

LANGEBERG MUNICIPALITY



ELECTRICITY MASTERPLAN

McGregor Area of Supply

P302015-ELE-MPL-005-B

SEPTEMBER 2022

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1 EXECUTIVE SUMMARY

An electricity master plan report is a long-term planning document that investigates the current infrastructure and status of the electrical network, which forms the basis for future planning and network upgrade recommendations. Information on the changes to existing 11 kV networks were obtained from Langeberg Municipality.

This report deals with the electrical infrastructure in the McGregor supply area of Langeberg Municipality. The current notified maximum demand is 3.7MVA with recent maximum demand peaking at 2.68MVA. The load growth is forecasted at 3.86% per year based on historical average with some minor developments planned indicating that the NMD might be exceeded by 2027.

The impact of the load growth and new developments on the existing infrastructure was determined and recommendations were made on how to make sure that the electricity supply for the whole area remains reliable and of an acceptable quality.

Major proposed capital projects are the addition of a second 132/11kV transformer and associated works to provide spare and redundant capacity. Furthermore, several 11kV overhead lines are earmarked for upgrading.

Service delivery, demand side management initiatives, assessment of asset condition and economic development and alternative sources of energy are also discussed.

The projects completed to date have been updated as applicable.

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REV	DESCRIPTION	ORIG	REVIEW	iXengineers APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for approval	 W Steyn	 W Snyman	N/A	2022-06-27		
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LIST OF ABBREVIATIONS

ACSR	Aluminium Conductor Steel Reinforced
ADMD	After Diversity Maximum Demand
IDP	Integrated Development Plan
LED	Local Economic Development
LV	Low Voltage
kVA	kilovolt Ampere: Apparent Power
kW	kilowatt: Real Power
kWh	kilowatt hour
MFMA	Municipal finance management act
MV	Medium Voltage
MVA	Megavolt Ampere: Apparent Power
MW	Megawatt
NDP	National Development Plan
NMD	Notified Maximum Demand
NRS	National Rationalised Specifications
N/C	Normally Closed
N/O	Normally Open
PILC	Paper Insulated Lead Covered
PV	Photovoltaic
SALGA	South African Local Government Association
SANS	South African National Standards
SDBIP	Service Delivery Budget Implementation Plan
SDF	Spatial Development Framework
SS	Substation
SSEG	Small Scale Embedded Generation
SWH	Solar Water Heater
TID	Token Identifier
XLPE	Cross-linked Polyethylene

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2 INTRODUCTION

ix Engineers (Pty) Ltd was appointed to compile a new master plan which includes updates to the previous master plan on the electricity infrastructure in the Langeberg Municipal area.

The contents of this report will cover the McGregor area of supply. The other supply areas will be covered in separate reports.

This master plan report must be read in conjunction with the drawings and other information available in the Appendices.

3 EXISTING INFRASTRUCTURE

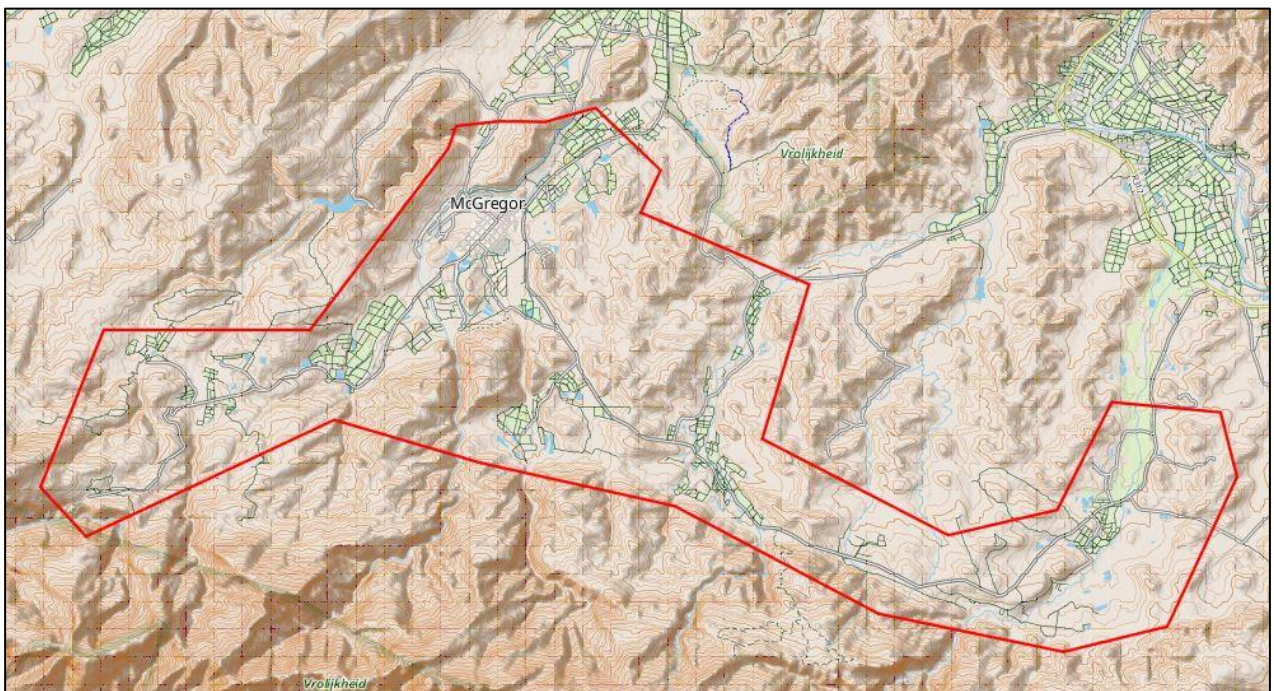


Figure 1: McGregor Distribution Area

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ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

3.1 BULK SUPPLY

McGregor is currently supplied in bulk from the Eskom 132kV Bacchus – Vryheid line. The 132 kV line feeds the 132/11kV McGregor Substation. There is currently only one 10 MVA 132/11kV transformer installed in the substation.

McGregor area is on the Miniflex tariff.

Supply Conductor	Supply Conductor Capacity (MVA)	Supply Voltage (kV)	Maximum Demand (MVA)	Notified Maximum Demand (MVA)
2 x 95mm ² PILC Cu*	9.15	132	2.68**	3.7

*The conductors mentioned are the 11kV supply from transformer to switching station.

**Maximum demand figure from February 2022.

Historical maximum demand and notified maximum figures for McGregor are shown in the chart below:

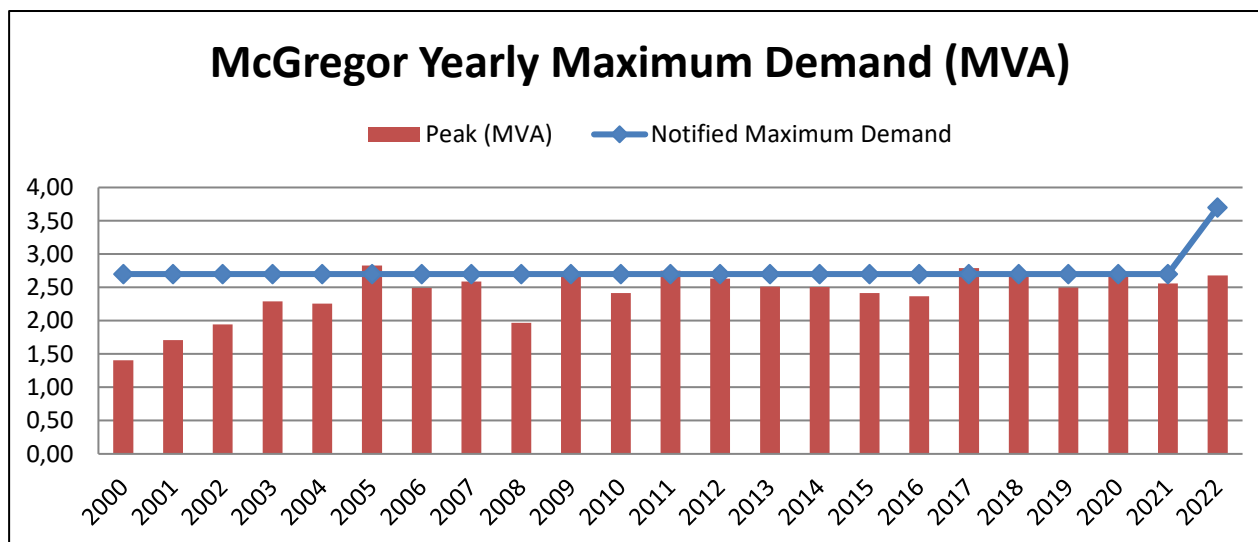


Figure 2: McGregor Yearly Maximum Demand Figures

McGregor has shown steady growth up until 2005, where after the demand levelled out and no significant increase has been seen since.

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The notified maximum demand (NMD) was increased from 2.7MVA to 3.7MVA in 2022 due to the recent completion of the Erf 360 housing project and new fruit packing stores being constructed.

The monthly maximum demand figures are included below indicating that McGregor area of supply has a seasonal demand reaching its peak during the month of February each year.

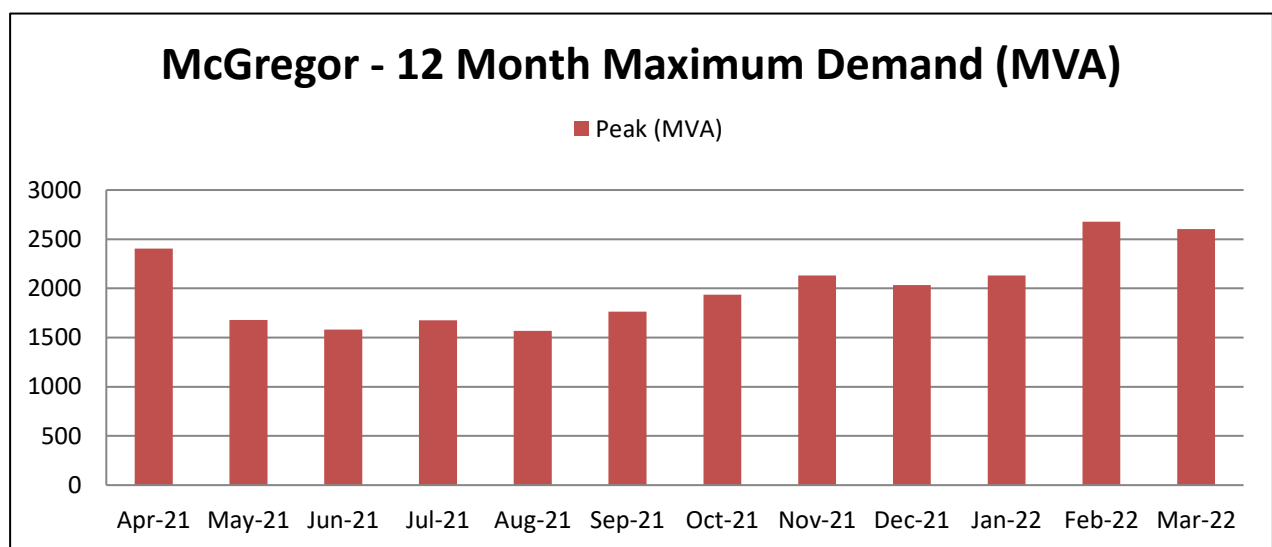


Figure 3: McGregor Monthly Maximum Demand Figures

3.2 11kV INFRASTRUCTURE

The McGregor supply area covers the town area and surrounding rural areas of Olifantsdoorn, Takkap and Koningsrivier.

The 11kV switching station consists of one incomer from the 132/11kV transformer and two feeders. No bus section is installed.

The two feeders are interconnected with a N/O point that can be switched should one of the feeders experience a fault. The network is also interconnected with supplies from Muiskraalskop and Goudmyn substations and managed via open points.

The majority of the McGregor network consists of ACSR overhead conductors and pole mounted transformers with short lengths of underground cables feeding a few miniature substations in the town area.

There are also 11kV capacitors installed on some of the overhead lines for voltage control.

The 11kV electrical distribution network layout for McGregor is included in Appendix 1.

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The 11kV switching diagram for the McGregor area is included in Appendix 2.

3.3 NETWORK ASSESSMENT

3.3.1 132kV NETWORK

The McGregor substation is fed from the Bacchus – Vryheid 132kV overhead line. There is no alternative supply to the McGregor substation.

3.4 ASSET CONDITION ASSESSMENT

The information of existing assets was obtained from the municipal asset register.

The asset condition assessments for the various equipment are included in Appendix 3.

The expected useful life for the different asset types are indicated below as published in the Municipal Finance Management Act Guidelines.

Asset Type	Expected Useful Life (Years)
MV Transformer	45
MV Cables and Lines	45
MV Substation and Switchgear	45
LV Network	50
Consumer Meters	15

Table 1: MFMA – Local Government Capital Asset Management Guideline

3.4.1 SUBSTATION

The 132/11kV substation equipment and transformer was installed in 2000 and are still within the expected useful life.

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3.4.2 SWITCHGEAR

The 11kV switchgear in McGregor switching station were installed in 2000 and still within the expected useful life.

3.4.3 MINIATURE SUBSTATIONS

The miniature substations are all still within their expected useful life with the oldest miniature substation due for replacement in 2023.

3.4.4 TRANSFORMERS

The assessment indicates that 68 transformers are over their expected useful life as and will need to be replaced urgently. When replacing these transformers, allowance should be made for installation of surge arrestors as some pole mounted transformers do not have surge arresters installed and are thus vulnerable to damage due to lightning strikes on the overhead line.

3.4.5 CONSUMER METERS

Langeberg Municipality is on a continued meter replacement programme. In the financial year 2020/21, 385 meters were replaced with prepaid meters for the entire Langeberg municipal area.

All STS prepayment meters will be affected by the Token Identifier (TID) rollover happening on 24 November 2024. Any tokens generated after this date will be rejected by the meter as being old tokens. The current TID base date that is used to generate tokens is 1993.

To overcome this issue, all STS prepayment meters will require a key change token to be entered into the meter and be accepted by the meter. After the key change has been accepted, the new tokens will be calculated from a 2014 base date and will have a lifespan up to 2045.

4 ASSESSMENT OF EFFICIENCY LEVELS AND SERVICE DELIVERY

4.1 OPERATIONS

The effectiveness of operations was assessed in accordance with the requirements of the Integrated Development Plan (IDP). Basic service delivery objectives were set at restoring 95% of municipal interruptions within 4 hours and 98% within 24 hours after complaints have been received according to NRS 047 Electricity Supply – Quality of Service and Reporting Guidelines.

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The electrical supply restore times for the McGregor area are not included in the municipality's yearly report and is assumed to be included in the Robertson area of supply. Refer to the Robertson area of supply report for evaluation.

The IDP also sets out an objective to provide quotations for new electricity connections (within 10 days) where existing network is being used, and within 30 days where extensions must be done.

The chart below indicates the response time success percentages per category. Deviations are indicated as 4% which is within the recommended target percentage success rate (at least 90% as stated in NRS 047) for providing quotations timeously.

The figures are for the whole of the Langeberg Municipal area.

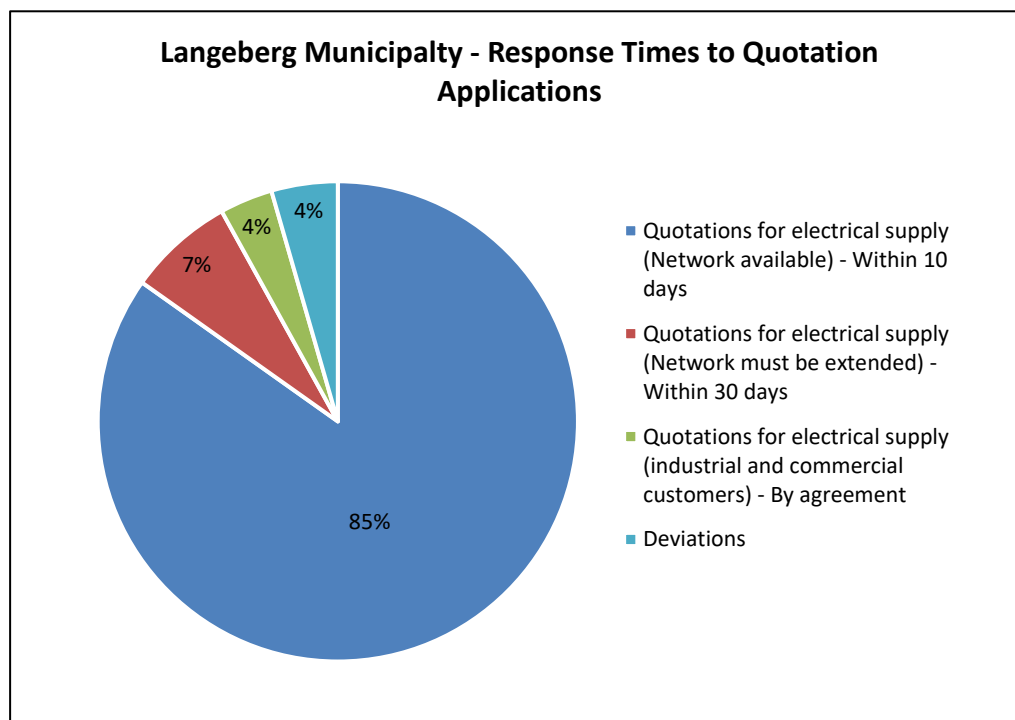


Figure 4: Quotation Application Response Times (Jun 20 – Jul 21)

4.2 LEVELS OF SERVICE

The possibility to restrict residential consumers by lowering the 60A rating of circuit breakers was also considered in this report.

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According to the SDBIP figures, there are 17,804 (30 June 2021) formal residential properties connected to the municipal network which are billed.

To replace these circuit breakers will require substantial resources from the municipality to implement. If implemented, the lowered rating could cause nuisance tripping due to established consumer load profiles.

An option that could be considered is to implement the setting of meters, where applicable, to a certain amperage to trip and reset after a certain period and evaluate the response from consumers.

4.3 DEMAND SIDE MANAGEMENT

The following are forms of demand side management initiatives that can be implemented / expanded on to further reduce the demand of the municipality:

- Set limits on meters,
- Installation of high efficiency motors,
- Installation of variable speed drives, where feasible to reduce,
- Installation of power factor correction equipment where low power factor measurements are experienced to reduce reactive energy supply from municipal network,
- Solar water heater installations / retrofit,
- SSEG installations with backup battery systems to reduce the reliance on the municipal network during peak periods,
- Replacement of street light lamps with LED.

5 ENERGY LOSSES

5.1 BACKGROUND OBJECTIVE METHODOLOGY

The transfer of electricity from generation to the end-users involves losses in energy volumes (electrical or technical losses) that reduce the amount of electricity volumes available for sale to end-customers. In addition, other energy losses may also occur due to non-metered usage related to electricity theft (non-technical).

Energy loss is an intrinsic risk in the electricity business and utilities globally have the challenge to address this issue.

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Technical losses include resistive losses of the primary feeders, the distribution transformer losses (resistive losses in windings and the core losses), resistive losses in the secondary network, resistive losses in service cables and losses in and due to kWh meter accuracy. Losses are inherent to the distribution of electricity and cannot be eliminated.

The calculation of technical losses can be done using various approaches with different degrees of accuracy. Technical losses in distribution systems are directly related to consumers' load curves, which vary due to seasonality and / or changes in load over the year. For the management of technical losses, a balance between absolute calculation accuracy and the effort must prevail. Acceptable approaches to calculate technical losses of an electricity distribution network can be divided into two groups. These are the full accuracy methods and methods of representative load profiles.

5.2 MCGREGOR TECHNICAL LOSSES

An investigation was done to determine the level of technical losses in the McGregor networks. The total losses were calculated by using the representative load profiles as the sum of all loads and no load losses. The table below summarises the contribution of each element in the network to the total technical loss, refer to Appendix 4 for the technical losses calculation.:

Network Element	% loss contribution
Transformers No Load Losses	2.31
Transformers Partial Load Losses	1.58
MV Network Losses	1.41
LV Network Losses	2.22
Total losses	7.52

The estimated technical loss factor for McGregor is therefore 1.0752. The McGregor network can be classified as a mixed load between urban (residential and small holdings) and rural. Using this classification and comparing the above calculated load factor to the NRS 080 table 1(a) and 1(b) guideline indicates the calculated value is within the guideline values.

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6 PREVIOUS COMPLETED PROJECTS

The following capital projects were executed since 2017:

	Project Description	Year	Reference numbers	Budget spent (VAT excluded)
1.	Replacement of Prepaid Meters	Continuous		
2.	Electrification of Housing Project Erf 360, McGregor	2018/19	T05/2016	R 3,252,276.63
3.	Reroute McGregor 11kV Line at McGregor Sport Fields	2019/20	T57/2018	R 671,687.30
4.	Upgrade 11kV Line to Buitenkant Street McGregor	2019/20	T58/2018	R 931,919.16
5.	Upgrade McGregor / Boesmansrivier 11kV Overhead Line	2019/20	T59/2018	R 2,257,800.00
Total				R 7,113,683.09

7 ASSESSMENT OF ECONOMIC DEVELOPMENT

The Local Economic Development Strategy must form an integral part of the assessment, latest version available is dated May 2018.

The LED strategy is aligned with the national and provincial planning framework.

The following are requirements set out in the National Development Plan (NDP) relating to electricity needs and supported by the LED strategy of Langeberg Municipality:

Objective (NDP)	Action proposed	Langeberg Municipality Status	Objective achieved / Action required
Economic Infrastructure	90% of people with access to the electricity grid by 2030	LED strategy confirmed that 94% of households used electricity as energy source for lighting. (2017)	Objective Achieved, continuously monitor new developments and provide electricity supply as required.

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	Move to less carbon-intensive electricity production (renewable energy), including solar water heating	Refer to section on Alternative Sources of Energy in the masterplan for description. SSEG grid connection allowed.	Continuous development, Langeberg Municipality to be included in future SWH programmes.
	Establish a national, regional and municipal fibre-optic network to provide the base for broad band access and attract private investment	N/A	Fibre-optic ducts could be installed, at relatively low cost, with new or replacement of existing cables on strategic routes to reduce double excavations.
Environmental Sustainability and Resilience	Municipal regulations to stimulate renewable energy	Guidelines currently in place for SSEG connection to grid	Objective achieved
	All new buildings to meet the energy-efficiency criteria set out in South African National Standard 204	Energy efficiency conditions included in Langeberg Municipality: Land Use Planning By Law Clause 66 (2) (h)	Land use Planning Bylaw dated 2015 includes "energy efficiency" as a condition of approval. Reference to SANS 204 "Energy efficiency in buildings" to be included.
Inclusive Rural Economy	Improved infrastructure and service delivery to activate rural economies	Installation of networks as required.	Continuous implementation.
Social Protection	Design and implement mechanisms to assist the unemployed to access the labour market	Contract Participation Goals (CPG) and Extended Public Works Programme (EPWP) requirements to be included in tender conditions	Continuous implementation and reporting in projects.

8 ALTERNATIVE SOURCES OF ENERGY

8.1 CURRENT SSEG INSTALLATIONS

There are currently 49 SSEG installations exporting into the Langeberg Municipal network. Below is a trend indicating the growth of SSEG installations.

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McGregor area of supply has three SSEG installations with a total of 10 kW installed capacity. The total installed capacity of SSEG's in Langeberg Municipal area is 1,863.28kW.

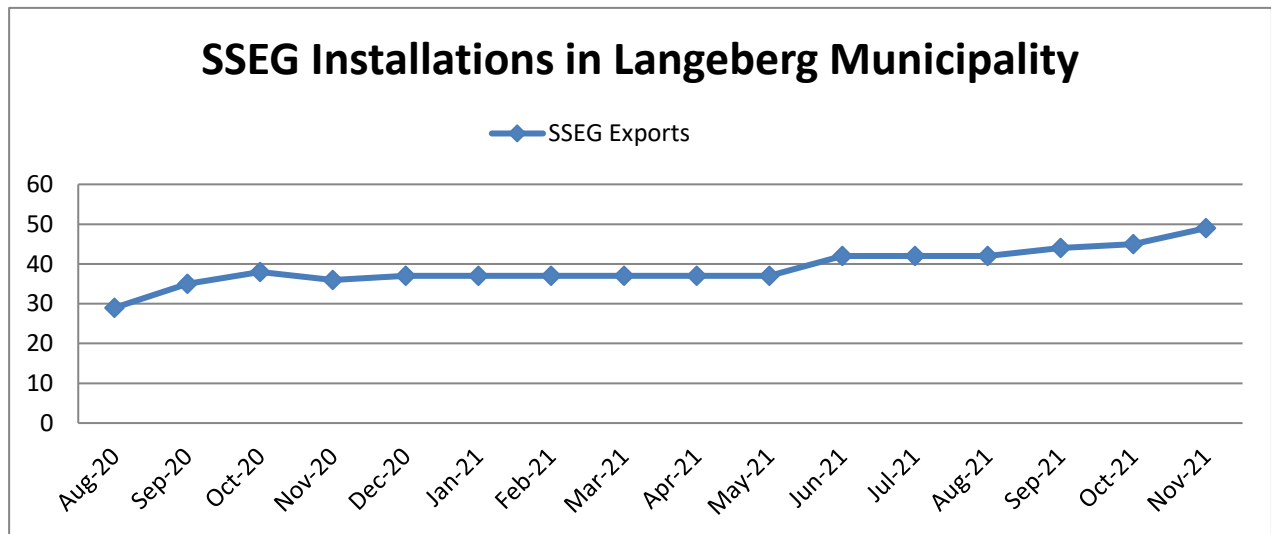


Figure 5: SSEG Installations

8.2 SSEG IMPACT ON MUNICIPAL REVENUE

A business case study on the impact of SSEG installations on municipal revenue was done and included in Appendix 5. Residential, Small Business, Medium Business and Large Business installations were considered.

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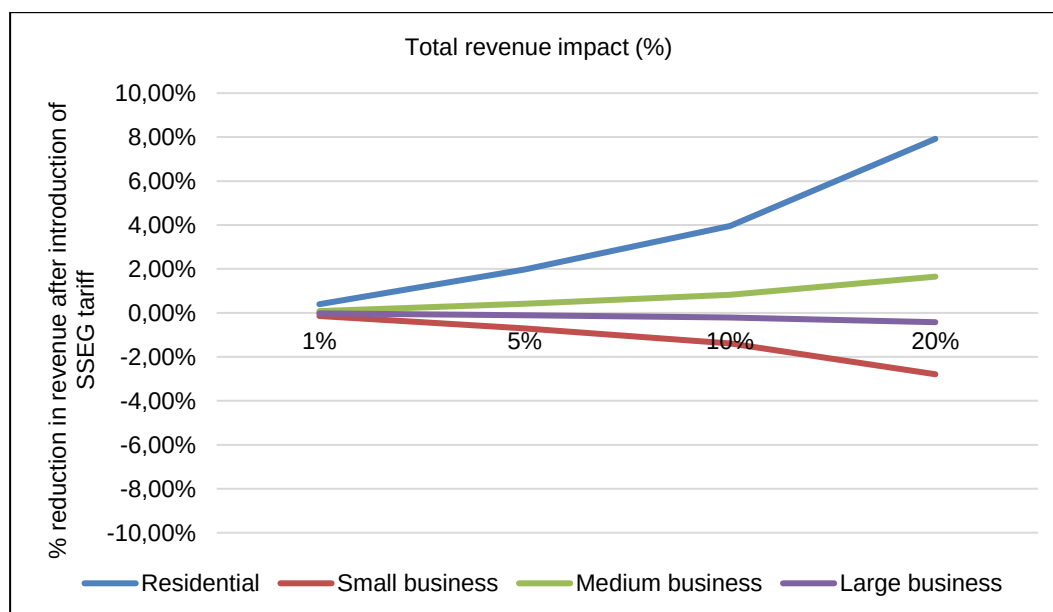


Figure 6: Revenue Impact of SSEG Installations

8.3 ALTERNATIVE ENERGY SUPPLY FOR MUNICIPAL BUILDINGS

An high level investigation into the possibility of supplying municipal buildings with alternative energy supply was undertaken. The Robertson municipal offices in Kerk Street was taken as an example study area for a solar PV system installation and report included in the Robertson area of supply masterplan report.

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8.4 ALTERNATIVE ENERGY SUPPLY OPTIONS FOR MUNICIPAL FEED IN POINTS

A high-level investigation into the possibility of implementing a 2MWp (DC) solar PV plant at the McGregor Main substation has been undertaken. The area directly adjacent of the substation was used as a hypothetical area that could be utilised for the plant. An area of approximate 1.9 Ha would be required and the estimated annual production would be around 3.5GWh, refer to Appendix 6 for the simulation report.

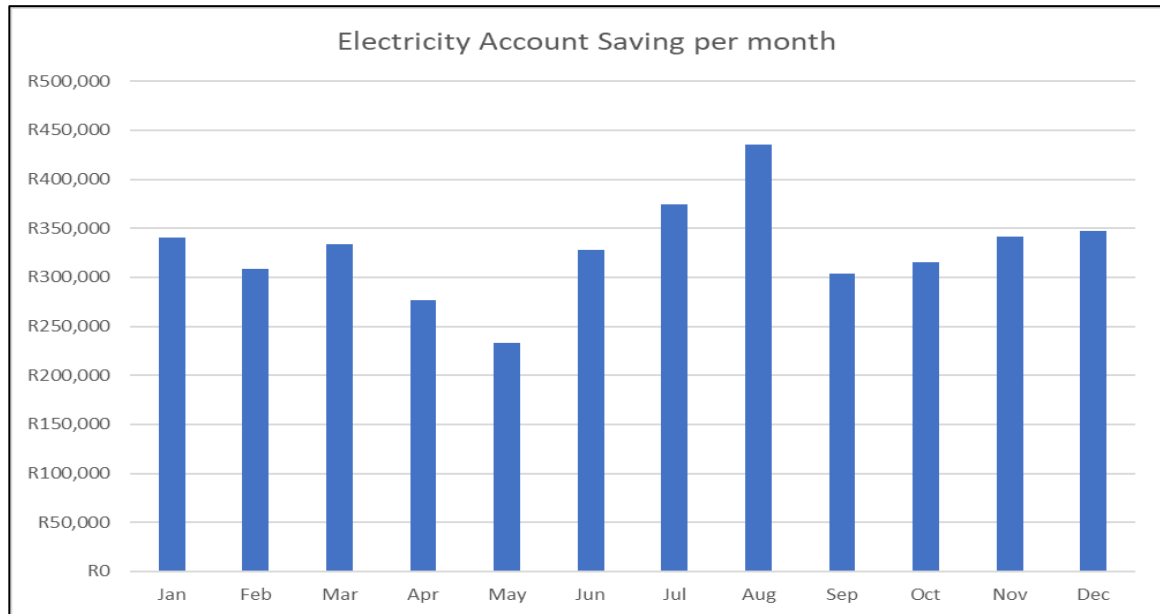
Below is a high-level cost estimate of both the capital and operation costs:

Capital Costs	
Solar PV Plant	Total
- Solar PV	24,000,000
-Perimeter Fence (electrified)	2,212,344
- CCTV	1,000,000
- Sundries	500,000
- Contingencies	2,771,234
Sub-total 1:	30,483,578
Grid Connection	
- Cable works	375,000
- Substation works	1,000,000
- Contingencies	137,500
Sub-total 2:	1,512,500
Professional Fees and Costs	
- Professional Fees	2,879,647
- Professional Costs	287,965
Sub-total 3:	3,167,612
Total (Sub-total 1+2+3)	35,163,690
Operational Costs per Annum	700,000

By applying the hourly production figures for a typical year to the applicable Eskom tariff (Miniflex 2022) and assuming no energy will be exported to the Eskom grid, the estimated monthly electricity account savings for the first year would be R3.94million. The chart below indicates the estimated saving per month:

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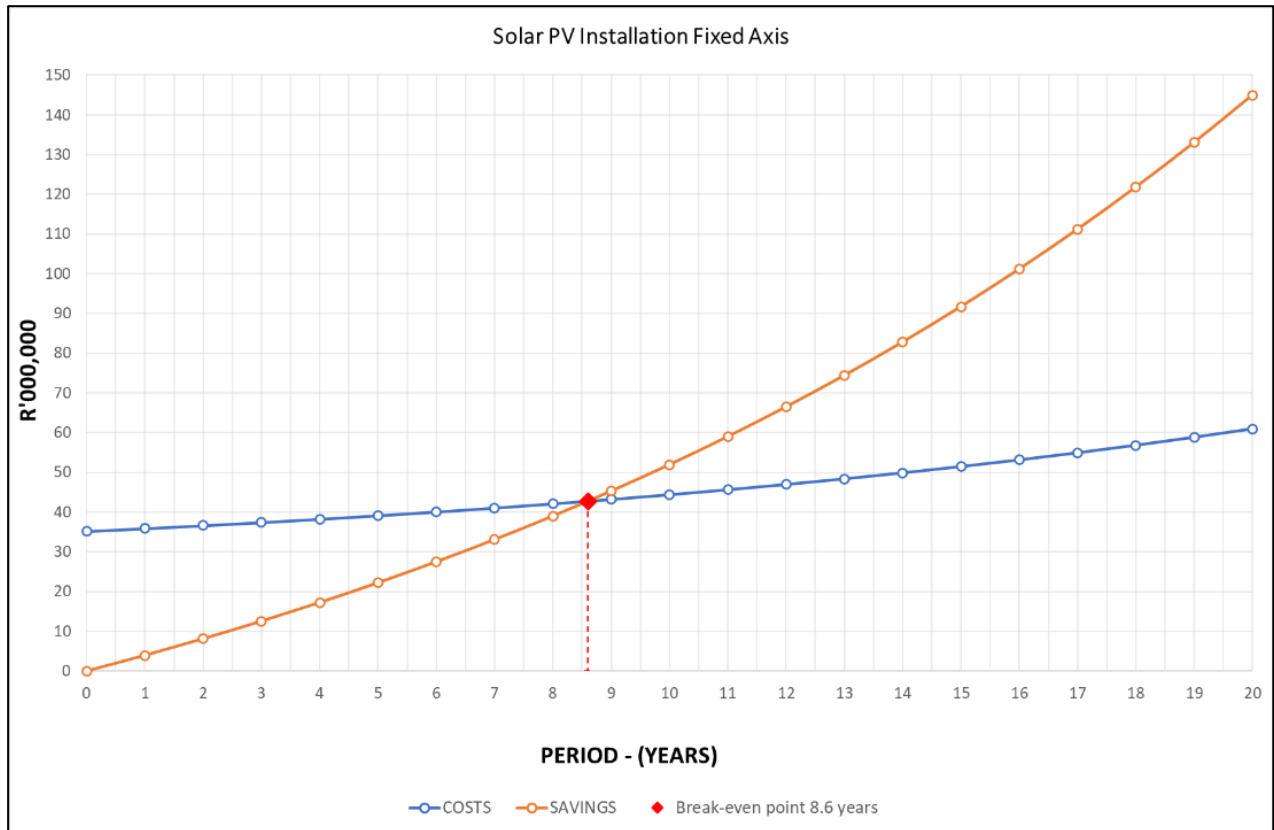


From the above a simple payback has been calculated without accounting for the costs of capital or the time cost of money. An annually compounded inflation rate of 6% has been assumed for both the O&M costs as well as tariff increases. The calculation indicates a break-even point of 8.598 years:

Solar PV - Fixed Axis					
PERIOD	Costs (R 'million)		Savings (R 'million)		NET Cashflow (R 'million)
	OPEX	Cum total	Annual	Cum total	
0		35.16		0	35.164
1	0.700	35.86	3.941	3.941	31.923
2	0.742	36.61	4.177	8.118	28.488
3	0.787	37.39	4.428	12.545	24.847
4	0.834	38.23	4.693	17.239	20.987
5	0.884	39.11	4.975	22.213	16.896
6	0.937	40.05	5.273	27.487	12.560
7	0.993	41.04	5.590	33.077	7.963
8	1.053	42.09	5.925	39.002	3.090
9	1.116	43.21	6.281	45.282	-2.075
10	1.183	44.39	6.658	51.940	-7.550
11	1.254	45.64	7.057	58.997	-13.353
12	1.329	46.97	7.480	66.477	-19.505
13	1.409	48.38	7.929	74.406	-26.025
14	1.493	49.87	8.405	82.811	-32.937
15	1.583	51.46	8.909	91.721	-40.264
16	1.678	53.13	9.444	101.165	-48.030
17	1.778	54.91	10.010	111.175	-56.262
18	1.885	56.80	10.611	121.786	-64.988
19	1.998	58.80	11.248	133.034	-74.238
20	2.118	60.91	11.923	144.956	-84.043

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9 FUTURE DEVELOPMENTS / LOAD GROWTH FORECAST

9.1 HISTORIC LOAD GROWTH TREND

Historic maximum demand figures for the McGregor network:

- Year 2000 : 1.41MVA
- Year 2005 : 2.83MVA
- Year 2010 : 2.42MVA
- Year 2015 : 2.41MVA
- Year 2020 : 2.68MVA

The historic maximum demand figures are based on the statistical metering data obtained from the Eskom Bulk Supply Point, as received from Langeberg Municipality.

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Analysis of this data reveals a historical growth of 3.86% year on year average.

Using the historical figures, a graph was compiled to forecast future growth and included below:

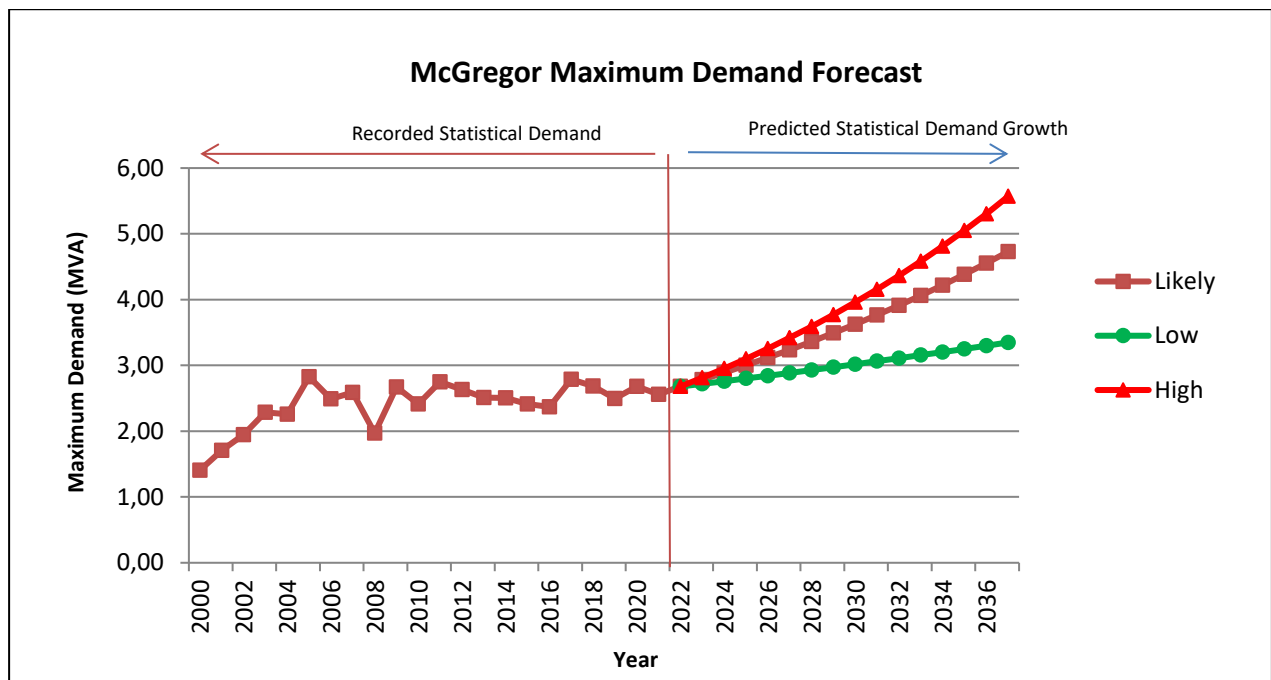


Figure 7: McGregor Maximum Demand Forecast based on historic growth

Predicted maximum demand figures for low, likely and high demand predictions are as follows:

These predictions exclude any future bulk loads.

Growth Prediction	Current	2027 (5-Year)	2032 (10-Year)
Low (1.5%)	2.68 MVA	2.89 MVA	3.11 MVA
Likely (3.86%)		3.24 MVA	3.91 MVA
High (5%)		3.42 MVA	4.36 MVA

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9.2 PROPOSED DEVELOPMENTS

The proposed future developments as indicated on the layout in Appendix 7 and detailed forecast in Appendix 8 is a combination of information received from the Langeberg Municipality's Spatial Development Framework, current electricity supply applications submitted and correspondence with large power users. The response from large powers users did not indicate any major planned upgrading in the near future.

A summary of the forecast is included on the next page.

The McGregor area still has approximately 31 erven remaining within the Erf 360 housing development to construct houses. The remaining planned developments are small areas earmarked as per the layout.

Only loads of significant size are demonstrated separately, the remaining form part of the "Other Load Growth". The growth trend for the area will be simulated according to the likely trend of 3.86%.

Applying the above load growth forecasting, it is forecasted that the current NMD of 3.7 MVA will be reached by 2027.

ADMD loads for the above table were calculated as per NRS 034-1 guidelines for classification of domestic consumers. The bulk loads indicated are indications obtained from the developer.

The following classifications were used, as detailed in NRS 034-1:

- Township area – 2.37 kVA / erf
- Urban Residential 1 – 3.59 kVA / erf
- Urban Residential 2 – 4.72 kVA / erf

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Summary of Load Growth Forecast:

Layout / Reference Number	Possible Developments	Area (Ha)	Number of erven	Total Load	Growth	Coinc. Factor	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Developments as per detailed Appendix																
	Other Current Loads			3,827	3.86%	0.7	3,827	3,975	4,128	4,288	4,453	4,625	4,804	4,989	5,182	5,382	5,589
	Total undiversified						3,827	4,200	4,375	4,750	5,001	5,418	5,654	5,876	6,069	6,269	6,626
	Total diversified (kVA)						2,679	2,940	3,063	3,325	3,501	3,793	3,958	4,113	4,248	4,388	4,638
	Total diversified (MVA)						2.68	2.94	3.06	3.32	3.50	3.79	3.96	4.11	4.25	4.39	4.64
	Notified Maximum Demand						3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70	3.70

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10 LOAD FLOW ANALYSIS

10.1 METHODOLOGY

The simulation software used to perform the load flow analysis is ReticMaster® Electrical Network Software for Distribution Systems.

The existing information was obtained from single line diagrams as well as technical input from the Langeberg Municipality for the following areas:

- McGregor

The load flow simulations were performed on the network to provide insight into the McGregor MV Network as it currently appears, and how it will perform with the addition of the known 5 and 10 year loads as well as the 3.86% per annum increase for average load growth.

The following load flow simulations were performed:

- Simulation 1: Current Maximum Demand;
- Simulation 2: 5 Year Maximum Demand;
- Simulation 3: 10 Year Maximum Demand;
- Simulation 4: Various Contingencies.

10.2 RESULTS OF LOAD FLOW ANALYSIS

The McGregor network represents a diversified maximum demand of 2.68 MVA (measured in February 2022).

The McGregor Network has a total installed capacity of 9.822MVA. Therefore, the McGregor network appears relatively lightly loaded, with a demand factor of approximately 0.27 ($2.68 / 9.822$).

The total connected load per individual transformer was entered into the simulation software and a scaling factor was introduced to all loads to bring the maximum demand on the network in line with load growth

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predictions to evaluate the effects on the network. This scenario was then simulated as the current status of the network and forms the basis for the future forecasting.

A coincidental factor of 0.7 was used as all the loads do not peak simultaneously.

The 5- and 10-year simulations were then prepared using scaling factors to coincide with the growth predictions and any known 5- and 10-year loads were added separately.

The following reports were then prepared for each scenario, where applicable and discussed:

- Prospective fault current study,
- Voltage level study (The NRS 034-1 stipulate that a voltage drop in the order of up to 3% to be acceptable in MV distributor cables),
- Conductor thermal capacity study.

10.2.1 CURRENT MAXIMUM DEMAND LOAD FLOW

Simulation 1 was based on the normal network configuration and operating conditions. The N/O and N/C points reflect the actual network status. There is one 10MVA 132/11kV transformer which supplies the McGregor MV network.

The simulation was performed applying a scaling factor of 0.40 to all the loads, which returned a maximum demand of 2.690 MVA compared to the actual maximum demand of 2.679 MVA. A difference of 11kVA, which is an acceptable difference.

Refer to Appendix 9 for the current maximum demand load flow analysis.

10.2.1.1 PROSPECTIVE FAULT CURRENT STUDY

The prospective short circuit fault current study was performed, and results included in Appendix 10. The study was only performed once as adding additional loads to the system will not affect the values. The equipment ratings exceed the prospective fault current values and no issues were identified.

10.2.1.2 VOLTAGE LEVEL STUDY

Refer to Appendix 11. All feeders are within guideline limits.

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10.2.1.3 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 12. All feeders are well within their thermal capacity limits with the highest loaded feeder currently at 25.23%.

10.2.2 5-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 2 was performed applying a scaling factor of 0.49 to all the loads, which returned a maximum demand of 3.30 MVA compared to the predicted maximum demand of 3.24 MVA. This was done prior to the adding of any known future loads

The following loads were added:

Description – 5 Year	kVA
Packing Stores	$250 \times 0.7 = 175\text{kVA}$
Roodezandt	$125 \times 0.7 = 88\text{kVA}$
Olifantsdoorn	$50 \times 0.7 = 35\text{kVA}$
Erf 357	$100 \times 0.7 = 70\text{kVA}$
Total	$525 \times 0.7 = 368\text{kVA}$

Refer to Appendix 13 for the 5-year maximum demand load flow analysis.

10.2.2.1 VOLTAGE LEVEL STUDY

Refer to Appendix 14. All feeders are within guideline limits.

10.2.2.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 15. All feeders are well within their thermal capacity limits with the highest loaded feeder currently at 33.33%.

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10.2.3 10-YEAR MAXIMUM DEMAND LOAD FLOW

Simulation 3 was performed applying a scaling factor of 0.58 to all the loads, which returned a maximum demand of 3.92 MVA compared to the predicted maximum demand of 3.91 MVA. This was done prior to the adding of any known future loads

The following loads were added:

Description – 10 Year	kVA
Roodezandt	$275 \times 0.7 = 193\text{kVA}$

Refer to Appendix 16 for the 10-year maximum demand load flow analysis.

10.2.3.1 VOLTAGE LEVEL STUDY

Refer to Appendix 17. Some of the loads slightly exceed the voltage limits. This should not be of an concern as the network has voltage regulators installed on the overhead lines which are not factored into the simulation.

10.2.3.2 CONDUCTOR THERMAL CAPACITY STUDY

Refer to Appendix 18. All feeders are well within their thermal capacity limits with the highest loaded feeder currently at 40.73%.

10.2.4 VARIOUS CONTINGENCIES

The purpose of Simulation 4 is to determine the effect various contingencies (switching requirements) will have on the McGregor MV Network, with respect to existing N/O and N/C points, in order to assess network viability in the event of network faults occurring.

The results of the simulation are contained in the table below.

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#	Critical Supply Scenarios	Action Required	Effect on Network
1	Fault on outgoing Feeder 1 (BUS 0127)	1] Close N/O point at BUS-0091	A] Feeder 2 increases from 25.23% to 38.92% thermal capacity
2	Fault on outgoing Feeder 2 (BUS 0023)	1] Close N/O point at BUS-0091	A] Feeder 1 increases from 13.55% to 39.08% thermal capacity

The simulation poses questions, tabulated as “critical supply scenarios”. For each “critical supply scenario” there is an action required to be affected in the McGregor MV Network, and the consequences of the “critical supply scenario” and “action required” are included in the “effect on network”.

The McGregor Network has sufficient capacity to accommodate the critical supply scenarios as simulated above.

11 RECOMMENDED UPGRADES

Refer to Appendix 19 for list of recommended upgrades.

The capital projects are included as per the municipal plan for upgrading of the networks.

Masterplan recommendations were also included and indicated separately:

12 CONCLUSIONS

The following conclusions can be made for the McGregor area of supply:

- The current maximum demand of 2.68MVA is within the recently upgraded notified maximum demand of 3.7MVA to Eskom,

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- The McGregor network is relatively lightly loaded, with a demand factor of 0.27. Total installed capacity of 9.822MVA,
- McGregor substation only has one transformer feeding the network,
- The current network has sufficient capacity to cater for the predicted demand growth,
- The substation and miniature substation equipment are still within their expected useful life but several transformers have exceeded their expected useful life,
- The network has sufficient capacity to accommodate the critical supply scenarios,
- The volt-drop across the network slightly exceeds limits recommended by NRS 034-1 guidelines for the 10-year forecast.

13 RECOMMENDATIONS

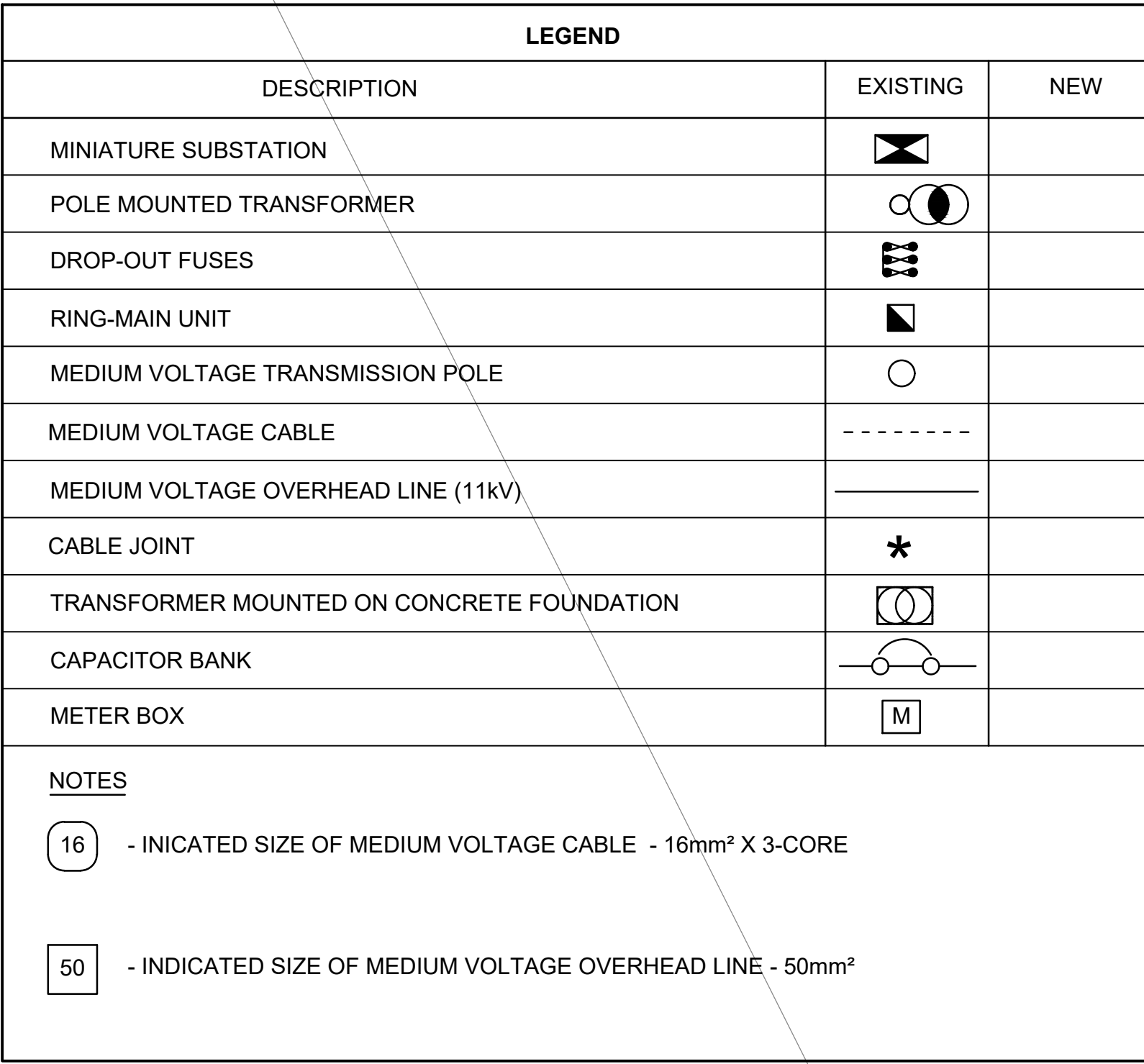
The following recommendations are made:

- Upgrading and replacement of network infrastructure as per the recommended capital project upgrades and masterplan recommendations,
- Regular updating of asset register,
- Information shortcomings were identified on existing layouts and schematics. Field studies to be conducted and all drawings to be updated,
- All infrastructure to be recorded on a GIS (geographic information system) and be updated regularly as projects are completed to keep an up to date database,
- An in-depth field study to determine the installation date of the different equipment types in the network to provide an accurate database of expected useful life remaining and phased replacement plan,
- Replacement of equipment that have exceeded their expected useful life as per asset condition assessment,
- Meter logging of municipal buildings electricity supply for implementation into study report for alternative energy supply e.g solar PV system,
- Installation of maximum demand meters on feeders in main switching station.

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APPENDIX 1 – MCGREGOR 11KV ELECTRICAL DISTRIBUTION NETWORK LAYOUT



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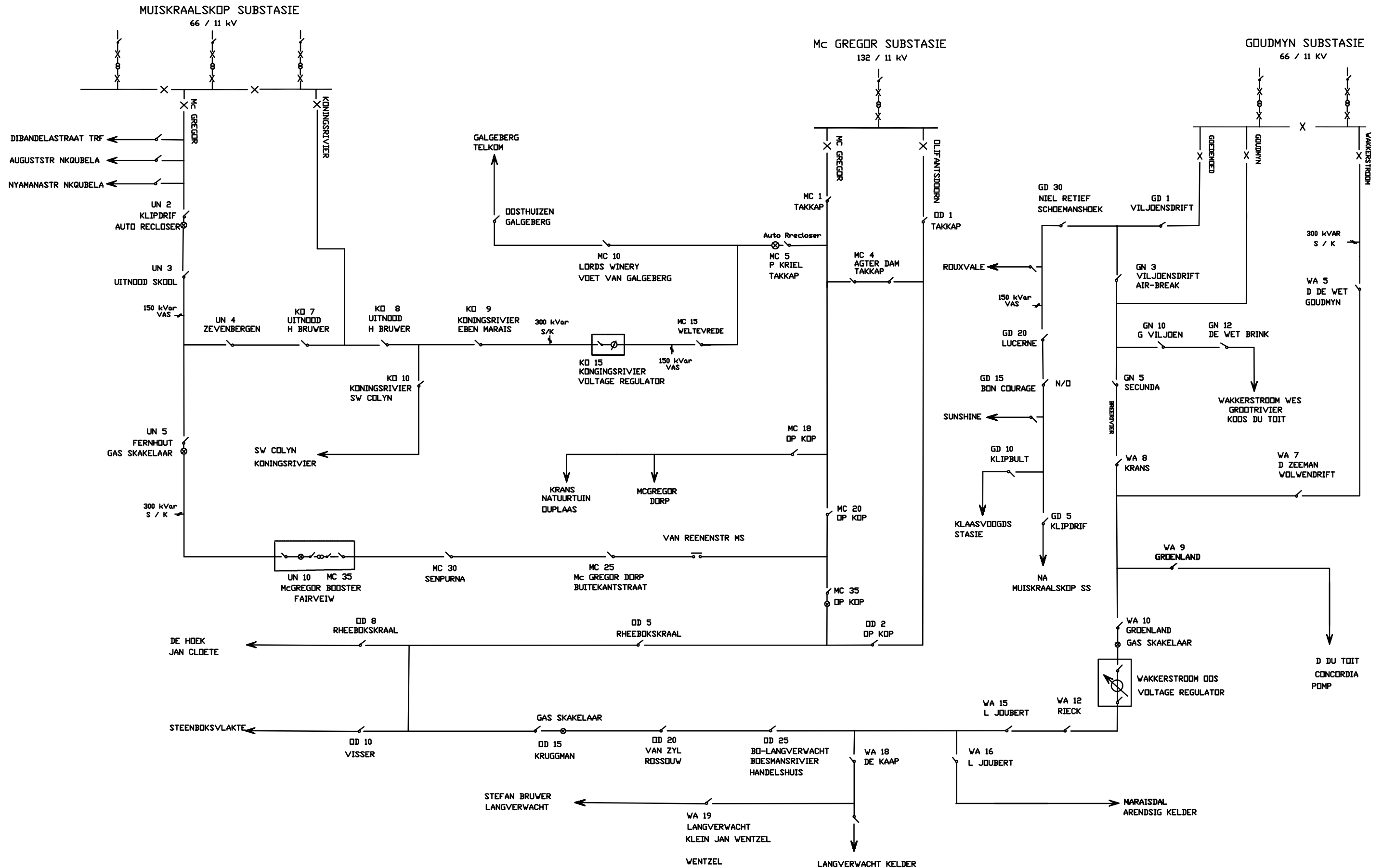
ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 2 – MCGREGOR 11KV SWITCHING DIAGRAM

DIAGRAM NO. 2: MC GREGOR, OLIFANTSDOORN, TAKKAP EN KONINGSRIVIER

BELANGRIK: GEEN PARALLEL SKAKELING OP 11 KV NETWERK MAG GEDOEN WORD TUSSEN

1. McGREGOR 132kV SUBSTASIE EN MUISKRAALSKOP 66kV SUBSTASIE NIE.
2. McGREGOR 132 kV SUBSTASIE EN GOUDMYN 66 kV SUBSTASIE NIE



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ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 3 – ASSET CONDITION ASSESSMENT

McGregor Substation Asset Condition

Area (Suburb)	Asset Location	Name	Installation Date	Replacement Date	Replacement Cost
McGregor	McGregor SS	Trfr 1 - 132/11kV - 10MVA	2000	2045	5,250,000.00
McGregor	McGregor SS	Aux Trfr 1	2000	2045	125,000.00
McGregor	McGregor SS	HV Yard Equipment 132kV Busbar, CT, VT	2000	2045	1,000,000.00
					6,375,000.00

McGregor 11kV Switchgear Substation Asset Condition

Area (Suburb)	Asset Location	Name	Function	Installation Date	Replacement Date	Replacement Cost
McGregor	SS McGregor	MVSG MCGREGOR TRF NO.1	INCOMER	2000	2045	650,000.00
McGregor	SS McGregor	MVSG MCGEGOR FEERDER	FEEDER	2000	2045	650,000.00
McGregor	SS McGregor	MVSG BOESMANRIVIER FEERDER	FEEDER	2000	2045	650,000.00
						1,950,000.00

McGregor Miniature Substation Asset Condition

Area (Suburb)	Name	Rating	Installation Date	Replacement Date	Replacement Cost
McGregor	MS 2 BUITEKANT STR	315	1978	2023	525,000.00
McGregor	MS 3 BARRY STR	250	1994	2039	525,000.00
McGregor	MS 1 BUITEKANT STR	315	2002	2047	525,000.00
McGregor	MS 1 KERK STR	315	2005	2050	525,000.00
McGregor	MS 3 BUITEKANT STR	315	2016	2061	525,000.00
McGregor			2008	2053	525,000.00
					3,150,000.00

McGregor Transformer Asset Condition

Area (Suburb)	Name	Type of Transformer	Rating	Installation Date	Replacement Date	Replacement Cost
McGregor	PTRF BOERBOK VOETSLAANPAT OFFICE	POLE MOUNTED	10	1960	2005	20,000.00
McGregor	PTRF OUTNOOD SKOOL	POLE MOUNTED	10	1960	2005	20,000.00
McGregor	PTRF DE ERF 2	POLE MOUNTED	20	1961	2006	20,000.00
McGregor	TRF WJ DE WET WEL VAN PAS STORE	FLOOR STANDING	75	1962	2007	464,288.00
McGregor	PTRF SEWEFONTEIN WORKERS HOUSES	POLE MOUNTED	10	1962	2007	20,000.00
McGregor	PTRF OILIFANT PUMP 3	POLE MOUNTED	25	1962	2007	40,000.00
McGregor	PTRF OILIFANT OFFICE	POLE MOUNTED	10	1962	2007	20,000.00
McGregor	PTRF STEENBOKS VLAKE	POLE MOUNTED	10	1963	2008	20,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 4	POLE MOUNTED	100	1964	2009	75,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET WORKERS HOUSES 3	POLE MOUNTED	10	1964	2009	20,000.00
McGregor	PTRF 1 VIRA	POLE MOUNTED	16	1964	2009	20,000.00
McGregor	PTRF MOUNTAIN VIEW 1	POLE MOUNTED	10	1965	2010	20,000.00
McGregor	PTRF MOUNTAIN VIEW PUMP 1	POLE MOUNTED	25	1965	2010	40,000.00
McGregor	TRF DEWILGEN DANIE & DISE PUMP 2	FLOOR STANDING	200	1966	2011	464,288.00
McGregor	PTRF 2 ZANDBERG	POLE MOUNTED	10	1966	2011	20,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET KERK	POLE MOUNTED	10	1966	2011	20,000.00
McGregor	PTRF RETREAT VAN ZYL WERKER HOUSEE	POLE MOUNTED	15	1966	2011	20,000.00
McGregor	PTRF ALMOND GROVE WORKERS HOUSES	POLE MOUNTED	75	1966	2011	75,000.00
McGregor	PTRF CLARISE WOLD ERASMUS HOUSE	POLE MOUNTED	75	1966	2011	75,000.00
McGregor	PTRF Jan no 1	POLE MOUNTED	50	1967	2012	55,000.00
McGregor	TRF DEWILGEN DANIE & DISE PUMP 1	POLE MOUNTED	50	1968	2013	464,288.00
McGregor	PTRF PREVOYANCE PUMP 5	POLE MOUNTED	100	1968	2013	75,000.00
McGregor	PTRF OILFANT 3	POLE MOUNTED	50	1968	2013	55,000.00
McGregor	PTRF TAKKAP	POLE MOUNTED	250	1968	2013	190,000.00
McGregor	PTRF OUNOOD 1	POLE MOUNTED	25	1968	2013	40,000.00
McGregor	PTRF RHOBOKSKRAAL 4	POLE MOUNTED	50	1968	2013	55,000.00
McGregor	PTRF OILIFANT 5	POLE MOUNTED	50	1968	2013	55,000.00
McGregor	PTRF RABIESDAL CALIE RABIE	POLE MOUNTED	75	1968	2013	75,000.00
McGregor	PTRF TANAGRA	POLE MOUNTED	50	1969	2014	55,000.00
McGregor	PTRF AGTRERKLIP HOOGTE FARMHOUSE 1	POLE MOUNTED	10	1970	2015	20,000.00
McGregor	PTRF MAIN CHANCE WORKERS HOUSES	POLE MOUNTED	10	1970	2015	20,000.00
McGregor	PTRF DIRK & SUZANNE APPELDRIJ PUMP	POLE MOUNTED	75	1971	2016	75,000.00
McGregor	PTRF LE GRAND CHASSEUR PUMP 4	POLE MOUNTED	75	1971	2016	75,000.00
McGregor	PTRF BUITEHOF	POLE MOUNTED	10	1972	2017	20,000.00
McGregor	Eselthjesrus	POLE MOUNTED	10	1972	2017	20,000.00
McGregor	PTRF WANSBECK OOS HANNES ERASMUS WORKERS HOUSES 1	POLE MOUNTED	15	1972	2017	20,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET WORKERS HOUSES 2	POLE MOUNTED	50	1972	2017	55,000.00
McGregor	PTRF SANDY LANE 2	POLE MOUNTED	50	1972	2017	55,000.00
McGregor	PTRF WANSBECK OOS HANNES ERASMUS	POLE MOUNTED	25	1972	2017	40,000.00
McGregor	PTRF McGREGOR BOOSTER	POLE MOUNTED	10	1973	2018	20,000.00
McGregor	PTRF UITNOOD KERK	POLE MOUNTED	10	1973	2018	20,000.00
McGregor	PTRF RETREAT JDE WET HOUSE	POLE MOUNTED	10	1973	2018	20,000.00
McGregor	PTRF CJ ROUX SKUILTE HOUSE	POLE MOUNTED	10	1973	2018	20,000.00
McGregor	PTRF WHIPE 2	POLE MOUNTED	15	1973	2018	20,000.00
McGregor	PTRF ALMOND GROVE	POLE MOUNTED	25	1973	2018	40,000.00
McGregor	PTRF WJ DE WET WEL VAN PUMP 3	POLE MOUNTED	25	1973	2018	40,000.00
McGregor	PTRF AURET	POLE MOUNTED	25	1973	2018	40,000.00
McGregor	PTRF IAN HOUSE	POLE MOUNTED	25	1973	2018	40,000.00
McGregor	PTRF PREVOYANCE WORKERS HOUSES 2	POLE MOUNTED	25	1973	2018	40,000.00
McGregor	PTRF DE ERF 1	POLE MOUNTED	50	1973	2018	55,000.00
McGregor	PTRF HOKAAI PUMP 2	POLE MOUNTED	315	1974	2019	190,000.00
McGregor	PTRF AGTER DIE KLIP GUESTHOUSE FARM	POLE MOUNTED	16	1975	2020	20,000.00
McGregor	PTRF JOHANNES DE WET STORE	POLE MOUNTED	16	1975	2020	20,000.00
McGregor	PTRF STEENBOKS 2	POLE MOUNTED	16	1975	2020	20,000.00
McGregor	PTRF MORCEAUX	POLE MOUNTED	25	1975	2020	40,000.00
McGregor	PTRF OESTERVANGER PUMPHOUSE	POLE MOUNTED	25	1975	2020	40,000.00
McGregor	PTRF DW PUMP 2	POLE MOUNTED	25	1975	2020	40,000.00
McGregor	PTRF DE ERF PUMP	POLE MOUNTED	50	1975	2020	55,000.00
McGregor	PTRF FRANCE 1	POLE MOUNTED	50	1975	2020	55,000.00
McGregor	PTRF GOEDE PAS WOUTER DE WET WORKERS HOUSES 3	POLE MOUNTED	25	1975	2020	40,000.00
McGregor	PTRF QUDE BLY EN RY	POLE MOUNTED	10	1976	2021	20,000.00
McGregor	PTRF ANTON	POLE MOUNTED	10	1976	2021	20,000.00
McGregor	PTRF DE ERF WORKERS HOUSES	POLE MOUNTED	16	1976	2021	20,000.00
McGregor	PTRF PREVOYANCE WORKERS HOUSES 1	POLE MOUNTED	25	1976	2021	40,000.00
McGregor	PTRF 2 VIRA	POLE MOUNTED	50	1976	2021	55,000.00
McGregor	PTRF HOUTBAAI 5	POLE MOUNTED	25	1977	2022	40,000.00
McGregor	PTRF EILANDIA PLASE DIE HEUWEL PUMP	POLE MOUNTED	50	1977	2022	40,000.00
McGregor	PTRF McGREGOR PADSTAL PUMP	POLE MOUNTED	50	1977	2022	55,000.00
McGregor	PTRF SAND LANE PUMP	POLE MOUNTED	16	1978	2023	20,000.00
McGregor	PTRF DE FONTEIN FRIKKIE J BURGER	POLE MOUNTED	25	1978	2023	40,000.00
McGregor	PTRF OU FARM BAKSTONE	POLE MOUNTED	50	1978	2023	55,000.00
McGregor	PTRF DANIE	POLE MOUNTED	50	1978	2023	55,000.00
McGregor	PTRF BUITEHOF PUMP 2	POLE MOUNTED	10	1979	2024	20,000.00
McGregor	PTRF ZEVENBERG PUMP 3	POLE MOUNTED	16	1979	2024	20,000.00
McGregor	PTRF DW LODGE	POLE MOUNTED	25	1979	2024	40,000.00
McGregor	PTRF BUFFELSKLOF 2	POLE MOUNTED	100	1980	2025	75,000.00
McGregor	PTRF OLIVE 2	POLE MOUNTED	10	1980	2025	20,000.00
McGregor	PTRF WANSBECK OOS FERDIE LE ROUX PUMP 1	POLE MOUNTED	16	1980	2025	20,000.00
McGregor	PTRF OESTERVANGER RIVIER PUMP 1	POLE MOUNTED	16	1980	2025	20,000.00

McGregor	PTRF UITNOOD	POLE MOUNTED	25	1980	2025	40,000.00
McGregor	PTRF LE CHASSEUR DRC PRIMARY	POLE MOUNTED	50	1980	2025	55,000.00
McGregor	PTRF 1 JACQUES	POLE MOUNTED	50	1980	2025	55,000.00
McGregor	PTRF OUT NOOD 2	POLE MOUNTED	50	1980	2025	55,000.00
McGregor	TRF LE CHASSEUR PAD	GROUND MOUNTED	100	1981	2026	464,288.00
McGregor	TRF MCGREGOR BOOSTER	FLOOR STANDING	315	1981	2026	20,000.00
McGregor	PTRF MAIN CHANCE	POLE MOUNTED	100	1981	2026	75,000.00
McGregor	PTRF UITVLUGHT HOUSE	POLE MOUNTED	10	1981	2026	20,000.00
McGregor	PTRF OILIFANT PUMP	POLE MOUNTED	10	1981	2026	20,000.00
McGregor	PTRF STEENBOKS PUMP	POLE MOUNTED	10	1981	2026	20,000.00
McGregor	PTRF PREVOYANCE HOUSE 2B	POLE MOUNTED	10	1981	2026	20,000.00
McGregor	PTRF HOUTBAAI 4	POLE MOUNTED	16	1981	2026	20,000.00
McGregor	PTRF OILIFANT PUMP 2	POLE MOUNTED	16	1981	2026	20,000.00
McGregor	PTRF KONINGS RIVIER COLYN PUMP 1	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF WANSBEK OOS HANNES & CELIA WORKERS HOUSES 2	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF WANSBEK OOS LINDIE & PHILBERT LOURENS 1	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF BELLA VUE PUMP 1	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF RETREAT J DE WET PUMP 1	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF OESTERVANGER SKAAPKRAAL	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF 2 WHIPSTOCK 2	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF 1 WHIPSTOCK 2	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF DE HOOK 2(3)	POLE MOUNTED	15	1981	2026	20,000.00
McGregor	PTRF DE HOOK 1	POLE MOUNTED	10	1981	2026	20,000.00
McGregor	PTRF OILIFANT DAN	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF OILIFANT HOUSEE	POLE MOUNTED	25	1981	2026	40,000.00
McGregor	PTRF KONINGS RIVIER PIETER KRIEL OFFICE	POLE MOUNTED	100	1981	2026	75,000.00
McGregor	PTRF CLAIRE'S WOLD PUMP 1	POLE MOUNTED	50	1981	2026	55,000.00
McGregor	PTRF BELLA VUE HOUSE & STORE	POLE MOUNTED	50	1981	2026	55,000.00
McGregor	PTRF CJ ROUX SKULTE	POLE MOUNTED	50	1981	2026	55,000.00
McGregor	PTRF MORCEAUX ANDRE & LIZELLE FERNHOUT	POLE MOUNTED	100	1982	2027	75,000.00
McGregor	PTRF HOKAAI PUMP 3	POLE MOUNTED	100	1982	2027	75,000.00
McGregor	PTRF CEDER FARM	POLE MOUNTED	25	1982	2027	40,000.00
McGregor	TRF LE GRAND CHASSEUR	GROUND MOUNTED	200	1983	2028	464,288.00
McGregor	TRF PREVOYANCE	GROUND MOUNTED	200	1983	2028	464,288.00
McGregor	PTRF ZEVENBERG STORE	POLE MOUNTED	160	1983	2028	130,000.00
McGregor	PTRF THE ELCHMEY PUMP	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF WOUTER JOHANNES DE WET PUMP 5B	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF RHEBOKSKRAAL	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF RHEBOKSKRAAL 3	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF PREVOYANCE PUMP 1B	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF BLACK OAKS WORKERS HOUSES	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF FAIRVIEW FARM PERDESTAL	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF APPELDRIFF	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF WANSBEK OOS LINDIE PHILBERT LOURENS WORKERS HOUSES 2	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF WANSBECK OOS FERDIE LE ROUX 2	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF WANSBECK OOS FERDIE LE ROUX 3	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF DEWILGEN DANIE & DISE DE WET	POLE MOUNTED	50	1983	2028	20,000.00
McGregor	PTRF LE GRAND CHASSEUR WORKERS HOUSES	POLE MOUNTED	16	1983	2028	20,000.00
McGregor	PTRF SCHALK COLYN PUMP 3	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF HOUSE OLIVA	POLE MOUNTED	50	1983	2028	40,000.00
McGregor	PTRF WANSBEK HANNES & CELIA ERASMUS HOUSE 1	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF WOUTER JOHANNES DE WET PUMP 4	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF BELLA VUE WORKERS HOUSES	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF DE HOOK 3	POLE MOUNTED	100	1983	2028	75,000.00
McGregor	PTRF DE HOOK 4	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 2	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF EILANDIA PLASE OUTSPAN WORKERS HOUSES	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF UITNOOD KRIEL KOMBUIS	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF THE ELICHEMEY	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF WEL VAN PAS APPELDRIFF WORKERS HOUSES	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET WORKERS HOUSES 4	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF VERGENOEG VOLSTRAUIS FARM	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF OUTNOOD PUMP	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF BUITEHOF PUMP 1	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF PREVOYANCE PUMP 4	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX HOUSE	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF LE CHASSEUR ANDRIES VILJOEN WORKERS HOUSES	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF WANSBECK OOS FERDIE LE ROUX 1	POLE MOUNTED	75	1983	2028	75,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET WORKERS HOUSES 1	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF WJ DE WET WEL VAN STORE	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF WANSBEK OOS LINDIE PHILBERT LOURENS HOUSE 2	POLE MOUNTED	25	1983	2028	40,000.00
McGregor	PTRF LE GRAND CHASSEUR PUMP 5	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	PTRF RIVER BEND PUMP 1	POLE MOUNTED	50	1983	2028	55,000.00
McGregor	TRF KONINGSRIVIER SCHALK COLYN & SEUNS	FLOOR STANDING	160	1984	2029	464,288.00
McGregor	PTRF OLIFANT 1	POLE MOUNTED	10	1984	2029	20,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET PUMP 2	POLE MOUNTED	25	1984	2029	40,000.00
McGregor	PTRF CLAIRE'S WOLD HANNES WORKERS HOUSES	POLE MOUNTED	25	1984	2029	40,000.00
McGregor	PTRF STEENBOKSVLAKTE	POLE MOUNTED	50	1984	2029	55,000.00
McGregor	PTRF RETREAT J DE WET PUMP 2	POLE MOUNTED	50	1984	2029	55,000.00
McGregor	PTRF GALGEBERG 3	POLE MOUNTED	50	1984	2029	55,000.00
McGregor	PTRF OILFANT 2	POLE MOUNTED	10	1984	2029	20,000.00
McGregor	PTRF NORA 2	POLE MOUNTED	50	1984	2029	55,000.00
McGregor	PTRF EILANDIA PLASE DIE HEUWEL HOUSE	POLE MOUNTED	50	1984	2029	55,000.00

McGregor	PTRF GOOD HOPE HOUSE	POLE MOUNTED	75	1984	2029	75,000.00
McGregor	PTRF AGTRERKLIP HOUSE	POLE MOUNTED	50	1984	2029	55,000.00
McGregor	PTRF ZEVENBERG WORKERS HOUSES & PUMP	POLE MOUNTED	100	1985	2030	75,000.00
McGregor	PTRF ZEVENBERG HOUSE	POLE MOUNTED	50	1985	2030	55,000.00
McGregor	PTRF WANSBEK OOS LINDIE & PHILBERT LOURENS PUMP 3	POLE MOUNTED	50	1985	2030	55,000.00
McGregor	PTRF BUTEKANT STR	POLE MOUNTED	160	1986	2031	130,000.00
McGregor	PTRF STEENBOKS	POLE MOUNTED	25	1986	2031	40,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 3	POLE MOUNTED	25	1986	2031	40,000.00
McGregor	PTRF OILIFANT HOUSE	POLE MOUNTED	30	1986	2031	55,000.00
McGregor	PTRF INA NUADE	POLE MOUNTED	50	1986	2031	55,000.00
McGregor	PTRF DE FONTEIN GERHARD BURGER	POLE MOUNTED	75	1986	2031	75,000.00
McGregor	PTRF PREVOYANCE HOUSE 1A	POLE MOUNTED	75	1986	2031	75,000.00
McGregor	PTRF NORA 4	POLE MOUNTED	100	1987	2032	75,000.00
McGregor	PTRF DE FONTEIN GERHARD BURGER PUMP 1	POLE MOUNTED	25	1987	2032	40,000.00
McGregor	PTRF OESTERVANGER PUMP 2	POLE MOUNTED	25	1987	2032	40,000.00
McGregor	PTRF KONINGS RIVIER COLYN WORKERS HOUSES	POLE MOUNTED	100	1988	2033	75,000.00
McGregor	PTRF FRANCE 3	POLE MOUNTED	16	1988	2033	20,000.00
McGregor	PTRF GOEDE PAS WOUTER DE WET PUMP 3	POLE MOUNTED	25	1988	2033	40,000.00
McGregor	PTRF CLAIRE WOLD WOUTER REETLING	POLE MOUNTED	25	1988	2033	40,000.00
McGregor	PTRF 2 JACQUES	POLE MOUNTED	25	1988	2033	40,000.00
McGregor	PTRF BUITEHOF HOUSEE	POLE MOUNTED	30	1988	2033	55,000.00
McGregor	PTRF KONINGS RIVIER DANIEL & MARAINNA PUMP 1	POLE MOUNTED	50	1988	2033	55,000.00
McGregor	PTRF KEISERSHOF	POLE MOUNTED	75	1988	2033	75,000.00
McGregor	PTRF BUFFELSKLOOF 1	POLE MOUNTED	100	1989	2034	75,000.00
McGregor	PTRF BRIERIVIER PUMP	POLE MOUNTED	15	1989	2034	20,000.00
McGregor	PTRF ANDRIES VILJOEN PUMP 1	POLE MOUNTED	250	1989	2034	190,000.00
McGregor	PTRF LE GRAND CHASSEUR WINE ESTATE PUMP 1	POLE MOUNTED	25	1989	2034	40,000.00
McGregor	PTRF DWARSWATER 1	POLE MOUNTED	25	1989	2034	40,000.00
McGregor	PTRF MOUNTAIN VIEW PUMP 3	POLE MOUNTED	15	1990	2035	20,000.00
McGregor	PTRF ZEVENBERG WORKERS HOUSES 1	POLE MOUNTED	16	1990	2035	20,000.00
McGregor	PTRF D PUMP	POLE MOUNTED	16	1990	2035	20,000.00
McGregor	PTRF HOUTBAAI 1	POLE MOUNTED	16	1990	2035	20,000.00
McGregor	PTRF WERK & RUS	POLE MOUNTED	50	1990	2035	55,000.00
McGregor	PTRF SEWEFONTEIN PUMP	POLE MOUNTED	75	1990	2035	75,000.00
McGregor	PTRF HOUTBAAI 3	POLE MOUNTED	100	1991	2036	75,000.00
McGregor	PTRF ANDRE VILJOEN APPELDRIJF HOUSE	POLE MOUNTED	10	1991	2036	20,000.00
McGregor	PTRF ZEVENBERG	POLE MOUNTED	100	1992	2037	75,000.00
McGregor	PTRF NAUDE 4	POLE MOUNTED	200	1992	2037	130,000.00
McGregor	PTRF WEL VAN PAS APPELDRIJF PUMP	POLE MOUNTED	50	1992	2037	55,000.00
McGregor	PTRF WANSBEK OOS DANIE & PETRO WORKERS HOUSES 1	POLE MOUNTED	75	1992	2037	75,000.00
McGregor	PTRF SCHALK RIVIER COLYN PUMP 2	POLE MOUNTED	100	1993	2038	75,000.00
McGregor	PTRF KONINGS RIVIER PIETER KRIEL WORKERS HOUSES	POLE MOUNTED	50	1993	2038	55,000.00
McGregor	PTRF WOUTER JOHANNES DE WET PUMP 5A	POLE MOUNTED	50	1993	2038	55,000.00
McGregor	PTRF GOOD HOPE FARM PUMP 2	POLE MOUNTED	50	1993	2038	55,000.00
McGregor	PTRF RETREAT JDE WET SKOOL & WORKERS HOUSES	POLE MOUNTED	50	1993	2038	55,000.00
McGregor	PTRF WERK & RUS RIVIER	POLE MOUNTED	100	1995	2040	75,000.00
McGregor	PTRF VAN REENEN STR	POLE MOUNTED	160	1995	2040	130,000.00
McGregor	PTRF OFFICE STR	POLE MOUNTED	160	1995	2040	130,000.00
McGregor	PTRF WANSBEK OOS LINDIE & PHILBERT LOURENS PUMP 4	POLE MOUNTED	25	1995	2040	40,000.00
McGregor	PTRF WOUTER JOHANNES DE WET HOUSE 2	POLE MOUNTED	25	1995	2040	40,000.00
McGregor	PTRF CLAIRE WOLD HANNES ERASMUS STORE	POLE MOUNTED	50	1995	2040	55,000.00
McGregor	PTRF PAYNESDALE	POLE MOUNTED	50	1995	2040	55,000.00
McGregor	PTRF KLEIN BEGIN	POLE MOUNTED	100	1996	2041	75,000.00
McGregor	PTRF WOUTER JOHANNES DE WET PUMP 2	POLE MOUNTED	100	1996	2041	75,000.00
McGregor	PTRF PREVOYANCE PUMP 2	POLE MOUNTED	100	1996	2041	75,000.00
McGregor	PTRF MOOIUITSIG FARM	POLE MOUNTED	10	1996	2041	20,000.00
McGregor	PTRF FAIRVIEW FARM HOUSE	POLE MOUNTED	16	1996	2041	20,000.00
McGregor	PTRF NADIA NAUDE PUMP	POLE MOUNTED	50	1996	2041	55,000.00
McGregor	PTRF GOOD HOPE FARM PUMP 1	POLE MOUNTED	50	1996	2041	55,000.00
McGregor	PTRF HOUTBAAI 2	POLE MOUNTED	50	1996	2041	55,000.00
McGregor	PTRF SILVER OAK HOUSE	POLE MOUNTED	100	1997	2042	75,000.00
McGregor	PTRF NAUDE 3	POLE MOUNTED	100	1997	2042	75,000.00
McGregor	PTRF ZEVENFONTEIN 1	POLE MOUNTED	25	1997	2042	40,000.00
McGregor	PTRF HOKAAI PUMP 1	POLE MOUNTED	315	1997	2042	190,000.00
McGregor	PTRF FARMWAG HOUSE	POLE MOUNTED	50	1997	2042	55,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 1	POLE MOUNTED	50	1997	2042	55,000.00
McGregor	PTRF WANSBEK OOS HANNES & CELIA ERASMUS WORKERS HOUSES	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF DE HOEK HOUSE 2	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF SCOTSFONTEIN HOUSE	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF DWARSWATER PUMP 1	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF OUTNOOD 2	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF PREVOYANCE PUMP 1A	POLE MOUNTED	100	1998	2043	75,000.00
McGregor	PTRF NAUDE 2	POLE MOUNTED	50	1998	2043	55,000.00
McGregor	PTRF OLIFANT 4	POLE MOUNTED	50	1998	2043	55,000.00
McGregor	PTRF SILVER OAK PAKSTORE	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF ANDRE & TRIDIE APPELDRIJF HOUSE	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF WEL VAN PAS WOUTER DE WET PUMP 1	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF WANSBEK OOS LINDIE & PHILBERT LOURENS WORKERS HOUSES 1	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF WINDFALLS HOUSE	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	takkap	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF EILANDIA PLASE OUTSPAN PUMP 1	POLE MOUNTED	100	1999	2044	75,000.00
McGregor	PTRF CHURCH STR	POLE MOUNTED	160	1999	2044	130,000.00
McGregor	PTRF WANSBEK OOS LINDIE & PHILBERT LOURENS PUMP 1	POLE MOUNTED	25	1999	2044	40,000.00

McGregor	PTRF McGRAGOR PADSTAL KITCHEN	POLE MOUNTED	50	1999	2044	55,000.00
McGregor	PTRF WJ DE WET WEL VAN PAS HOUSE	POLE MOUNTED	50	1999	2044	55,000.00
McGregor	PTRF DE HOEK HOUSE 1	POLE MOUNTED	50	1999	2044	55,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 5	POLE MOUNTED	100	1999	2044	55,000.00
McGregor	PTRF KONINGSRIVIER 2	POLE MOUNTED	100	2000	2045	75,000.00
McGregor	PTRF MAIN CHANCE HOUSE	POLE MOUNTED	100	2000	2045	75,000.00
McGregor	PTRF KONINGS RIVIER PIETER KRIEL PUMP	POLE MOUNTED	50	2000	2045	55,000.00
McGregor	PTRF GALGEBERG 1	POLE MOUNTED	50	2000	2045	55,000.00
McGregor	PTRF KONINGS RIVER ROUX DE KLERK HOUSE	POLE MOUNTED	50	2001	2046	55,000.00
McGregor	PTRF MAIN CHANCE OFFICES	POLE MOUNTED	50	2001	2046	55,000.00
McGregor	PTRF DWARSWATER 3	POLE MOUNTED	100	2002	2047	75,000.00
McGregor	PTRF LOOP STR	POLE MOUNTED	200	2002	2047	130,000.00
McGregor	PTRF WOUTER JOHANNES DE WET PUMP 3	POLE MOUNTED	50	2002	2047	55,000.00
McGregor	PTRF RETREAT JDE WET HOUSE 2	POLE MOUNTED	50	2002	2047	55,000.00
McGregor	PTRF FOSSIL HILLS	POLE MOUNTED	100	2003	2048	75,000.00
McGregor	PTRF WANSBEK OOS DANIE & PETRO HOUSE 1	POLE MOUNTED	100	2003	2048	75,000.00
McGregor	PTRF NORA 3	POLE MOUNTED	100	2003	2048	75,000.00
McGregor	PTRF OESTERVANGER HOUSE	POLE MOUNTED	50	2003	2048	55,000.00
McGregor	PTRF 3 JACQUES	POLE MOUNTED	50	2003	2048	55,000.00
McGregor	PTRF DAM	POLE MOUNTED	50	2003	2048	55,000.00
McGregor	PTRF KONINGS RIVIER DANIEL & MARAINNE PUMP 2	POLE MOUNTED	100	2004	2049	75,000.00
McGregor	PTRF MAIN CHANCE PUMP 2	POLE MOUNTED	100	2004	2049	75,000.00
McGregor	PTRF KONINGSRIVIER SCHALK & SEUNS HOUSE	POLE MOUNTED	100	2004	2049	75,000.00
McGregor	PTRF BUITEKANT STR	POLE MOUNTED	200	2004	2049	130,000.00
McGregor	PTRF McGRAGOR RIOOLWERKE	POLE MOUNTED	100	2005	2050	75,000.00
McGregor	PTRF DWARSWATER H	POLE MOUNTED	100	2005	2050	75,000.00
McGregor	PTRF VOOR DEN BERG	POLE MOUNTED	100	2005	2050	75,000.00
McGregor	PTRF KONIESRIVER 1	POLE MOUNTED	100	2005	2050	75,000.00
McGregor	PTRF ZEVENBERG PUMP 1	POLE MOUNTED	50	2005	2050	55,000.00
McGregor	PTRF MOUNTAIN VIEW PUMP 2	POLE MOUNTED	50	2005	2050	55,000.00
McGregor	PTRF GALGEBERG 2	POLE MOUNTED	100	2005	2050	75,000.00
McGregor	PTRF DOVE	POLE MOUNTED	50	2005	2050	55,000.00
McGregor	PTRF LE GRAND CHASSEUR PUMP 3	POLE MOUNTED	100	2006	2051	75,000.00
McGregor	PTRF MOUNTAIN VIEW HOUSE	POLE MOUNTED	100	2006	2051	75,000.00
McGregor	PTRF DWARSWATER PUMP	POLE MOUNTED	100	2006	2051	75,000.00
McGregor	PTRF SAND LANE 1	POLE MOUNTED	100	2006	2051	75,000.00
McGregor	PTRF CJ ROUX SKULTE SKAAPKRAAL	POLE MOUNTED	100	2006	2051	75,000.00
McGregor	PTRF WANSBEK DANIE & PETRO	POLE MOUNTED	25	2006	2051	40,000.00
McGregor	PTRF MOUNTAIN VIEW GROSVENOR HOUSE	POLE MOUNTED	50	2006	2051	55,000.00
McGregor	PTRF LE CHASSEUR ANDRIES VIJOEN HOUSE	POLE MOUNTED	100	2007	2052	75,000.00
McGregor	PTRF LONG STR	POLE MOUNTED	200	2007	2052	130,000.00
McGregor	PTRF WEL VAN PAS APPELDRIF DAM	POLE MOUNTED	100	2008	2053	75,000.00
McGregor	PTRF LE CHASSEUR CJ ROUX PUMP 1	POLE MOUNTED	100	2008	2053	75,000.00
McGregor	PTRF FRANCE 2	POLE MOUNTED	50	2008	2053	55,000.00
McGregor	PTRF DIE KAAP RESTUARANT	POLE MOUNTED	50	2009	2054	55,000.00
McGregor	PTRF UITNOOD HOUSE	POLE MOUNTED	50	2009	2054	55,000.00
McGregor	PTRF McGREGOR PLAKKERSKAMP	POLE MOUNTED	200	2007	2052	130,000.00
McGregor	TRANSFORMER	FLOOR STANDING	500	1998	2043	520,381.40
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX PUMP 3	POLE MOUNTED	25	1986	2031	40,000.00
McGregor	PTRF LE CHASSEUR JOHAN & RIANA ROUX HOUSE	POLE MOUNTED	50	1983	2028	55,000.00
McGregor		POLE MOUNTED	25			40,000.00
McGregor		POLE MOUNTED	75			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	25			40,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor	148	POLE MOUNTED	25			40,000.00
McGregor	Wandsbek Johannes Erasmus	POLE MOUNTED	25			40,000.00
McGregor	wansbek hannes erasmus work house 1	POLE MOUNTED	15			20,000.00
McGregor	BELLA VUE WORKERS HOUSES	POLE MOUNTED	50			55,000.00
McGregor	De Fontein	POLE MOUNTED	75			75,000.00
McGregor	PTRF CEDER FARM	POLE MOUNTED	25	1982	2027	40,000.00
McGregor	PTRF CEDER FARM	POLE MOUNTED	25	1982	2027	40,000.00
McGregor	PTRF CEDER FARM	POLE MOUNTED	25	1982	2027	40,000.00
McGregor	PTRF CEDER FARM	POLE MOUNTED	25	1982	2027	40,000.00
McGregor	PTRF GALGEBERG 1	POLE MOUNTED	50	2000	2045	55,000.00
McGregor	GALGEBERG GROUND MOUNTED	FLOOR STANDING	50			464,288.00
McGregor	NO NAME	POLE MOUNTED	50			55,000.00
McGregor	NADIA NUADE	FLOOR STANDING	25			464,288.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor	NUADE 5	FLOOR STANDING	100			464,288.00
McGregor	SILVER OAKS NO NAME2	POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor	PTRF PREVOYANCE PUMP 3	POLE MOUNTED	75	1983	2028	75,000.00
McGregor		POLE MOUNTED	50			75,000.00
McGregor	PTRF MAIN CHANCE HOUSE	POLE MOUNTED	10	1983	2028	20,000.00
McGregor	PTRF MAIN CHANCE WORKERS HOUSES 2	POLE MOUNTED	75	1985	2030	75,000.00
McGregor	PTRF MAIN CHANCE PUMP 1	POLE MOUNTED	100	1993	2038	75,000.00
McGregor	PTRF MAIN CHANCE PUMP 1	POLE MOUNTED	100	1993	2038	75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	50			55,000.00

McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		FLOOR STANDING	100			464,288.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED	25			40,000.00
McGregor		POLE MOUNTED	25			40,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor	Fixed load trfr	POLE MOUNTED				75,000.00
McGregor		POLE MOUNTED	50			75,000.00
McGregor		POLE MOUNTED				75,000.00
McGregor		POLE MOUNTED	75			75,000.00
McGregor		POLE MOUNTED	75			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	100			75,000.00
McGregor		POLE MOUNTED	10			75,000.00
McGregor		POLE MOUNTED	25			40,000.00
McGregor	Fixed Load Trfr	POLE MOUNTED				75,000.00
McGregor		POLE MOUNTED				75,000.00
McGregor		POLE MOUNTED	75	1988	2033	75,000.00
McGregor	PTRF GOOD HOPE FARM PUMP 2	POLE MOUNTED	50	1993	2038	55,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED	50			55,000.00
McGregor		POLE MOUNTED				75,000.00
McGregor		POLE MOUNTED				75,000.00
McGregor	Olifantsdoorns	POLE MOUNTED	50			55,000.00
McGregor		FLOOR STANDING	50			464,288.00
McGregor	CT/VT	POLE MOUNTED				75,000.00
						25,421,837.40

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 4 – NETWORK TECHNICAL LOSSES CALCULATION

 LANGEBERG MUNISIPALITEIT MUNICIPALITY MASIPALA	 iXengineers Infrastructure Excellence	Langeberg Municipality - Energy Losses	
0 0		Langeberg Municipality - McGregor 0	PAGE 2
		iX P302015	REV. 0

Calculation of network losses in support of NRS 080 Reporting

CALCULATION SHEET NOTES

Langeberg Municipality - Energy Losses

NETWORK ANALYSIS AND ENERGY LOSSES

Energy losses calculation

Notes:

Energy losses comprises:

- 1 System losses due to I^2R losses in distribution networks as calculated by loadflow analysis
- 2 No load losses of inductive element's magnetic circuits.
- 3 Load losses of transformers proportional to loading
- 4 Partial discharge losses - not considered due to destructive nature and maintenance requirements
- 5 Dielectric losses - Not considered
- 6 Similar network LV distribution losses used, no information available on LV Network

Calculation base:

- 1 Network I^2R losses derived from network load-flow analysis
- 2 Network I^2R losses adjusted for averaged load
- 3 Monthly maximum demand and energy statistics required

Definitions

- 1 Demand - Apparent power drawn from supply network
- 2 Load (Connected, etc) - The total connected load on the system.
- 3 Load Factor (LF) - The average power in the typical monthly period divided by the peak apparent power
- 4 Demand factor (DF) - The maximum demand divided by the connected load (indicative of reserve capacity)

PREPARED FOR:



LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

Langeberg Municipality
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ASHTON

Telephone: +27 (0) 23 615 8000

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McGregor

PAGE

3

REV.

0

Date

6/17/2022

MV Network losses					Billing/log data																							
Simu- lato	Network peak power:		P kW		2546	Month	Demand kVA	Energy kWh	Load factor	Demand Factor																		
	Network losses @ peak power:		P _{loss} kW		35.92	Apr	2406	999594	0.57	0.26																		
Network Average power			kVA		1198	May	1679	708002	0.58	0.18																		
Total electrical losses			kW	kWh/month	% loss	Jun	1582	691498	0.60	0.17																		
Transformer No load Losses			27.7	20221	2.31% <th>Jul</th> <td>1675</td> <td>735499</td> <td>0.60</td> <td>0.18</td>	Jul	1675	735499	0.60	0.18																		
Transformer Partial Load losses			18.9	13797	1.58% <th>Aug</th> <td>1569</td> <td>739245</td> <td>0.64</td> <td>0.17</td>	Aug	1569	739245	0.64	0.17																		
HV & MV Network system losses pm			16.9	12328	1.41% <th>Sep</th> <td>1764</td> <td>749103</td> <td>0.58</td> <td>0.19</td>	Sep	1764	749103	0.58	0.19																		
LV Network losses calculated pm				19410	2.22% <th>Oct</th> <td>1936</td> <td>875457</td> <td>0.62</td> <td>0.21</td>	Oct	1936	875457	0.62	0.21																		
Total losses				65756	7.52% <th>Nov</th> <td>2133</td> <td>928997</td> <td>0.60</td> <td>0.23</td>	Nov	2133	928997	0.60	0.23																		
Technical Loss Factor tlf :					1.075	Dec	2035	937902	0.63	0.22																		
Installed Transformer and reactor losses <table><tr><th>Qty</th><th>kVA</th><th colspan="2">Losses/unit kW</th><th colspan="2">Total loss kW</th></tr><tr><th colspan="2"></th><th>No load</th><th>Load</th><th>No load</th><th>FL loss</th></tr><tr><td>27</td><td>16</td><td>0.095</td><td>0.41</td><td>2.565</td><td>11.07</td></tr></table>						Qty	kVA	Losses/unit kW		Total loss kW				No load	Load	No load	FL loss	27	16	0.095	0.41	2.565	11.07	Jan	2132	1011480	0.65	0.23
						Qty	kVA	Losses/unit kW		Total loss kW																		
								No load	Load	No load	FL loss																	
						27	16	0.095	0.41	2.565	11.07																	
						Feb	2680	981227	0.50	0.29																		
						Mar	2602	1134070	0.60	0.28																		
						Avg demand	2016	874340	0.60	0.22																		
Avg power	1198																											

Notes:

1) Transformer quantities from single line diagram

2) Billing/Logs Eskom period Apr 2021 to Mar 2022.

Installed Transformer and reactor losses					
Qty	kVA	Losses/unit kW		Total loss kW	
		No load	Load	No load	FL loss
27	16	0.095	0.41	2.565	11.07
24	25	0.12	0.57	2.88	13.68
30	50	0.18	1	5.4	30
16	100	0.3	1.7	4.8	27.2
6	160	0.44	2.4	2.64	14.4
1	200	0.52	2.7	0.52	2.7
1	250	0.62	3.2	0.62	3.2
8	315	0.72	3.8	5.76	30.4
1	400	0.91	5.4	0.91	5.4
0	500	1.1	5.4	0	0
0	630	1.3	6.4	0	0
1	800	1.6	8	1.6	8
0	1000	1.9	9.5	0	0
0	1600	2.75	13.5	0	0
0	2000	3.25	16	0	0
115				27.695	146.05

Total installed capacity kVA 9262

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 5 – SSEG IMPACT ON MUNICIPAL REVENUE

This report was generated on	5/25/2022
For	Langeberg Municipality

Developed by

G:ENESIS
UNLOCKING VALUE

8 SALGA
SOUTH AFRICAN LOCAL
GOVERNMENT ASSOCIATION
Inspiring service delivery

**german
cooperation**
DEUTSCHE ZUSAMMENARBEIT

represented by
giz
German Technical Cooperation
for Sustainable Development

Table 1: SSEG tariffs chosen by the municipality

		Summer				Winter			
		Residential	Small business	Medium business	Large business	Residential	Small business	Medium business	Large business
Tariff type	TOU or flat tariff structure	Flat	Flat	TOU	TOU	Same as summer			
	Monthly or annual clearing of balances	Monthly clearing	Monthly clearing	Monthly clearing	Monthly clearing				
	Payment of credit balances to customers	No payments	No payments	No payments	No payments				
	Escalation of export tariff	Changes over time	Changes over time	Changes over time	Changes over time				
TOU tariffs	Import tariff								
	Fixed charge (R/m)			2,368	2,368			2,368	2,368
	Monthly demand charge (R/kVA)			276	254			276	254
	Peak (c/KWh)			94	93			94	93
	Standard (c/KWh)			94	93			94	93
	Off-peak (c/KWh)			94	93			94	93
	Export tariff								
	Peak (c/KWh)			68	68			68	68
	Standard (c/KWh)			68	68			68	68
Off-peak (c/KWh)			68	68			68	68	
Flat tariffs	Import tariff								
	Fixed charge (R/m)	1,538	1,538			1,538	1,538		
	Monthly demand charge (R/kVA)	-	-			-	-		
	Variable charge (c/KWh)	190	190			190	190		
	Export tariff								
	Variable charge (c/KWh)	68	68			68	68		

Table 2: Total revenue impact * (%)

% of customers on the relevant tariff that install rooftop PV	Residential	Small business	Medium business	Large business	Total
1%	0.40%	-0.14%	0.08%	-0.02%	0.25%
5%	1.98%	-0.70%	0.41%	-0.11%	1.23%
10%	3.96%	-1.40%	0.83%	-0.21%	2.46%
20%	7.92%	-2.79%	1.65%	-0.42%	4.91%

Notes: * Total revenue impact = (Reduction in municipal revenue + Value of Solar)/Municipal revenue prior to introduction of Solar PV SSEG tariffs

Chart 1: Total revenue impact (%)

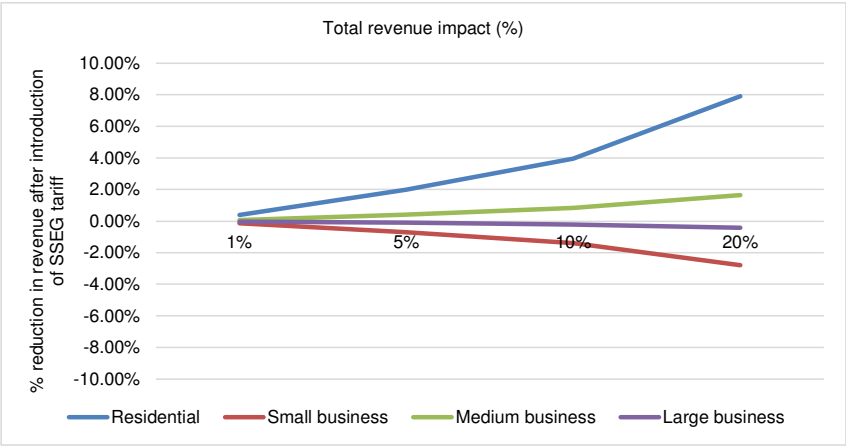


Table 3: Reduction in revenue, Value of Solar and Total effect (Rm)

	Residential	Small business	Medium business	Large business	Total
1% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	1.1	-0.2	-0.2	-0.1	0.6
Value of Solar (Rm) (B)	0.6	0.1	0.3	0.1	1.0
Total effect (Rm) (A + B)	1.8	-0.1	0.0	0.0	1.7
5% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	5.6	-1.2	-1.0	-0.3	3.1
Value of Solar (Rm) (B)	3.2	0.5	1.3	0.3	5.2
Total effect (Rm) (A + B)	8.8	-0.7	0.2	-0.1	8.3
10% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	11.3	-2.3	-2.1	-0.7	6.2
Value of Solar (Rm) (B)	6.3	0.9	2.6	0.5	10.4
Total effect (Rm) (A + B)	17.6	-1.4	0.5	-0.1	16.5
20% of customers install rooftop PV					
Reduction in revenue (Rm) (A)	22.5	-4.6	-4.2	-1.4	12.3
Value of Solar (Rm) (B)	12.7	1.8	5.1	1.1	20.7
Total effect (Rm) (A + B)	35.2	-2.8	0.9	-0.3	33.0

Table 4: Business case for the Solar PV customer for the chosen SSEG tariffs

	Residential	Small business	Medium business	Large business	Key for PBP and IRR results:	Key for NPV results:
Net present value (Rands)	-263,700	648,328	409,308	4,101,820	Unfavourable	Negative
Pay-back period (PBP) (Years)	>26	3	11	6	Average	Positive
Internal rate of return	0%	36%	10%	19%	Very good	
LCOE (Rands)	0.94	1.04	0.97	0.89		
Monthly bill for one Solar PV customer (Rands)	R 2,608	R 11,891	R 8,485	R 259,127		

Table 5: Average electricity consumption per annum, average solar self-consumption rate per annum and peak demand per season

	Residential	Small business	Medium business	Large business
Avg elect cons/annum (KWh/a)	10,853	87,831	92,013	2,415,350
Avg solar self-cons rate/annum*	71%	100%	43%	100%
Summer peak demand (kW)	2.21	12.19	12.78	346.05
Winter peak demand (kW)	3.36	17.13	17.95	503.08

Notes: * Avg solar self-cons rate/annum = Rooftop PV electricity consumed on-site/Total rooftop PV electricity produced

Chart 2: Energy balances

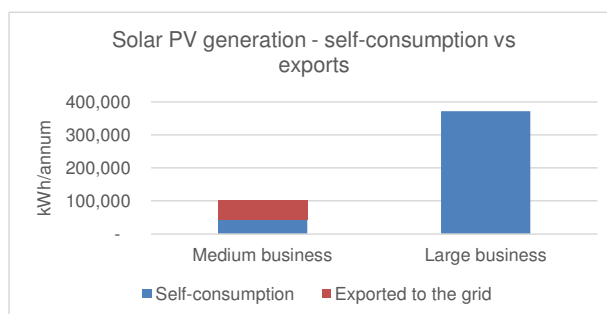
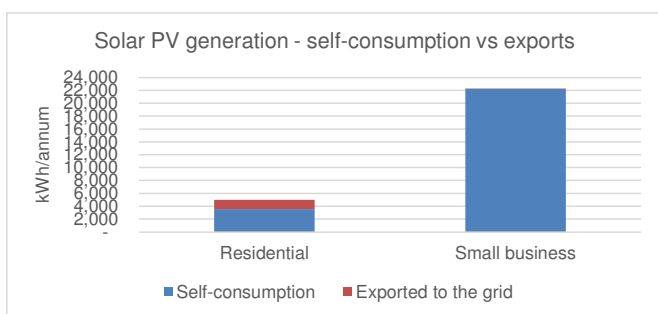


Table 6: Revenue Available for Network Costs and Average Bulk Energy Costs

		Residential	Small business	Medium business	Large business
Revenue per customer available for Network Costs (ZAR/month)	non-SSEG	R 1,280	R 9,688	R 7,482	R 132,456
	SSEG*	R 2,028	R 7,545	R 5,219	R 126,505
Average Bulk Purchase Costs (c/kWh)	non-SSEG	88.51	78.15	78.15	77.28
	SSEG	93.56	79.53	77.14	77.86

*Includes value of solar exports

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 6 – ALTERNATIVE ENERGY SUPPLY OPTION FOR MUNICIPAL FEED IN POINTS

McGregor 2MWp Langeberg Masterplan, Robertson, South Africa

Report

Project Name	Langeberg Masterplan
Project Address	Robertson, South Africa
Prepared By	Wiets Snyman info@ixengineers.co.za



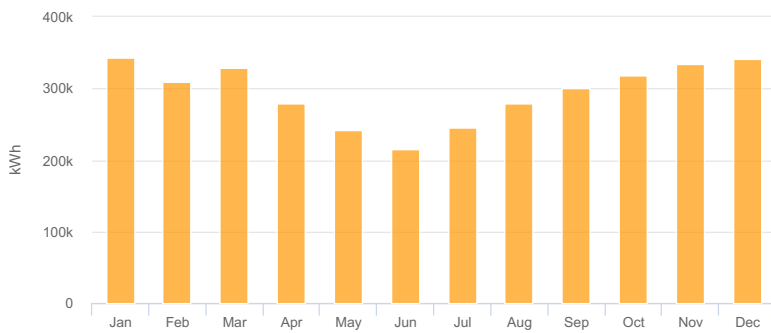
System Metrics

Design	McGregor 2MWp
Module DC Nameplate	2.00 MW
Inverter AC Nameplate	1.61 MW Load Ratio: 1.24
Annual Production	3,539 GWh
Performance Ratio	81.0%
kWh/kWp	1,766.2
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	4e8ad109b5-7184273f86-abd41a2ac5-1253cc88f6

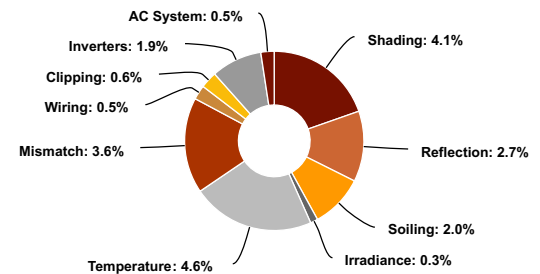
Project Location



Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,902.8	
	POA Irradiance	2,181.1	14.6%
	Shaded Irradiance	2,091.9	-4.1%
	Irradiance after Reflection	2,036.4	-2.7%
	Irradiance after Soiling	1,995.7	-2.0%
	Total Collector Irradiance	1,995.5	0.0%
Energy (kWh)	Nameplate	4,001,244.8	
	Output at Irradiance Levels	3,989,938.5	-0.3%
	Output at Cell Temperature Derate	3,805,839.0	-4.6%
	Output After Mismatch	3,668,822.5	-3.6%
	Optimal DC Output	3,649,023.8	-0.5%
	Constrained DC Output	3,626,122.6	-0.6%
	Inverter Output	3,556,807.2	-1.9%
	Energy to Grid	3,539,023.0	-0.5%
Temperature Metrics			
	Avg. Operating Ambient Temp		20.3 °C
	Avg. Operating Cell Temp		30.3 °C
Simulation Metrics			
	Operating Hours	4607	
	Solved Hours	4607	

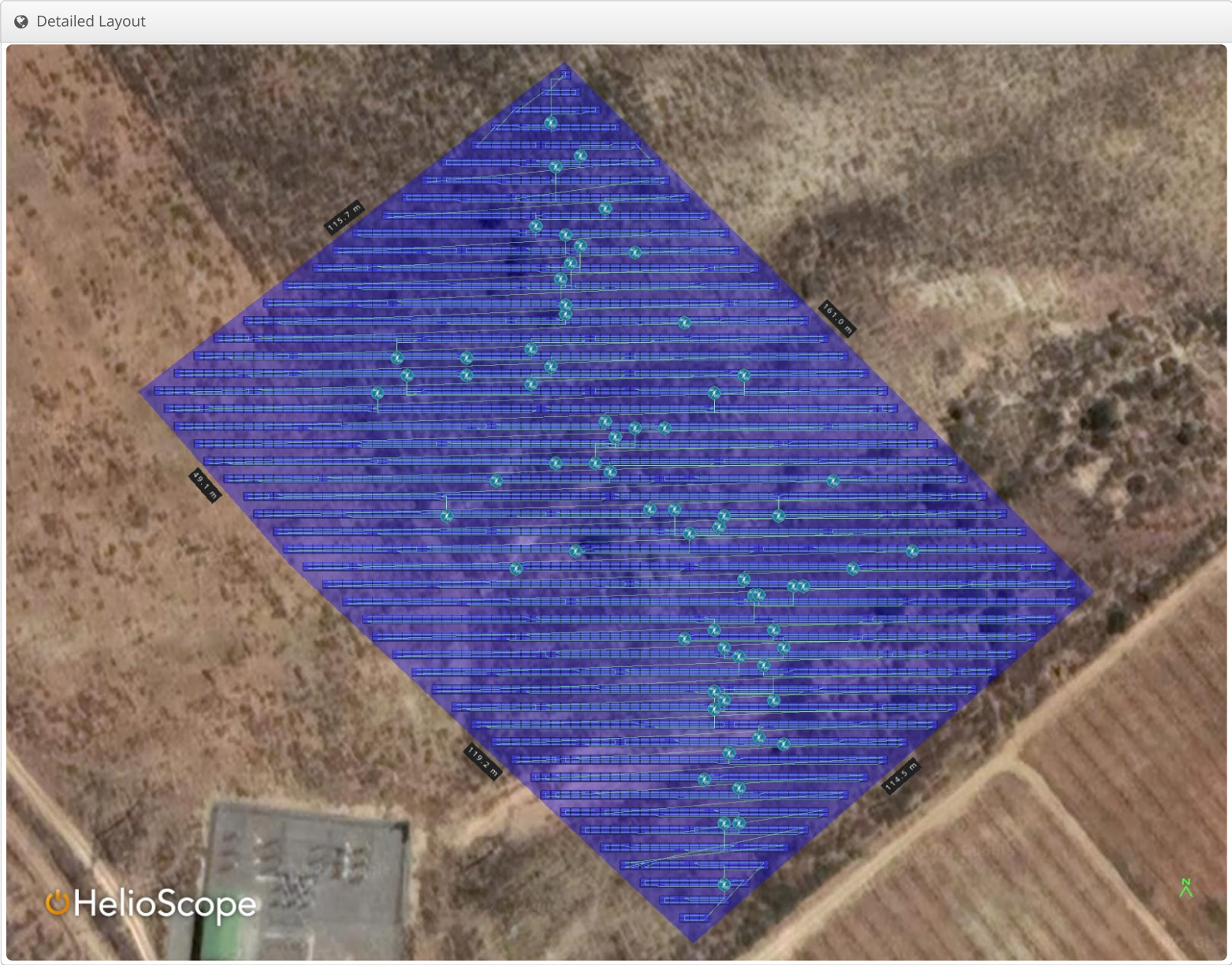
Condition Set

Description	Condition Set 1											
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	2	2	2	2	2	2	2	2	2	2	2	2
Irradiation Variance	5%											
Cell Temperature Spread	4° C											
Module Binning Range	-2.5% to 2.5%											
AC System Derate	0.50%											
Module Characterizations	Module	Uploaded By						Characterization				
	CS3W-440MB-AG (Canadian Solar)	HelioScope						Spec Sheet Characterization, PAN				
Component Characterizations	Device	Uploaded By						Characterization				
	Sunny Tripower 24000TL-US (SMA)	HelioScope						Modified CEC				

Components		
Component	Name	Count
Inverters	Sunny Tripower 24000TL-US (SMA)	67 (1.61 MW)
Strings	10 AWG (Copper)	270 (16,192.4 m)
Module	Canadian Solar, CS3W-440MB-AG (440W)	4,554 (2.00 MW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	4-19	Along Racking

Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	32°	0°	2.0 m	2x1	2,277	4,554	2.00 MW



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 7 – PROPOSED DEVELOPMENTS

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

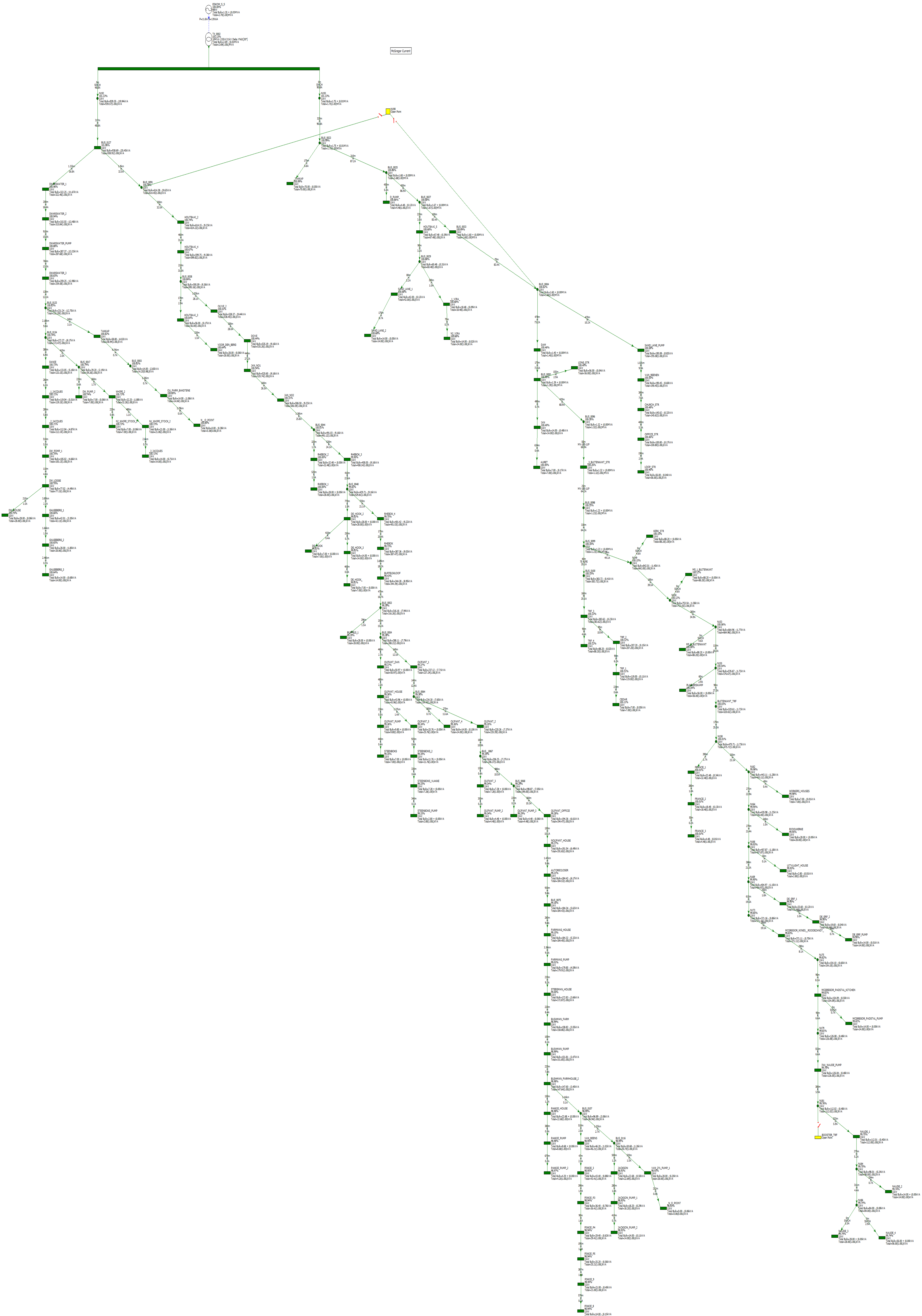
APPENDIX 8 – LOAD GROWTH FORECAST

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LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 9 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 10 – PROSPECTIVE FAULT LEVEL STUDY

McGregor Prospective Fault Level Study

SUBSTATI+A4:C165ON/TRANSFORMER	3ø Fault (kA)	ø-G Fault (kA)
McGREGOR	5.2	0.33
BUS_0127	4.85	0.32
BUS_0023	4.84	0.32
_TAKKAP	4.66	0.32
BUS_0025	4.52	0.32
D_PUMP_	4.11	0.32
BUS_0027	4.11	0.32
BUS_0033	4.02	0.31
BUS_0004	3.96	0.31
HOUTBAAI_5	3.92	0.31
BUS_0029	3.85	0.31
SAND_LANE_1	3.79	0.31
_1_VIRA_	3.7	0.31
DWARSWATER_1	3.67	0.31
SAND_LANE_2	3.66	0.31
N2_VIRA	3.65	0.31
DAM	3.61	0.31
DWARSWATER_2	3.53	0.31
BUS_0093	3.49	0.31
SAND_LANE_PUMP	3.49	0.31
LONG_STR	3.39	0.31
BUS_0091	3.29	0.3
BUS_0096	3.23	0.3
_3_BUITENKANT_STR	3.22	0.3
BUS_0098	3.22	0.3
IAN	3.19	0.3
HOUTBAAI_2	3.14	0.3
BUS_0099	3.04	0.3
N149	3.03	0.3
KERK_STR	3.03	0.3
BUS_0100	3.02	0.3
DWARSWATER_PUMP	2.99	0.3
N150	2.93	0.3
MS_1_BUITENKANT	2.93	0.3
TRF_3	2.91	0.3
HOUTBAAI_4	2.9	0.3
AURET	2.86	0.3
TRF_4	2.85	0.3
TRF_2	2.85	0.3
BUS_0038	2.81	0.3
TRF_1	2.79	0.3
N153	2.76	0.29
MS_2_BUITENKANT	2.76	0.29

HOUTBAAI_3	2.73	0.29
VAN_REENEN	2.71	0.3
N155	2.71	0.29
PLAKKERSKAMP	2.7	0.29
BUITENKANT_TRF	2.68	0.29
CEDAR	2.66	0.29
DWARSWATER_3	2.65	0.29
VOOR_DEN_BERG	2.64	0.29
N158	2.61	0.29
BUS_0133	2.6	0.29
TAKKAP	2.51	0.29
N162	2.51	0.29
CHURCH_STR	2.5	0.29
WORKERS_HOUSES	2.5	0.29
FRANCE_1	2.46	0.29
N164	2.42	0.29
OLIVE_2	2.4	0.29
DOVE	2.33	0.28
FRANCE_2	2.33	0.28
RIOOLWERKE	2.33	0.28
N166	2.33	0.28
FRANCE_3	2.32	0.28
UITVLUGHT_HOUSE	2.31	0.28
OFFICE_STR	2.3	0.29
N169	2.25	0.28
JAN_NO1	2.22	0.28
LOOP_STR	2.22	0.29
DE_ERF_1	2.17	0.28
DE_ERF_2	2.16	0.28
JAN_NO2	2.15	0.28
DE_ERF_PUMP	2.15	0.28
N173	2.08	0.28
MCGREGOR_WINES__ROODEZANDT_	2.04	0.27
N175	1.97	0.27
BUS_0134	1.95	0.27
MCGREGOR_PADSTAL_KITCHEN	1.95	0.27
MCGREGOR_PADSTAL_PUMP	1.95	0.27
N179	1.93	0.27
DANIE	1.86	0.27
BUS_0017	1.86	0.27
BUS_0044	1.85	0.27
INA_NAUDE_PUMP	1.83	0.27
_1_JACQUES	1.81	0.27
DW_PUMP_2	1.81	0.27
WHIPE_2	1.81	0.27
RHEBOK_2	1.78	0.27
N181	1.77	0.27

_2_JACQUES	1.76	0.26
N2_WHIPE_STOCK_2	1.76	0.26
RHEBOK_3	1.74	0.27
N1_WHIPE_STOCK_2	1.72	0.26
NAUDE_1	1.71	0.26
RHEBOK_1	1.68	0.27
DW_POMP_1	1.67	0.26
BUS_0048	1.66	0.27
N184	1.66	0.26
DW_LODGE	1.65	0.26
NAUDE_2	1.63	0.26
DW_HOUSE	1.61	0.26
N186	1.61	0.26
NAUDE_3	1.61	0.26
NAUDE_4	1.61	0.26
RHEBOK_4	1.54	0.26
DE_HOOK_2	1.53	0.26
RHEBOK	1.52	0.26
DE_HOOK_3	1.49	0.26
BUS_0003	1.46	0.25
DE_HOOK	1.46	0.26
DE_HOOK_	1.42	0.26
_3_JACQUES	1.35	0.24
OU_FARM_BAKSTENE	1.25	0.24
GALGEBERG_1	1.19	0.23
BUFFELSKLOOF	1.13	0.23
BUS_0053	1.09	0.23
BUS_0054	1.07	0.23
BUFFELS_1	1.07	0.23
GALGEBERG_2	1.06	0.22
OLIFANT_1	1.06	0.23
BUS_0064	1.05	0.23
N__O_POINT	1.04	0.23
OLIFANT_DAN	1.04	0.23
OLIFANT_2	1.04	0.23
OLIFANT_4	1.03	0.23
BUS_0067	1.02	0.23
OLIFANT_3	1.02	0.23
OLIFANT_HOUSE	1	0.23
OLIFANT_PUMP	0.99	0.23
OLIFANT_PUMP_2	0.99	0.22
STEENBOKS	0.96	0.22
BUS_0068	0.96	0.22
OLIFANT_PUMP_3	0.95	0.22
OLIFANT_OFFICE	0.94	0.22
NOLIFANT_HOUSE	0.94	0.22
OLIFANT_5	0.92	0.22

GALGEBERG_3	0.91	0.21
STEENBOKS_2	0.86	0.22
AUTORECLOSER	0.86	0.21
STEENBOKS_VLAKKE	0.85	0.22
STEENBOKS_PUMP	0.83	0.22
BUS_0075	0.82	0.21
FARMWAG_HOUSE	0.81	0.2
FARMWAG_PUMP	0.69	0.19
STEEGMAN_HOUSE	0.69	0.19
BUSHMAN_FARM	0.68	0.19
BUSHMAN_PUMP	0.68	0.19
BUSHMAN_FARMHOUSE_2	0.67	0.19
PAKKIE_HOUSE	0.67	0.18
PAKKIE_PUMP	0.66	0.18
PAKKIE_PUMP_2	0.64	0.18
BUS_0107	0.64	0.18
VAN_REENS	0.63	0.18
PIKKIE_3	0.63	0.18
PIKKIE_P3	0.62	0.18
PIKKIE_P4	0.62	0.18
BUS_0116	0.61	0.18
PIKKIE_P5	0.61	0.18
JACKSON	0.6	0.17
VAN_ZYL_PUMP_1	0.6	0.17
PIKKIE_9	0.6	0.17
_N_O_POINT	0.6	0.17
JACKSON_PUMP_1	0.59	0.17
PIKKIE_8	0.59	0.17
JACKSON_PUMP_2	0.58	0.17

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 11 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

McGregor Current Voltage Level Study

Node Name	Min Voltage	Difference
McGREGOR	101.13%	
BUS_0127	101.06%	0.07%
BUS_0023	100.99%	0.14%
_TAKKAP	100.99%	0.14%
DWARSWATER_1	100.96%	0.17%
DWARSWATER_2	100.94%	0.19%
DWARSWATER_PUMP	100.88%	0.25%
BUS_0025	100.86%	0.27%
D_PUMP_	100.86%	0.27%
DWARSWATER_3	100.83%	0.30%
BUS_0133	100.83%	0.30%
TAKKAP	100.82%	0.31%
BUS_0003	100.81%	0.32%
OU_FARM_BAKSTENE	100.80%	0.33%
N_O_POINT	100.80%	0.33%
BUS_0091	100.78%	0.35%
BUS_0134	100.74%	0.39%
BUS_0017	100.74%	0.39%
DW_PUMP_2	100.74%	0.39%
HOUTBAAI_2	100.74%	0.39%
DANIE	100.73%	0.40%
WHIPE_2	100.73%	0.40%
N2_WHIPE_STOCK_2	100.73%	0.40%
N1_WHIPE_STOCK_2	100.73%	0.40%
_1_JACQUES	100.72%	0.41%
_3_JACQUES	100.72%	0.41%
_2_JACQUES	100.71%	0.42%
DW_POMP_1	100.70%	0.43%
DW_LODGE	100.70%	0.43%
DW_HOUSE	100.70%	0.43%
BUS_0027	100.68%	0.45%
HOUTBAAI_5	100.68%	0.45%
BUS_0029	100.68%	0.45%
SAND_LANE_1	100.68%	0.45%
SAND_LANE_2	100.68%	0.45%
_1_VIRA_	100.68%	0.45%
N2_VIRA	100.68%	0.45%
HOUTBAAI_4	100.67%	0.46%
GALGEBERG_1	100.66%	0.47%
GALGEBERG_2	100.65%	0.48%
GALGEBERG_3	100.64%	0.49%
BUS_0038	100.64%	0.49%
HOUTBAAI_3	100.64%	0.49%
VOOR_DEN_BERG	100.64%	0.49%
BUS_0033	100.64%	0.49%
BUS_0004	100.62%	0.51%

SAND_LANE_PUMP	100.58%	0.55%
OLIVE_2	100.51%	0.62%
VAN_REENEN	100.50%	0.63%
CHURCH_STR	100.48%	0.65%
DAM	100.46%	0.67%
OFFICE_STR	100.46%	0.67%
LOOP_STR	100.46%	0.67%
DOVE	100.44%	0.69%
BUS_0093	100.40%	0.73%
IAN	100.40%	0.73%
LONG_STR	100.40%	0.73%
AURET	100.40%	0.73%
JAN_NO1	100.34%	0.79%
JAN_NO2	100.31%	0.82%
BUS_0096	100.26%	0.87%
_3_BUITENKANT_STR	100.26%	0.87%
BUS_0098	100.25%	0.88%
BUS_0099	100.16%	0.97%
BUS_0100	100.15%	0.98%
N149	100.15%	0.98%
KERK_STR	100.15%	0.98%
TRF_3	100.13%	1.00%
TRF_4	100.12%	1.01%
TRF_2	100.12%	1.01%
N150	100.12%	1.01%
MS_1_BUITENKANT	100.12%	1.01%
TRF_1	100.11%	1.02%
CEDAR	100.11%	1.02%
N153	100.06%	1.07%
MS_2_BUITENKANT	100.06%	1.07%
N155	100.04%	1.09%
PLAKKERSKAMP	100.04%	1.09%
BUITENKANT_TRF	100.03%	1.10%
BUS_0044	100.01%	1.12%
N158	100.01%	1.12%
FRANCE_1	100.01%	1.12%
FRANCE_2	100.01%	1.12%
FRANCE_3	100.01%	1.12%
RHEBOK_2	100.00%	1.13%
RHEBOK_1	100.00%	1.13%
N162	99.98%	1.15%
WORKERS_HOUSES	99.98%	1.15%
N164	99.95%	1.18%
RIOOLWERKE	99.95%	1.18%
N166	99.93%	1.20%
UITVLUGHT_HOUSE	99.93%	1.20%
RHEBOK_3	99.90%	1.23%
N169	99.90%	1.23%
DE_ERF_1	99.90%	1.23%
DE_ERF_2	99.90%	1.23%

DE_ERF_PUMP	99.90%	1.23%
N173	99.85%	1.28%
MCGREGOR_WINES__ROODEZANDT_	99.83%	1.30%
BUS_0048	99.82%	1.31%
N175	99.82%	1.31%
MCGREGOR_PADSTAL_KITCHEN	99.82%	1.31%
MCGREGOR_PADSTAL_PUMP	99.82%	1.31%
DE_HOOK_2	99.81%	1.32%
DE_HOOK	99.81%	1.32%
DE_HOOK_3	99.81%	1.32%
DE_HOOK_	99.81%	1.32%
N179	99.81%	1.32%
INA_NAUDE_PUMP	99.78%	1.35%
N181	99.76%	1.37%
RHEBOK_4	99.75%	1.38%
NAUDE_1	99.75%	1.38%
N184	99.75%	1.38%
NAUDE_2	99.74%	1.39%
N186	99.74%	1.39%
NAUDE_3	99.74%	1.39%
NAUDE_4	99.74%	1.39%
RHEBOK	99.73%	1.40%
BUFFELSKLOOF	99.43%	1.70%
BUS_0053	99.39%	1.74%
BUFFELS_1	99.39%	1.74%
BUS_0054	99.38%	1.75%
OLIFANT_DAN	99.37%	1.76%
OLIFANT_1	99.37%	1.76%
OLIFANT_HOUSE	99.36%	1.77%
OLIFANT_PUMP	99.36%	1.77%
BUS_0064	99.36%	1.77%
OLIFANT_4	99.36%	1.77%
STEENBOKS	99.35%	1.78%
OLIFANT_2	99.35%	1.78%
OLIFANT_5	99.34%	1.79%
STEENBOKS_2	99.34%	1.79%
BUS_0067	99.34%	1.79%
OLIFANT_3	99.34%	1.79%
OLIFANT_PUMP_2	99.34%	1.79%
STEENBOKS_VLAKKE	99.33%	1.80%
STEENBOKS_PUMP	99.33%	1.80%
BUS_0068	99.29%	1.84%
OLIFANT_PUMP_3	99.29%	1.84%
OLIFANT_OFFICE	99.28%	1.85%
NOLIFANT_HOUSE	99.27%	1.86%
AUTORECLOSER	99.21%	1.92%
BUS_0075	99.16%	1.97%
FARMWAG_HOUSE	99.15%	1.98%
FARMWAG_PUMP	99.01%	2.12%
STEEGMAN_HOUSE	99.00%	2.13%

BUSHMAN_FARM	98.99%	2.14%
BUSHMAN_PUMP	98.99%	2.14%
BUSHMAN_FARMHOUSE_2	98.98%	2.15%
PAKKIE_HOUSE	98.98%	2.15%
PAKKIE_PUMP	98.98%	2.15%
PAKKIE_PUMP_2	98.97%	2.16%
VAN_REENS	98.95%	2.18%
BUS_0107	98.95%	2.18%
PIKKIE_3	98.95%	2.18%
PIKKIE_P3	98.94%	2.19%
PIKKIE_P4	98.94%	2.19%
BUS_0116	98.94%	2.19%
PIKKIE_P5	98.94%	2.19%
PIKKIE_9	98.94%	2.19%
PIKKIE_8	98.94%	2.19%
JACKSON	98.93%	2.20%
JACKSON_PUMP_1	98.93%	2.20%
JACKSON_PUMP_2	98.93%	2.20%
VAN_ZYL_PUMP_1	98.93%	2.20%
_N_O_POINT	98.93%	2.20%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 12 – CURRENT MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

McGregor Current Feeder Loading

Feeder to	Feeder % Loading
N193	25.23%
BUS_0023	24.22%
BUS_0025	24.15%
BUS_0027	23.17%
BUS_0033	23.17%
ESKOM_S_S	22.16%
BUS_0096	20.87%
BUS_0004	20.35%
DAM	20.14%
_3_BUITENKANT_STR	19.47%
BUS_0093	19.13%
BUS_0098	17.84%
N192	13.55%
BUS_0099	12.26%
OLIVE_2	11.65%
DOVE	11.35%
N149	10.97%
JAN_NO2	10.74%
BUS_0044	10.03%
N150	9.69%
RHEBOK_3	9.42%
BUS_0127	8.89%
BUS_0091	8.89%
HOUTBAAI_2	8.69%
HOUTBAAI_4	8.62%
N153	8.40%
BUS_0038	7.81%
BUS_0100	7.73%
BUS_0099	7.62%
N155	7.59%
JAN_NO1	7.36%
BUITENKANT_TRF	6.93%
N158	6.46%
N162	6.36%
N164	5.95%
N166	5.91%
BUS_0048	5.87%
RHEBOK_4	5.66%
N169	5.42%
N173	5.42%
RHEBOK	5.05%
BUS_0127	4.66%
BUFFELSKLOOF	4.64%

DWARSWATER_1	4.56%
BUS_0053	4.23%
TRF_3	4.18%
DWARSWATER_2	4.16%
BUS_0004	3.92%
SAND_LANE_PUMP	3.83%
DWARSWATER_PUMP	3.75%
BUS_0054	3.48%
OLIFANT_1	3.44%
DWARSWATER_3	3.35%
BUS_0064	3.23%
OLIFANT_2	3.03%
VAN_REENEN	2.93%
BUS_0067	2.92%
BUS_0068	2.86%
OLIFANT_OFFICE	2.81%
TX_0002	2.79%
MCGREGOR_PADSTAL_KITCHEN	2.76%
N179	2.76%
NOLIFANT_HOUSE	2.71%
AUTORECLOSER	2.71%
BUS_0075	2.71%
FARMWAG_HOUSE	2.65%
FARMWAG_PUMP	2.55%
BUS_0133	2.50%
INA_NAUDE_PUMP	2.46%
TRF_2	2.40%
STEEGMAN_HOUSE	2.34%
MCGREGOR_WINES__ROODEZANDT_	2.25%
N175	2.25%
BUSHMAN_FARM	2.24%
BUSHMAN_PUMP	2.17%
CHURCH_STR	2.03%
BUS_0134	1.93%
McGREGOR	1.82%
TRF_3	1.78%
DANIE	1.72%
N181	1.64%
_1_JACQUES	1.62%
_2_JACQUES	1.52%
BUSHMAN_FARMHOUSE_2	1.43%
NAUDE_1	1.43%
N184	1.23%
N155	1.22%
OFFICE_STR	1.13%
DW_POMP_1	1.12%
BUS_0054	1.12%

BUS_0023	1.01%
BUS_0027	0.98%
McGREGOR	0.98%
OLIFANT_DAN	0.97%
HOUTBAAI_5	0.88%
BUS_0133	0.85%
BUS_0038	0.81%
BUS_0093	0.81%
BUS_0107	0.75%
BUS_0044	0.71%
BUS_0107	0.68%
VAN_REENS	0.64%
BUS_0053	0.62%
DW_LODGE	0.61%
RHEBOK_2	0.61%
BUS_0048	0.61%
BUS_0029	0.61%
N164	0.61%
BUS_0134	0.57%
OLIFANT_HOUSE	0.57%
PIKKIE_3	0.54%
BUSHMAN_FARMHOUSE_2	0.50%
N169	0.49%
BUS_0017	0.47%
N158	0.47%
PIKKIE_P3	0.43%
GALGEBERG_1	0.41%
HOUTBAAI_3	0.41%
BUS_0116	0.41%
DW_LODGE	0.41%
PIKKIE_P4	0.37%
BUS_0116	0.33%
DE_HOOK_2	0.31%
PIKKIE_P5	0.31%
N184	0.31%
WHIPE_2	0.30%
DE_ERF_1	0.29%
BUS_0003	0.28%
JACKSON	0.27%
BUS_0029	0.27%
FRANCE_1	0.27%
OLIFANT_5	0.26%
OLIFANT_HOUSE	0.22%
TAKKAP	0.21%
BUS_0064	0.21%
JACKSON_PUMP_1	0.21%
PIKKIE_9	0.21%

GALGEBERG_2	0.20%
N1_WHIPE_STOCK_2	0.20%
BUS_0093	0.20%
SAND_LANE_1	0.20%
_1_VIRA_	0.20%
DE_ERF_2	0.20%
PAKKIE_HOUSE	0.19%
STEENBOKS_2	0.16%
BUS_0067	0.16%
OLIFANT_PUMP	0.15%
DE_HOOK_2	0.15%
DE_HOOK_3	0.15%
TRF_1	0.14%
BUS_0017	0.10%
WHIPE_2	0.10%
OLIFANT_3	0.10%
IAN	0.10%
N162	0.10%
PAKKIE_PUMP	0.09%
N149	0.09%
N150	0.09%
N153	0.09%
BUS_0068	0.07%
FRANCE_2	0.07%
STEENBOKS_VLAKKE	0.06%
BUS_0025	0.06%
N186	0.06%
N166	0.04%
N186	0.03%
OU_FARM_BAKSTENE	0.01%
MCGREGOR_PADSTAL_KITCHEN	0.01%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 13 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 14 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

McGregor 5 Year Voltage Level Study

Node Name	Min Voltage	Difference
McGREGOR	101.05%	
BUS_0127	101.05%	
DWARSWATER_1	100.93%	0.12%
DWARSWATER_2	100.91%	0.14%
BUS_0023	100.87%	0.18%
_TAKKAP	100.87%	0.18%
DWARSWATER_PUMP	100.83%	0.22%
DWARSWATER_3	100.78%	0.27%
BUS_0133	100.77%	0.28%
TAKKAP	100.76%	0.29%
BUS_0003	100.75%	0.30%
OU_FARM_BAKSTENE	100.74%	0.31%
N_O_POINT	100.74%	0.31%
BUS_0025	100.70%	0.35%
D_PUMP_	100.70%	0.35%
BUS_0091	100.69%	0.36%
BUS_0134	100.66%	0.39%
BUS_0017	100.66%	0.39%
DW_PUMP_2	100.66%	0.39%
DANIE	100.65%	0.40%
WHIPE_2	100.65%	0.40%
N2_WHIPE_STOCK_2	100.65%	0.40%
N1_WHIPE_STOCK_2	100.65%	0.40%
_1_JACQUES	100.64%	0.41%
_3_JACQUES	100.64%	0.41%
HOUTBAAI_2	100.64%	0.41%
_2_JACQUES	100.63%	0.42%
DW_POMP_1	100.61%	0.44%
DW_LODGE	100.61%	0.44%
DW_HOUSE	100.61%	0.44%
GALGEBERG_1	100.57%	0.48%
GALGEBERG_2	100.55%	0.50%
HOUTBAAI_4	100.55%	0.50%
GALGEBERG_3	100.54%	0.51%
BUS_0038	100.52%	0.53%
HOUTBAAI_3	100.51%	0.54%
VOOR_DEN_BERG	100.51%	0.54%
BUS_0027	100.46%	0.59%
HOUTBAAI_5	100.46%	0.59%
BUS_0029	100.45%	0.60%
SAND_LANE_1	100.45%	0.60%
SAND_LANE_2	100.45%	0.60%
_1_VIRA_	100.45%	0.60%

N2_VIRA	100.45%	0.60%
BUS_0033	100.41%	0.64%
BUS_0004	100.37%	0.68%
OLIVE_2	100.34%	0.71%
SAND_LANE_PUMP	100.33%	0.72%
DOVE	100.25%	0.80%
VAN_REENEN	100.23%	0.82%
CHURCH_STR	100.20%	0.85%
OFFICE_STR	100.18%	0.87%
LOOP_STR	100.18%	0.87%
DAM	100.16%	0.89%
JAN_NO1	100.12%	0.93%
JAN_NO2	100.08%	0.97%
BUS_0093	100.08%	0.97%
LONG_STR	100.08%	0.97%
IAN	100.07%	0.98%
AURET	100.06%	0.99%
ERF_357	100.06%	0.99%
BUS_0096	99.90%	1.15%
_3_BUITENKANT_STR	99.90%	1.15%
BUS_0098	99.89%	1.16%
BUS_0099	99.76%	1.29%
BUS_0100	99.76%	1.29%
N149	99.76%	1.29%
KERK_STR	99.76%	1.29%
TRF_3	99.73%	1.32%
TRF_4	99.72%	1.33%
TRF_2	99.72%	1.33%
TRF_1	99.71%	1.34%
CEDAR	99.71%	1.34%
N150	99.71%	1.34%
MS_1_BUITENKANT	99.71%	1.34%
BUS_0044	99.69%	1.36%
RHEBOK_2	99.68%	1.37%
RHEBOK_1	99.67%	1.38%
N153	99.63%	1.42%
MS_2_BUITENKANT	99.63%	1.42%
N155	99.61%	1.44%
PLAKKERSKAMP	99.61%	1.44%
BUITENKANT_TRF	99.59%	1.46%
N158	99.56%	1.49%
FRANCE_1	99.56%	1.49%
FRANCE_2	99.56%	1.49%
FRANCE_3	99.56%	1.49%
RHEBOK_3	99.55%	1.50%
N162	99.53%	1.52%
WORKERS_HOUSES	99.53%	1.52%

N164	99.48%	1.57%
RIOOLWERKE	99.48%	1.57%
BUS_0048	99.44%	1.61%
N166	99.44%	1.61%
UITVLUGHT_HOUSE	99.44%	1.61%
DE_HOOK_2	99.43%	1.62%
DE_HOOK	99.43%	1.62%
DE_HOOK_3	99.43%	1.62%
DE_HOOK_	99.43%	1.62%
N169	99.41%	1.64%
DE_ERF_1	99.41%	1.64%
DE_ERF_2	99.40%	1.65%
DE_ERF_PUMP	99.40%	1.65%
RHEBOK_4	99.35%	1.70%
RHEBOK	99.33%	1.72%
N173	99.33%	1.72%
MCGREGOR_WINES__ROODEZANDT_	99.30%	1.75%
ADDITIONAL	99.30%	1.75%
N175	99.29%	1.76%
MCGREGOR_PADSTAL_KITCHEN	99.29%	1.76%
MCGREGOR_PADSTAL_PUMP	99.29%	1.76%
N179	99.28%	1.77%
INA_NAUDE_PUMP	99.24%	1.81%
N181	99.22%	1.83%
NAUDE_1	99.21%	1.84%
N184	99.20%	1.85%
NAUDE_2	99.20%	1.85%
N186	99.19%	1.86%
NAUDE_3	99.19%	1.86%
NAUDE_4	99.19%	1.86%
BUFFELSKLOOF	98.92%	2.13%
BUS_0053	98.87%	2.18%
BUFFELS_1	98.86%	2.19%
BUS_0054	98.85%	2.20%
OLIFANT_DAN	98.83%	2.22%
OLIFANT_1	98.83%	2.22%
OLIFANT_HOUSE	98.82%	2.23%
OLIFANT_PUMP	98.82%	2.23%
STEENBOKS	98.82%	2.23%
BUS_0064	98.82%	2.23%
OLIFANT_4	98.82%	2.23%
OLIFANT_5	98.80%	2.25%
STEENBOKS_2	98.80%	2.25%
OLIFANT_2	98.80%	2.25%
OLIFANTSDOORN	98.80%	2.25%
STEENBOKS_VLAKKE	98.79%	2.26%
STEENBOKS_PUMP	98.79%	2.26%

BUS__0067	98.79%	2.26%
OLIFANT_3	98.79%	2.26%
OLIFANT_PUMP_2	98.79%	2.26%
BUS_0068	98.74%	2.31%
OLIFANT_PUMP_3	98.74%	2.31%
OLIFANT_OFFICE	98.72%	2.33%
NOLIFANT_HOUSE	98.71%	2.34%
AUTORECLOSER	98.63%	2.42%
BUS_0075	98.58%	2.47%
FARMWAG_HOUSE	98.56%	2.49%
FARMWAG_PUMP	98.38%	2.67%
STEEGMAN_HOUSE	98.37%	2.68%
BUSHMAN_FARM	98.36%	2.69%
BUSHMAN_PUMP	98.36%	2.69%
BUSHMAN_FARMHOUSE_2	98.35%	2.70%
PAKKIE_HOUSE	98.35%	2.70%
PAKKIE_PUMP	98.34%	2.71%
PAKKIE_PUMP_2	98.34%	2.71%
VAN_REENS	98.31%	2.74%
BUS_0107	98.31%	2.74%
PIKKIE_3	98.31%	2.74%
PIKKIE_P3	98.30%	2.75%
PIKKIE_P4	98.30%	2.75%
PIKKIE_P5	98.30%	2.75%
PIKKIE_9	98.30%	2.75%
PIKKIE_8	98.30%	2.75%
BUS_0116	98.29%	2.76%
JACKSON	98.29%	2.76%
JACKSON_PUMP_1	98.29%	2.76%
JACKSON_PUMP_2	98.29%	2.76%
VAN_ZYL_PUMP_1	98.29%	2.76%
_N_O_POINT	98.29%	2.76%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 15 – 5-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

McGregor 5 Year Feeder Loading

Feeder to	Feeder % Loading
N193	33.33%
BUS_0023	32.09%
BUS_0025	32.01%
BUS_0027	30.81%
BUS_0033	30.81%
ESKOM_S_S	28.86%
BUS_0004	27.34%
DAM	27.09%
BUS_0096	27.08%
_3_BUITENKANT_STR	25.36%
BUS_0093	24.82%
BUS_0098	23.24%
BUS_0099	16.37%
OLIVE_2	15.12%
N149	14.79%
DOVE	14.75%
JAN_NO2	14.00%
N150	13.21%
BUS_0044	13.13%
RHEBOK_3	12.37%
N153	11.63%
BUS_0127	11.45%
BUS_0091	11.45%
HOUTBAAI_2	11.21%
HOUTBAAI_4	11.13%
N155	10.63%
BUS_0038	10.13%
BUITENKANT_TRF	9.82%
JAN_NO1	9.58%
BUS_0100	9.51%
BUS_0099	9.37%
N158	9.24%
N162	9.12%
N164	8.61%
N166	8.56%
N169	7.96%
N173	7.96%
BUS_0048	7.75%
RHEBOK_4	7.49%
RHEBOK	6.74%
BUFFELSKLOOF	6.23%
BUS_0053	5.73%
BUS_0127	5.71%

DWARSWATER_1	5.59%
TRF_3	5.14%
DWARSWATER_2	5.10%
BUS_0054	4.81%
BUS_0004	4.81%
OLIFANT_1	4.76%
SAND_LANE_PUMP	4.70%
DWARSWATER_PUMP	4.60%
BUS_0064	4.50%
DWARSWATER_3	4.10%
OLIFANT_2	3.73%
TX_0002	3.64%
BUS_0067	3.60%
VAN_REENEN	3.59%
BUS_0068	3.52%
OLIFANT_OFFICE	3.47%
MCGREGOR_PADSTAL_KITCHEN	3.40%
N179	3.40%
NOLIFANT_HOUSE	3.34%
AUTORECLOSER	3.34%
BUS_0075	3.34%
FARMWAG_HOUSE	3.27%
FARMWAG_PUMP	3.14%
BUS_0133	3.06%
INA_NAUDE_PUMP	3.02%
TRF_2	2.95%
STEEGMAN_HOUSE	2.88%
MCGREGOR_WINES__ROODEZANDT__	2.77%
N175	2.77%
BUSHMAN_FARM	2.76%
BUSHMAN_PUMP	2.68%
CHURCH_STR	2.49%
McGREGOR	2.40%
BUS_0134	2.36%
TRF_3	2.19%
DANIE	2.11%
N181	2.02%
_1_JACQUES	1.99%
_2_JACQUES	1.87%
BUSHMAN_FARMHOUSE_2	1.76%
NAUDE_1	1.76%
N155	1.51%
N184	1.51%
BUS_0054	1.38%
OFFICE_STR	1.38%
DW_POMP_1	1.37%
MCGREGOR_WINES__ROODEZANDT__	1.28%

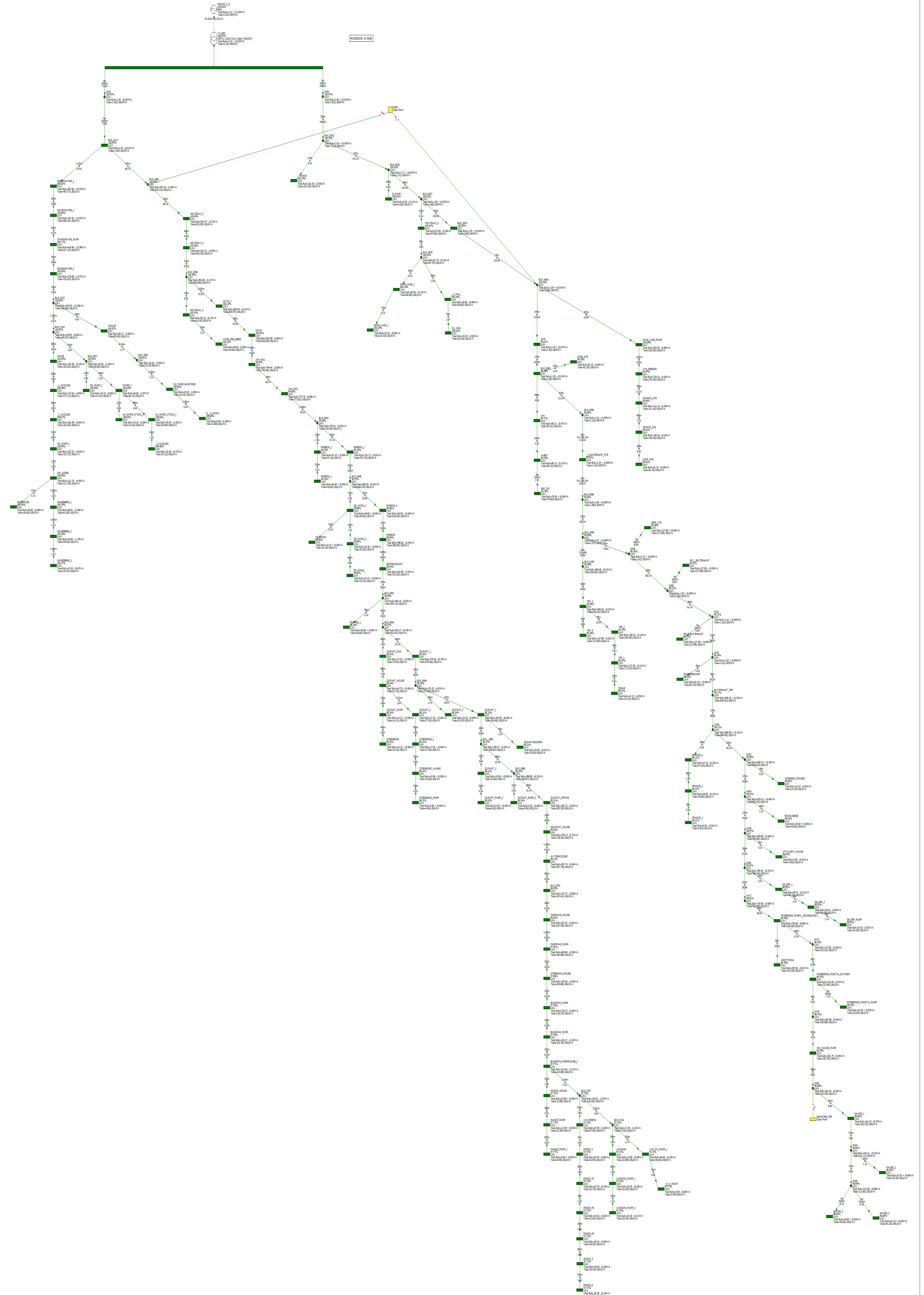
BUS_0093	1.27%
N192	1.24%
BUS_0023	1.24%
McGREGOR	1.24%
BUS_0027	1.20%
OLIFANT_DAN	1.19%
IAN	1.14%
HOUTBAAI_5	1.08%
BUS_0133	1.04%
AURET	1.02%
BUS_0038	1.00%
BUS_0093	1.00%
BUS_0107	0.92%
BUS_0044	0.87%
BUS_0107	0.84%
VAN_REENS	0.79%
BUS_0053	0.76%
DW_LODGE	0.75%
RHEBOK_2	0.75%
BUS_0048	0.75%
BUS_0029	0.75%
N164	0.75%
BUS_0134	0.70%
OLIFANT_HOUSE	0.70%
PIKKIE_3	0.66%
BUSHMAN_FARMHOUSE_2	0.62%
N169	0.60%
N158	0.58%
BUS_0017	0.57%
PIKKIE_P3	0.53%
OLIFANT_2	0.52%
BUS_0116	0.51%
GALGEBERG_1	0.50%
HOUTBAAI_3	0.50%
DW_LODGE	0.50%
PIKKIE_P4	0.46%
BUS_0116	0.41%
DE_HOOK_2	0.38%
PIKKIE_P5	0.38%
N184	0.38%
WHIPE_2	0.37%
DE_ERF_1	0.35%
BUS_0003	0.34%
JACKSON	0.33%
BUS_0029	0.33%
FRANCE_1	0.33%
OLIFANT_5	0.32%

OLIFANT_HOUSE	0.27%
GALGEBERG_2	0.25%
N1_WHIPE_STOCK_2	0.25%
TAKKAP	0.25%
BUS_0064	0.25%
JACKSON_PUMP_1	0.25%
SAND_LANE_1	0.25%
PIKKIE_9	0.25%
_1_VIRA_	0.25%
DE_ERF_2	0.25%
PAKKIE_HOUSE	0.24%
STEENBOKS_2	0.20%
BUS_0067	0.20%
OLIFANT_PUMP	0.19%
DE_HOOK_2	0.19%
DE_HOOK_3	0.19%
TRF_1	0.17%
N162	0.13%
BUS_0017	0.12%
WHIPE_2	0.12%
OLIFANT_3	0.12%
PAKKIE_PUMP	0.11%
N149	0.11%
N150	0.11%
N153	0.11%
STEENBOKS_VLAKKE	0.08%
BUS_0068	0.08%
BUS_0025	0.08%
FRANCE_2	0.08%
N186	0.07%
N166	0.05%
N186	0.04%
MCGREGOR_PADSTAL_KITCHEN	0.02%
OU_FARM_BAKSTENE	0.01%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 16 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS



LANEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 17 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – VOLTAGE LEVEL STUDY

McGregor 10 Year Voltage Level Study

Node Name	Min Voltage	Difference
McGREGOR	100.97%	
BUS_0127	100.97%	
DWARSWATER_1	100.83%	0.14%
DWARSWATER_2	100.80%	0.17%
BUS_0023	100.75%	0.22%
_TAKKAP	100.75%	0.22%
DWARSWATER_PUMP	100.71%	0.26%
DWARSWATER_3	100.65%	0.32%
BUS_0133	100.64%	0.33%
TAKKAP	100.63%	0.34%
BUS_0003	100.61%	0.36%
OU_FARM_BAKSTENE	100.60%	0.37%
N_O_POINT	100.60%	0.37%
BUS_0025	100.55%	0.42%
D_PUMP_	100.55%	0.42%
BUS_0091	100.54%	0.43%
BUS_0134	100.51%	0.46%
BUS_0017	100.50%	0.47%
DW_PUMP_2	100.50%	0.47%
WHIPE_2	100.50%	0.47%
N2_WHIPE_STOCK_2	100.50%	0.47%
N1_WHIPE_STOCK_2	100.50%	0.47%
DANIE	100.49%	0.48%
HOUTBAAI_2	100.49%	0.48%
_1_JACQUES	100.48%	0.49%
_3_JACQUES	100.48%	0.49%
_2_JACQUES	100.47%	0.50%
DW_POMP_1	100.45%	0.52%
DW_LODGE	100.45%	0.52%
DW_HOUSE	100.45%	0.52%
GALGEBERG_1	100.39%	0.58%
GALGEBERG_2	100.38%	0.59%
HOUTBAAI_4	100.38%	0.59%
GALGEBERG_3	100.37%	0.60%
BUS_0038	100.34%	0.63%
HOUTBAAI_3	100.34%	0.63%
VOOR_DEN_BERG	100.33%	0.64%
BUS_0027	100.25%	0.72%
HOUTBAAI_5	100.24%	0.73%
BUS_0029	100.24%	0.73%
SAND_LANE_1	100.24%	0.73%
SAND_LANE_2	100.24%	0.73%
_1_VIRA_	100.24%	0.73%

N2_VIRA	100.24%	0.73%
BUS_0033	100.19%	0.78%
BUS_0004	100.14%	0.83%
OLIVE_2	100.13%	0.84%
SAND_LANE_PUMP	100.09%	0.88%
DOVE	100.02%	0.95%
ESKOM_S_S	100.00%	0.97%
VAN_REENEN	99.97%	1.00%
CHURCH_STR	99.94%	1.03%
OFFICE_STR	99.92%	1.05%
LOOP_STR	99.91%	1.06%
JAN_NO1	99.87%	1.10%
DAM	99.87%	1.10%
JAN_NO2	99.82%	1.15%
BUS_0093	99.78%	1.19%
LONG_STR	99.78%	1.19%
IAN	99.77%	1.20%
AURET	99.76%	1.21%
ERF_357	99.76%	1.21%
BUS_0096	99.56%	1.41%
_3_BUITENKANT_STR	99.55%	1.42%
BUS_0098	99.55%	1.42%
BUS_0099	99.39%	1.58%
BUS_0100	99.38%	1.59%
N149	99.38%	1.59%
KERK_STR	99.38%	1.59%
BUS_0044	99.36%	1.61%
RHEBOK_2	99.35%	1.62%
RHEBOK_1	99.35%	1.62%
TRF_3	99.34%	1.63%
TRF_4	99.34%	1.63%
TRF_2	99.33%	1.64%
TRF_1	99.33%	1.64%
CEDAR	99.32%	1.65%
N150	99.32%	1.65%
MS_1_BUITENKANT	99.32%	1.65%
N153	99.21%	1.76%
MS_2_BUITENKANT	99.21%	1.76%
RHEBOK_3	99.19%	1.78%
N155	99.19%	1.78%
PLAKKERSKAMP	99.18%	1.79%
BUITENKANT_TRF	99.17%	1.80%
N158	99.13%	1.84%
FRANCE_1	99.12%	1.85%
FRANCE_2	99.12%	1.85%
FRANCE_3	99.12%	1.85%
N162	99.08%	1.89%

WORKERS_HOUSES	99.08%	1.89%
BUS_0048	99.07%	1.90%
DE_HOOK_2	99.06%	1.91%
DE_HOOK	99.05%	1.92%
DE_HOOK_3	99.05%	1.92%
DE_HOOK_	99.05%	1.92%
N164	99.02%	1.95%
RIOOLWERKE	99.01%	1.96%
N166	98.97%	2.00%
UITVLUGHT_HOUSE	98.97%	2.00%
RHEBOK_4	98.96%	2.01%
RHEBOK	98.94%	2.03%
N169	98.92%	2.05%
DE_ERF_1	98.92%	2.05%
DE_ERF_2	98.92%	2.05%
DE_ERF_PUMP	98.91%	2.06%
N173	98.81%	2.16%
MCGREGOR_WINES__ROODEZANDT_	98.78%	2.19%
ADDITIONAL	98.78%	2.19%
N175	98.76%	2.21%
MCGREGOR_PADSTAL_KITCHEN	98.76%	2.21%
MCGREGOR_PADSTAL_PUMP	98.76%	2.21%
N179	98.75%	2.22%
INA_NAUDE_PUMP	98.70%	2.27%
N181	98.68%	2.29%
NAUDE_1	98.66%	2.31%
N184	98.65%	2.32%
NAUDE_2	98.65%	2.32%
N186	98.64%	2.33%
NAUDE_3	98.64%	2.33%
NAUDE_4	98.64%	2.33%
BUFFELSKLOOF	98.45%	2.52%
BUS_0053	98.40%	2.57%
BUFFELS_1	98.39%	2.58%
BUS_0054	98.37%	2.60%
OLIFANT_DAN	98.35%	2.62%
OLIFANT_1	98.35%	2.62%
OLIFANT_HOUSE	98.34%	2.63%
OLIFANT_PUMP	98.34%	2.63%
BUS_0064	98.34%	2.63%
OLIFANT_4	98.34%	2.63%
STEENBOKS	98.33%	2.64%
OLIFANT_2	98.32%	2.65%
OLIFANTSDOORN	98.32%	2.65%
OLIFANT_5	98.31%	2.66%
STEENBOKS_2	98.31%	2.66%
STEENBOKS_VLAKKE	98.31%	2.66%

STEENBOKS_PUMP	98.31%	2.66%
BUS__0067	98.31%	2.66%
OLIFANT_3	98.31%	2.66%
OLIFANT_PUMP_2	98.30%	2.67%
BUS_0068	98.24%	2.73%
OLIFANT_PUMP_3	98.24%	2.73%
OLIFANT_OFFICE	98.21%	2.76%
NOLIFANT_HOUSE	98.20%	2.77%
AUTORECLOSER	98.11%	2.86%
BUS_0075	98.05%	2.92%
FARMWAG_HOUSE	98.03%	2.94%
FARMWAG_PUMP	97.82%	3.15%
STEEGMAN_HOUSE	97.80%	3.17%
BUSHMAN_FARM	97.79%	3.18%
BUSHMAN_PUMP	97.78%	3.19%
BUSHMAN_FARMHOUSE_2	97.77%	3.20%
PAKKIE_HOUSE	97.77%	3.20%
PAKKIE_PUMP	97.77%	3.20%
PAKKIE_PUMP_2	97.77%	3.20%
BUS_0107	97.73%	3.24%
VAN_REENS	97.72%	3.25%
PIKKIE_3	97.72%	3.25%
PIKKIE_P3	97.72%	3.25%
PIKKIE_P4	97.72%	3.25%
PIKKIE_P5	97.72%	3.25%
BUS_0116	97.71%	3.26%
JACKSON	97.71%	3.26%
VAN_ZYL_PUMP_1	97.71%	3.26%
PIKKIE_9	97.71%	3.26%
PIKKIE_8	97.71%	3.26%
_N_O_POINT	97.71%	3.26%
JACKSON_PUMP_1	97.70%	3.27%
JACKSON_PUMP_2	97.70%	3.27%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 18 – 10-YEAR MAXIMUM DEMAND LOAD FLOW ANALYSIS – CONDUCTOR THERMAL CAPACITY STUDY

McGregor 10 Year Feeder Loading

Feeder to	Feeder % Loading
N193	40.73%
BUS_0023	39.26%
BUS_0025	39.17%
BUS_0027	37.75%
BUS_0033	37.75%
ESKOM_S_S	34.87%
BUS_0004	33.62%
BUS_0096	33.62%
DAM	33.33%
_3_BUITENKANT_STR	31.58%
BUS_0093	30.82%
BUS_0098	28.95%
BUS_0099	20.78%
N149	18.91%
OLIVE_2	17.84%
DOVE	17.40%
N150	17.03%
JAN_NO2	16.51%
BUS_0044	15.47%
N153	15.15%
RHEBOK_3	14.58%
N155	13.96%
BUS_0127	13.52%
BUS_0091	13.52%
HOUTBAAI_2	13.23%
HOUTBAAI_4	13.13%
BUITENKANT_TRF	13.00%
N158	12.31%
N162	12.16%
BUS_0038	11.95%
N164	11.56%
N166	11.50%
JAN_NO1	11.30%
BUS_0100	11.30%
BUS_0099	11.13%
N169	10.78%
N173	10.78%
BUS_0048	9.12%
RHEBOK_4	8.82%
RHEBOK	7.92%
BUFFELSKLOOF	7.32%
BUS_0127	6.76%
BUS_0053	6.72%

DWARSWATER_1	6.63%
TRF_3	6.11%
DWARSWATER_2	6.04%
BUS_0004	5.71%
BUS_0054	5.62%
SAND_LANE_PUMP	5.58%
OLIFANT_1	5.56%
DWARSWATER_PUMP	5.45%
BUS_0064	5.26%
DWARSWATER_3	4.86%
OLIFANT_2	4.44%
TX_0002	4.39%
BUS_0067	4.29%
VAN_REENEN	4.27%
BUS_0068	4.19%
OLIFANT_OFFICE	4.13%
MCGREGOR_PADSTAL_KITCHEN	4.05%
N179	4.05%
NOLIFANT_HOUSE	3.98%
AUTORECLOSER	3.98%
BUS_0075	3.98%
FARMWAG_HOUSE	3.89%
FARMWAG_PUMP	3.74%
BUS_0133	3.63%
INA_NAUDE_PUMP	3.60%
TRF_2	3.51%
STEEGMAN_HOUSE	3.43%
MCGREGOR_WINES__ROODEZANDT__	3.30%
N175	3.30%
BUSHMAN_FARM	3.28%
BUSHMAN_PUMP	3.19%
CHURCH_STR	2.95%
McGREGOR	2.93%
MCGREGOR_WINES__ROODEZANDT__	2.84%
BUS_0134	2.80%
TRF_3	2.60%
DANIE	2.51%
N181	2.40%
_1_JACQUES	2.36%
_2_JACQUES	2.21%
BUSHMAN_FARMHOUSE_2	2.10%
NAUDE_1	2.10%
N184	1.80%
N155	1.79%
BUS_0054	1.64%
OFFICE_STR	1.64%
DW_POMP_1	1.62%

BUS_0023	1.47%
N192	1.46%
McGREGOR	1.46%
OLIFANT_DAN	1.42%
BUS_0027	1.42%
BUS_0093	1.32%
HOUTBAAI_5	1.28%
BUS_0133	1.24%
BUS_0093	1.19%
BUS_0038	1.18%
IAN	1.17%
BUS_0107	1.10%
BUS_0044	1.04%
BUS_0107	1.00%
VAN_REENS	0.94%
BUS_0048	0.90%
BUS_0053	0.90%
N164	0.90%
DW_LODGE	0.89%
RHEBOK_2	0.89%
BUS_0029	0.89%
BUS_0134	0.83%
OLIFANT_HOUSE	0.83%
PIKKIE_3	0.79%
BUSHMAN_FARMHOUSE_2	0.74%
N169	0.72%
N158	0.69%
BUS_0017	0.68%
PIKKIE_P3	0.64%
BUS_0116	0.61%
GALGEBERG_1	0.59%
HOUTBAAI_3	0.59%
DW_LODGE	0.59%
PIKKIE_P4	0.55%
OLIFANT_2	0.52%
BUS_0116	0.49%
DE_HOOK_2	0.45%
PIKKIE_P5	0.45%
N184	0.45%
WHIPE_2	0.44%
DE_ERF_1	0.42%
BUS_0003	0.41%
JACKSON	0.39%
BUS_0029	0.39%
FRANCE_1	0.39%
OLIFANT_5	0.38%
OLIFANT_HOUSE	0.32%

GALGEBERG_2	0.30%
TAKKAP	0.30%
BUS_0064	0.30%
JACKSON_PUMP_1	0.30%
SAND_LANE_1	0.30%
PIKKIE_9	0.30%
_1_VIRA_	0.30%
DE_ERF_2	0.30%
N1_WHIPE_STOCK_2	0.29%
PAKKIE_HOUSE	0.28%
OLIFANT_PUMP	0.23%
STEENBOKS_2	0.23%
BUS_0067	0.23%
DE_HOOK_2	0.22%
DE_HOOK_3	0.22%
TRF_1	0.21%
BUS_0017	0.15%
WHIPE_2	0.15%
N162	0.15%
OLIFANT_3	0.14%
PAKKIE_PUMP	0.14%
N149	0.14%
N150	0.14%
N153	0.14%
BUS_0068	0.10%
FRANCE_2	0.10%
STEENBOKS_VLAKKE	0.09%
BUS_0025	0.09%
N186	0.09%
AURET	0.07%
N166	0.06%
N186	0.04%
MCGREGOR_PADSTAL_KITCHEN	0.02%
OU_FARM_BAKSTENE	0.01%

LANGEBERG MUNICIPALITY

ELECTRICITY MASTERPLAN - MCGREGOR AREA OF SUPPLY

APPENDIX 19 – RECOMMENDED CAPITAL UPGRADES

Langeberg Municipality Electrical Engineering Services Infrastructure: Capital Projects - McGregor

Priority	Ward	Project Description As per masterplan	Budget 2022/23	Budget 2023/24	Budget 2024/25	Budget 2025/26	Budget 2026/27	Budget 2027/28	Budget 2028/29	Budget 2029/30	Budget 2030/31	Budget 2031/32	Project Total
1. CAPITAL PROJECTS													
1.1		Install 2nd 132/11 kV transformer, 132 kV switchgear and 11 kV switchgear Mc Gregor substation		R3,000,000.00	R4,000,000.00								R7,000,000.00
1.2		Upgrade Mc Gregor Boesmansrivier 11 kV line from Ghappie le Roux to Krugman Switching Point OD 15 - 6,2 km				R1,700,000.00							R1,700,000.00
1.3		Replacement of Prepaid Meters (PLC)											R0.00
1.4		Upgrade 11 kV line to the farm Uitvlugt Mc Gregor - 500 m			R150,000.00								R150,000.00
1.5		Replace existing street lights with LED street lights		R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00	R100,000.00		R800,000.00
													R0.00
2. MASTERPLAN RECOMMENDATIONS													R0.00
2.1		Transformer replacements		R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R300,000.00	R2,700,000.00
2.2		Upgrading of overhead line to Hare from McGregor Padstal Pump to McGregor Booster Transformer (1,08km)				R400,000.00							
		Total	R0.00	R3,400,000.00	R4,550,000.00	R2,500,000.00	R400,000.00	R400,000.00	R400,000.00	R400,000.00	R400,000.00	R300,000.00	R12,350,000.00

Notes

All amounts excl VAT