KAAP AGULHAS MUNISIPALITEIT
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REPORT

ON

MASTER PLAN FOR THE MV (11kV) DISTRIBUTION NETWORK AT NAPIER

REPORT NO: G/10264/E/R3

Dated: 30 JUNE 2017

Prepared by:
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CONSULTING MECHANICAL
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INDEX

1.0 INTODUCTION

This report has been compiled on the instruction of the Manager of the Electrical Department, Mr Steve Cooper, to prepare a master plan for the Medium Voltage (MV – 11kV) distribution network for Napier.

The purpose of the master plan can be summarised as follows:

1.1 To identify the network components which need to be augmented to address immediate problems and to cater for long term load growth, i.e. 20 years, and new developments.

1.2 To serve as a basis for any new construction work so that it can be carried-out in a planned and phased manner, thus minimizing any abortive work due to a lack of insight into the future requirements.

1.3 To cost and programme the augmentation work to form part of as business plan for the implementation thereof.

The report contains sufficient information for forward planning to cater for full development of presently serviced areas and known new developments, which together, will generate a total load in the order of 2,1 MVA over the next ten (10) years.

It must be pointed out that load growth patterns will change and it is recommended that the window for the technical issues related to the master plan not be longer than two (2) years, but for financial planning it can be made up to five (5) years.

This report focusses more on the financial rather than the technical issues, which are depicted in detail on the master plan drawings and have previously been discussed and agreed with the Manager of the Electrical Department.

2.0 BASIS OF REPORT

The report is based on the following:

(i) Information received from Mr Steve Cooper from the Municipality's Electrical Department and Mr Gerrit van Rooyen from Eskom during meetings and telephone conversations in 2017.
(ii) Drawings of the existing municipal MV Network.
(iii) Information received from the Municipality's Town Planning and Housing Departments regarding possible future developments in the area.

3.0 DRAWINGS

Reference should also be made to the following drawings, of which a copy of each is issued separately:

Existing Network

Drawing No. 10264/E3/01: - Napier: Existing MV (11kV) Plan Layout
Drawing No. 10264/E3/02: - Napier: Existing MV (11kV) Schematic Diagram

Master Plan Network

Drawing No. 10264/E3/03: - Napier: Master MV (11kV) Plan Layout
Drawing No. 10264E3/04: - Napier: Master MV (11kV) Schematic Diagram

The master plan drawings show the existing network in blue and the upgrading and extension measures required in red. This method has been adopted to avoid having to refer to two sets of drawings.

4.0 LOAD, DESIGN CRITERIA AND 20 YEAR GROWTH FORECAST

The load figures, i.e Town's peak kVA demand and the connected kVA load of the existing network (diversity factors ranging from 40% to 70% were used), and future load depicted on the master plan have been used to assess the loading in the various areas as a basis to evaluate the present and future capacity of the existing network components and to determine the upgrading and extension measures required.

The maximum voltage regulation is taken at ±2,5% in the MV networks, ±2,5% across distribution substations and ±7% across the LV network.

The Town's peak kVA demands over the last sixteen (16) years were obtained from Mr Steve Cooper, as measured at the Eskom Bulk Metering Point and included in Annexure A. This annexure also depicts the Town's load growth for the next twenty (20) years. Annexure B depicts a graph of a best fit exponential curve depicting the projected load growth.

The design of the system is based on the system being able to supply the full load demand in an area, or areas, after the loss of any one feeder while the voltage regulation remains within reasonable limits at the furthest point of the network. It is not considered necessary to base planning on the loss of more than one feeder at the same time.

It is to be noted that the proposed network improvement is a concept design only and should not be considered as a final detailed planning. It provides a concept to guide actual detail planning and also acts as a guide to such planning to ensure general compliance with the spirit of the overall network master plan, without dictating rigid adherence to the order of priority given. The development within an area may occur earlier or later than is presently envisaged requiring a re-allocation of the order of the work.

5.0 IMPACT OF RENEWABLES ON THE MASTER PLAN

Renewable energy is energy that is generated from natural processes that are continuously replenished. This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass. This energy cannot be exhausted and is constantly renewed. Since it is, however, not possible to exactly determine the extent of the afore-mentioned natural processes it has been decided not to take the impact of any renewable technologies in consideration in the electricity master planning for the town.

6.0 EXISTING NETWORK AND PROPOSED CHANGES

The layout and schematic diagram of the existing MV network are shown on Drawing No.'s 10264/E3/01and 10264/E3/02respectively.

6.1 Eskom Supply:

The supply is provided from a 66/11kV Eskom substation via an 11kV overhead radial line (no firm supply) and underground cable with capacities of 1,62MVA and 2,28MVA respectively to the main intake substation, i.e. "SS Hoof Substasie", situated on the Northern side of Napier.

The current notified maximum demand with Eskom is 1 800 kVA and the maximum actual kVA demand was measured in June 2014 at 1 618 kVA. From the graph under Annexure A it is clear that the load requirement from 2014 has dropped slightly.

The estimated maximum demand in the next 10 years is about 2,1 MVA, which means that the existing supply cable and overhead line will not be sufficient to cater for the expected load requirements. It is estimated that the town will reach its notified demand in 2020. It is very important that the short length of 16mm² Cu overhead line between the Eskom Substation and the town's Main Intake Substation be upgraded as depicted on the drawings as a matter of urgency.

Eskom, however, indicated that they will only be able to increase the Notified Demand of the town by 2021 after they have strengthen their 66kV network, or introduced a new 132kV/66kV substation to the area. It is therefore critical that demand side management systems be investigated, i.e. geaser control, etc. to ensure that the load requirement of the town be kept below 1,8 MVA as long as possible.

6.2 MV Feeders:

The existing main MV reticulation network consists mostly of bare overhead lines feeding from "SS Hoof Substasie". The lines are connected to a various number of ground mounted transformer substations and miniature substations forming part of a ring system and are predominantly Rabbit ACSR. Sections of 70mm² Cu underground cables are noted in the built-up areas, which also form part of the main network. The loads on the system conductors are well within the current capacities of the conductors, but additional overhead lines / underground cables and a load centre are required to ensure that all future erven are electrically supplied and existing transformer substations / miniature substations on a ring feed supply as further discussed below.

The existing minor feeders are mainly on the outskirts of town, are generally overhead radial lines consisting of Rabbit ACSR conductor and are taken from the afore-mentioned main MV reticulation network. These feeders needed to be extended to ensure that all existing transformer substations / miniature substations are on a ring feed supply.

CBD and Town Areas:

The CBD and Town Areas are presently fed by means of Rabbit ACSR & 70mm² ABC overhead lines/conductor and 70mm² Cu underground cables. We recommend that all radial feeds be connected to 70mm² Cu underground cables to ensure that all transformer substations and miniature substations are connected to a ring feed supply.

The Industrial Area:

The Industrial Area is presently fed by a radial Rabbit ACSR overhead line. The connected load to the area is only 275kVA and since the average down time to repair an overhead line fault is so short, immediate upgrading measures to this area is not required. An overhead line has, however, been indicated on the master plan to be installed in future to link the Industrial Area directly to the main intake substation and to provide a ring feed supply to the area.

Townships

The townships are fed by overhead lines. It is recommended that all radial lines are connected to the main network via 70mm² Cu underground cables to ensure that all transformer substations are connected to a ring feed supply.

6.3 Substations:

A number of ground mounted transformer substations, which are fed from overhead lines via radial underground cables, must be replaced with miniature substations equipped with ring main units as depicted on the master plan drawings. Provision has been made for additional miniature substations within the urban edge to cater for the future load and to ensure that the voltage regulation on the LV networks is within the allowable limits.

Provision has been made for ring main units on the main network as depicted on the drawings which will increase the switching possibilities of said network.

Currently there is not a power factor correction capacitor bank in the main intake substation, i.e. “SS Hoof Substasie”, and we propose that this matter be further investigated to determine if there will be a financial benefit to the Municipality by installing same.

From our inspection it was noted that some of the ring main units were wrongly labeled. We propose that all switchgear and equipment be labeled according to the drawings.

6.4 Condition:

There is quite a number of switchgear at the aforementioned substations and pole mounted transformers which are very old, i.e. 30 years and older. Regular inspections and tests are needed to ensure that all components are working safely.

The following equipment was highlighted during the survey that needs attention: (Note that this equipment is not highlighted on the drawings)

(a) Ground Mounted Transformer Substation: “GMT Jubeleum”.
(b) Pole Mounted Transformer Substations (PMT’s): “PMT Industria”, “PMT Wynkelder”, “PMT Jobstraat 2”, “PMT Patafees”, “PMT Begrafnisondernemers”.
(c) Miniature Substation at: “MS-Karee Straat”, “MS-Reservoir”.

7.0 **UPGRADING OF THE MV NETWORK**

In order to overcome the immediate and ten year load growth problems, the systematic strengthening of the internal reticulation system is recommended. An ongoing commitment to regular maintenance is also a pre-requisite to the provision of a quality supply to the town’s consumers.

The immediate urgent elements which must be attended to:

(a) Upgrade 11kV Overhead Line between Eskom Substation and SS Hoof Substasie.
(b) Ensure that all transformer substations and miniature substations are connected to a ring feed supply.
(c) Replace ground mounted transformer substations with miniature substations, equipped with ring main units.
(d) Commence / proceed with a maintenance programme.

The vision for the town in future is a ring main overhead / underground line / cable system which connects “SS Hoof Substasie” with all the existing & future miniature substations, and pole mounted transformer substations.

The proposed improvements and extensions have been divided into three phases. Phase 1 covers the most urgent work which should be carried out within the period from present (2018) to 2019, followed by Phase 2 and Phase 3 each of four year work periods, i.e. 2020 to 2023 and 2024 to 2027. Phase 3 encompasses some items of work for which it is not practical to set a time period, as certain items may be required at any time between 2020 to 2027, depending on the rate of development.

7.1 Phase 1 - (2018 to 2019):

7.1.1 MS Sarel Cilliers: Ensure that miniature substation “MS Sarel Cilliers” is on a ring feed supply by installing the two ring main units, i.e. “RMU Sarel Cilliers” & “RMU Sarel Cilliers 2”, including the 70mm² Cu underground cable between the latter two ring main units.

7.1.2 General: Inspect and test equipment mentioned under Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.

7.2 Phase 2 - 2020 to 2023:

7.2.1 MS Hertzog: Replace ground mounted transformer substation, “MS Hertzog”, with a miniature substation, incl, ring main unit and install “RMU Hertzog”.

7.2.2 PMT Job Straat: Ensure that “PMT Job Straat 1”, PMT Job Straat 2”, “PMT Plakkerskamp” and “MS Hertzog” is on a ring feed supply by installing a 70mm² Cu underground cable and Rabbit ACSR overhead line between pole mounted transformer substations “PMT Job Straat” and “PMT Plakkerskamp”. Install “RMU Pakkerskamp”.

7.2.3 MS Erica: Ensure that miniature substation “MS Erica” is on a ring feed supply by installing ring main unit “RMU Karee”, including the 35mm² Cu underground cable between the latter ring main unit and “MS Erica”. Replace “MS Erica” with a new miniature substation.

7.2.4 MS Ou Skool: Ensure that miniature substation “MS Ou Skool” is on a ring feed supply by installing the 70mm² Cu underground cable between the latter miniature substation and the overhead line as depicted on the drawings.

7.2.5 General: Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.

7.3 Phase 3 - (2024 to 2027):

7.3.1 MS October: Replace ground mounted transformer substation, “MS October”, with a miniature substation, incl, ring main unit.

7.3.2 MS Kort Str : Ensure that miniature substation “MS Kort Str” is on a ring feed supply by installing the 70mm² Cu underground cable between the latter miniature substation and ring main unit “RMU Sarel Cilliers”. Install ring main unit “RMU D”.

7.3.3 SS Hoof Substasie: Install a circuit breaker inside “SS Hoof Substasie” to supply the CBD.

7.3.4 MS Grobbelaar: Install “MS Grobbelaar” to better the LV voltage regulation in the area.

7.3.5 MS New Union: Install “MS New Union” to better the LV voltage regulation in the area, including the installation of an underground 70mm² Cu underground cable between the latter miniature substation and ‘MS Kort Str”.

7.3.6 General: Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.

Note that the new infrastructure required for new developments, i.e. the proposed low cost housing development on the south western side of town, or any other smaller developments in town, have not been priced, since it has been assumed that said infrastructure will be financed by the respective developers. Some of the miniature substations in town and the extensions of the infrastructure to the eastern side of town have not been priced since it has been assumed that same will only be implemented after 2027.

8.0 PROPOSED CHANGES TOGETHER WITH COST ESTIMATES

The proposed upgrading and extensions to the MV network, together with the cost estimates & proposed order of priority, is given hereafter.

It is to be noted that the cost estimates exclude VAT, escalation and planning fees. Escalation can be added at approximately 1,25% per month. The cost estimates are order of magnitude values and must be refined the year before implementation after a more detailed design has been carried-out.

8.1 Phase 1 - (2018 to 2019):

8.1.1	MS Sarel Cilliers: Ensure that miniature substation “MS Sarel Cilliers” is on a ring feed supply by installing the two ring main units, i.e. “RMU Sarel Cilliers” & “RMU Sarel Cilliers 2”, including the 70mm² Cu underground cable between the latter two ring main units.	R1,8 mil	
8.1.2	General: Inspect and test equipment mentioned under Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.	R0,6 mil	R2,4 mil

8.2 Phase 2 - 2020 to 2023:

8.2.1	MS Hertzog: Replace ground mounted transformer substation, “MS Hertzog”, with a miniature substation, incl, ring main unit and install “RMU Hertzog”.	R 1 mil	
8.2.2	MS Kort Str : Ensure that miniature substation “MS Kort Str” is on a ring feed supply by installing the 70mm² Cu underground cable between the latter miniature substation and ring main unit “RMU Sarel Cilliers”. Install ring main unit “RMU D”.	R2,132 mil	

8.2.3	MS Erica: Ensure that miniature substation "MS Erica" is on a ring feed supply by installing ring main unit "RMU Karee", including the 35mm² Cu underground cable between the latter ring main unit and "MS Erica". Replace "MS Erica" with a new miniature substation.	R1,219 mil	
8.2.4	MS Ou Skool: Ensure that miniature substation "MS Ou Skool" is on a ring feed supply by installing the 70mm² Cu underground cable between the latter miniature substation and the overhead line as depicted on the drawings.	R0,240 mil	
8.2.5	General: Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.	R0,600 mil	R5,191 mil

8.3 Phase 3 – (2024 to 2027):

8.3.1	MS October: Replace ground mounted transformer substation, "MS October", with a miniature substation, incl, ring main unit.	R0,660 mil	
8.3.2	PMT Job Straat: Ensure that "PMT Job Straat 1", PMT Job Straat 2", "PMT Plakkerskamp" and "MS Hertzog" is on a ring feed supply by installing a 70mm² Cu underground cable and Rabbit ACSR overhead line between pole mounted transformer substations "PMT Job Straat" and "PMT Plakkerskamp". Install "RMU Pakkerskamp".	R0,920 mil	
8.3.3	SS Hoof Substasie: Install a circuit breaker inside "SS Hoof Substasie" to supply the CBD.	R0,480 mil	
8.3.4	MS Grobbelaar: Install "MS Grobbelaar" to better the LV voltage regulation in the area.	R0,600 mil	
8.3.5	MS New Union: Install "MS New Union" to better the LV voltage regulation in the area, including the installation of an underground 70mm² Cu underground cable between the latter miniature substation and 'MS Kort Str".	R0,830 mil	
8.3.6	General: Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.	R0,600 mil	R4,090 mil
	Total, excl. VAT		R11,681 mil

9.0 **FUNDING**

It is only viable to implement the capital expenditure proposed under Clause 7.0 if suitable income sources can be found to fund such expenditure. These income sources can be as follows:

(i) A portion of the income from the sales of electricity to fund External Loans.

(ii) Contribution by developers in the form of:

(a) Augmentation Levies that will become Internal Funds.
(b) Direct payments for the supply and installation of external or main MV network components necessary to supply specific new developments.

(iii) Grants from example the Department of Energy (DoE) for the electrification of sub-economy housing, schools, etc, and MIG funding from Provincial Government for mainly streetlighting projects.

It is recognised that in the case of External Loans, although it could be financially justified and increased year by year in relation to the increased income from electricity sales, there are other considerations in terms of the Municipality's overall budget, the availability of loans, etc, that finally determines the value thereof. The income from this source should therefore be determined by the Municipality's treasury department in consultation with the electrical department.

10.0 **CONCLUSION**

It is recommended that adequate financial provision be made in the budgets for ongoing upgrading to the network as set out above. We would recommend that at least R 900 000-00 to R 1 200 000-00 per year be budgeted for upgrading of the network.

It is believed that the terms of reference have been covered, but we hold ourselves available if clarification is required on any of the items or points raised within this report, and to possibly assist with the discussions with the treasury department to determine the allocation of the expenditure in terms of the Municipality's overall budget.

11.0 **ACKNOWLEDGEMENT**

The assistance of Mr Steve Cooper is gratefully acknowledged and we would like to thank the Municipality for entrusting this commission to us.

We present our report for your consideration and await your further instructions.

J.S. de Villiers Pr Tech Eng
CLINKSCALES MAUGHAN-BROWN

June 2017

ANNEXURE A

LOAD FIGURES

SCHEDULE A

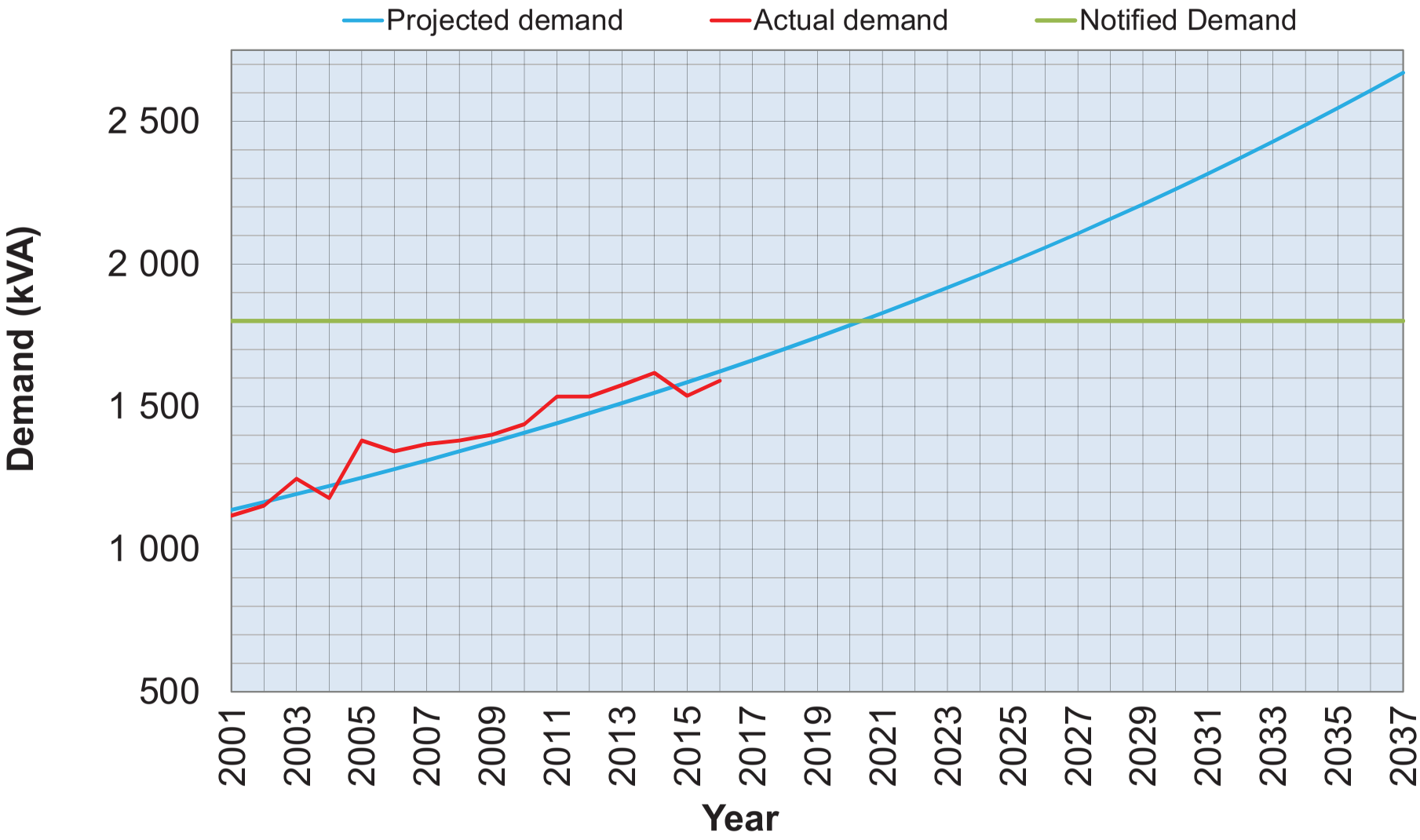
NAPIER'S PEAK DEMAND (kVA) SINCE 2001 AND PROJECTED LOAD GROWTH FOR THE NEXT 20 YEARS

Year	Actual Peak kVA	Actual % Growth	Approx Projected Peak kVA
2001	1 118		
2002	1 153	3,13	
2003	1 247	8,15	
2004	1 179	-5,45	
2005	1 381	17,13	
2006	1 343	-2,75	
2007	1 369	1,94	
2008	1 381	0,88	
2009	1 401	1,45	
2010	1 438	2,64	
2011	1 535	6,75	
2012	1 535	0,00	
2013	1 576	2,67	
2014	1 618	2,66	
2015	1 538	-4,94	
2016	1 591	3,45	
2017			1 662
2018			1 702
2019			1 743
2020			1 785
2021			1 828
2022			1 872
2023			1 916
2024			1 962
2025			2 010
2026			2 058
2027			2 107
2028			2 158
2029			2 209
2030			2 262
2031			2 317
2032			2 372
2033			2 429
2034			2 487
2035			2 547
2036			2 608
2037			2 671

ANNEXURE B

PROJECTED GROWTH GRAPH

Napier:
Projected Load Growth



ANNEXURE C

DRAWINGS


PMT KLEINHOEWE 1
50kVA
PMT KLEINHOEWE 2
25kVA
PMT KLEINHOEWE 3
25kVA
PMT KLEINHOEWES 4
25kVA
PMT WYNKELDER
50kVA
PMT RIOOLWERKE
200kVA
PMT INDUSTRIA
100kVA
ESKOM SUBSTATION
MS VICTORIA
160kVA
SS HOOF SUBSTASIE
315kVA
MS B.N.K.
200kVA
MS KLINIEK
500kVA
GMT MONSANTO
500kVA
PMT JOBSTRAAT 1
160kVA
MS SAREL CILLIERS
500kVA
MS HERTZOG
200kVA
MS KORT STR
800kVA
MS KAREE STR
200kVA
PMT JOBSTRAAT 2
100kVA
MS OCTOBER
315kVA
PMT PLAKKIERSKAMP
200kVA
MS NEPENG
200kVA
MS OU SKOOL
315kVA
MS ROLBAL
500kVA
MS SMARTIE TOWN 2
315kVA
MS SMARTIE TOWN 1
500kVA
GMT JUBELEUM
100kVA
PMT PATATFEES
50kVA
PMT BEGRAFNIS ONDERNEMERS
160kVA
MS RESERVOIR
150kVA
16C*3 INTERDAC OPERATED AT 3.3kV
GMT WATERWERKE 16 STEP-DOWN
25kVA
GMT WATERWERKE STEP-DOWN
50kVA
GMT WATERWERKE STEP-UP
50kVA
RABBIT*3
HARE*3
70C*3P
35C*3P
25C*3
35ABC

LEGEND

REFER TO DRAWING NO. S/E/2 - STANDARD GRAPHICAL SYMBOLS FOR ELECTRICAL RETICULATION SYSTEMS

- EXISTING MV OVERHEAD LINE

95C*3 **MV OVERHEAD LINE SIZE**
- NO PHASE CONDUCTORS
- C - COPPER
- A - ALUMINIUM
- PHASE CONDUCTOR SIZE IN mm²

- EXISTING MV CABLE

120C*3P **MV CABLE SIZES**
- P - PILCA
- X - XLPE
- NO. OF CORES
- C - COPPER
- A - ALUMINIUM
- CONDUCTOR SIZE IN mm²

- SUBSTATION IN BUILDING ("SS") / SWITCHING STATION IN BUILDING ("S/S")
- MINIATURE SUBSTATION ("MS")
- POLE MOUNTED TRANSFORMER ("PMT")
- GROUND MOUNTED TRANSFORMER ("GMT") / MINIATURE SUBSTATION WITHOUT RING MAIN UNIT
- RING MAIN UNIT ("RMU")
- START/END OF OVERHEAD LINE
- FUSE

"RMU" RING MAIN UNIT

"SS" SWITCHING STATION

"O/H" OVERHEAD LINE

NOTE

REFER TO DRAWING NO. 10264/E3/02 FOR EXISTING MV (22 & 11kV) SCHEMATIC DIAGRAM.

No.	DATE	DRAWN	DESCRIPTION

REVISIONS

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ELECTRICAL RETICULATION

CLIENT

CAPE AGULHAS MUNICIPALITY

cmb

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CLINKSCALES MAUGHAN-BROWN (PTY) LTD (2003/010026/07)

CESA

PROJECT

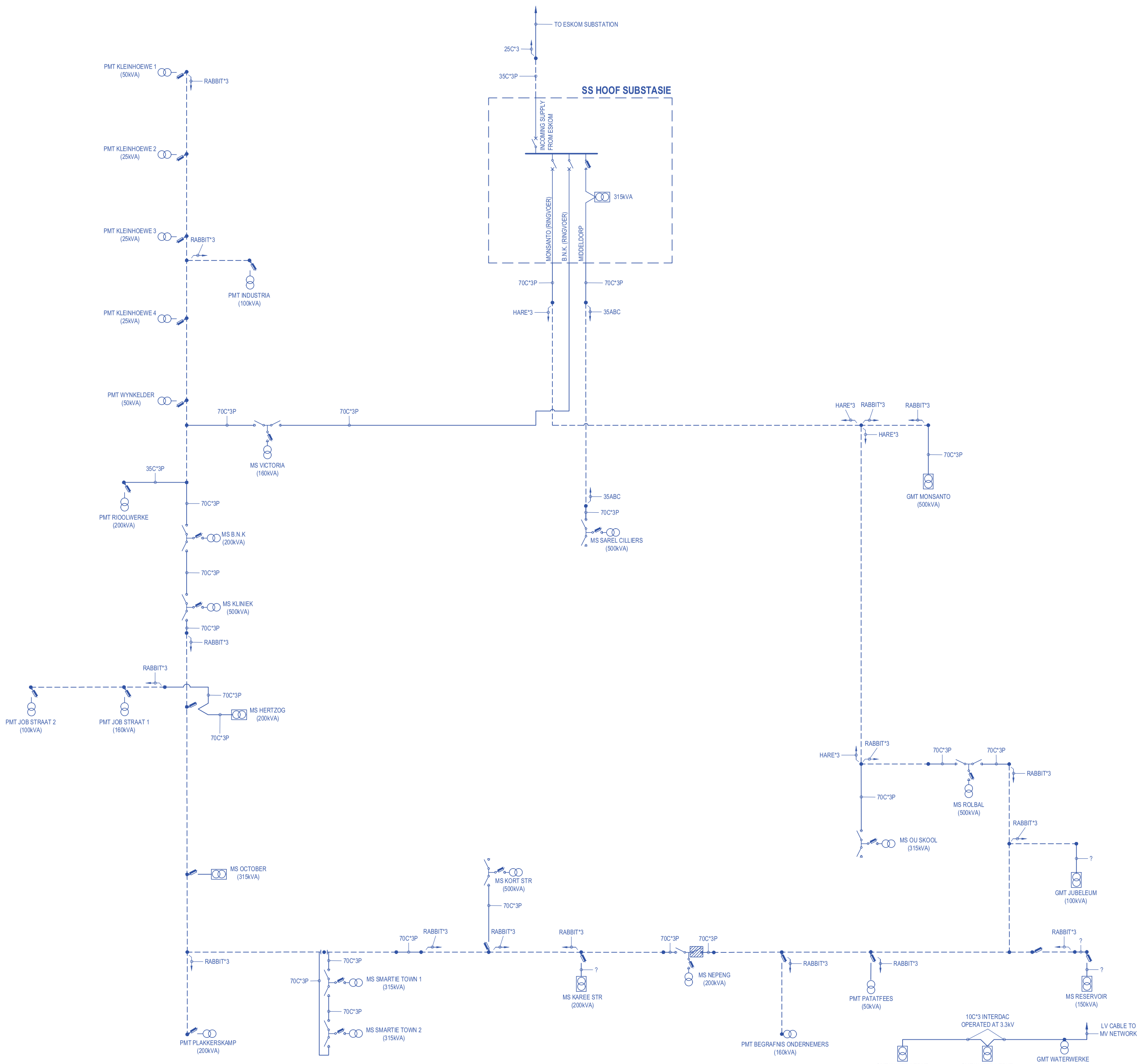
CAPE AGULHAS MUNICIPALITY MASTER MV (11kV) RETICULATION

DRAWING TITLE

NAPIER: EXISTING MV (11kV) PLAN LAYOUT

DRAWN	DESIGNED	CHECKED	APPROVED
MvM	JdV		
SCALE	**DATE**	**CAD REF No.**	**DWG-SIZE**
1:5000	2017-06-30	10264-E3-01	A0

DRAWING NO	REVISION
10264/E3/01	



TO ESKOM SUBSTATION
25C*3
35C*3P
SS HOOF SUBSTASIE
INCOMING SUPPLY FROM ESKOM
315kVA
MONSANTO (RINGVOER)
B.N.K. (RINGVOER)
MIDDELDORP
70C*3P
HARE*3
35ABC
PMT KLEINHOEWE 1 (50kVA)
RABBIT*3
PMT KLEINHOEWE 2 (25kVA)
PMT KLEINHOEWE 3 (25kVA)
PMT INDUSTRIA (100kVA)
PMT KLEINHOEWE 4 (25kVA)
PMT WYNKELDER (50kVA)
MS VICTORIA (160kVA)
35C*3P
PMT RIOOLWERKE (200kVA)
MS B.N.K (200kVA)
MS KLINIEK (500kVA)
MS SAREL CILLIERS (500kVA)
PMT JOB STRAAT 2 (100kVA)
PMT JOB STRAAT 1 (160kVA)
MS HERTZOG (200kVA)
MS OCTOBER (315kVA)
PMT PLAKKERSKAMP (200kVA)
MS SMARTIE TOWN 1 (315kVA)
MS SMARTIE TOWN 2 (315kVA)
MS KORT STR (500kVA)
MS KAREE STR (200kVA)
MS NEPENG (200kVA)
PMT BEGRAFNIS ONDERNEMERS (160kVA)
PMT PATATFEES (50kVA)
MS RESERVOIR (150kVA)
GMT MONSANTO (500kVA)
MS ROLBAL (500kVA)
MS OU SKOOL (315kVA)
GMT JUBELEUM (100kVA)
10C*3 INTERDAC OPERATED AT 3.3kV
GMT WATERWERKE 16 STEP-DOWN (25kVA)
GMT WATERWERKE STEP-DOWN (50kVA)
GMT WATERWERKE STEP-UP (50kVA)
LV CABLE TO MV NETWORK

LEGEND

REFER TO DRAWING NO. S/E/2 - STANDARD GRAPHICAL SYMBOLS FOR ELECTRICAL RETICULATION SYSTEMS

- EXISTING MV OVERHEAD LINE

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- MINIATURE SUBSTATION WITH RMU ("MS")
- RING MAIN UNIT ("RMU")
- MINIATURE SUBSTATION WITHOUT RMU ("MS") / GROUND MOUNTED TRANSFORMER ("GMT")
- POLE MOUNTED TRANSFORMER ("PMT")
- START/END OF OVERHEAD LINE
- FUSE SWITCH
- CIRCUIT BREAKER
- ISOLATOR
- LINK
- OPEN POINT
- "SS" SWITCHING STATION
- "O/H" OVERHEAD LINE

NOTE

REFER TO DRAWING NO. 10264/E3/01 FOR EXISTING MV (11kV) PLAN LAYOUT.

No.	DATE	DRAWN	DESCRIPTION

REVISIONS

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ELECTRICAL RETICULATION

CLIENT

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PORT ELIZABETH EAST LONDON · GEORGE · CAPE TOWN WINDHOEK

PROJECT

CAPE AGULHAS MUNICIPALITY MASTER MV (11kV) RETICULATION

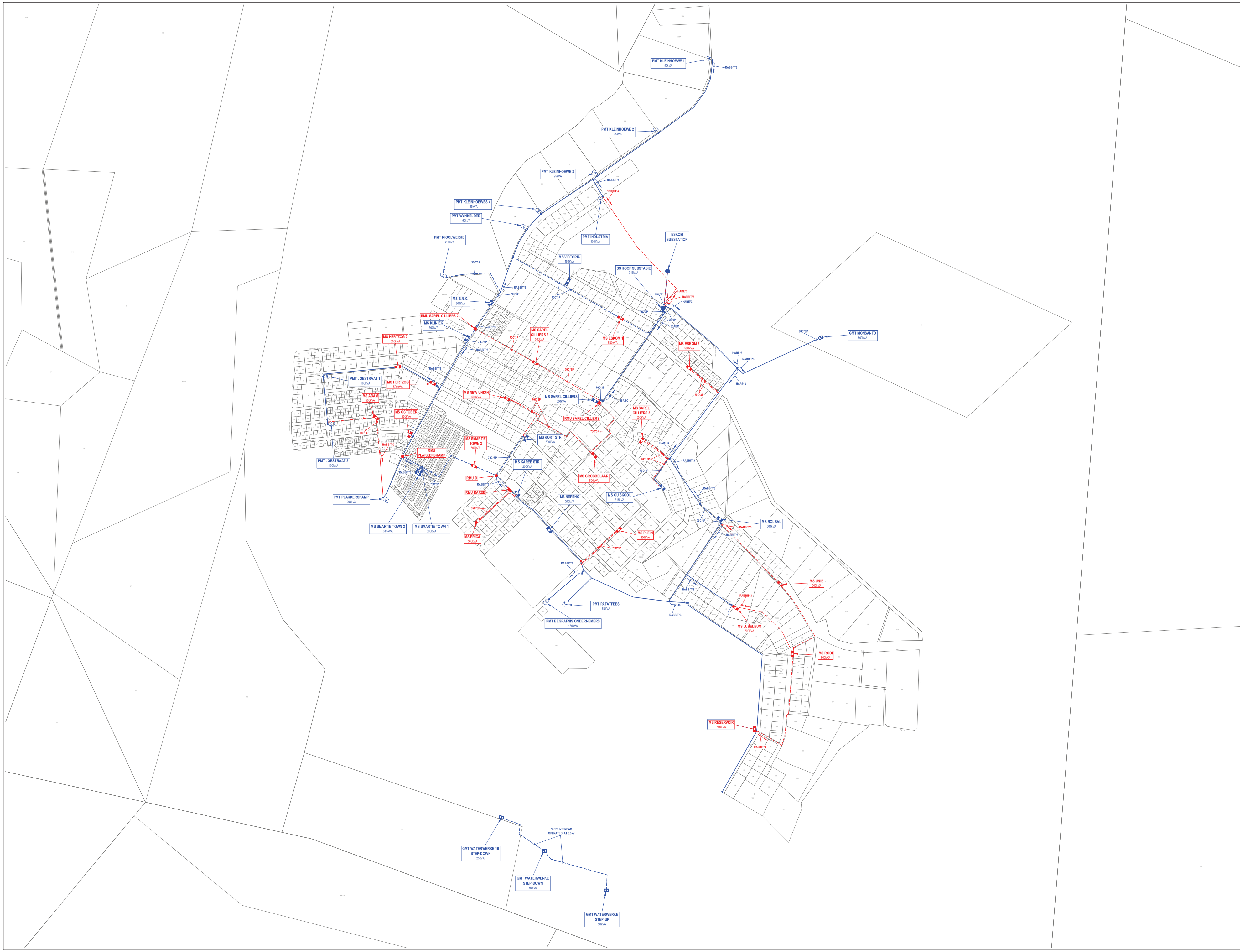
DRAWING TITLE

NAPIER: EXISTING MV (11kV) SCHEMATIC DIAGRAM

DRAWN	DESIGNED	CHECKED	APPROVED
MvM	JdV	JdV	

SCALE	DATE	CAD REF No.	DWG-SIZE
N.T.S.	30/06/2017	10264-DIAG	A1

DRAWING NO **10264/E3/02** REVISION


PMT KLEINHOEWE 1
PMT KLEINHOEWE 2
PMT KLEINHOEWE 3
PMT KLEINHOEWES 4
PMT WYNKELDER
PMT RIOOLWERKE
PMT INDUSTRIA
ESKOM SUBSTATION
MS VICTORIA
SS HOOF SUBSTASIE
GMT MONSANTO
MS B.N.K.
RMU SAREL CILLIERS 2
MS KLINIEK
MS HERTZOG 2
MS SAREL CILLIERS 2
MS ESKOM 1
MS ESKOM 2
PMT JOBSTRAAT 1
MS HERTZOG
MS ADAM
MS NEW UNION
MS SAREL CILLIERS
RMU SAREL CILLIERS
MS SAREL CILLIERS 3
MS OCTOBER
MS SMARTIE TOWN 3
MS KORT STR
RMU PLAKKERSKAMP
PMT JOBSTRAAT 2
MS KAREE STR
MS GROBBELAAR
RMU KAREE
MS NEPENG
MS OU SKOOL
PMT PLAKKERSKAMP
MS SMARTIE TOWN 2
MS SMARTIE TOWN 1
MS ERICA
MS PLEIN
MS ROLBAL
MS UNIE
PMT PATATFEES
PMT BEGRAFNIS ONDERNEMERS
MS JUBILEUM
MS ROOI
MS RESERVOIR
GMT WATERWERKE 16 STEP-DOWN
GMT WATERWERKE STEP-DOWN
GMT WATERWERKE STEP-UP

LEGEND

REFER TO DRAWING NO. S/E/2 - STANDARD GRAPHICAL SYMBOLS FOR ELECTRICAL RETICULATION SYSTEMS

EXISTING MV OVERHEAD LINE

95C*3

MV OVERHEAD LINE SIZE
- NO PHASE CONDUCTORS
- C - COPPER
- A - ALUMINIUM
- PHASE CONDUCTOR SIZE IN mm²

EXISTING MV CABLE

120C*3P

MV CABLE SIZES
- P - PILCA
- X - XLPE
- NO. OF CORES
- C - COPPER
- A - ALUMINIUM
- CONDUCTOR SIZE IN mm²

11kV OVERHEAD LINE

11kV UNDERGROUND CABLE

EXISTING	PROPOSED	
		SUBSTATION IN BUILDING ("SS") / SWITCHING STATION IN BUILDING ("S/S")
		MINIATURE SUBSTATION ("MS")
		POLE MOUNTED TRANSFORMER ("PMT")
		GROUND MOUNTED TRANSFORMER ("GMT")
		RING MAIN UNIT ("RMU")
		START/END OF OVERHEAD LINE
		FUSE

"RMU" RING MAIN UNIT

"SS" SWITCHING STATION

"O/H" OVERHEAD LINE

NOTE

REFER TO DRAWING NO. 10264/E3/04 FOR MASTER MV (11kV) SCHEMATIC DIAGRAM.

No.	DATE	DRAWN	DESCRIPTION

REVISIONS

THIS DRAWING IS TO BE USED FOR THE ENGINEERING SERVICE DEPICTED ONLY.

ELECTRICAL RETICULATION

CLIENT

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CLINKSCALES MAUGHAN-BROWN
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS

PORT ELIZABETH
EAST LONDON
GEORGE
CAPE TOWN
WINDHOEK

CLINKSCALES MAUGHAN-BROWN (PTY) LTD (2003/010026/07)

CESA

PROJECT

CAPE AGULHAS MUNICIPALITY
MASTER MV (11kV) RETICULATION

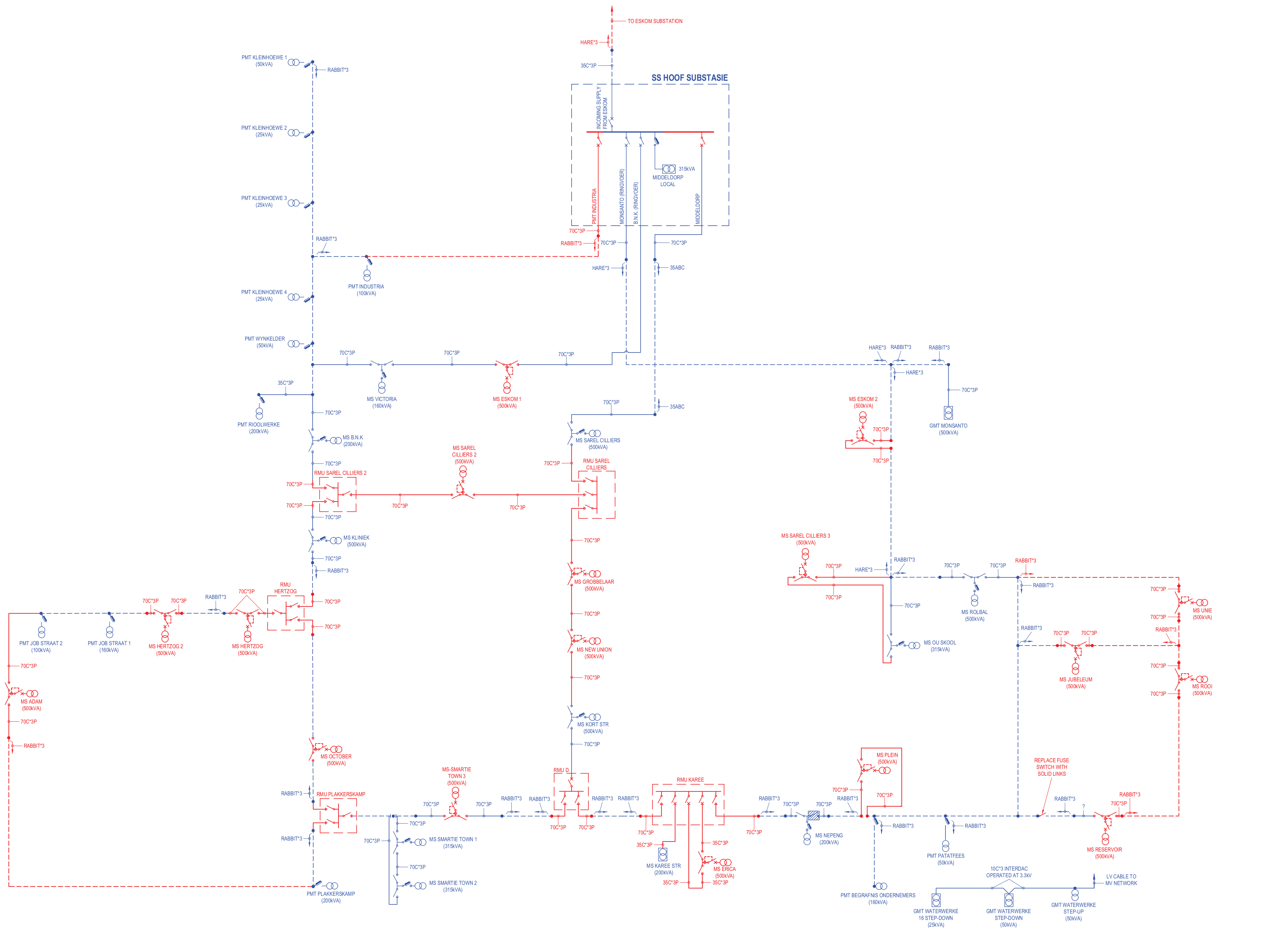
DRAWING TITLE

NAPIER: MASTER MV (11kV) PLAN LAYOUT

DRAWN	DESIGNED	CHECKED	APPROVED
MvM	JdV		

SCALE	DATE	CAD REF No.	DWG-SIZE
1:5000	2017-06-30	10264-E3-03	A0

DRAWING NO	REVISION
10264/E3/03	


TO ESKOM SUBSTATION
HARE*3
35C*3P
SS HOOF SUBSTASIE
INCOMING SUPPLY FROM ESKOM
315kVA
MIDDELDORP LOCAL
PMT INDUSTRIA
MONSANTO (RINGVOER)
B.N.K. (RINGVOER)
MIDDELDORP
35ABC
PMT KLEINHOEWE 1 (50kVA)
PMT KLEINHOEWE 2 (25kVA)
PMT KLEINHOEWE 3 (25kVA)
PMT INDUSTRIA (100kVA)
PMT KLEINHOEWE 4 (25kVA)
PMT WYNKELDER (50kVA)
MS VICTORIA (160kVA)
MS ESKOM 1 (500kVA)
PMT RIOOLWERKE (200kVA)
MS B.N.K (200kVA)
MS SAREL CILLIERS 2 (500kVA)
RMU SAREL CILLIERS 2
MS SAREL CILLIERS (500kVA)
RMU SAREL CILLIERS
MS KLINIEK (500kVA)
MS GROBBELAAR (500kVA)
RMU HERTZOG
MS HERTZOG (500kVA)
MS HERTZOG 2 (500kVA)
PMT JOB STRAAT 2 (100kVA)
PMT JOB STRAAT 1 (160kVA)
MS ADAM (500kVA)
MS NEW UNION (500kVA)
MS KORT STR (500kVA)
MS OCTOBER (500kVA)
MS-SMARTIE TOWN 3 (500kVA)
RMU PLAKKERSKAMP
PMT PLAKKERSKAMP (200kVA)
MS SMARTIE TOWN 1 (315kVA)
MS SMARTIE TOWN 2 (315kVA)
RMU D
RMU KAREE
MS KAREE STR (200kVA)
MS ERICA (500kVA)
MS NEPENG (200kVA)
MS PLEIN (500kVA)
PMT BEGRAFNIS ONDERNEMERS (160kVA)
PMT PATATFEES (50kVA)
GMT WATERWERKE 16 STEP-DOWN (25kVA)
10C*3 INTERDAC OPERATED AT 3.3kV
GMT WATERWERKE STEP-DOWN (50kVA)
GMT WATERWERKE STEP-UP (50kVA)
LV CABLE TO MV NETWORK
MS RESERVOIR (500kVA)
REPLACE FUSE SWITCH WITH SOLID LINKS
MS JUBELEUM (500kVA)
MS UNIE (500kVA)
MS ROOI (500kVA)
MS SAREL CILLIERS 3 (500kVA)
MS ROLBAL (500kVA)
MS OU SKOOL (315kVA)
MS ESKOM 2 (500kVA)
GMT MONSANTO (500kVA)
70C*3P
RABBIT*3
HARE*3

LEGEND

REFER TO DRAWING NO. S/E/2 - STANDARD GRAPHICAL SYMBOLS FOR ELECTRICAL RETICULATION SYSTEMS

- NEW MV OVERHEAD LINE

95C*3

MV OVERHEAD LINE SIZE
- NO PHASE CONDUCTORS
- C - COPPER
- A - ALUMINIUM
- PHASE CONDUCTOR SIZE IN mm²

- NEW MV CABLE

120C*3P

MV CABLE SIZES
- P - PILCA
- X - XLPE
- NO. OF CORES
- C - COPPER
- A - ALUMINIUM
- CONDUCTOR SIZE IN mm²

EXISTING	PROPOSED	
		MINIATURE SUBSTATION WITH RMU ("MS")
		MINIATURE SUBSTATION WITHOUT RMU ("MS") / GROUND MOUNTED TRANSFORMER ("GMT")
		POLE MOUNTED TRANSFORMER ("PMT")
		START/END OF OVERHEAD LINE
		FUSE SWITCH
		CIRCUIT BREAKER
		ISOLATOR
		LINK
		OPEN POINT

RING MAIN UNIT ("RMU")

"RMU" RING MAIN UNIT

"SS" SWITCHING STATION

"O/H" OVERHEAD LINE

NOTE

REFER TO DRAWING NO. 10264/E3/03 LAYOUTS FOR MASTER MV (11kV) PLAN LAYOUT.

No.	DATE	DRAWN	DESCRIPTION

REVISIONS

ELECTRICAL RETICULATION

CLIENT
CAPE AGULHAS MUNICIPALITY

CLINKSCALES MAUGHAN-BROWN
CONSULTING MECHANICAL & ELECTRICAL ENGINEERS
PORT ELIZABETH / EAST LONDON / GEORGE / CAPE TOWN / WINDHOEK

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NAPIER: MASTER MV (11kV) SCHEMATIC DIAGRAM

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REVISION