the Municipality should be to ensure that the way water is used by consumers as well as the water supply system is as efficient as possible. The Municipality as a WSA has the responsibility to develop and implement a comprehensive WC/WDM business plan. The implementation of a comprehensive WC/WDM programme for each water supply scheme will require the development of a comprehensive strategy for water loss control and consumer use reduction. As part of the strategy, it is imperative that the raw water, bulk water system, and consumer metering infrastructure is installed to ensure that a proper water can be undertaken.

It is envisaged that for the development and implementation of a comprehensive WC/WDM the following must be undertaken:

- Establishment of pressure management zones and District Management Areas (DMAs) within each water supply scheme area with a view to undertaking comprehensive water audits and prioritizing supply zones for a water loss control management programme;
- Establishment of water savings targets for each supply scheme;
- Implementation of a pressure and leakage management programme (PLM) which includes establishment of a dedicated Active Leakage Control (ALC) units in each water supply scheme; and
- Undertaking refurbishment of old pipework contributing to high-water losses is required as a matter of urgency.

For reconciliation purposes, it has been assumed that a WC/WDM can reduce water requirements by 2% per annum (SRK, April 2011).

Given the status quo a considerable percentage of the population still regularly complains about interrupted water supply. The problem occurs more severely during the hot summer months.

The recent investigations for additional water sources could alleviate the immediate problems, but the underlying problems of the unequitable distribution of water, operational issues, and wastage of water by consumers needs to be adequately addressed.

7 WATER RESOURCES

7.1 Water Sources and Volumes

7.2 Situation Assessment

The main water source for Dr JSM LM is both groundwater and surface as outlined below.

7.2.1 Water Source Per Village

The water sources for all settlements of Dr JSM LM include the following:

- Bulk water supply
- Boreholes
- Springs
- Rainwater
- Dams
- Rivers/streams
- Water vendors
- Water Tanks

Details of different water sources per ward are outlined in table 7.1 given below.

Table 7.1: Water Source per Ward

Ward	Village	Regional / Local Water Scheme (Operated by LM / other WSP)	Borehole	Spring	Rain-water Tank	Dam, Pool /Stagnant water	River/ Stream	Water Vendor	Water tanker	Other
Dr JSM		40 457	11675	148	391	164	110	3435	3368	2414
1	Kwaphahla	1800	4	91	5	-	-	1	1	145
	Siyabuswa D									
2	Toiskraal	1756	134	-	17	16	40	228	303	79
	Makopanong									
	Siyabuswa A									
3	Siyabuswa A	1818	2	-	-	-	-	6	-	2
4	Makopanong	1727	17	-	4	1	3	1	11	22
	Siyabuswa A									
5	Siyabuswa B	2041	93	-	1	-	-	2	-	2
6	Siyabuswa C	2333	4	2	3	-	1	6	16	91
	Morhonong									
	Mabuyeni									
7	Thabana	1525	75	3	3	6	2	1	1	32
	Ramokgeletsane									
8	Mthambothini	1655	12	-	5	1	-	8	18	12
9	Ga-Morwe	1143	4	-	5	24	-	1	-	4
10	Ga-Morwe	1783	4	-	8	-	-	10	6	19
	Meetsemadiba									
11	Mestmadima	1588	28	-	-	74	-	14	101	55
	Mabusa									
	Mmakola									
12	Mashiding	1916	5	2	4	2	-	10	132	108
	Marobtholong									
	Manyebethwana									
13	Pieterskraal	1695	10	-	3	-	1	9	32	7
	Borolo									
	Skimming									

Ward	Village	Regional / Local Water Scheme (Operated by LM / other WSP)	Borehole	Spring	Rain-water Tank	Dam, Pool /Stagnant water	River/ Stream	Water Vendor	Water tanker	Other
14	Mapotla	1291	8	5	8	5	2	137	112	32
15	Digwale	2200	49	-	5	-	4	32	10	11
	Molapoamogale									
	Rondehoog									
16	Libangeni	759	5	-	4	-	1	132	62	79
17	Mbongo	2292	20	1	5	4	-	46	51	43
18	Maphanga	1383	239	1	-	6	1	27	102	20
19	Madubaduba	1166	46	-	3	3	30	163	845	169
	Makometsana									
	Ukukhanya									
20	Senotlelo	1351	55	6	14	4	1	50	92	151
21	Kabete	1546	212	-	12	-	-	118	72	74
	Ga -Maria									
	Ramunanabela									
22	Lefiso	504	1407	2	2	2	1	305	61	170
	Lefisoane									
23	Marapyane	138	1132	2	5	2	1	67	44	162
24	Maduma	829	1798	4	49	4	2	7	175	127
	Marapyane									
	Seabe									
25	Seabe	227	1211	5	5	-	2	76	148	232
	Nokaneng									
26	Loding	1580	287	-	167	4	1	24	275	22
	Sehoko									
27	Katjibane	1127	403	6	8	4	1	32	186	144
28	Nokaneng	454	963	9	19	3	7	163	107	56
	Mammethlake									
	Mahareng									
	Diere									
29	Mammethlake	82	1645	5	18	-	7	92	226	262
30	Phake	209	620	3	2	-	-	1210	160	8
31	Masobye	543	1182	2	6	-	-	457	18	73

7.2.2 Existing groundwater infrastructure

Refer to section 4.1.3.1

7.2.3 Existing surface water

The Rhenosterkop (Mkhombo) Dam is situated inside the boundaries of Dr JSM LM. This dam is the property of the National Government as managed by DWS. Other dams and weirs associated with the supply of water to the area are also included in the table below:

Table 7.2: Existing surface water

Dam	Unit	Loskop	Mtombo Balancing Dam	Weltevreden Weir	Rhenosterkop (Mkhombo) Dam	Rust de Winter
Longitude	(0.'.")	25.25.05	29.07.08	28.59.30	28.55.00	28.31.01
Latitude	(0.'.")	29.21.32	25.06.19	25.06.30	25.05.45	25.14.01
River		Olifants	Loskop canal	Elands	Elands	Elands
Dam Type		Concrete Gravity	Embankment	Concrete buttress	Massive buttress	Concrete faced rock fill embankment
Year completed	Year	1939	1978	1980	1984	1934
Max height (FSL - RBL)	m	54	2.95	±2.6	32	24.1
Full Supply Level (FSL)	mAMSL	1,001.61	938	907.63	942	1,035.1
Storage capacity at FSL	million m3	348	0.05	0.2	204.591	26.943
Dead Storage	million m³	Unknown	Unknown	Unknown	1.234	0.265
Historical firm yield (HFY)	million m³/a	451	2.55 (Allocation)	9.65	8.1-10.7	9.8
Outlet capacity with water at FSL	m3/s	Left: 10.2 Right: 3.5	Unknown	6 high-capacity pumps feeding into 2 x 700 mm pipes	Scour valves: 7,8 Sediment valves: 50	1.388

7.2.4 Situational Analysis

The basis for the analysis of water sources being supplied to all settlements of Dr JSM LM was the synthesised water supply data for all settlements. For the purpose of the Water Situation Assessment, it was decided to use the recorded supply volumes for all settlements. The selected method consisted of the following steps:

1. The water losses in the water conveyance systems and reticulation networks were estimated at 25% of the water demand.
2. The water demand projection for all settlements for the period between 2022-2042 and the estimation was based on the population projections and level of service improvements were used to estimate the water demand projections as per red book guidelines water demand rates for all categories of consumers.

A projected water balance for the surface water sources in shown in table 4.24.

Table 4.24: Surface Sources (Mℓ/day)

Description	2022	2027	2032	2037	2042
Demand (AADD) (Mm³/a)	13.82	15.07	16.48	17.98	19.51
Yield (Mm³/a)					
Allocation from Loskop Dam	2.55	2.55	2.55	2.55	2.55

(Mtombo Balancing Dam)					
Mkhombo Dam (Weltevreden Weir) - Reported maximum firm yield	9.45	9.45	9.45	9.45	9.45
Total (Mm³/a)	**12.00**	**12.00**	**12.00**	**12.00**	**12.00**
Surplus/Deficit Yield (Mm³/a)	**-1.82**	**-3.07**	**-4.48**	**-5.98**	**-7.51**
Total Permitted Abstraction (All Sources) (Mm³/a) (2014 WSDP)	**1.86**	**1.86**	**1.86**	**1.86**	**1.86**
Surplus/Deficit Permitted (Mm³/a)	**-11.96**	**-13.21**	**-14.62**	**-16.12**	**-17.65**

Findings

- The current and future projected demand are significantly higher than the allocation and yield of the surface water sources. This is a major cause for concern.
- Need to upgrade the permitted abstraction of raw water supply to Dr JS Moroka by 11.96 Mm³/Annum in 2022 and up to 17.65 Mℓ/Annum in 2042.

8 FINANCIAL PROFILE

8.1 Division of Revenue Act (DORA) Allocations

According to the **Division of Revenue Act (DORA)** determinants, the budget for Dr JSM LM is set out as indicated here below.

The following explanatory detail pertains to the DORA:

- Schedule 3 is the determination of each municipality's equitable share of the local government sphere's share of revenue raised nationally;
- Schedule 4, Part A is allocations to provinces to supplement the funding of programmes or functions funded from provincial budgets;
- Schedule 4, Part B is allocations to municipalities to supplement the funding of programmes or functions funded from municipal budgets;
- Schedule 5, Part A is specific purpose allocations to provinces;
- Schedule 5, Part B is specific purpose allocations to municipalities;
- Schedule 6, Part A is allocations-in-kind to provinces for designated special programmes;
- Schedule 6, Part B is allocations-in-kind to municipalities for designated special programmes;
- Schedule 7, Part A is allocations to provinces for immediate disaster response;
- Schedule 7, Part B is allocations to municipalities for immediate disaster response;

The lates national budget for DrJSMLM is:

Schedule 3: Determination of each municipality's equitable share of the local government sphere's share of revenue raised nationally: Dr JS Moroka (MP316)			
	Column A	**Column B (forward estimates)**	
	2022/23	**2023/24**	**2024/25**
Equitable share	R 461,561,000	R 489,995,000	R 520,754,000
Annexure W4: Specific Purpose Allocations to Municipalities (Schedule 5, Part B and Schedule 7, Part B): Current Grants: Dr JS Moroka (MP316)			
	2022/23	**2023/24**	**2024/25**
Local Government Finance Management Grant (National and Municipal Financial Year)	R 2,450,000	R 2,450,000	R 2,450,000
Expanded Public Works Programme Integrated Grant for Municipalities (National and Municipal Financial Year)	R 2,432,000	R 0	R 0
Annexure W5: Infrastructure Grant Allocations to Municipalities (Schedule 4, Part B and Schedule 5, Part B): Current Grants: Dr JS Moroka (MP316)			
	2022/23	**2023/24**	**2024/25**
Municipal Infrastructure Grant (National and Municipal Financial Year)	R 153,660,000	R 150,239,000	R 157,299,000
Regional Bulk Infrastructure Grant (National and Municipal Financial Year)	R 0	R 0	R 0
Water Services Infrastructure Grant (National and Municipal Financial Year)	R 0	R 0	R 0
Annexure W6: Allocations-In-Kind to Municipalities (Schedule 6, Part B): Current Grants: Dr JS Moroka (MP316)			
	2022/23	**2023/24**	**2024/25**
Integrated National Electrification Programme (Eskom) Grant (National and Municipal Financial Year)	R 15,461,000	R 14,356,000	R 57,259,000
Regional Bulk Infrastructure Grant (National and Municipal Financial Year)	R 5,000,000	R 13,721,000	R 31,399,000
Schedule 7: Equitable Share and Total Allocations to Municipalities: Dr JS Moroka (MP316)			

		2022/23	2023/24	2024/25
Equitable Share (National and Municipal Financial Year)		R 461,561,000	R 489,995,000	R 520,754,000
Total Allocations to Municipalities (National and Municipal Financial Year)		R 640,564,000	R 670,761,000	R 769,161,000
Appendix W1: Appendix to Schedule 3: Equitable Share Allocations to Municipalities (Equitable Share Formula Allocations + RSC Levies Replacement + Special Support for Councillor Remuneration and Ward Committees + Breakdown of Equitable Share Allocations per Local Municipality per Service for District Municipalities Authorised for Services: Dr JS Moroka (MP316)				
		2022/23	**2023/24**	**2024/25**
Equitable Share Formula (National and Municipal Financial Year)		R 447,787,000	R 475,803,000	R 506,007,000
Special Support for Councillor Remuneration and Ward Committees (National and Municipal Financial Year)		R 13,774,000	R 14,192,000	R 14,747,000
Appendix W4: Appendix to Schedule 5, Part B: Targets for Expanded Public Works Programme Integrated Grant for Municipalities: Dr JS Moroka (MP316)				
		2022/23	**2023/24**	**2024/25**
MP316 Dr JS Moroka: (National and Municipal Financial Year)	FTE (Full Time Equivalent jobs) Target for 2022/23: 376	R2,432,000	R 0	R 0
Appendix W5: Appendix to Schedule 5, Part B and Schedule 6, Part B: Regional Bulk Infrastructure Grant: Breakdown of Regional Bulk Infrastructure Grant Allocations per Local Municipality per Project: Dr JS Moroka (MP316)				
		2022/23	**2023/24**	**2024/25**
Nkangala District Municipality: (National and Municipal Financial Year)	(Schedule 6, Part B) RL33 Western Highveld (Rust de Winter) Bulk Water Scheme MP316 THLM & Dr JSM LM	R 5,000,000	R 13,721,000	R 31,399,000

8.2 Nkangala DM IDP Indications

The **NDM IDP** noted that a number of LM's experienced cash flow challenges since the 2014/2015 financial year. While specific LMs were not named, the DrJSMLM may possibly count amongst them, and consequently the NDM devised key strategies to assist its challenged local municipalities.

Short-term Strategy: Development of a credible and cash-backed budget that will assist with:

- Effective cash-flow management, forecasting and monitoring;
- Effective management of operating and capital expenditure;
- Effective maintenance of Municipal Standard Chart of Accounts (mSCOA) for the local municipalities; and
- Effective implementation of credit control and debt collection measures.

Medium-term Strategies: Implementation of a Revenue Enhancement Strategy, which includes the following:

- Enhancement of the current revenue base, considering the socio-economic factors of its surroundings, and promote initiatives aimed at sustainable revenue growth;
- Current revenue streams must be effectively managed. Strategies must be introduced to reduce electricity and water losses to the absolute minimum; and
- Existing fees, tariffs and charges must be reviewed annually to ensure that the revenue attributable to fees and charges are maximized and that the bases for determining fees and

charges are cost reflective and/or market related.

Operating Expenditure Framework

The NDM's expenditure framework for the MTREF is informed by the following:

- Balanced budget constraint (operating expenditure should not exceed operating revenue) unless there are existing uncommitted cash-backed reserves to fund any deficit;
- Funding of the budget over the medium-term as informed by Section 18 and 19 of the MFMA;
- The contribution to local municipalities is aligned to the asset, IDP and backlog eradication plan;
- Operational gains and efficiencies will be directed to funding the contribution to local municipalities and other core services; and
- Project lists submitted by local municipalities.

Table 8.1: 2020/21 Medium Term Revenue & Expenditure Framework

Description	2020/21 Medium Term Revenue & Expenditure Framework		
R thousand	Budget Year 2020/21	Budget Year +1 2021/22	Budget Year +2 2022/23
Operating Transfers and Grants			
National Government:	**402 697**	**454 869**	**443 686**
Local Government Equitable Share	25 748	27 817	29 784
RSC Levy Replacement	341 474	351 052	367 902
Finance Management	1 000	1 000	1 000
Municipal Systems Improvement	–	–	–
EPWP Incentive	1 977	–	–
Water and Sanitation Management Grant	–	–	–
Water Service Scheme (DWS Schedule 6B)	32 498	75 000	45 000
Total Operating Transfers and Grants	**402 697**	**454 869**	**443 686**
Capital Transfers and Grants			
National Government:	**2 198**	**2 319**	**2 454**
Rural Transport Services and Infrastructure	2 198	2 319	2 454
Total Capital Transfers and Grants	**2 198**	**2 319**	**2 454**
Total Receipts of Transfers & Grants	**404 895**	**457 188**	**446 140**

8.3 Dr JSM LM IDP Indications

The **Dr JSM LM IDP 2022/23-2026/27** indicated that financial viability is a priority area and key performance indicator for the council. One of their development objectives is to improve the overall financial management if the municipality by developing and implementing appropriate financial policies, procedures, and systems.

The Auditor General's recent annual audits ended as follows:

- 2016/17: qualified opinion;
- 2017/18: adverse opinion;
- 2018/19: disclaimer audit opinion;
- 2019/20: not indicated;
- 2020/21: not indicated; and
- 2021/22: not indicated, municipality indicated that they are on course to improve their audit opinion, however, the municipal IDP also indicated that: "to date, most of the findings if not all, have not been dealt with."

The municipality generates revenue by levying services rendered to clients / consumers, as well as receipt of revenue from National Government (i.t.o. Section 152 of the Constitution), i.e., resources are allocated as grants to the municipality in order for the municipality to render services. The system of internal controls instituted i.t.o. the MFMA sections 65 and 66, indicates weaknesses,

and that the municipality must ensure that there is no breakdown in business process and activities.

- Creditor payment detail
- Supply chain management system
- Improving GRAP 17 asset register

Internal control measures must be put in place to ensure that Section 32 of the MFMA expenditures is prevented or detected timeously, and that fruitless and wasteful expenditure and irregular expenditure are disclosed in the annual financial statement, since disclosure is a good sign of accountability and transparency.

In order for the DrJSMLM to attract investors, the LM needs to be financially responsible, transparent, and receive clean audits, as well as be in a position where service delivery such as potable water supply, and suitable sanitation, can be rendered, amongst others, without undue disruption.

Financial resources are derived from rates and grants. External loans and possible PPP's may be considered for capital expenditure, while operational financing is required from normal revenue streams.

The municipality set various financial management strategies that should enable them to attend to the sustainability and financial wellbeing of the municipality. They also have an asset management strategy that should enable them to ensure proper safeguarding and management of their assets.

Features if the municipal expenditure framework include:

- Balanced budget constraint (Expenditure may not exceed Revenue);
- Asset renewal strategy (infrastructure repairs and maintenance a priority). Treasury guidelines indicate that 40% of the Capital Budget should be allocated to this strategy.
- Capital program aligned to Asset renewal strategy.
- Concentrate on amounts to be budgeted for repairs and maintenance of infrastructure - to the amount of 8% of the asset value of PPE, according to Treasury Guidelines.
- Operational gains and efficiencies resulting in additional funding capacity on the Capital program, as well as redirection of funding to other critical areas; and
- Strict principle of no project plan (business plan), no budget allocation (funding allocation).

Capital Requirements

Capital Budgets should be prioritized in such a manner as to reflect consistent efforts to address backlogs in basic services and the refurbishment and expanding of existing infrastructure.

National Government has prioritized the quality of drinking water and failures in the management of wastewater through the Blue Drop and Green Drop performance ratings. Measures have therefore been taken over the Medium-Term Revenue and Expenditure Framework period to implement these strategies to ensure that existing water supply and wastewater management comply with these requirements.

The continued improvement and development of an effective financial planning aids the actualization of fulfilling its facilitating role to capacitate the community to build a prosperous future for all.

The Financial planning imperatives contribute to ensuring that the Dr JSM LM remains financially viable and that municipal services are provided economically to all communities. The Multi-year Financial Plan contains realistic and credible revenue and expenditure forecasts which should provide a sound basis for improved financial management and institutional development as well as service delivery improvements and implementation.

Table 8.2: Existing revenue sources and management

Revenue	Observation
Water	The flat rate system used for water consumption is not economically responding to the usage thereof.
Sewerage	The challenges remain on the capacity and upgrading needed to improve the service.

8.4 General

The water and sanitation infrastructure for Dr JSM LM include the following:

- Bulk water pipelines;
- Water service reservoirs;
- Water pump stations;
- Boreholes equipped with mono pumps which are powered by diesel engines and electric motors;
- Water reticulation;
- Sewer reticulation of Siyabuswa and Vaalbank;
- Siyabuswa WWTW; and
- Vaalbank WWTW.

Each of the above infrastructure need to be operated and maintained. There is need to have adequate budget if the above water and sanitation infrastructure are to meet customer satisfaction.

8.4.1 Situation Assessment of Existing Water and Sanitation Infrastructure

Dr JSM LM possesses a well-developed bulk water supply network. Schematic layouts of the existing infrastructure are shown in Appendix A. The water infrastructure, within their area of jurisdiction, of the historic Kwa-Ndebele Homeland has been transferred to Dr JSM LM from the DWS as per the agreement signed on 28 December 2004.

Budgets are not ring fenced and the estimated operation and maintenance costs as indicated in the tables below reflect the values as indicated in the Transfer Agreement between DWS and the Dr JSM LM. The estimated total value of the infrastructure is as follows:

Table 8.3 (a): Summary of Asset Values and Costs

Value: R million			Operation and Maintenance Cost: R million		
Replacement Cost [1]	Depreciated Present Value (2022)	Refurbishment Cost (2022)	O&M[2]	Bulk Water Purchase	Total
332.27	69.20	23.16	13.66	n/a	13.66

Note:
1 - Values from the Transfer Agreement 2004.
2 - The calculated O&M costs are based on typical a percentage allowance for each infrastructure component as prescribed by DWS.

The breakdown of the summary as given above is shown below as extracted from the Transfer Agreement:

Table 8.3 (b): Breakdown of Asset Values (R million)

Description	Replacement Cost (2004)	Replacement Cost (2022)	Depreciated Present Value (2022)	Refurbishment Cost (2022)
Boreholes	3.82	11.87	0.68	0.08
Surface Water	20.24	62.88	5.61	0.00
Water Treatment Works	27.48	85.37	6.15	0.91
Pumping Stations	44.68	138.81	7.92	0.91
Bulk Pipelines	78.00	242.32	18.61	4.82
Reservoirs and Tanks	61.85	192.15	15.77	0.11
Community Reticulation	83.92	260.71	12.72	9.84
Bulk Outfall Sewer	0.02	0.06	0.01	0.00
Sewage Treatment Plants	12.25	38.07	1.74	6.49
Total	**332.27**	**1,032.23**	**69.20**	**23.16**

8.4.2 Funds Provided for 2022/23 to 2024/25 Financial Year

The largest portion of the DrJSMLM budget is derived from grants and allocations to the municipality. The municipality generates other revenue from the provision of services to residents i.e., community- and social services, public safety services, planning and development services, as well as trading services (water-, wastewater- and waste management).

Table 9.4: MTREF budget indicates the following for the 2022/23 to 2024/25 financial years

Functional Expenditure for Trading Services (R'000)			
Description	**2022/23 Budget**	**2023/24 Budget**	**2024/25 Budget**
Water management	99,444	103,820	108,491
Wastewater management	10,700	11,171	11,673
Functional Revenue for Trading Services (R'000)			
Water Distribution	82,000	85,608	89,460
Wastewater Treatment	8,000	8,352	8,728
Expenditure by Vote (to be appropriated)			
Wastewater Management	**149,362**	**155,934**	**162,951**
Vote 8.3 - Water	82,000	85,608	89,460
Vote 8.5 – Capital Project Sanitation Services	8,000	8,352	8,728
Expenditure by Vote			
Vote 8 – Wastewater Management	**149,362**	**155,934**	**162,951**
Vote 8.2 - Water	99,444	103,820	108,491,
Vote 8.4 - Sanitation	39,218	40,944	42,786
Vote 8.5 – Capital Project Sanitation Services	10,700	11,171	11,673
*Relevant budgets to be confirmed			

Table 8.5: MTREF budget - Repairs and Maintenance Budget

Repairs and Maintenance Budget (MTREF website)			
Asset Class	**2022/23 Budget**	**2023/24 Budget**	**2024/25 Budget**
Water Supply Infrastructure	**22,500**	**23,490**	**24,547**
Boreholes	6,000	6,264	6,546
Reservoirs	4,000	4,176	4,364
Pump Stations	9,000	9,396	9,819
Bulk Mains	3,500	3,654	3,818
Sanitation Infrastructure	**6,000**	**6,264**	**6,546**
Wastewater Treatment Works	6,000	6,264	6,546
Total	**28,500**	**29,754**	**31,093**

New infrastructure is budgeted for through grant funding like the MIG.

8.5 Cost Recovery for provision of Water and Sanitation Services

Cost recovery is currently by means of flat rates levied to consumers. The flat rate was instituted due to the difficulties experienced by meter-readers in finding meters. This is not a recommended system since it does not take cognisance of various levels of water use and / or a billing-strategy connected to incremental water usage, and may under-collect due revenue to the municipality. In addition, it seems that the level of unaccounted water in the municipality is relatively high, and a proper water conservation and demand management strategy will be required to ensure that water losses is minimised and managed.

8.6 Tariff Charges

8.6.1 Tariff Principals

The basic principle is to ensure as far as possible that the tariff structure generates enough revenue from customers to cover operating costs, amortization of loans and depreciation.

The cost characteristics of a water supply system are such that variable costs of supply are usually very small. Once a transmission and distribution system has been built the only variable operating costs relate to maintenance, power consumption from pumping and chemicals.

Water supply infrastructure is generally designed and constructed to meet expanding demand over a long period, and is planned to be used by an increasing number of consumers over time. As a result, the operating costs per customer reduce over time as more customers make use of the infrastructure. The cost of supplying water to consumers are required to be recovered.

8.6.2 Economic Theory

In accordance with the principles set out above economic theory on public utility pricing states that for optimal resource allocation any tariff structure should be based on the long-term marginal costs, rather than the short-term costs. The consequences of this are that in order to achieve the proper allocation of costs a tariff consisting of the following elements would be required:-

- A fixed charge to recover the consumers share of the long run fixed costs of the system; and
- A small variable charge recovering the variable costs of the water consumed, however, in practice such a policy is normally difficult to implement due to the following: -
    - The long-term marginal costs can be difficult to identify, although this is not normally such a problem on a small scheme.
    - The long-term marginal costs fluctuate from year to year.
    - The total revenue derived from such a tariff structure may not cover the short-term financial requirements of the water undertaking, or indeed the long-term financial requirements where inflation is increasing the replacement cost of the water scheme.

This can result in a fixed charge would be so high that the cost of supply to small consumers

would be unaffordable. This would discourage the introduction of water supply other than by standpipes among the poorer sections of the community.

8.6.3 Further Considerations

The following factors should also be considered when deciding upon the form and type of a tariff structure:-

- The tariff structure must encourage the efficient use of water, both by domestic and industrial users.
- It should reflect the differing costs of supplying different classes of users.
- It should target available water to the highest value users and should seek to adjusted consumer demands to an economic level.
- There should be sufficient flexibility in the pricing policy to permit alternative rates to be operated in different situations to support low-income sectors of the community.
- It should encourage water use by domestic consumers to improve public health.
- Tariffs to industry should not deter development.

8.6.4 Comparative Tariff

There are three principal methods by which water charges are levied:

- rateable value
- fixed charge
- metering

Dr JSM LM applies fixed charge and metering as shown in table 7.3 given below. This could be attributed to the fact that 74.38% of the population earn less than R1600.00 per month. If R3 200/month or R38 200 per annum is used as the cut off point for people qualifying for Government subsidies, 92.2% will qualify for Government subsidies.

Table 8.6: Water and Sanitation Tariffs

Service Charges Categories	Residential Areas, Non-Profit Organizations, and Residential Businesses (Spazas)	Commercial Businesses and Industrials	Bulk Water Supply to Municipalities	State Institutions, Schools, and Tertiary Institutions
WATER TARIFFS:				
	Developed townships:	Bulk supply for business:	Bulk supply to municipalities:	Water supply to government:
Flat rate	To: R79.50	To: ↓	To: ↓	To: ↓
	From: R167.00	From: R12.75/kℓ	From: R12.00/kℓ	From: R10.93/kℓ
Kilolitre consumption	0 kℓ – 6kℓ = R 0.00/kℓ	0 kℓ – 6kℓ = R 10.35/kℓ	0 kℓ – 6kℓ = R 17.86/kℓ	0 kℓ – 6kℓ = R 6.57/kℓ
	6kℓ – 20kℓ = R 7.80/kℓ	6kℓ – 20kℓ = R 15.77/kℓ	6kℓ – 20kℓ = R 20.51/kℓ	6kℓ – 20kℓ = R 12.80/kℓ
	20kℓ – 60kℓ = R 9.00/kℓ	20kℓ – 60kℓ = R 19.80/kℓ	20kℓ – 60kℓ = R 22.82/kℓ	20kℓ – 60kℓ = R 17.58/kℓ
	60kℓ + = R 18.90/kℓ	60kℓ + = R 21.39/kℓ	60kℓ + = R 23.13/kℓ	60kℓ + = R 22.18/kℓ
Flat rate for unmetered areas		Unmetered business:		Unmetered state institutions:
	To: R79.50	To: metering		To: R205.00
	From: R79.50	From: R195.15		From: R196.00
SANITATION TARIFFS:				
Sewer charge	To: R40.00	To: R58,320.00 (commercial industry)		To: R58,320.00 (university & colleges)
	From: R59.10	From: R55,756.00		From: R55,756.00
				To: R191.60 (schools)
				From: R183.15
Drainage of septic tanks per suction	To: R580.00			R1,520.00 (drainage, school)
	From: R580.00			
Blockage	To: R300.00	To: R1,570.00		To: R1,570.00
	From: R300.00	From: R1,500.00		From: R1,500.00

8.6.5 Metering, Billing & Income: Water & Sanitation

There is need to capture data on water consumption of all categories as the data would inform the municipality the required funding to supplement the revenue raised from water bills sent to consumers. The data to be captured include the following:

- Units supplied
- % Metered
- % Billed
- Not metered
- Non-payment
- Industrial and Commercial consumers
- Income received and
- Non payments

Responses given in the tables 9.7 to 9.9 given below show that there is no data on any of the above therefore, Dr JSM LM is not in a position to have accurate budgets for the operation and maintenance of water and sanitation infrastructure in as far as customer satisfaction is concerned.

Table 8.7: Capital Funds, Conditional Grants and Subsidies

Conditional Grant & Subsidies	2022/2023 Draft Budget	2023/2024 Budget	2024/2025 Budget
Equitable Share	461,561,000	489,995,000	520,754,000
MIG	153,660,000	150,239,000	157,299,000
FMG	2,450,000	2,450,000	2,450,000
EPWP	2,432,000	0	0
Total	**620,103,000**	**642,684,000**	**680,503,000**

Table 8.8: Income and Expenditure Budget: Water

Water		Budget
Income	Sales, other	TBC
	Grants, subsidies and other	TBC
	Other income	TBC
	Total Income	**TBC**
Expenditure	Employee related cost(salaries, allowances, bonuses, medical, pension etc)	TBC
	Bulk water purchase	TBC
	General Expenditure	TBC
	Municipal rates and services	TBC
	Operational and Maintenance Cost	TBC
	Depreciation	TBC
	Total Expenditure	**TBC**
	Surplus/Deficit	**TBC**

Table 8.9: Income and Expenditure Budget: Sanitation

Sanitation		Budget
Income	Sales, other	TBC
	Grants, subsidies and other	TBC
	Other income	TBC
	Total Income	**TBC**
Expenditure	Employee related cost(salaries, allowances, bonuses, medical, pension etc)	TBC
	Bulk water purchase	TBC
	General Expenditure	TBC
	Municipal rates and services	TBC
	Operational and Maintenance Cost	TBC
	Depreciation	TBC
	Total Expenditure	**TBC**
	Surplus/Deficit	**TBC**

Table 8.10: Metering, billing & Income: Water

Residential Water	Urban		Rural	
	Current	Previous	Current	Previous
Units supplied	No data	No data	No data	No data
% Metered	No data	No data	No data	No data
% Billed	No data	No data	No data	No data
Not metered	No data	No data	No data	No data
Non payment	No data	No data	No data	No data
Industrial & Commercial: Water	No data	No data	No data	No data
Units supplied	No data	No data	No data	No data
% Metered	No data	No data	No data	No data
% Billed	No data	No data	No data	No data
Not metered	No data	No data	No data	No data
Income received %	No data	No data	No data	No data
Non-payments %	No data	No data	No data	No data

Table 8.11: Metering, billing & Income: Sanitation

Residential: Sanitation	Urban		Rural	
	Fixed charge	Value Charge	Fixed charge	Value Charge
Units supplied	No data	No data	No data	No data
% Metered	No data	No data	No data	No data
% Billed	No data	No data	No data	No data
Not metered	No data	No data	No data	No data
Income Received %	No data	No data	No data	No data
Non-Payment %	No data	No data	No data	No data
Industrial & Commercial: Sanitation	No data	No data	No data	No data
Units supplied	No data	No data	No data	No data
% Metered	No data	No data	No data	No data
% Billed	No data	No data	No data	No data
Not metered	No data	No data	No data	No data
Income received %	No data	No data	No data	No data
Non-payments %	No data	No data	No data	No data

9 WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER CARE

9.1 Water Services Institutional Arrangements

The following are the requirements of the water service institutional arrangement profile:

1. Policies for management of the water service institution need to be in place
2. Regulations for management of the water service institution need to be in place
3. Mechanisms for infrastructure development need to be in place
4. Mechanism for performance management need to be in place

9.1.1 Policy Development

The following policies need to be in place as per the requirement of the water policy by any Local Municipality:

- Indigent Policy;
- Free Basic Water;
- Free Basic Sanitation;
- Procurement Policy; and
- Credit Control Policy.

Dr JSM LM has all the above policies, complete for the 2022/2023 financial year. The policies were approved by the council, the power to enforce the policies is in place as well as the budget and personnel to implement the policy. More details on the above policies can be obtained from Dr JS Moroka website.

9.1.2 Regulations

The following regulations are required for management of a water services institution:

- Bylaws (To be updated - Draft)
- Mechanism to ensure compliance of the bylaws
- Tariff structure
- Tariff promulgation

The above regulations were approved by the council and are in place, the manpower to enforce the policies is in place as well as the budget to implement the policy. More details on the above policies can be obtained from Dr JS Moroka website.

The website includes a notice of draft by-laws 2018/2019 (council resolution number R297.04.2018 ND) for:

- Credit control and debt collection
- Tariffs policy
- Property rates

9.1.3 Mechanism for Infrastructure Development (projects)

The following mechanisms are critical for the delivery of infrastructure development by any LM:

- Mechanism to undertake projects (Integrated Development Process & Plan);
- Mechanisms for prioritizing projects (Integrated Development Process & Plan);
- Mechanism to approve projects (Service Delivery Budget Implementation Plan);
- Mechanism for selection of contractors, managing contractors and monitoring implementing agents (Supply Chain Management Policy); and
- Mechanism to monitor project implementation (Project Management Unit).

Dr JSM LM has all the above mechanisms for infrastructure development, it was approved by the council, the manpower to enforce the mechanisms is in place as well as the budget to implement the mechanisms.

9.1.4 Mechanism for Performance Management and Monitoring

The following mechanisms are critical for the performance management and monitoring:

- Performance Management System and
- Water Service Monitoring and Evaluation

Dr JSM LM has a Performance Management System in implementation, which runs under the office of the Municipal Manager, and has an allocated budget and set of personnel.

It is not clear whether a Water Service Monitoring and Evaluation Plan exists and / or how it is executed, if by any other means other than the Technical Services Department.

9.1.5 WSDP

The annual IDP-, Budget-, SDBIP, and Annual Report processes are used as a tool to monitor and report WSDP implementation. The GIS system within the municipality is used to record the relevant detail of the municipal database. The IDP Process should be the mechanism for stakeholder participation.

9.1.6 Recommendations

The municipality should enforce policies, regulations, and mechanisms to implement and monitor projects, and conduct customer satisfaction surveys to determine what the impact of service delivery is in the recipient communities.

9.2 Customer Care

Social and customer care requirements by any water and sanitation service provider entails having the resources to attend to customer complaints of both water and sanitation. The following resources are critical for the customer satisfaction:

- Budget
- Physical resources such as transport and materials
- Personnel to conduct the tasks

No records pertaining to social and customer care requirements or complaints could be found other that a general discontent from the general public pertaining to the supply of water and conveyed across the popular social media platforms such as Facebook and Twitter by the general public residing in the DrJSMLM.

From the NDM IDP it was detailed that, in the medium to long-term period, the DM, together with strategic partners (i.e., LM's) needed to place emphasis on the following matters:

- Lack of water in informal settlements within NDM.
- Inadequate bulk infrastructure to meet the demands.
- Dilapidated of existing bulk infrastructure.
- Unavailability of fully accredited laboratory facilities.
- Process controllers not registered with Department of Water and Sanitation.
- Lack of operation and maintenance plan.
- Lack of access to water and waterborne sanitation in farm areas.
- Unaccounted water loss.
- Ageing of bulk infrastructure.
- Lack of maintenance budgets.
- Poor water quality.
- High water losses (UAW).
- Improve revenue enhancement in LMs.

The approved SDBIP for 2022/23 referred to quarterly reports provided to Council w.r.t. the provision of water to the community.

The SDBIP also refers to Customer Care Reports / issues raised by communities that is reported

on monthly to the Top Management (SDBIP, p22 of 64).

9.2.1 Budget

The required budget would cater for costs such as fuel for motor vehicles, travelling allowances for staff, salaries, and any other related expenses.

The approved Service Delivery and Budget Implementation Plan (SDBIP) for the DrJSMLM indicates that the key operating expenditure (Opex) allocations in the final 2022/23 budget for Technical Services amounts to some R128.4M, however, this also includes electrification and roads and stormwater. The total allocations between the 5 different areas requiring operating expenditure amounts to some R314.1M, of the total budget of R690.53M (or 45.5%). The larger budget includes depreciation and debt impairment, which are non-cash items.

The Medium-Term Revenue and Expenditure Framework (MTREF) indicates that the following amounts were dedicated to repairs and maintenance to the following Asset Class:

Table 10.1: Repairs and Maintenance Budget

Repairs and Maintenance Budget (MTREF website)			
Asset Class	**2022/23 Budget**	**2023/24 Budget**	**2024/25 Budget**
Water Supply Infrastructure	**22,500**	**23,490**	**24,547**
Boreholes	6,000	6,264	6,546
Reservoirs	4,000	4,176	4,364
Pump Stations	9,000	9,396	9,819
Bulk Mains	3,500	3,654	3,818
Sanitation Infrastructure	**6,000**	**6,264**	**6,546**
Wastewater Treatment Works	6,000	6,264	6,546
Total	**28,500**	**29,754**	**31,093**

9.2.2 Physical Resources

Physical resources needed include transport, maintenance, tools, and any other items that may be required for attending to complaints of water and sanitation services.

The Dr JSM LM has plant, vehicles, and tools; however, no / limited details thereof are available in the documents that was referenced.

The Dr JSM LM has an Asset Management Policy for the 2022/23 financial year, which indicates that there are fixed and movable assets / available resources, to enable the provision of customer services requirements.

9.2.3 Personnel

The personnel include all staff that are employed to attend to all matters that relate to provision of water and sanitation services. These would include Engineers, technicians etc. The approved organisation structure show that there is adequate manpower to carryout activities of customer satisfaction.

Dr JSM LM has all the above resources for customer care as shown from the responses in table 10.2 to 10.5. The resources were approved by the council; the budget is in place to implement the customer care activities.

Table 10.2: Resources Available to Perform Functions of Customer Service Requirements (WSDP 2014)

Function to perform	(Y/N/NA)				
	Urban Households			Rural Households	
	Budget	Physical resources	Personnel	Budget	Personnel
Attending to Complaints of water	Yes	Yes	Yes	Yes	Yes
Attending to Complaints for sanitation	Yes	Yes	Yes	Yes	Yes
Attending to Complaints for Pit/Tank Pumping	Yes	Yes	Yes	Yes	Yes

Table 10.3: Attending to complaints for water (WSDP 2014)

Type of Complaint	Number	
	Urban	Rural
Total number of consumer units	No data	No data
Number of queries/complaints received within the year	No data	No data
% Queries responded within 24 hours	100	100
Number of major or visible leaks reported within the year	No data	No data
% Major or visible leaks reported within 48hours after being reported	100	100
Number of consumers receiving flow rate of less than 10 litres per minute	No data	No data

Table 10.4: Attending to complaints for sanitation (WSDP 2014)

Type of Complaint	Number			
	Water		Sewer	
	Urban	Rural	Urban	Rural
Total number of consumer units	No data	No data	No data	No data
Number of queries/complaints received within the year	No data	No data	No data	No data
% Queries responded within 24 hours	100	100	100	100
Number of Blockages repaired within a year	No data	No data	No data	No data
% Blockages repaired within 48 hours after being reported	100	100	100	100
Number of consumers experiencing greater than 7 days interruption in supply per year	No data	No data	No data	No data
Sanitation promotion and health and hygiene awareness	No data	No data	No data	No data

Table 10.5: Attending to complaints for sanitation: Pit Tank and Pumping (WSDP 2014)

Type of Complaint	Number	
	Urban	Rural
Total number of Pit/Tanks	No data	No data
Number of calls received within the year for emptying	No data	No data
Number of calls received within the year for emergency maintenance to pits/tanks	No data	No data
% Queries responded to within 24 hours	100	100
% Pits/Tanks pumped within 48 hours of being reported	100	100

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Observations

After reviewing Dr JS Moroka WSDP, the following is a summary of the observations which have been the basis of coming up with the recommendations for each of the following profiles:-

- Administration
- Water and Sanitation Assets
- Operation and Maintenance
- Water Conservation and Demand Management
- Water Resources
- Financial
- Water Institutional Arrangements and Customer Care

10.2 Administration of the Water and Sanitation Department

The municipality has just reviewed the new organisation structure during the IDP process, which indicated that there are approximately 98 posts in the Technical Services Department, of which 61 posts are filled, and 37 posts are vacant.

In terms of the organisational structure in the Water- and Sanitation Departments, the various positions and areas of operation is as follows:

1. Water Supply: 150 positions (to be re-evaluated and confirmed from the IDP information); and
2. Sanitation and drainage: 11 positions (to be re-evaluated and confirmed from the IDP information).

The approved structure will mainly focus on the following activities:

Operation and Maintenance of the Water Sanitation Infrastructure which will focus on the following activities:

- Monitoring and operation of Siyabuswa WWTP, and Vaalbank Oxidation ponds.
- Operation and Maintenance of all bulk water pipelines and water pump stations.
- Operation of water service reservoirs
- Operation and Maintenance of 225.149km of bulk water reticulation network with pipe diameters ranging from 125mm to 700mm.
- Operation and maintenance of sewer reticulation in settlements of Siyabuswa and Vaalbank ranging from 160mm to 500mm
- Monthly Water quality monitoring of bulk water supplied to Thembisile Hani LM.
- Yearly wastewater quality monitoring at Siyabuswa WWTP, and Vaalbank Oxidation ponds.
- Operation and Maintenance of boreholes supplying water to settlements.

10.2.1 Adequacy Analysis of approved Organisation Structure

The components for which staff must be considered are for water supply services and sanitation services:

10.2.2 Water Supply and Sanitation services

The existing water supply and sanitation services include the following:-

- The bulk water pump stations, and bulk water pipelines.
- The service reservoirs.
- Water reticulation network to various areas.
- Wastewater Treatment Plants
- Sewer reticulation networks
- Stores.
- Administration.

- Meter reading, billing, and collecting revenue.

10.2.3 Comparison between the approved organisation structure and the required staff

DWS guidelines given below have been used to make a comparison between the approved organisation structure and the estimated required personnel to manage the municipal water supply and sanitation undertaking, and whose proposed organisation structure is outlined in **Appendix 5**:

- Where water is abstracted from a river/dam, chlorinate, and pumped to a reservoir from where it is reticulated to the community an operator will be necessary with appropriate training in pumps diesel/petrol engines or electric motors. Depending on the length of pipelines and extent of the reticulation, number of standpipes etc. an additional person may be needed to help with maintenance.
- Any water supply scheme/or sewage disposal system where a treatment works as defined in the Water Act forms part of the system will fall under Regulation R2834 of 1985 and such works will have to be registered with DWS and will have to employ operators of the requisite grading. These regulations are included in the ***Legislation and Policy Folder***. These regulations only stipulate the minimum number of operators needed to meet the law. In every case this minimum must be compared with the number of operators physically required to always man the works during its operation. Where any works is to operate continuously, for example, at least 4 operators will be required to allow for days off and sick and vacation leave. Besides the operating staff for the treatment process, additional operating staff for dams and pump stations etc., as well as maintenance staff may be required. Depending on the overall length and diameters of the pipelines involved the number and size of maintenance teams will need to be decided. It is recommended that there be at least 1 team per 10 km of pipeline with the size of teams as follows:

Diameter of Pipe	Size of Team
<75mm	2
75 - 100mm	3
100 - 300mm	4
300 - 800mm	5
>800mm	6

The amount and type of equipment installed will dictate whether full time mechanical and electrical artisans need to be employed or whether such services can be contracted out.

The extent of the buildings and structured will determine the number of civil maintenance staff needed and the number of cleaners needed.

The size of the treatment plant and complexity of the process employed will determine whether full time laboratory staff are required. Usually, they would only be necessary on a Class "B" or higher works.

As the size of a treatment plant and/or the major pipelines and reticulation increases, so does the number of supporting staff. Stores are of major importance and a Class "C" or higher works should be provided with a store man.

Where billing and tariff collection is to be the responsibility of the scheme itself, provision must be made for meter readers (when meters are installed) and for clerks and a cashier.

Financial arrangements need to be made with the WSA to facilitate payments for fuel or electricity and chemicals.

Using the above criteria, details of comparison between the number of staff for the approved organisation structure and the estimated required staff are shown in the table given below:

Table 11.1: Comparison of required and existing support staff for O & M of bulk water pipelines/Sewer Reticulation network

COMPONENT		Pipe dia(mm)	Pipe length(km)	REQUIRED STAFF		Shortfall	Remark
				No of staff	Approved No of staff		
Bulk water pipelines		125	0.78	1	58	25	Dr JSM LM needs to increase the number of staff by 25, in order to effectively manage the bulk water pipelines.
		200	27.7	11			
		250	3.05	2			
		300	28.863	15			
		350	22.016	11			
		400	15.787	8			
		500	50.45	26			
		600	11.24	6			
		700	4.4	3			
			TOTAL	**83**	**58**	**25**	
Sewer Reticulation	Siyabuswa	160	7	3	9	5	Dr JSM LM needs to increase the number of staff by 5, in order to effectively manage the sewer reticulation pipelines.
		250	4	2			
		350	2	1			
		400	1	1			
	Vaalbank	160	15	6			
		250	3	1			
		350	2	1			
		400	1	1			
			TOTAL	**16**	**9**	**5**	

Table 11.2: Comparison of required and existing staff for O & M of Water & Sanitation Infrastructure

COMPONENT	Description	REQUIRED STAFF		Shortfall	Remark
		No of staff	Approved No of staff		
Administration	Water & Sanitation Engineer	1	1	0	Dr JSM LM needs to employ 7 more staff as per the column of shortfall
	Water supply Engineer	1	0	-1	
	Technician: Water supply	2	2	0	
	Sanitation Engineer	1	0	-1	
	Technician: Sanitation	2	1	-1	
	Meter Readers	8	4	-4	
	Water Quality Technician	2	2	0	
	Billing & Revenue	2	2	0	
	Stores	2	2	0	
	TOTAL	**21**	**14**	**-7**	
Siyabuswa WWTW	1 x 3.3 Mℓ/day	6	13	+7	Dr JSM LM needs to employ 1 more staff and redeploy some of the staff as per the column of shortfall
Vaal bank Oxidation Ponds	1 x 0.5Mℓ/day	1	6	0	
Bulk water Pump stations	13 Pump stations	26	7	-7	
Sewage Pump stations	1 Pump station	2	2	0	
Service Reservoirs	21 service reservoirs	4	4	0	
	TOTAL	**38**	**37**	**-1**	

10.2.4 Recommended Organisation Structure

The recommended organisation structure will be as per the DWS criteria, and according to the above analysis the of staff the number of staff for proposed organisation structure will increase by 38 as shown in the proposed organisation structure in Appendix 5 .

10.3 Water and Sanitation Assets

10.3.1 Adequacy Analysis

The following is recommended:

- Detailed investigation of under capacitated pumps, pipelines, and reservoirs.
- Implementation of the Western Highveld BWSS to alleviated reliance on ground water sources (Boreholes) and to ensure a sustainable potable water supply to communities within the Mathanjana Magisterial District.

10.3.2 Blue Drop

The following blue drop status recommendations are to be implemented without fail:

- The Water Safety need to be developed, the plan should include Risk Assessments of catchment, treatment works and reticulation. The Risk Assessment should indicate that the treatment facility can treat the water from raw water quality to DWQ complying with SANS 241;
- Process Control, Maintenance & Management Skills;
- Monitoring Programme;
- Credibility of Sample Analyses;
- Submission of Results;
- Drinking Water Quality Compliance;
- Performance Publication; and
- Asset Management.

10.3.3 Green Drop

The following green drop status recommendations are to be implemented without fail:

- A Wastewater Risk Abatement Plan (W2RAP) as a systematic process that aims to consistently ensure acceptable wastewater quality that does not exceed the numerical limits in wastewater treatment works licenses/permits by implementing an integrated risk management plan from wastewater collection through wastewater treatment and including final effluent discharge into the environment. In so doing the process allows for better understanding of wastewater systems.
- Employ registered technical staff or train the existing staff managing the wastewater treatment plants;
- Record flows to the plants, and the quality monitoring programme need to be broadened to provide an improved base for process control and compliance monitoring;
- Put measures in place to achieve adequate effluent quality compliance, so that the effluent does not pose a risk to the receiving environment and public health;
- Put in place key managerial functions and systems i.e., bylaws, incident response management and planning aspects; and
- Put in place risk-based approach and adoption of integrated asset management principles, so that the existing infrastructure is valued and maintained to reach the expected design lifespan.

10.3.4 Needs Development Projects

The following recommendations have been proposed for the Water and Sanitation Infrastructure development:

- Develop a Monitoring Programme of Water and Sanitation Assets;
- Develop a Disaster Management Plan of Water and Sanitation Assets;

- Develop a Water Quality Plan for Groundwater;
- Develop a Management Plan of Untreated Effluent against Pollution of Groundwater; and
- There is need to conduct borehole pump testing to establish the current borehole yields for all areas being supplied by boreholes.

10.4 Operation and Maintenance Profile

The following constitute the Operation and Maintenance profile:-

- Resources available to perform functions that enable the Municipality to provide water and sanitation services.
- Information on all the existing water and sanitation infrastructure.
- Operation and Maintenance of water and sanitation Infrastructure.

10.4.1 Resources Available

Resources include the following:

- Staff to perform functions
- External Resources such as subcontracting certain works
- Spare parts of all infrastructure such as pumps, pipes, electric motors etc.
- Tools and equipment and
- Budget

Dr JS Moroka has indicated that all the above resources are available. However, records obtained from the municipality on the above show that some of the resources are inadequate and we therefore recommend the following:-

- Increase the number of staff based on the recommended organization structure
- Develop a comprehensive budget that should be able to address the needs i.e., Operation and Maintenance of the following:
    - Intake works
    - Bulk water pipelines
    - Water reticulation networks
    - Sewer Reticulation networks
    - Siyabuswa WWTW
    - Vaalbank WWTW
    - Service Reservoirs and
    - Boreholes equipped with pumps
    - Water Demand and Conservation Management

10.4.2 Recommendations of Operation and Maintenance of Water and Sanitation Infrastructure

10.4.2.1 Operation and maintenance of Mechanical and electrical facilities

Mechanical and electrical facilities for the proposed upgrade of Dr JS Moroka water supply infrastructure include the following:

- Pumps and electric motors
- Telemetry
- Air valves
- Gate valves
- Electric motors and control panels

Given below are the proposed operation and maintenance procedures for each of the above mechanical electrical facilities:

Table 11.3: Existing Mechanical and Electrical O & M procedures

Component	MANAGEMENT					
	Drawings	Operation logos	Standards of operation control	Quantity of tools	Statutory Regulations	Repairs
Mechanical facility Pumps, valves	Drawings for Piping Structures Assembly	Operation Failure Maintenance Inspection Equipment ledgers	Operation Control Inspection Maintenance Regulations Safety	Maintenance Instruments Equipment Consumables	SABS	Develop Preventive measures
Electrical facility Electrical motors & Control panels	Drawings for Structures Assembly	Operation Failure Maintenance Inspection Equipment ledgers	Operation Control Inspection Maintenance Regulations Safety	Maintenance Instruments Equipment Consumables	SABS	Develop Preventive measures

10.4.2.2 Operation and maintenance of service reservoirs

The recommended operation and maintenance procedures of the service reservoirs is outlined in table 11.4 given below

Table 11.4: Existing Service Reservoirs O & M procedures

Service area	Operation and Management	
Dr JS Moroka LM	Inspection of operating devices i.e., water gauges, remote system etc	Tank Cleaning
	Monthly	Every two years

10.4.2.3 Leakage prevention for the bulk water pipelines and water reticulation network

Leakage from water pipes is not only a waste of purified water, but also causes secondary troubles such as insufficient water service, contamination of tap water on occurrence of suspension of water supply, subsidence of roads and flooding of houses .Consequently, leakage prevention is very important.

A long term (10 years) or medium term (3 to 5 years) leakage prevention program has been recommended depending on the funding with the target value fixed according to the age of the facility, real situations of leakage, leakage prevention technology, organisation, and finances.

In order to accomplish the target values, it will be mandatory that the implementation program for each fiscal year matches the long- or medium-term program.

10.4.2.4 Water quality for distribution and service reservoir

The final goal in the water supply is that the water in the water tap meets the water standard

.High quality water supplied from the filtration plant may be contaminated during water supply/distribution. Accordingly, it is necessary to hold residual chlorine at the water service terminal and to try to detect abnormality as quickly as possible by testing water quality periodically.

Large quality fluctuations must be investigated even when the result of the periodical water quality test meets the drinking water standards.

Accordingly, order to adhere to the blue drop status, the following water quality monitoring is recommended at the following points:-

- Raw water sources from Dams

- Weltevreden Water Purification Plant (receiving well, after sedimentation, after filtration)
- Service reservoirs
- Extreme points of water reticulation networks from service reservoirs

The water quality monitoring frequency at each of the above points is outlined below.

10.4.2.5 Monitoring Raw water sources

The monitoring frequency of raw water from Dams is outlined in table 11.5 given below.

Table 11.5: Raw water quality monitoring frequency

Parameters	Method / Equipment	Frequency	Remark
pH	pH meter	Monthly	Testing can also be done when abnormal values are observed
Turbidity	Turbidity meter	Monthly	Testing can also be done when abnormal values are observed
Colour	Colour comparator	Monthly	Testing can also be done when abnormal values are observed
E-coli	Incubator	Monthly	Testing can also be done when abnormal values are observed
Conductivity	Conductivity meter	Monthly	Testing can also be done when abnormal values are observed
TDS	Weighing balance/ Calculations	Monthly	Testing can also be done when abnormal values are observed
Total hardness Calcium hardness Magnesium hardness Total alkalinity	Titrations	Monthly	Testing can also be done when abnormal values are observed
Sulphates Chlorides Fluorides Nitrates Iron Manganese	Turbidity/ Gravimetric Titration Spectrometry	Monthly	Testing can also be done when abnormal values are observed

10.4.3 Operation and Maintenance of Weltevreden Water Treatment Works

10.4.3.1 General

General Management of Weltevreden Water Treatment Works would be according to the following criteria:-

- Regular investigation of leakages within the plant
- Measuring and adjusting water amount by conducting measurement of water amount of purified water, water used for the plant operation, the water lost in the purification plant and water supplied to the consumers.
- Protection against pollution by: -
  - Provision of secure fence around the plant to prevent unauthorized people entry into the plant.
  - Monitor all drainpipes of the filter beds
- Water quality control shall be according to the following criteria: -
  - Regular examination of raw water
  - Examination of the purification efficiency of sedimentation and filtration basins
  - Regular examination of water from the clear water reservoir and service reservoirs.
- Emergency measures shall be according to the following criteria
- To put in place steps against secondary damages caused by fires and gas escaping.
- To inspect the indicated values and working conditions of meters and communication lines; maintain inspection of the amounts of raw water, purified, water, conveyed water and distribution water through the respective flow meters.
- In case of violent thunder, the following measures will be recommended;
  - To equalize the potential of metering instruments which are weak against a thunder with that of the earth.
  - Spare conductors to be in stock

- In case of fire the following measures will be recommended: -
  - To report all fires
  - Strive to extinguish the fire using fire extinguishers
  - Power sources for damaged parts should be cut off and the valves of the chemical pipes passing the place of the fire should be closed at once.
- In case of chlorine gas leakage, the following measures will be recommended: -
  - Operators entering the room with chlorinators to wear protective clothing
  - To check damage to machinery
  - Non-functional chlorinators should be exchanged with spare ones
- In case of power outage, the following measures will be recommended:
  - Standby generator to be used
  - To confirm the time of normal power restoration and to inform all those concerned if there is fear of poor storage.
- In case of suspending service for an urgent reason, there is need to inform all those concerned.

10.4.3.2 Management of treatment facilities

Management of components of Weltevreden Water Treatment Works will mainly focus on the following components:-

- Receiving well
- Chemical feeding installations
- Coagulation basin
- Sedimentation basin
- Rapid sand filters
- Pipe system at filter plant
- Clear water reservoir

10.4.3.2.1 Receiving well

Water meter sluice valve and sluice gate built on a receiving well to be inspected from time to time.

10.4.3.2.2 Chemical feeding Installation

Management of chemical feeding installations shall be according to the following criteria:-

- Records shall be kept of chemicals available, amounts consumed, the quantity of water treated and the treatment efficiency of the chemicals.
- The inside of coagulant solution tanks shall be cleaned regularly to detect leaking and to prevent problems caused by undissolved substances.
- Coagulants shall be fed upstream of the mixing chamber, at the apron of the weir or at the position just before the rapid mixer.

10.4.3.2.3 Chemical feeding facilities

The working condition shall be checked regularly for the following: -

- Chemical dosing Pumps
- Control valves
- Reversing valves,
- Speed reducing or changing apparatus

The following shall be observed for chemical feeding facilities for corrosive liquors: -

- Not to be touched by hand and care shall be taken to avoid body and clothing stains.
- Periodic inspection to ensure that there are no leakages.
- The gland of liquor pumps shall be checked regularly to ensure leaking liquor is being correctly discharged into the discharging ditch.
- The storage tank used for heavy sulphates should be well sealed.

The following shall comply for feeding facilities for liquors which easily solidify i.e., activated silica, sodium alginate and alkaline agents: -

- Clean water washing shall be applied from time-to-time t protect them.
- To store sodium silicic acid for extended period and will be required to be covered with a thin layer of water to prevent the acid from solidifying.
- The storage temperature of 98% or 95% solution of heavy sulphate to be lower than 3°C.
- Minute care shall be taken for solid sodium hydroxide since it crystallizes at low temperature.

The following shall comply for feeding facilities for powder chemicals

- The feeding room shall be kept dry to prevent slaked lime from adhering to the facilities. Remove all adhering powder chemicals to cause no errors in dosage.
- The hopper for powder chemicals shall be protected from entry of foreign matter.

10.4.3.2.4 Coagulation basin

The following shall be observed in the management of the coagulation basin:-

- The average velocity of the flocculation basin shall be 15 to 300cm/sec.
- Disposal of sludge in the coagulation basin shall be made at the proper time and in the proper way. The walls shall be cleaned when removing the sludge and the accessory shall be repaired if necessary.

10.4.3.2.5 Sedimentation Basin: Chemical sedimentation

The following shall be observed in the management of the sedimentation basin:-

- The flow velocity shall be within the design velocity.
- Inlet, outlet, drainage, and overflow shall be checked regularly for perfect operation.
- Settled sludge shall be removed regularly to maintain the designed effective depth of water.

10.4.3.2.6 Rapid Sand Filters

The following shall be observed in the management of the rapid sand filters:-

- Measure and watch the turbidity of unfiltered water (settled water) and the amount and size of floc.
- Maintain the filtration rate between 120 to 150m/day.
- Operation of the filter shall conform to the following: -
    - The water level of the filter shall be maintained near the designed water level, at least one meter above the surface of the sand layer, to prevent filtering failure caused by excessive negative head.
    - The filtration rate shall be kept within the designed maximum filtration rate.
    - Loss of head shall be within 10 to 20 cm at the beginning of filtration and about 30cm at the maximum. The filter shall be examined for excessive high or low head loss.
    - The quantity of filtered water, head loss from filtration, average filtration rate and bed-cleaning records shall be kept as data for operation in the form of daily reports. Further, for general judgements on filtration efficiency, respective data for quantity of the raw water, jar test, chemical feeding conditions, operational condition of the sedimentation basin and quality analysis of the filtered water shall be consolidated.
    - To regularly check working condition of machinery and instrumental metering facilities for filtration such as control equipment for filtration run, meters for filtration head loss, meters of the filtered water, various kinds of valves and sluice gates and operational control desk should arrange that they can work efficiently.
- Filter bed maintenance shall conform to the following: -
    - Inside of each filter should be regularly checked about the following:
        - Pollution of filter bed
        - Formation of mud balls and cracks in filtration layer
        - Increase in effective size of filter sand
        - Fractures and outflow of filter sand

        - Air obstruction due to excessive loads
        - Failure in cleaning installations
        - Damage on the walls of filter
        - Movement of sand and gravel
    - Newly replaced sand should be cleaned with water until the turbidity of the water is less than 5 degrees
- Cleaning of the filter bed shall conform to the following:
    - Cleaning sand filters shall be achieved by surface wash and backwash
    - Washing shall be conducted in the following order when the filtration period and filtration head loss have reached the designed value of the filter.
        - Close the inlet. Lower the water level of the filter of the filter to the upper edge of the through. Continue the filtration until the water level is 10 to 15 cm above the sand surface.
        - Close the outlet valve.
        - Open the flush drainage valve and begin surface washing by opening the surface washing by opening the surface wash valve.
        - Open backwash valves gradually; continue washing at the specified rate, increasing the flow rate by degrees. After lapse of the specified time (usually 4 to 6 minutes), close the surface wash valve, then close the backwash valve. However, it is necessary to continue to feed a little wash water to prevent sand blocking the surface-washing pipe.
        - Close washing drainage valves
        - Open inflow valves. Introduce the raw water into the basin and raise the water level to the designed height. Open the filters discharging valves and release the water until its quality improves. If the process is regarded unnecessary from the results of water analysis, filter water discharge need not be performed.
        - Open the outflow valves and close the filter discharging valves simultaneously, and then begin filtration.

10.4.3.2.7 Pipe System at Filter Plant

- The water purification plant has many kinds of pipe systems of specific character and functions. In the case of urgent operation, a single mishandling of any of these systems might invite non-operation or no service of water. To avoid confusion, a diagram of the pipe system will be provided.
- When using a bypass, the dead water would be released from the drainpipe on the way before use.
- The drainpipe must be used most of the time to avoid collection of mud and sludge.
- The valves and the valve room would be required to be in good condition; the valve controller and joint rod would be constantly ready for use.

10.4.3.2.8 Clear Water Reservoir

1. Management of the clear water reservoir would conform to the following criteria: -
    - A clear water reservoir will operate as a buffer basin.
    - Auxiliary installations of the clear water reservoir shall be protected against corrosion caused by chlorine.
    - The ventilating hole, manhole, control gallery, control room and water inspection hole shall be locked and protected against pollution caused by rainfall, dust, and small animals such as rodents.
    - The water gauge, remote system water gauge, alarm devices, and automatic operation devices shall always be checked for their correct function.
2. Cleaning and disinfection of the clear water reservoir shall be according to the following criteria: -
    - Cleaning of the reservoir shall be done with clean water containing approximately 10ppm of free chlorine.
    - The existence of offensive smells shall always be checked after cleaning.
    - The water would be left for 24 hours in the tank upon which if the residual chlorine exceeds 5ppm, the water would be left for more days to allow dissolution of the alkali in water.
    - In case of the residual chlorine below 5ppm, disinfection shall be repeated. After which procedure the water shall be drained and the clear water reservoir shall be filled with clean

water.

- The water shall only be distributed when residual chlorine seems to decrease and only a little and when the offensive smell is not noticeable after 24 hours.

10.4.3.2.9 Water quality monitoring at the WTW

Water quality monitoring frequency at the WTW shall be according to the criteria outlined in table 10.6

Table 10.6: Water quality monitoring frequency at Dr JS Moroka WTW

Parameters	Method / Equipment	Frequency	Remark
pH	pH meter	Daily	
Turbidity	Turbidity meter	Daily	
Colour	Colour comparator	Daily	
Chlorine Total residual: Free residual	Chlorine comparator	At least twice a day	When chlorine tablets or solutions are used.
E-coli	Incubator	Daily	
Conductivity	Conductivity meter	Daily	
TDS	Weighing balance/Calculations	Weekly	
Total hardness Calcium hardness Magnesium hardness Total alkalinity	Titrations	Daily	
Flocculation test	Laboratory jar stirrer	When necessary	When replacing flocculants with a new one or when the nature of the raw water changes.
Stability test	Calculations	Daily	
Sulphates Chlorides Fluorides Nitrates Iron Manganese	Turbidity Gravimetric Titration Spectrometry	Weekly	Iron and Manganese may be analysed for on a frequent basis, where these are known to occur. Other specific metals may need to be determined when there is industrial or mining activities in the vicinity.

10.4.3.3 Service Reservoirs and extreme point of water reticulation network

The water quality monitoring frequency at service reservoirs and the extreme points of water reticulation are outlined in table 10.7 given below.

Table 10.7: Water quality monitoring frequency at service reservoirs and water Reticulation network extreme points

Parameters	Method / Equipment	Frequency	Remark
pH	pH meter	Monthly	Testing can also be done when abnormal values are observed
Turbidity	Turbidity meter	Monthly	Testing can also be done when abnormal values are observed
Colour	Colour comparator	Monthly	Testing can also be done when abnormal values are observed
Free residual	Chlorine comparator	Monthly	Testing can also be done when abnormal values are observed
E-coli	Incubator	Monthly	Testing can also be done when abnormal values are observed
Conductivity	Conductivity meter	Monthly	Testing can also be done when abnormal values are observed
TDS	Weighing balance/ Calculations	Monthly	Testing can also be done when abnormal values are observed

10.4.3.4 Public/Private Partnership

Improving the efficiency of O&M depends to a great extent on the proper functioning of flow meters and instrumentation along with dosing at the WTW. Unfortunately, it is not always

possible to find and employ personnel with specialised skills.

The recruitment of staff to carry out repairs and maintenance of the specialised equipment is a challenge and the engagement of external specialised service providers for maintenance of all electro-mechanical equipment is the only viable option. The maintenance service contract should provide for regular inspection and repairs of all electro-mechanical equipment and also ado response for emergency repairs.

10.4.3.5 Asset Register

The Department of Water and Sanitation (DWS) have developed a program to ensure all municipal water service providers establish an asset register. All local municipalities need to be able to access this registry and add any newly acquired assets.

Dr JSM LM have developed an asset register which contains acquisition, maintenance, operation, rehabilitation extension and disposal of the assets in order to provide an acceptable level of service in a sustainable and cost-effective manner and hence reflects the following data for each asset owned or operated by Dr JSM LM as follows:

- Unique asset identification;
- Asset type;
- Asset description;
- Location;
- Date commissioned;
- Asset specifications;
- Asset value;
- Economic life;
- Replacement value;
- Replacement date;
- Maintenance requirements; and
- Date of last maintenance.

10.4.4 Information of the Water and Sanitation Infrastructure

The required information of Water and Sanitation Infrastructure for the Operation and Maintenance include the following:

- Manuals;
- As-Built information;
- Tools & Equipment; and
- Contingency and Safety Plans.

10.5 Water Conservation and Demand Management

The following recommendations have been proposed for the Water and Conservation Management:-

- Develop programmes for night flow metering;
- Inspection for illegal sewer and water connections for all schemes of Dr JSM LM; and
- Need to consider conjunctive use of water.

10.6 Water Resources Profile

The following recommendations have been proposed for the Water Resources Profile

- Develop Water Quality Plans for Water and Wastewater which will show the frequency and conducting water and wastewater quality tests.
- Confirm and update permitted abstraction volume permit.

10.7 Financial Profile

The following recommendations are proposed for the Financial Profile.

The budget provision for the Operation and Maintenance of the following:

- Bulk Water Pipelines;
- Water Service Reservoirs;
- Water Pump Stations;
- Boreholes equipped with mono pumps which are powered by diesel engines and electric motors;
- Water Reticulation;
- Sewer Reticulation of Siyabuswa; and
- Siyabuswa WWTW.

The following information should be recorded:

- Units supplied;
- % Metered;
- % Billed;
- Not Metered;
- Non-Payment;
- Industrial and Commercial Consumers;
- Income Received; and
- Non-Payments.

10.8 Water Services Institutional Arrangement and Customer Care

10.8.1 Water Services Institutional Arrangement

Dr JSM LM is currently subsidizing the water supplied to the consumers and does not recover any costs for provision of sanitation services in Siyabuswa and Vaalbank. In order to try as much as possible to at least have a cost recovery, the following is being proposed:

Dr JSM LM need to look at the possibility of revising the tariff structure for the provision of both water and sanitation services since current records of income and expenditure show that the Municipality is subsidizing the water supplied to the consumers. At the same time there seem to be no cost recovery for the provision of sanitation services in Siyabuswa and Vaalbank as records show that people are not being billed.

10.8.2 Customer Care

For the purpose of monitoring performance in as far as customer care is concerned, the following recommendations are proposed:-

- Provide a register where all categories of consumers should be recorded.
- Record all queries/complaints received indicating dates and time when a complaint is received.
- Record each time a reported complaint is resolved indicating the time of starting and the end time.

11 NEEDS DEVELOPMENT PLANS / PROJECT PLANS

11.1 Project, Programmes and Activities

11.1.1 General

Information of projects implemented and completed during previous financial years were obtained from the municipal website and additional municipal sources (where same was made available) and were included on the available infrastructure lists. Incomplete projects and newly planned projects were included here below, as derived from the various institutional planning documents provided by Dr JSM LM and the NDM. Additional projects, considered as critical or important to the running of the infrastructure, was recommended by the author after consideration of the municipal requirements as a whole.

The needs development / anticipated project, programmes and activities were determined by adequacy analysis of the existing water and sanitation infrastructure of Dr JSM LM, which resulted in a blend of the following capital – and operational projects for the next three financial years.

Capital projects in particular, are envisioned to be executed in terms of the Expanded Public Works Program (EPWP).

11.1.2 Required Water Projects

Table 11.1: Anticipated Water Projects for the next 3 Years

Project, Programme and Activity	Ward	Location	Key Performance Indicator	Medium Term Budget & Expenditure Framework 2022/23/24/25		
				Year 1	Year 2	Year 3
Borehole, Pump station, sealing of existing reservoir & reticulation	28	Serateng	Borehole, pump station, sealing of existing reservoir & reticulation completed.	R 500,000.00	R -	R -
Construction of 400KL elevated steel tank, Construction of 3X guard houses on the boreholes with the palisade fence, installation of booster pump, installation of dosage unit and bulk line	14	Maphotla	400KL elevated steel tank, 3X guard houses on the boreholes with the palisade fence completed	R10,392,601.00	R -	R -
Construction of 4 boreholes, guard house, pump station, sealing of existing boreholes, reviving of existing water bulk line and installation of new water bulk line to the reservoir. And construction of 5km water pipeline	17	Mbongo	Four (4) boreholes, guard house, pump station and construction of 5km water pipeline completed	R 500,000.00	R -	R -
Replacement of 5km asbestos bulk line to HDPE including installation of 100m steel pipe and of air valve butterfly valves, water bulk meters, scour valves, strainers, accessories, and construction of rectangular manhole	8	Mthambothini	Replacement of 5km asbestos bulk line to HDPE completed	R11,041,553.00	R -	R -
Replacement of 11,5km asbestos bulk line to HDPE including installation of 100m steel pipe and of air valve butterfly valves, water bulk meters, scour valves and construction of rectangular manhole	8 & 20	Mthambothini & Senotlelo	Replacement of 11,5km asbestos bulk line to HDPE completed	R23,021,693.00	R15,444,427.00	R -
Replacement of 6km asbestos bulk line to HDPE including installation of chamber, scour valves, pressure reducing valves, bulk water meters and accessories	1 & 3	Ga-Phaahla to Siyabuswa	Replacement of 6km asbestos bulk line to HDPE completed	R23,021,693.00	R11,654,487.00	R -
Replacement of 30km asbestos pipeline to UPVC pipeline, yard connections 500 households	3 & 4	Siyabuswa A	Replacement of 30km asbestos pipeline to UPVC completed	R -	R15,000,000.00	R12,000,000.00
Replacement of 50km asbestos pipeline to UPVC pipeline, yard connections 1500 households	5	Siyabuswa B	Replacement of 50km asbestos pipeline to UPVC completed	R -	R18,000,000.00	R15,000,000.00
Replacement of 2km asbestos pipeline to 400mm HDPE pipe air valve, scour valve, isolation valve and chambers	13 & 14	Pieterskraal B to Maphotla	Replacement of 2km asbestos pipeline to 400mm HDPE completed	R -	R20,000,000.00	R15,000,000.00

Project, Programme and Activity	Ward	Location	Key Performance Indicator	Medium Term Budget & Expenditure Framework 2022/23/24/25		
				Year 1	Year 2	Year 3
Replacement of pumps at Walkraal	11	Walkraal	Pumps replacement completed	R -	R12,000,000.00	R12,000,000.00
Installation of Bulk services (Water reticulation) at Siyabuswa 1A industrial (Phaahla extension)	1	Siyabuswa Industrial	Water reticulation for 518 stands completed	R -	R10,000,000.00	R 5,000,000.00
Total				**R68,477,540.00**	**R102,098,914.00**	**R59,000,000.00**

11.1.3 Required Sanitation Projects

Table 11.2: Anticipated Sanitation Projects for the next 3 Years

Project, Programme and Activity	Ward	Location	Key Performance Indicator	Medium Term Budget & Expenditure Framework 2022/23/24/25		
				Year 1	Year 2	Year 3
Construction of Ga-Phaahla sewer outfall, sewer reticulation of 46km, manholes, yard connections, installation precast structure of 1640.	1	Ga-Phaahla	2km of sewer outfall completed	R30,442,000.00	R 38,563,973.00	R38,563,973.00
Construction of 2 pumpstations, class 34 uPVC heavy sewer Pipes,30 km 160mm dia uPVC,1.1 km of 200mm dia uPVC,1 km of 35mm PipeuPVC,534 manholes,200 Toilets Units & installation of Power Supply 2x Transformer.	16 & 17	Libangeni	Construction of 2 pump stations,30km of 160mm dia uPVC, 1.1 km of 200mm dia uPVC,1 km of 35mm & installation of Power Supply 2x Transformer completed	R 7,000,000.00	R -	R -
Construction of 3.5km sewer outfall, construction of sewer reticulation of 30km, manholes, installation of precast and 1000 house connections.	7	Thabana	Construction of 3.5km sewer outfall completed.	R -	R 25,000,000.00	R32,107,160.00
Installation of Bulk services (sewer outfall and sewer)	1	Siyabuswa Industrial	Bulk sewer project completed	R -	R 10,000,000.00	R15,000,000.00
Upgrading of the football curve, ablution facility installing flooding lights, athletics tracks, drilling of borehole and installation 4 x 10,000ℓ Jojo tanks. Paving driveways and parking's area. Upgrading of irrigation system. Storm management erection\fencing of VIP at the pavilion. Preparing and install outdoor gym.	10	Ga-Morwe	Upgrading of the football curve, ablution facility installing flooding lights, athletics tracks, drilling of borehole completed	R10,058,000.00	R -	R -
Fencing of municipal facilities	Dr JSM LM	Municipal Facilities	Fencing of municipal facilities completed	R 5,000,000.00	R 5,245,000.00	R 5,502,005.00
Total				**R52,500,000.00**	**R 78,808,973.00**	**R91,173,138.00**

11.1.4 Required Standing Projects / Operational Budgets by Technical Services

Table 11.3: Standing Water and Sanitation Operational Budgets for the next 3 Years

Strategic Objective	Vote / Department: Technical Services					
	Divisions: Water, Roads, Sanitation, Mechanical & Electrical					
	Project Name, Programme & Activity	Source of Funding	Key Performance Indicator	Medium Term Budget & Expenditure Framework 2022/23/24/25		
				Council Funding		
				Year 1	Year 2	Year 3
Sustainable delivery of improved services for all households within Dr JSM LM	Repairs, maintenance of pump station	Council	Pump station repaired	R 6,000,000.00	R 6,240,000.00	R 6,489,600.00
	Maintenance of Reservoirs		Water reservoirs maintained	R 4,000,000.00	R 4,160,000.00	R 4,326,400.00
	Borehole Repair		Boreholes maintained	R 2,500,000.00	R 2,600,000.00	R 2,704,000.00
	Bulk water mains		Bulk water mains supplied / maintained	R 3,500,000.00	R 3,640,000.00	R 3,785,600.00
	Supply potable water tankers		Water supplied through water tankers	R 800,000.00	R 832,000.00	R 865,280.00
	Manholes and unblocking		Manholes unblocked	R 4,000,000.00	R 4,160,000.00	R 4,326,400.00
Total				**R20,800,000.00**	**R21,632,000.00**	**R22,497,280.00**

11.1.5 Nkangala District Municipality Funded Projects

Table 11.4: Nkangala District Municipality Funded Projects for the next 3 Years

Description	2023 Budget	2024 Budget	2025 Budget
VIP Toilets & Septic Tanks Drainage	R 1,000,000.00	R 1,000,000.00	R -
VIP Toilets & Septic Tanks Drainage Dr JSM LM (CB)	R -	R -	R -
Makometsane Water Supply - 154175	R -	R 4,350,000.00	R -
Western Highveld (Rust de Winter) Water Scheme	R 5,000,000.00	R 13,721,000.00	R 31,399,000.00
Total	**R 6,000,000.00**	**R 19,071,000.00**	**R 31,399,000.00**

11.1.6 Department of Water and Sanitation Funded Projects

Table 11.5: Department of Water and Sanitation Funded Projects for the next 3 Years

Project / Programme Name / Description	2022/23 Target	2022/23 Budget Allocation Annual)	Total Project Cost
RBIG Schedule 5B - Western Highveld (Rust De Winter) Bulk Water Scheme	Dr JSMLM	R 5,000,000.00	R 50,120,000.00
Total		**R 5,000,000.00**	**R 50,120,000.00**

11.1.7 Department of Agriculture, Rural Development, Land and Environmental Affairs

Table 11.6: Department of Agriculture, Rural Development, Land and Environmental Affairs

Project / Programme Name / Description	2023/2023 Target	2022/23 Budget Allocation (Annual)	Total Project Cost
Marapyane Training Centre - Repair of the sewer system: waste treatment plant replaced, and electric works repaired.	Local farmers and youth capacitated to effectively participate in the agricultural sector.	R 3,576,000.00	R 12,000,000.00
Total		**R 3,576,000.00**	**R 12,000,000.00**

11.1.8 Proposed Project Emanating from the Adequacy Analysis of Water Services Development Plan

Table 11.7: Pump Station Projects

Project / Programme Name / Description	Total Project Cost
Weltevreden Raw Water (Weir) – Additional capacity of 2,3 Mℓ/day in 2042 required	R 1 278 565.94
Matjiesgoedkuil – Additional capacity of 0.57 Mℓ/day in 2022 required	R 1 362 592.38
Weltevreden High Lift - Kameelrivier Sub-system – Additional capacity of 1.08 Mℓ/day in 2032 required	R 2 153 875.57
Kameelrivier – Additional capacity of 1.01 Mℓ/day in 2022 required	R 3 966 355.90
Weltevreden High Lift - Bloedfontein Sub-system – Additional capacity of 1.47 Mℓ/day in 2032 required	R 4 031 847.77
Weltevreden High Lift - Walkraal Sub-system – Additional capacity of 3.68 Mℓ/day in 2037 required	R 6 187 322.23
Total	**R 18 980 559.80**

Table 11.8: Pipeline Projects

Project / Programme Name / Description	Total Project Cost
Weltevreden (Kuilen) – PLW037 - Weltevreden R19 Reservoir (6Mℓ) to Steel tank supplying Matjiesgoedkuil – Upgrade to 315mm dia – 1639m	R 4 419 084.65
Kameelrivier – PLW057 - Leeufontein R14 6Mℓ to Majaganeng(Wolwenkraal Private) - Upgrade to 315mm dia – 3089m	R 8 328 586.02
Kameelrivier – PLW059 - Leeufontein R14 6Mℓ to Vaalbank(Libangeni) /Allemansdrift(Beirut) - Upgrade to 355mm dia – 7263m	R 24 066 909.22
Walkraal - PLB041, PLB042A - Zoetmelksfontein R23 A(10Mℓ) + Zoetmelksfontein R23 B(12Mℓ)] to Elandsdoorn Reservoir(10.7Mℓ) - Upgrade to 500mm dia – 18000m	R 96 932 008.09
Walkraal - PLB048A - Zoetmelksfontein R23 A(10Mℓ) + Zoetmelksfontein R23 B(12Mℓ)] to Elandsdoorn Reservoir(10.7Mℓ) - Upgrade to 400mm dia – 16814m	R 74 213 359.45
Walkraal - PLB041 - Zoetmelksfontein R23 A(10Mℓ) + Zoetmelksfontein R23 B(12Mℓ)] to Taiwan Reservoir(5.8Mℓ) - Upgrade to 500mm dia – 5257m	R 28 309 531.47
Walkraal - PLB044 - Zoetmelksfontein R23 A(10Mℓ) + Zoetmelksfontein R23 B(12Mℓ)] to Taiwan Reservoir(5.8Mℓ) - Upgrade to 355mm dia – 3470m	R 11 498 303.04
Walkraal – PLB040 - Zoetmelksfontein R23 A(10Mℓ) + Zoetmelksfontein R23 B(12Mℓ) to Klipplaatdrift RO6B Reservoir & Klipplaatdrift RO6A Reservoir (800KL) - Upgrade to 315mm dia – 4298m	R 11 588 301.30
Walkraal – PLB038 - Klipplaatdrift RO6B Reservoir (800KL) +Klipplaatdrift RO6A Reservoir(800KL)] to Steel tank supplying Waterval A - Upgrade to 315mm dia – 6737m	R 18 164 352.23
Total	**R 277 520 435.47**

Table 11.9: Storage (Reservoir) Projects

Project / Programme Name / Description	Total Project Cost
Bloedfontein – Additional capacity of 1,3 Mℓ in 2037 required	R 6 344 350.00
Spitspunt – Additional capacity of 2,8 Mℓ in 2022 required	R 11 445 353.79
Leeuwfontein Old – Additional capacity of 1,2 Mℓ in 2032 required	R 5 965 612.97
Vrieskraal – Additional capacity of 0,4 Mℓ in 2022 required	R 2 563 001.32
Total	**R 26 318 318.07**

12 REFERENCES

- Dr JS Moroka LM, September 2012, Computer Analysis and Master Planning of the portion of the Western Highveld Bulk Water Scheme within the Dr. JS Moroka Local Municipality
- Dr JS Moroka LM, 2022/23 – 2026/27, *Integrated Development Plan (IDP)*
- Dr JS Moroka LM, 2014, Water Services Development Plan (WSDP) Review
- Dr JS Moroka LM, 2009, Water Services Development Plan (WSDP) Revision 2
- Dr JS Moroka LM, 2022/2023, *Final Annual Budget*
- Dr JS Moroka LM, 2022/2023, *Budget Policy Review*
- Dr JS Moroka LM, 2022/2023, Service Delivery and Budget Implementation Plan (SDBIP)
- Dr JS Moroka LM, 2015, Spatial Development Framework (SDF)
- Dr JS Moroka LM, 2023, Municipal Annual Budgets and MTREF & Supporting Tables
- Dr JS Moroka LM, 2020/2021, Free Basic Services and Indigent Support Policy
- DWS, 2022, Blue Drop Progress Report
- DWS, 2022, Green Drop Report – Mpumalanga
- Statistic South Africa, 2016, Community Survey
- Statistic South Africa, 2011, Census
- VUMESA, February 2022, Western Highveld Bulk Water Supply Scheme Feasibility Report

APPENDIX 1: LAYOUT OF BULK WATER AND SANITATION INFRASTRUCTURE OF DR JS MOROKA SCHEMES

MUNICIPAL JURISTDICTION :

ELIAS MOTSOALEDI LOCAL MUNICIPALITY

DR JS MOROKA LOCAL MUNICIPALITY

EPHRAIM MOGALE LOCAL MUNICIPALITY

THEMBISILE HANI LOCAL MUNICIPALITY

LEFISO 2ML (CONCRETE) | 320KL ST | 120KL ST | GEELBEKSVLEI (LEFISO) | PLW075/ 110mmØ/1639m | PLW017/300-200mmØ/ 9684m | DITHLAGANE | PLW018/200mmØ/2707m | PLW019/ 150mmØ/ 3821m | PLW022/ 100mmØ/ 1426m | DRIEFONTEIN | VLAKPLAATS (KWAMATABANE) | PLW020/150mmØ/2745m

SEMOHLASHE | 40KL ST | SEABE NOT OPERATIONAL 6ML | SEABE | MMADUMA (GREENSIDE) | 300KL ST | PL/250mmØ/6063m | 108KL ST | MARAPYANE | MARAPYANE NOT OPERATIONAL 10ML | HAAKDORINLAAGTE (GA MARIA) | LEFISWANE | SPITSPUNT R23 2.7ML TWL: 1056.1 BWL: 1048.1 | PLW021/100mmØ/1024m | SPITSPUNT

MOLETSI | SEKGOKGO | 150KL ST | PLW01W/90mmØ/5947m | PL/315mmØ HDPE/4592m | PLW016/200 mm Ø/ 4138 m | UITVLUGT | PLW025/200-150mmØ/3557m | MAKEEPSVLEY (RATHOKE) | 200KL ST | KEEROM (METSANAGWANA) | DOORNLAAGTE | 64KL ST | Not in use | PLW024/250mmØ/5373m | PLW031/200-150mmØ/7031m | 200KL ST | ZAMENKOMST (MATHLEREKENG)

LODING (ROODEKOPPIES B) | 400KL ST | 200KL ST | ROODEKOPPIES (DIHEKENG) | 2x400KL ST ST | GA-MATIMPULE | NEWPLW012&013/ 315mmØ/23000m | PLW013/500mmØ/16220m | PLW012/200mmØ/5956m | PLW015/200mmØ/2300m | LEEUWKUIL (TSIKANOSSI) | PLW014/ 150mmØ/ 2057m | 200KL ST | KABETE (KOEDOESPOORT) | PLW094/ 400mmØ/ 7388m | PLW023/300mmØ/6044m | PLW027/200mmØ/3775m | PLW028/160mmØ/4044m | PLW032/160mmØ/2733m | TOITSKRAAL (LOW LEVEL) | TOITSKRAAL (HIGH LEVEL)

NEW 2ML/DAY (In Construction) | VAALBANK (OLD) 500kL | OLD 0.05ML/DAY | VAALBANK (NEW) ??ML | PLW056/ 200mmØ/ 1300m | VAALBANK A,B (LIBANGELI) | ALLEMANSDRIF B (BEIRUT) | PLW09-011/350-250mmØ/ 7387m | TWEEFONTEIN AH | Numerous take-offs | WITFONTEIN AH | Numerous take-offs | PLW030/250mmØ/8147m | PLW029/200mmØ/6647m

PLW07/300mmØ/1570m | BLOEDFONTEIN R22 16ML TWL: 1043.6 BWL: 1030.9 | BLOEDFONTEIN (SENOTLELO) | PLW08/250mmØ/7175m | Two Pipelines | PLW090/400-350mmØ/11238m | Line Not-verified | MATJESGOEDKUIL | 210KL ST | PLW037 150mmØ/ 1639m

PLW064/250-160mmØ/7263m | DIGWALE 5000kL TWL: 1034.00 BWL: 1028.00 | LEEUFONTEIN A (HIGH LEVEL) | PLW086/110mmØ/193m | PLW057/ 160-100mmØ/ 3089m | MAJAGANENG (HIGH LEVEL) | MAJAGANENG (WOLWEKRAAL PRIVATE) | KAMEELRIVIER B | PLW061/250mmØ/820m | ALLEMANSDRIF C,D | RHENOSTERKOP (MAKOMETSANE) | Gantry for tanker filling | MABUYENI (WELTEVREDEN) | WELTEVREDEN (MAPOCH) | PLW034/300mmØ/4350m | WELTEVREDEN R19 6ML TWL: 985.1 BWL: 975.4 | PLW035/150mmØ/5230m | VRIESKRAAL R21 770KL TWL: 961.0 BWL: 956.0 | VRIESKRAAL (THABANE)

LEEUFONTEIN B (HIGH LEVEL) | LEEUFONTEIN R14 6ML TWL: 1084.65 BWL: 1074.90 | PLW059/060/250mmØ/11710m | KAMEELRIVIER R24 6ML TWL: 970.05 BWL: 960.30 | PLW058/300mmØ/3448m | WELTEVREDEN WATER PURIFICATION WORKS WTP | PLW04700mmØ/705m | Not in use | 50KL ST | PLW036/150mmØ/4699m | Line disused

205KL ST | PLW089/ 250mmØ/ 1740m | LEEUFONTEIN B (LOW LEVEL) | PLW088/ 160mmØ/ 894m | LEEUFONTEIN A,C | NEW METER | LEEUFONTEIN RDP | 1ML ST | KAMEELRIVIER 5ML | BOREHOLE

PLW053/087/250mmØ/4610m | KAMEELRIVIER A | WOLWEKRAAL B | PLW062/250mmØ/6035m | ELANDS RIVER | RHENOSTERKOP (MKHOMBO) DAM | PLW038/ 700 mm Ø/ 9032 m | WELTEVREDEN WEIR | PLW03/500mmØ/6558m | PLW02/500mmØ/6325m | PLW01/3x450mmØ/13850m | PLW01 NEW 1400m (In Construction) | CANAL FROM LOSKOP DAM | MTOMBO BALANCING DAM

Line disused | PIETERSKRAAL A 770KL TWL: 1050.0 BWL: 1054.0 | PLW044/250mmØ/2763m | PIETERSKRAAL A (MATLAYEDWA) | WOLWEKRAAL A | PIETERSKRAAL B R10 770KL TWL: 1056.1 BWL: 1048.5 | PLW045/087/ 250mmØ/ 1409m | PLW046/ 200mmØ/ 500m | WOLWEKRAAL (Skimming) 770KL TWL: 998.15 BWL: 993.15 | WOLWEKRAAL 2 (Skimming) 4000KL | PL UNKNOWN 9000m | Not in use | 100KL ST | PIETERSKRAAL B

PLW064/250-160mmØ/7263m | PLW086/110mmØ/193m | PLW057/ 160-100mmØ/ 3089m | PLW061/250mmØ/820m | PLW059/060/250mmØ/11710m | PLW088/ 160mmØ/ 894m | PLW053/087/250mmØ/4610m | PLW058/300mmØ/3448m | PLW04700mmØ/705m | PLW03/500mmØ/6558m | PLW02/500mmØ/6325m | PLW01/3x450mmØ/13850m | PLW01 NEW 1400m (In Construction)

PLW041/250mmØ/3720m | PLW042/250-200mmØ/5247m | PLW043/150mmØ/1800m | KLIPPLAATDRIFT (V3) 5ML TWL: 1070.45 BWL: 1065.00 | KLIPPLAATDRIFT B (MOROTHOBOLONG) | WATERVAL A (MAKOLA) | TWOLINE (WATERVAL C) | PLW057/ 160mmØ/ 2556m | WATERVAL 1 R07A 800KL TWL: 1022.90 BWL: 1017.00 | WATERVAL 2 R07B 800KL TWL: 1022.90 BWL: 1017.00 | BOREHOLE | PLW048/150mmØ/4519m | PLW049/150mmØ/1575m | WATERVAL B1 800KL TWL: 984.0 BWL: 979.0 | WATERVAL B2 800KL TWL: 984.0 BWL: 979.0 | WATERVAL B OLD | WATERVAL B NEW | DISUSED | PLB038/250mmØ/6737m

PLB041/350mmØ/5257m | ZOETMELKSFONTEIN R23A 10ML TWL: 1200.0 BWL: 1193.0 | ZOETMELKSFONTEIN R23B 12ML TWL: 1200.0 BWL: 1193.0 | PLW048/ 400mmØ/ 630m | ZOETMELKSFONTEIN A (MOLETI A) | ZOETMELKSFONTEIN C (MOLETI C) | GOEDERede 1ML | PLB040/150mmØ/4298m | PLW039/600mmØ/9811m | PLW04700mmØ/705m | PLW042A/300-400mmØ/16814m | PLW042A/350mmØ/18000m | ELANDSDOORN R03 10.7ML TWL: 1117.35 BWL: 1109.50

WAALKRAAL (OORLOG) 40 kl ST | WALKRAAL R17A 12ML TWL: 1004.0 BWL: 997.0 | WALKRAAL R17B 12ML TWL: 1004.0 BWL: 997.0 | SIYABUSWA 12ML TWL: 987.0 BWL: 976.0 | SIYABUSWA IND | MAGANAUBUSWA (VALSCHFONTEIN) | NDEBELE COLLEGE PROV. EDUCATION | PLW040 500mmØ/3304m | PLW062/600mmØ/1920m | PLW063/400mmØ/935m | PLW065/300mmØ/845m | 8m | SIYABUSWA A | 5+5=10ML/DAY (Refurbishment in Process) | PHAALA | ClosedX | SIYABUSWA D | 50KL ST | PLW064/300mmØ/1387m | Closed X | SIYABUSWA B/C

NEW RDP HOUSES | MOUTSE TLC | PLW039/600mmØ/9811m | KGOBOKWANE | PLW074/150mmØ/5547m | Nganeng | KUILSRIVIER (MATLALA) | PLW071/200mmØ/4848m | 40KL ST | TAIWAN R04 5.8ML TWL: 1137.05 BWL: 1128.85 | WALKRAAL B (STOMP) | WALKRAAL B R29 750KL TWL: 1034.55 BWL: 1030.38 | WALKRAAL B1 05 300KL | PLB044/ 250-200mmØ/ 3470m | PLW066A/ 450mmØ/ 300m | PLW072 200 mm Ø 2933 m | LUSAKA | PLW066B/ 450mmØ/ 587m | ZOETMELKSFONTEIN B (MOLETI B) | 10 MORG (DENNILTON) | SLOVO | PHUMULA | PLW067/ 250mmØ/ 2013m | PLW068/400mmØ/830m | PLW069/250mmØ/3100m | PLW070/250mmØ/1500m | PLW076/ 400-250mmØ/ 4697m | PLW077/ 150mmØ/ 1442m | ZONDAGSFONTEIN 300KL | ZONDAGSFONTEIN A | MAGAKADIMENG 300KL | UITSPANNING A,C | UITSPANNING B (MAGAKADIMENG) | 100KL ST | PHILADELPHIA 300KL | PHILADELPHIA HOSPITAL | KIKVORSCHFONTEIN N (THEARENG) | KIKVORSCHFONTEIN (KALOFONE) | Abandoned Pipe X | PLW078/250mmØ/ 2800m | ELANDSDOORN A | PLW079/250mmØ/ 2523m | ELANDSDOORN B (MARAPENG) | KWARRIELAAGTE R02 1.1ML TWL: 1159.00 BWL: 1152.83 | KWARRIELAAGTE | PLW080/ 150mmØ/ 3400m | PLW081/ 150mmØ/ 1651m | WATERKLOOF R01 750KL TWL: 1232.6 BWL: 1228.6 | WATERKLOOF

PLW031/ 600mmØ/ 3657m | PLW030/500mmØ/7473m | LINK WITH SOUTHERN AREA | KWAGGAFONTEIN 12ML | KWAGGAFONTEIN 12ML TWL: 1409.5 BWL: 1402.5 | PLB032/200mmØ/6913m | PLB033/ 200mmØ/ 7441m | PLB034/ 200mmØ/ 916m | MATHYS ZYN LOOP ?KL | MATTHYS-ZYN-LOOP | X Closed | KWAGGAFONTEIN A (LOW LEVEL) | KWAGGAFONTEIN A (HIGH LEVEL) | KWAGGAFONTEIN B/C | KWAGGAFONTEIN D (HIGH LEVEL) | KWAGGAFONTEIN D (LOW LEVEL) | PLB035/125mmØ/780m | PLB037/600mmØ/11245m | PLW082/300mmØ/2860m

WITNEK GARAGE | KWAGGA BAKERY | KWAGGAFONTEIN SMALL INDUSTRY | VRISGEWAAGD 500KL TWL: 1306.5 BWL: 1304.0 | VRISGEWAAGD (KWAGGAFONTEIN E) | BOEKENHOUTHOEK 500KL TWL: 1323.5 BWL: 1319.0 | BOEKENHOUTHOEK 500KL TWL: 1323.5 BWL: 1319.0 | BOEKENHOUTHOEK A | BOEKENHOUTHOEK B 1.8ML TWL: 1254.25 BWL: 1249.00 | KENT3000 | BOEKENHOUT B | PLW036/200mmØ/8887m | GOEDERede 750KL TWL: 1159.0 BWL: 1154.0 | GOEDERede A (MATSHOPE) | RAMAPHOSA 1ML | KLIPPLAATDRIFT R06B 800KL TWL: 1096.0 BWL: 1091.0 | KLIPPLAATDRIFT R06A 800KL TWL: 1096.0 BWL: 1091.0 | KLIPPLAATDRIFT A (MATSIHIDING) | WATERVAL 3 (Magola) 2ML CONCRETE TWL: 1026.50 BWL: 1020.00 | PLW051/150mmØ/1813m

LEGEND :

RESERVOIR | WATER TOWER | STORAGE TANK | SEWAGE TREATMENT PLANT | PUMP | RISING MAIN | RISING MAIN IN CONSTRUCTION | GRAVITY MAIN | WEIR | BULK MAIN DETAILS PLB029/200mm Ø/3511m

PRESSURE REDUCING VALVE AND OUTLET PRESSURE | NON-RETURN VALVE | ZONE VALVE | ISOLATING VALVE | EXISTING METER AND TYPE | ULTRASONIC METER | ABONDONED METER | WATER TREATMENT WORKS | DAM | ZONES | BOREHOLE

NOTES:

- THE ACCURACY OF INFORMATION REFLECTED ON THIS SCHEMATIC LAYOUT DRAWING IS NOT GUARANTEED. THE USER OF THIS DRAWING SHOULD TAKE RESPONSIBILITY TO VERIFY THE VALIDITY OF THE INFORMATION REFLECTED ON THIS DRAWING.

REFERENCES:

- NKANGALA DISTRICT MUNICIPALITY AND DR JS MAROKA LOCAL MUNICIPALITY:
  - MR. FLOYD MASHELE
  - MR. LUCAS MASOMBUKA
  - MR. SAYA MASANGO
- WESTERN HIGHVELD AUGMENTATION STUDY
- SIBAMBISENE PHASE 1 PROJECT
- WRP (SIBAMBISENE PHASE 2 - NORTHERN SUPPLY SCHEME: WESTERN HIGHVELD REGION)

No	DATE	INNITIALS	DESCRIPTION
E	21/10/22	K.C.	DETAIL ADDED

APPROVED BY

FOR AFI CONSULT DATE

DESIGNED BY	----
CHECKED BY	K.C.
DRAWN BY	F.C.
CHECKED BY	----

Dr. JS MOROKA LOCAL MUNICIPALITY
PRIVATE BAG X4012 SIYABUSWA 0472
Tel.: (013) 973 1101
Fax.: (013) 973 2463

AFI CONSULT Plan • Design • Implement
ISO 9001:2015 Quality Management Cert: 2012112701
21 VIA LATINA RING, IRENE CORPORATE CORNER, IRENE FARM VILLAGES, CENTURION, 0157
TEL. (012) 346 1848
FAX. (012) 460 6481
e-MAIL : ad@aficonsult.co.za

CONTRACT NUMBER: 154190

WATER SERVICES DEVELOPMENT PLAN

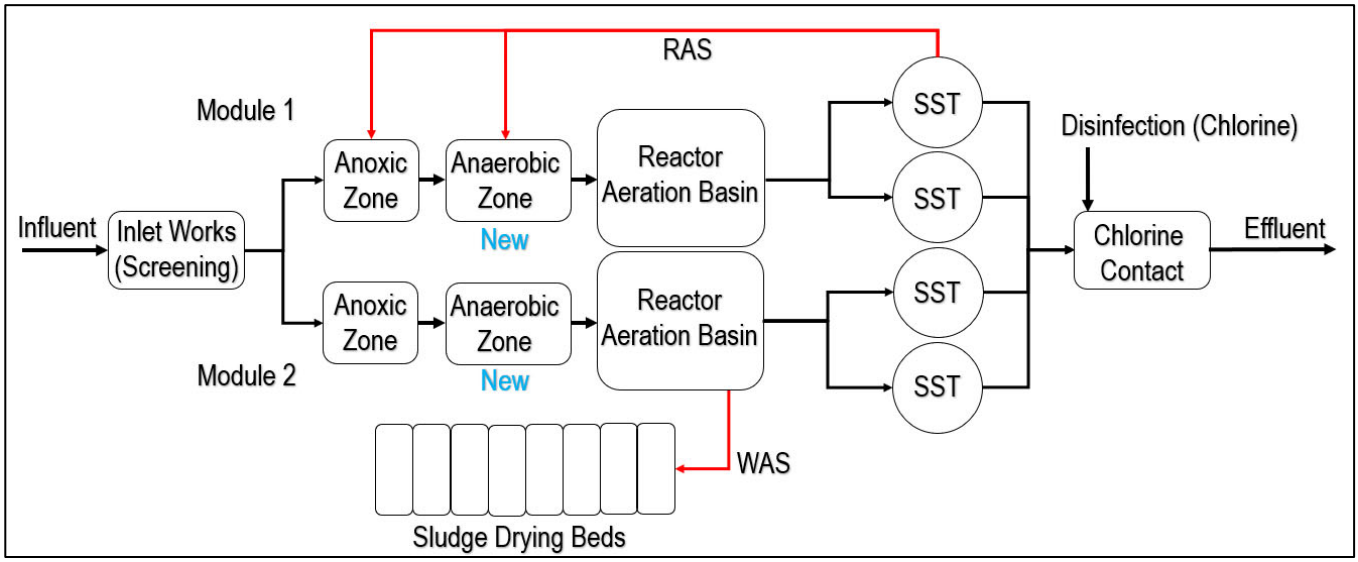
SCHEMATIC LAYOUT OF SUPPLY SCHEME

SCALE	SHEET SIZE
N.T.S	A1
DATE	REVISION
October 2022	E

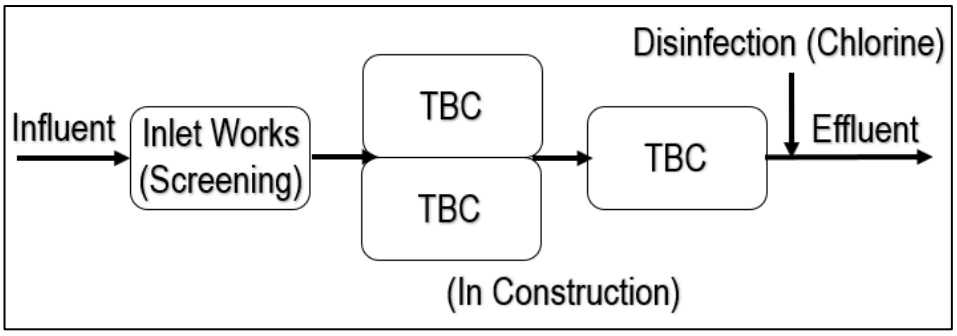
CONSULTANTS DRAWING NUMBER

2021/19/01-SCHEMATIC

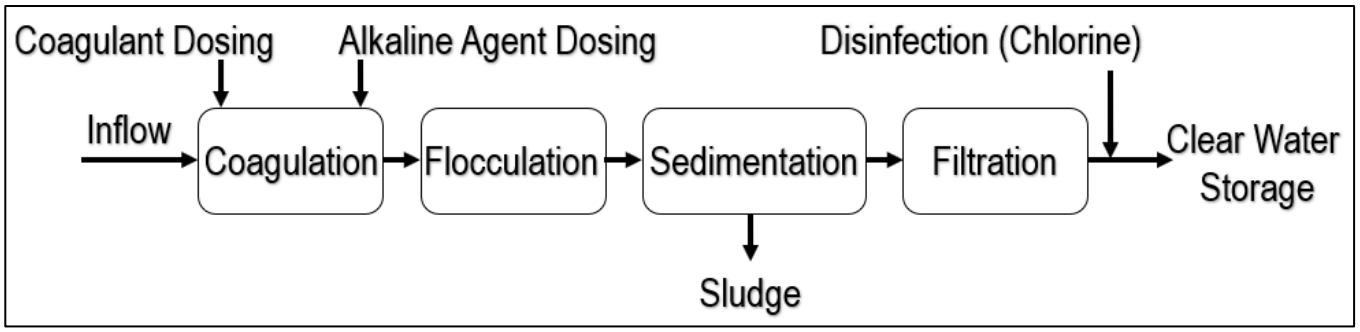
APPENDIX 2: SCHEMATIC DIAGRAM OF SIYABUSWA WWTP



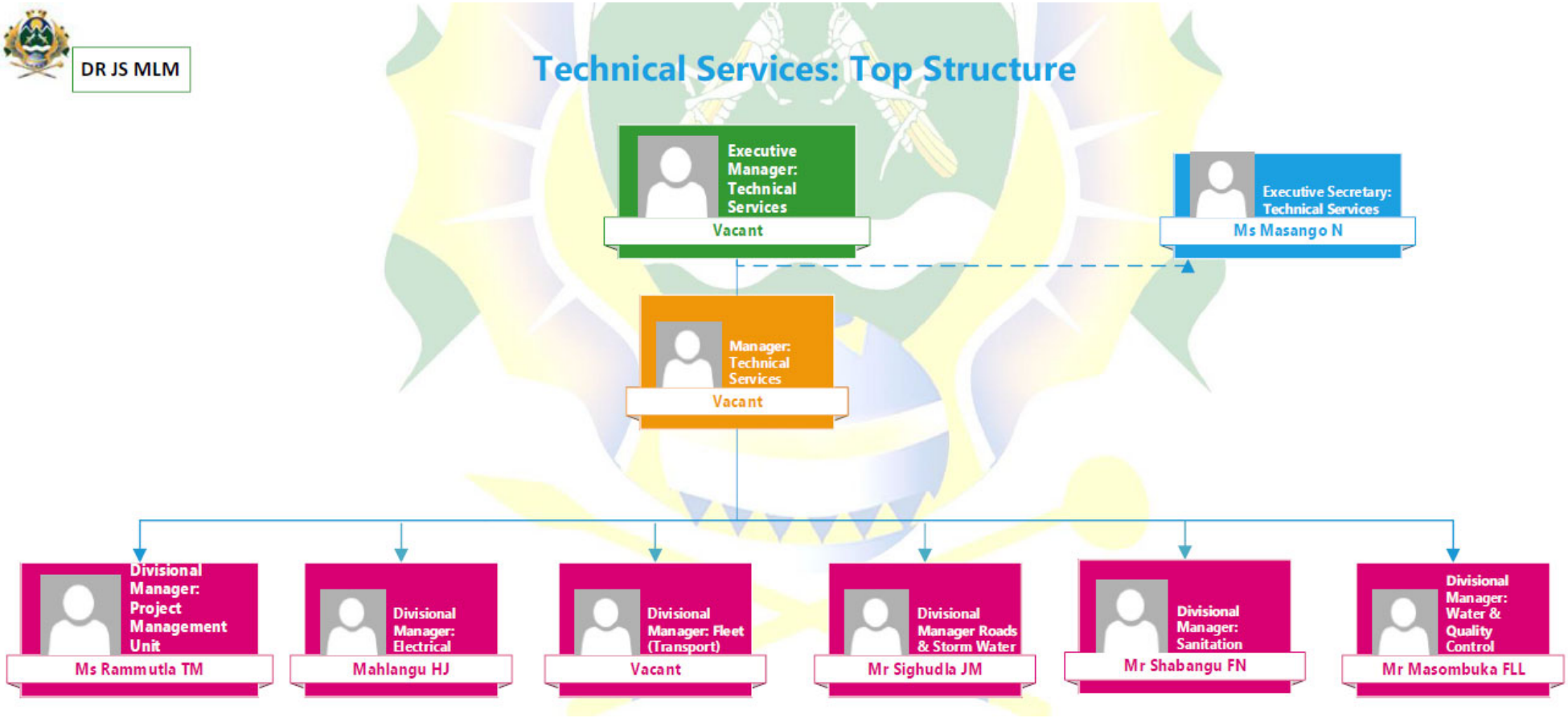
APPENDIX 3: SCHEMATIC DIAGRAM OF NEW LIBANGENI WWTW

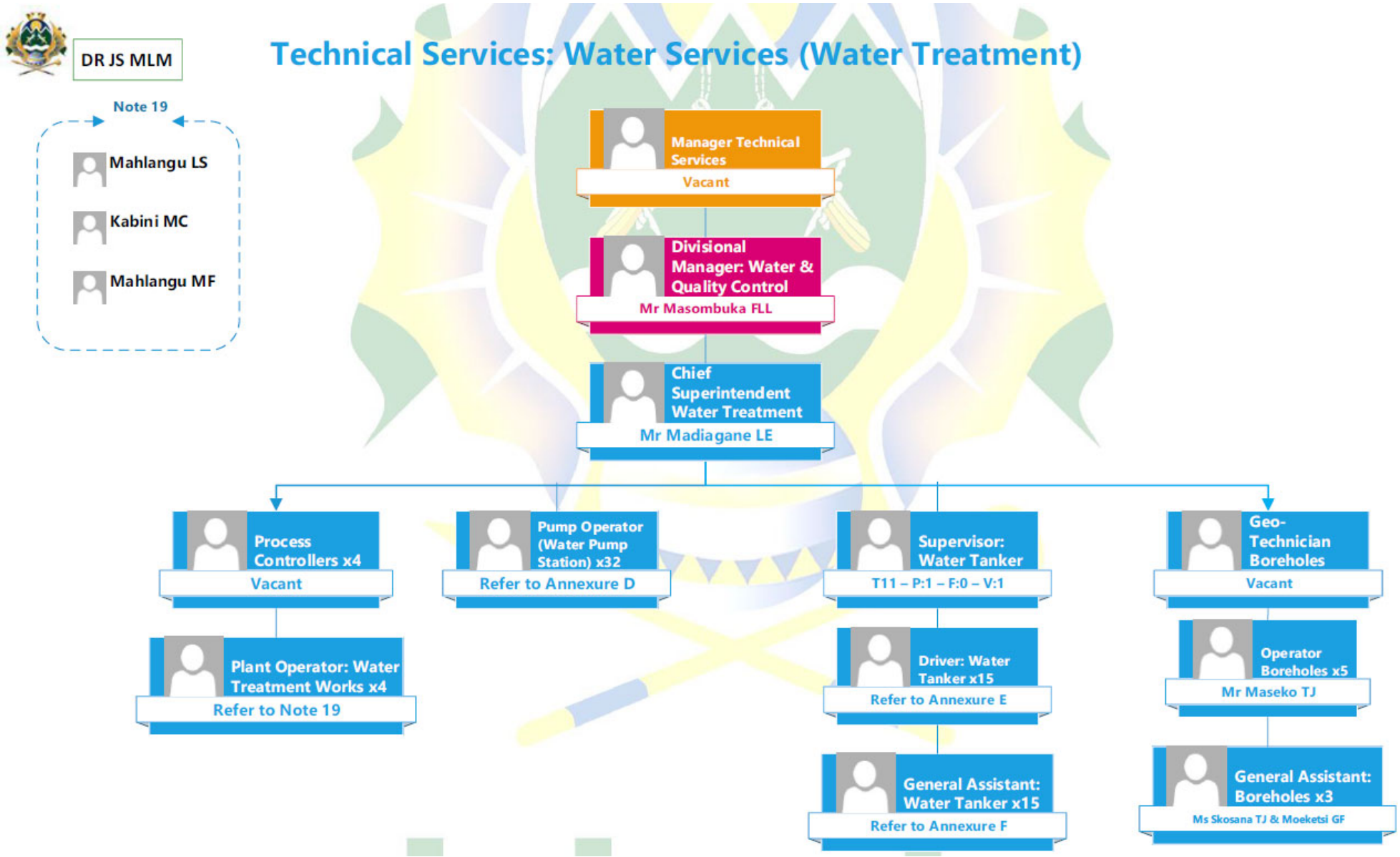


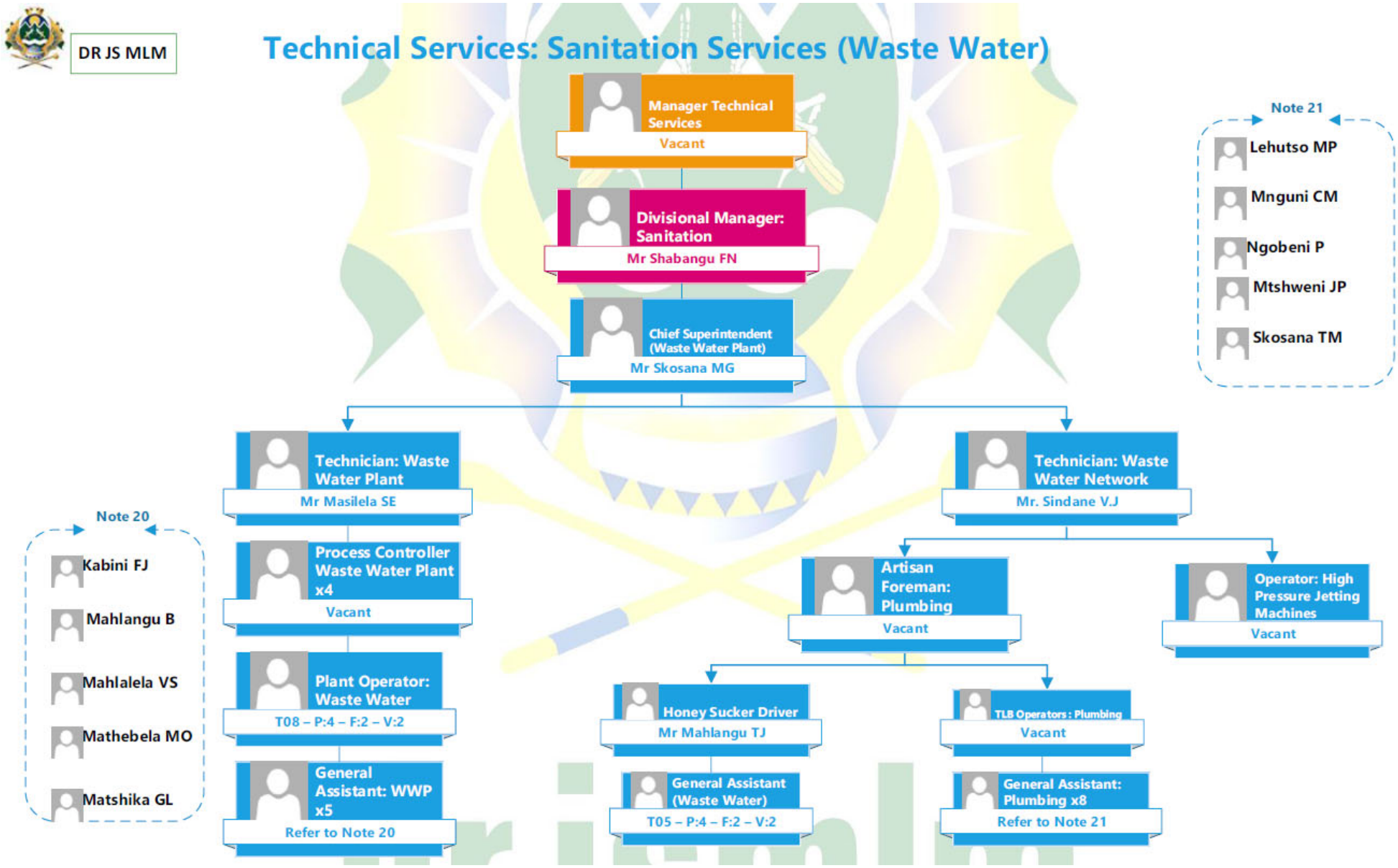
APPENDIX 4: SCHEMATIC DIAGRAM OF WELTEVREDEN WTP

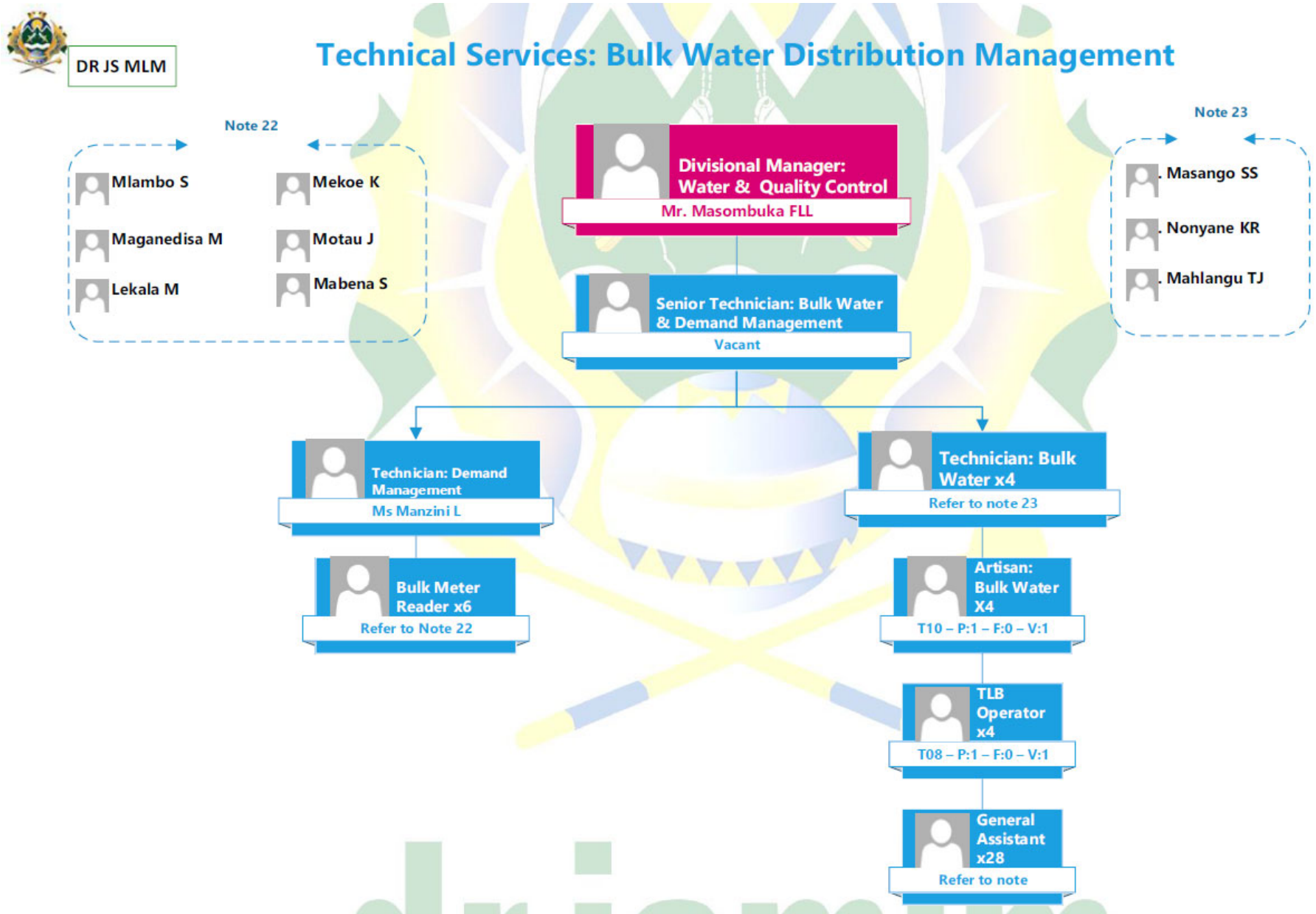


APPENDIX 5: ORGANISATION STRUCTURE OF DR JS MOROKA LM WATER AND SANITATION DEPARTMENTS




DR JS MLM
Technical Services: Water Services (Water Treatment)
Note 19
Mahlangu LS
Kabini MC
Mahlangu MF
Manager Technical Services
Vacant
Divisional Manager: Water & Quality Control
Mr Masombuka FLL
Chief Superintendent Water Treatment
Mr Madiagane LE
Process Controllers x4
Vacant
Plant Operator: Water Treatment Works x4
Refer to Note 19
Pump Operator (Water Pump Station) x32
Refer to Annexure D
Supervisor: Water Tanker
T11 – P:1 – F:0 – V:1
Driver: Water Tanker x15
Refer to Annexure E
General Assistant: Water Tanker x15
Refer to Annexure F
Geo-Technician Boreholes
Vacant
Operator Boreholes x5
Mr Maseko TJ
General Assistant: Boreholes x3
Ms Skosana TJ & Moeketsi GF


DR JS MLM
Technical Services: Sanitation Services (Waste Water)
Manager Technical Services
Vacant
Divisional Manager: Sanitation
Mr Shabangu FN
Chief Superintendent (Waste Water Plant)
Mr Skosana MG
Note 21
Lehutso MP
Mnguni CM
Ngobeni P
Mtshweni JP
Skosana TM
Technician: Waste Water Plant
Mr Masilela SE
Technician: Waste Water Network
Mr. Sindane V.J
Note 20
Kabini FJ
Mahlangu B
Mahlalela VS
Mathebela MO
Matshika GL
Process Controller Waste Water Plant x4
Vacant
Artisan Foreman: Plumbing
Vacant
Operator: High Pressure Jetting Machines
Vacant
Plant Operator: Waste Water
T08 – P:4 – F:2 – V:2
Honey Sucker Driver
Mr Mahlangu TJ
TLB Operators: Plumbing
Vacant
General Assistant: WWP x5
Refer to Note 20
General Assistant (Waste Water)
T05 – P:4 – F:2 – V:2
General Assistant: Plumbing x8
Refer to Note 21


DR JS MLM
Technical Services: Bulk Water Distribution Management
Note 22
Mlambo S
Mekoe K
Maganedisa M
Motau J
Lekala M
Mabena S
Divisional Manager: Water & Quality Control
Mr. Masombuka FLL
Senior Technician: Bulk Water & Demand Management
Vacant
Note 23
. Masango SS
. Nonyane KR
. Mahlangu TJ
Technician: Demand Management
Ms Manzini L
Technician: Bulk Water x4
Refer to note 23
Bulk Meter Reader x6
Refer to Note 22
Artisan: Bulk Water X4
T10 – P:1 – F:0 – V:1
TLB Operator x4
T08 – P:1 – F:0 – V:1
General Assistant x28
Refer to note

DR JS MLM


Technical Services: Water & Quality Control
Executive Manager Technical Services
Vacant
Manager Technical Services
Vacant
Divisional Manager: Water & Quality Control
Mr Masombuka FLL
Technician: Quality & Monitoring x2
Vacant
Technician: Lab Analysis & Sampling
Vacant
Technician: Compliance & Reporting
Mr Jiyane DB
Research Sampler x2
Vacant