



KAAP AGULHAS MUNISIPALITEIT  
CAPE AGULHAS MUNICIPALITY  
U MASIPALA WASECAPE AGULHAS

## REPORT

ON

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

REPORT NO: G/10264/E/R1

Dated: 30 JUNE 2017

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CONSULTING MECHANICAL  
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## 1.0 **INTRODUCTION**

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 Bredasdorp.

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 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 a 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 14,9 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/E1/01: - Bredasdorp: Existing MV (11kV) Plan Layout  
Drawing No. 10264/E1/02: - Bredasdorp: Existing MV (11kV) Schematic Diagram

### Master Plan Network

- Drawing No. 10264/E1/03: - Bredasdorp: Master MV (11kV) Plan Layout  
Drawing No. 10264/E1/04: - Bredasdorp: 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 55% 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  $\pm 2,5\%$  in the MV networks,  $\pm 2,5\%$  across distribution substations and  $\pm 7\%$  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. Appendix 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 farthest 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/E1/01 and 10264/E1/02 respectively.

##### 6.1 Eskom Supply:

The supply is provided from a 66/11kV Eskom substation via two 11kV, 300mm<sup>2</sup> Cu x 3 core underground cables with a total capacity of 15,62 MVA, i.e. 7,81MVA firm supply at Nooitgedacht Substation, situated on the northern side of Bredasdorp.

The current notified maximum demand with Eskom is 11 000 kVA and the maximum actual kVA demand was measured in May 2011 at 10 735 kVA. The load requirement has, however, decreased from May 2011 to 9 499kVA in 2012 and has since then increase slightly to a maximum in 2016 of 10 144kVA.

It is expected that the load requirement of the town will reach the Notified Demand of 11 MVA by 2018. Eskom, however, indicated that they will only be able to increase the Notified Demand of the town by 2021 with 1MVA after they have strengthen their 66kV network, or introduce a new 132kV/66kV substation to the area. It is therefore critical that demand side management systems be investigated, i.e. geyser control, etc. to ensure that the load requirement of the town be kept below 11MVA as long as possible.

To ensure a firm supply of 14,9 MVA (expected load requirement towards 2027) to town, the Municipality needs to install an additional, 11kV, 300mm<sup>2</sup> Cu x 3 core underground cable.

Should the Municipality, however, decides that a firm supply to town is not a priority then the town's load requirement to the end of the ten (10) year period must be closely monitored to determine if a third overhead MV supply line will be required.

## 6.2 MV Feeders:

The existing main MV reticulation network consists of bare / ABC overhead lines and underground cable feeders feeding from "Nooitgedacht Substation". The cables are connected to a various number of brick built switching stations and ring main units forming part of a major ring system. The loads on the system conductors are generally within the current capacities of the conductors, but upgrading measures on some cables, switching stations and an additional load center, are required to accommodate the expected load growth in Bredasdorp and to ensure ring feed supplies to all the end users as further discussed below.

The following upgrading measures are proposed:

- (i) Upgrading measures to the main feeders are required in the CBD area. A 95mm<sup>2</sup> Cu underground cable is shown on the drawings from "SS Bredasdorp Sub 1" to "MS PNP" to strengthen the main ring in the CBD.
- (ii) A dedicated Hare ACSR overhead line is proposed from "SS Bredasdorp Sub 1" to "SS Sub" This arrangement will strengthen the supply capacity and switching possibilities at "SS Sub"
- (iii) The Hare ACSR overhead line from "PMT Diepkloof" has been extended to load centre "SS Sub" to provide an additional supply to the latter substation. This arrangement will increase the supply capacity and switching possibilities as mentioned under item (ii) above. It is further advised that the Rabbit ACSR overhead line between "PMT Lae Druk Pompe" and "Sub 12" be replaced with Hare ACSR conductor.
- (iv) The upgrading of the short lengths of underground cable between "R&B Kalkwerke Sub", through the Industrial Area and low cost residential areas on the eastern side of town, to "SS Sub" with 185mm<sup>2</sup> is required for the ring feed requirements to said area.
- (v) The extension of the ring between "MS Jakaranda Laan" through the future low cost housing development and "SS Sub" will increase the ring feed possibilities to said low cost housing development.

### The CBD and Town Areas:

These areas are presently fed by bare ACSR / ABC overhead lines and 50/70mm<sup>2</sup> underground Cu cables. It is recommended that all radial feeds be connected to the existing municipal infrastructure to ensure ring feed supplies to all miniature substations and transformer substations.

Provision has been made for a ring feed supply to the future development on the western side of town, between "Sub 11" and the proposed ring main unit "RMU Lae Druk Pompe".

### The Industrial Area:

The Industrial Area is presently fed by 35/50/70/95 and 185mm<sup>2</sup> Cu cables. It is recommended that all radial feeds be connected to the existing municipal infrastructure to ensure ring feed supplies to all miniature substations and transformer substations.

### Townships

The townships are fed by bare ACSR / ABC overhead lines and 50/70mm<sup>2</sup> Cu cables, it is recommended that the network be inspected regularly to ensure unnecessary outages due to bad maintenance. It is recommended that all radial feeds be connected to the existing municipal infrastructure to ensure ring feed supplies to all miniature substations and transformer substations.

## 6.3 Substations:

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. "Nooitgedacht Substation", 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.

A number of ring main units needed to be upgraded and installed, as depicted on the drawings, to cater for the future load.

## 6.4 Condition:

There is quite a number of equipment which are very old, i.e. 30 years and older. From what has been observed, however, the system components generally appear to be in a good condition and are well maintained, but regular inspections and tests are needed to ensure that all components are working safely.

The following equipment is older than thirty years:

- (a) CT/VT inside the following substations: "Breda Flooring Sub", "Graansilos Sub", "Overberg Agri Sub", "Nacht Wacht".
- (b) Ring main unit at: "RMU Graansilos", "RMU Overberg Agri", "Sub 11", "Sub 12", "Sub 13", "Sub 16", "Sub 5", "Sub 7", "Sub 9", "RMU Laerskool Albert Myburgh", "RMU Park St".
- (c) Switchgear at: "SS Bredasdorp Sub 1", "Sub St 6".
- (d) Ground Mounted Transformer Substations at: "SS Bredasdorp Sub 1", "Sub 11", "Sub 3", "Sub 4", "Sub 5", "Sub 7", "Sub 8", "SS Rioolplaas", "Sub St 6", "Sub 9", "Sub 10".
- (e) Pole mounted transformer substations at: "PMT Bertusgarden Plaas", "PMT Boorgat 4", "PMT Boorgat 3", "PMT Agri Tubes", "PMT Hondeplaas", "PMT Diepkloof".
- (f) Miniature substations: "MS High School".

## 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) Strengthen the MV rings between "Nooitgedacht Substation" and "SS Sub" as indicated on the drawings.
- (b) Provide ring feed supplies to all transformer substations.
- (c) Commence / proceed with a maintenance programme.

The vision for the town in future is a ring main underground cable/overhead system which connects "Nooitgedacht Substation" with all the switching stations and to provide a new 11kV load centre on the southern side of town to accommodate the proposed new developments and to strengthen the existing network.

Until such time that load growth demands a new load centre on the southern side of town, i.e. "SS Sub", provision should be made to strengthen the existing MV underground ring feeds as proposed.

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 RMU Lae Druk Pompe: Install "RMU Lae Druk Pompe" and Hare ACSR overhead line between the latter ring main unit and the Hare ACSR overhead line feeding from ring main unit "RMU Du Preez Str Park". Install Hare ACSR overhead line between "RMU Lae Druk Pompe" and the overhead line between "Sub 11" and "PMT Bertusgarden Plaas", in the location as depicted on the drawings.

- 7.1.2 Sub 12: Replace the Rabbit ACSR conductor, between “Sub 12” and “RMU Lae Druk Pompe” with Hare ACSR.
  - 7.1.3 RMU Park St: Replace the 35mm<sup>2</sup> ABC overhead conductor, between “RMU Park St” and “Sub 7” with a 50mm<sup>2</sup> Cu underground cable, incl. ring main unit at “SS Sub 7”, to ensure sufficient supply capacity to the new low cost housing development.
  - 7.1.4 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 Sub 12: Install 70mm<sup>2</sup> Cu underground cable between “Sub 12” and “PMT Golfklub” to strengthen the main ring from “Nooitgedacht Substation” to “RMU Kerk St” to 3,52 MVA. Install ring main units “RMU Uitsig” and “RMU Recreation”. Ensure that all tie feeders to miniature substations, ring main units and transformer substations are at least 70mm<sup>2</sup> Cu cables.
  - 7.2.2 SS Bredasdorp Sub 1: Install 95mm<sup>2</sup> Cu underground cable between “SS Bredasdorp Sub 1” and “MS PNP”, incl. ring main unit “RMU Lower Saints” and switchgear unit inside “SS Bredasdorp”.
  - 7.2.3 Sub 4: Replace the Rabbit ACSR conductor, between “Sub 4” and “Sub 18” with Hare ACSR conductor as depicted on the drawings.
  - 7.2.4 RMU Du Preez Str Park and RMU Kloof Str: Replace “RMU Du Preez Str Park” and RMU Kloof Str” with ring main units as shown on the drawings.
  - 7.2.5 RMU Bredasdorp Sub 1: Install ‘RMU Bredasdorp Sub 1’ as shown on the drawings.
  - 7.2.6 RMU Ou Meule: Install ‘RMU Ou Meule’ as shown on the drawings.
  - 7.2.7 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 PMT Diepkloof: Install Hare ACSR overhead line between “PMT Diepkloof” and circuit breaker switch at “SS Sub” to complete the main ring between “Nooitgedacht Substation” and “SS-Sub”.
  - 7.3.2 SS Bredasdorp Sub 1: Install Hare ACSR dedicated overhead line to “SS Sub”, incl. circuit breaker switches at “SS Bredasdorp Sub 1” and “SS Sub”.
  - 7.3.3 SS Bredasdorp Sub 1: Install circuit breaker switch (Sub 16) at “SS Bredasdorp”.
  - 7.3.4 RMU Du Preez Str Park: Replace the Rabbit ACSR conductor, between “RMU Du Preez Str Park” and “SS Bredasdorp Sub 1” with Hare ACSR conductor as depicted on the drawings.



- 7.3.5 Sub 8, Sub 13 and RMU Park St: Upgrade switches inside “Sub 5”, “Sub 8”, “Sub 13” and “RMU Park St” as shown on the schematic diagrams.
- 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 private development on the western side of town and the proposed township developments have not been priced, since it has been assumed that said infrastructure will be financed by the respective developers and Government.

The other upgrading measures as shown on the drawings have not been priced, since it has been assumed that same will be upgraded at a later stage when funds are available.

## 8.0 **PROPOSED CHANGES 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 RMU Lae Druk Pompe: Install “RMU Lae Druk Pompe” and Hare ACSR overhead line between the latter ring main unit and the Hare ACSR overhead line feeding from ring main unit “RMU Du Preez Str Park”. Install Hare ACSR overhead line between “RMU Lae Druk Pompe” and the overhead line between “Sub 11” and “PMT Bertusgarden Plaas”, in the location as depicted on the drawings. R 640 000
- 8.1.2 Sub 12: Replace the Rabbit ACSR conductor, between “Sub 12” and “RMU Lae Druk Pompe” with Hare ACSR. R 260 000
- 8.1.3 RMU Park St: Replace the 35mm<sup>2</sup> ABC overhead conductor, between “RMU Park St” and “Sub 7” with a 50mm<sup>2</sup> Cu underground cable to ensure sufficient supply capacity to the new low cost housing development. R 580 000
- 8.1.4 General: Inspect and test equipment mentioned under Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing. R 600 000 R 2 080 000

8.2 Phase 2 - 2020 to 2023:

- 8.2.1 Sub 12: Install 70mm<sup>2</sup> Cu underground cable between "Sub 12" and "PMT Golfklub" to strengthen the main ring from "Nooitgedacht Substation" to "RMU Kerk St" to 3,52 MVA. Install ring main units "RMU Uitsig" and "RMU Recreation". Ensure that all tie feeders to miniature substations, ring main units and transformer substations are at least 70mm<sup>2</sup> Cu cables. R1 240 000
- 8.2.2 SS Bredasdorp Sub 1: Install 95mm<sup>2</sup> Cu underground cable between "SS Bredasdorp Sub 1" and "MS PNP", incl. ring main unit "RMU Lower Saints" and switchgear unit inside "SS Bredasdorp". R3 120 000
- 8.2.3 Sub 4: Replace the Rabbit ACSR conductor, between "Sub 4" and "Sub 18" with Hare ACSR conductor as depicted on the drawings. R 130 000
- 8.2.4 RMU Du Preez Str Park and RMU Kloof Str: Replace "RMU Du Preez Str Park" and RMU Kloof Str" with ring main units as shown on the drawings. R 540 000
- 8.2.5 RMU Bredasdorp Sub 1: Install "RMU Bredasdorp Sub 1" as shown on the drawings. R 270 000
- 8.2.6 RMU Ou Meule: Install "RMU Ou Meule" as shown on the drawings. R 270 000
- 8.2.7 General: Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing. R 600 000 R 6 170 000

Phase 3 - (2024 to 2027):

- 8.3.1 PMT Diepkloof: Install Hare ACSR overhead line between "PMT Diepkloof" and circuit breaker switch at "SS Sub" to complete the main ring between "Nooitgedacht Substation" and "SS-Sub". R1 688 000
- 8.3.2 SS Bredasdorp Sub 1: Install Hare ACSR dedicated overhead line to "SS Sub", incl. circuit breaker switches at "SS Bredasdorp Sub 1" and "SS Sub". R2 760 000

8.3.3	<u>SS Bredasdorp Sub 1</u> : Install circuit breaker switch (Sub 16) at “SS Bredasdorp”.	R 480 000	
8.3.4	<u>RMU Du Preez Str Park</u> : Replace the Rabbit ACSR conductor, between “RMU Du Preez Str Park” and “SS Bredasdorp Sub 1” with Hare ACSR conductor as depicted on the drawings.	R 240 000	
8.3.5	<u>Sub 8, Sub 13 and RMU Park St</u> : Upgrade switches inside “Sub 5”, “Sub 8”, “Sub 13” and “RMU Park St” as shown on the schematic diagrams.	R1 345 000	
8.3.6	<u>General</u> : Inspect and test equipment mentioned under item Sub-Clause 6.4 of Clause 6.0 and replace with new or refurbish existing.	<u>R 600 000</u>	<u>R 7 113 000</u>
	Total, excl. VAT		R15 363 000

## 9.0 **FUNDING**

It is only viable to implement the capital expenditure proposed under Clause 8.0 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. After the immediate urgent work has been completed, and excluding the capital cost to provide a second main intake feeder, we would recommend that at least R 1 500 000-00 to R 1 600 000-00 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

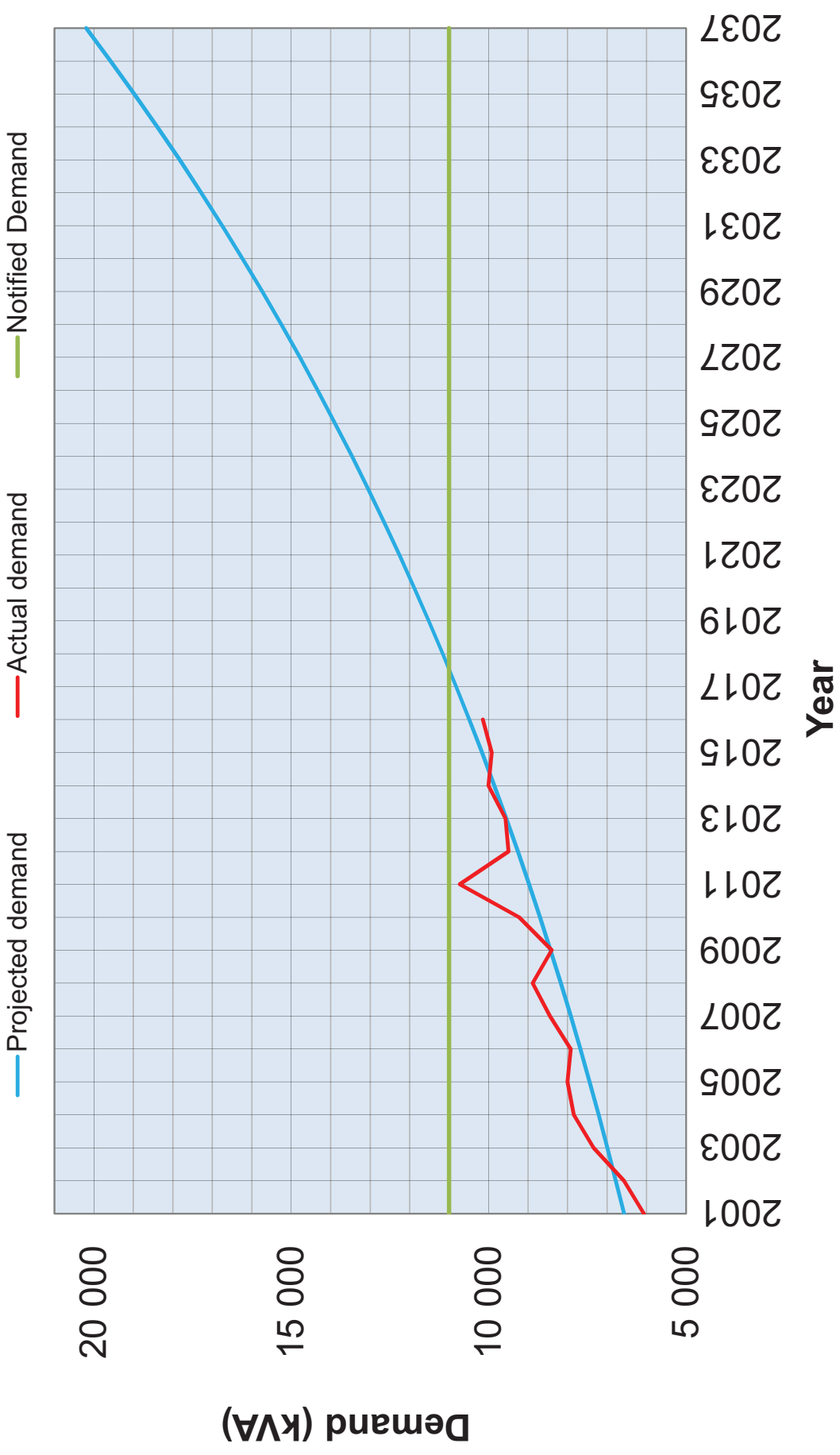
### BREDASDORP'S PEAK DEMAND (kVA) SINCE 2001 AND PROJECTED LOAD GROWTH FOR THE NEXT 20 YEARS

Year	Actual Peak kVA	Actual % Growth	Approx Projected Peak kVA
2001	6 066		
2002	6 573	8,36	
2003	7 343	11,71	
2004	7 842	6,80	
2005	8 000	2,01	
2006	7 920	-1,00	
2007	8 448	6,67	
2008	8 886	5,18	
2009	8 402	-5,45	
2010	9 228	9,83	
2011	10 735	16,33	
2012	9 499	-11,51	
2013	9 573	0,78	
2014	10 002	4,48	
2015	9 918	-0,84	
2016	10 144	2,28	
2017			10 821
2018			11 164
2019			11 518
2020			11 883
2021			12 260
2022			12 648
2023			13 049
2024			13 463
2025			14 889
2026			14 329
2027			14 784
2028			15 252
2029			15 735
2030			16 234
2031			16 749
2032			17 279
2033			17 827
2034			18 392
2035			18 975
2036			19 576
2037			20 197

# **ANNEXURE B**

## **PROJECTED GROWTH GRAPH**

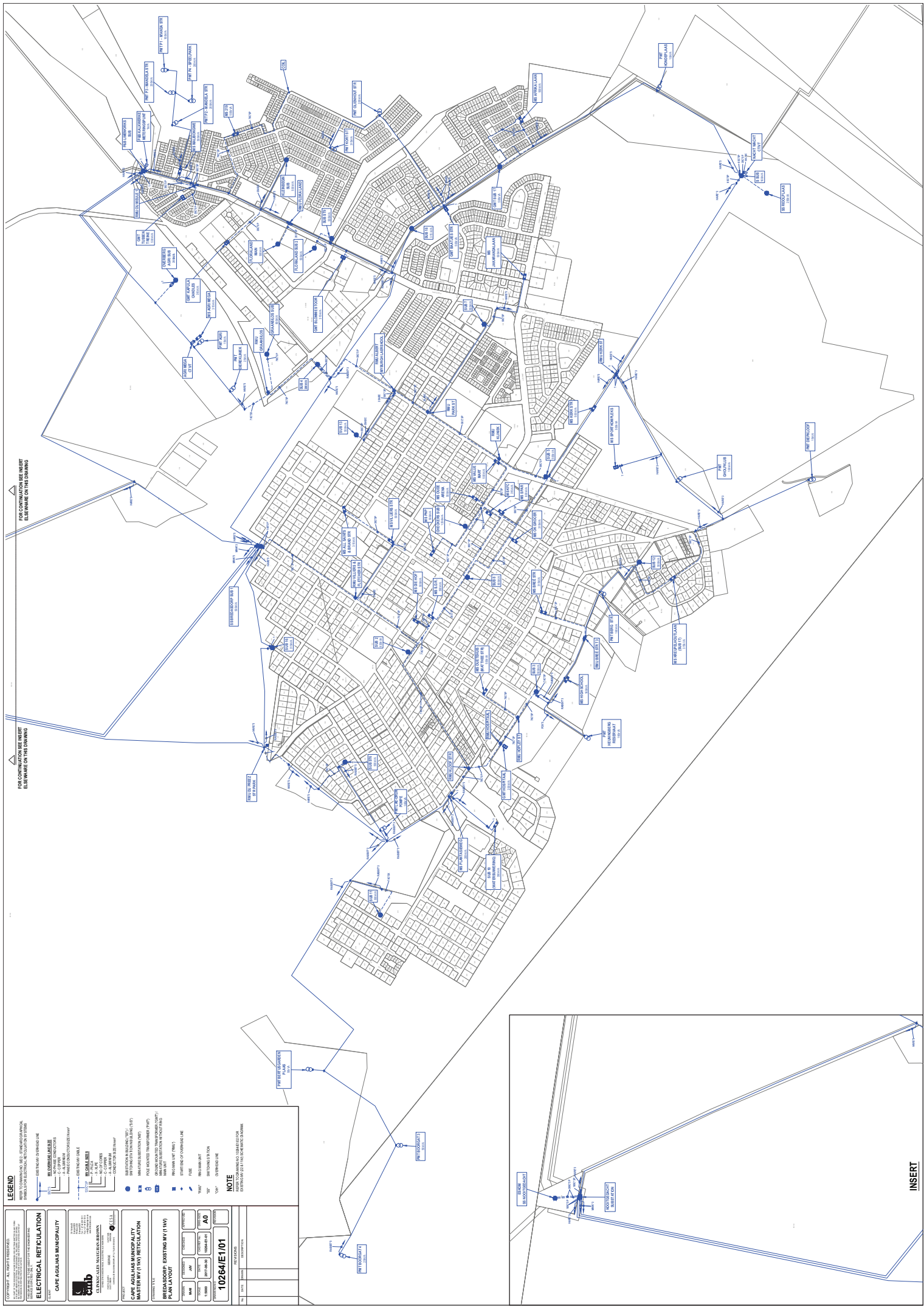
# Bredasdorp: Projected Load Growth





# **ANNEXURE C**

## **DRAWINGS**



FOR ALL ELECTRICAL WORK, REFER TO THE ELECTRICAL ACT AND REGULATIONS IN FORCE.  
 ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.  
 ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

**LEGEND**

- 10KV OVERHEAD LINE
- 10KV UNDERGROUND CABLE
- 24KV OVERHEAD LINE
- 24KV UNDERGROUND CABLE
- 11KV OVERHEAD LINE
- 11KV UNDERGROUND CABLE
- 4KV OVERHEAD LINE
- 4KV UNDERGROUND CABLE
- 2KV OVERHEAD LINE
- 2KV UNDERGROUND CABLE
- 1KV OVERHEAD LINE
- 1KV UNDERGROUND CABLE
- 0.75KV OVERHEAD LINE
- 0.75KV UNDERGROUND CABLE
- 0.4KV OVERHEAD LINE
- 0.4KV UNDERGROUND CABLE
- 0.2KV OVERHEAD LINE
- 0.2KV UNDERGROUND CABLE
- 0.1KV OVERHEAD LINE
- 0.1KV UNDERGROUND CABLE
- 0.05KV OVERHEAD LINE
- 0.05KV UNDERGROUND CABLE
- 0.02KV OVERHEAD LINE
- 0.02KV UNDERGROUND CABLE
- 0.01KV OVERHEAD LINE
- 0.01KV UNDERGROUND CABLE
- 0.005KV OVERHEAD LINE
- 0.005KV UNDERGROUND CABLE
- 0.002KV OVERHEAD LINE
- 0.002KV UNDERGROUND CABLE
- 0.001KV OVERHEAD LINE
- 0.001KV UNDERGROUND CABLE
- 0.0005KV OVERHEAD LINE
- 0.0005KV UNDERGROUND CABLE
- 0.0002KV OVERHEAD LINE
- 0.0002KV UNDERGROUND CABLE
- 0.0001KV OVERHEAD LINE
- 0.0001KV UNDERGROUND CABLE
- 0.00005KV OVERHEAD LINE
- 0.00005KV UNDERGROUND CABLE
- 0.00002KV OVERHEAD LINE
- 0.00002KV UNDERGROUND CABLE
- 0.00001KV OVERHEAD LINE
- 0.00001KV UNDERGROUND CABLE
- 0.000005KV OVERHEAD LINE
- 0.000005KV UNDERGROUND CABLE
- 0.000002KV OVERHEAD LINE
- 0.000002KV UNDERGROUND CABLE
- 0.000001KV OVERHEAD LINE
- 0.000001KV UNDERGROUND CABLE
- 0.0000005KV OVERHEAD LINE
- 0.0000005KV UNDERGROUND CABLE
- 0.0000002KV OVERHEAD LINE
- 0.0000002KV UNDERGROUND CABLE
- 0.0000001KV OVERHEAD LINE
- 0.0000001KV UNDERGROUND CABLE

**NOTE**

1. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

2. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

3. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

4. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

5. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE ELECTRICAL REGULATIONS IN FORCE.

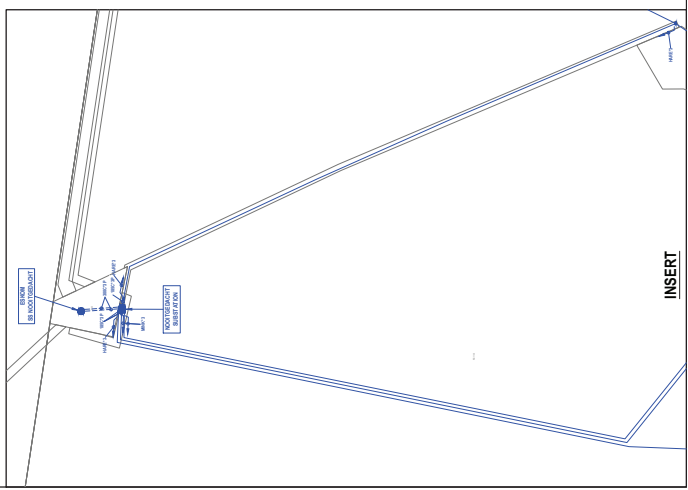
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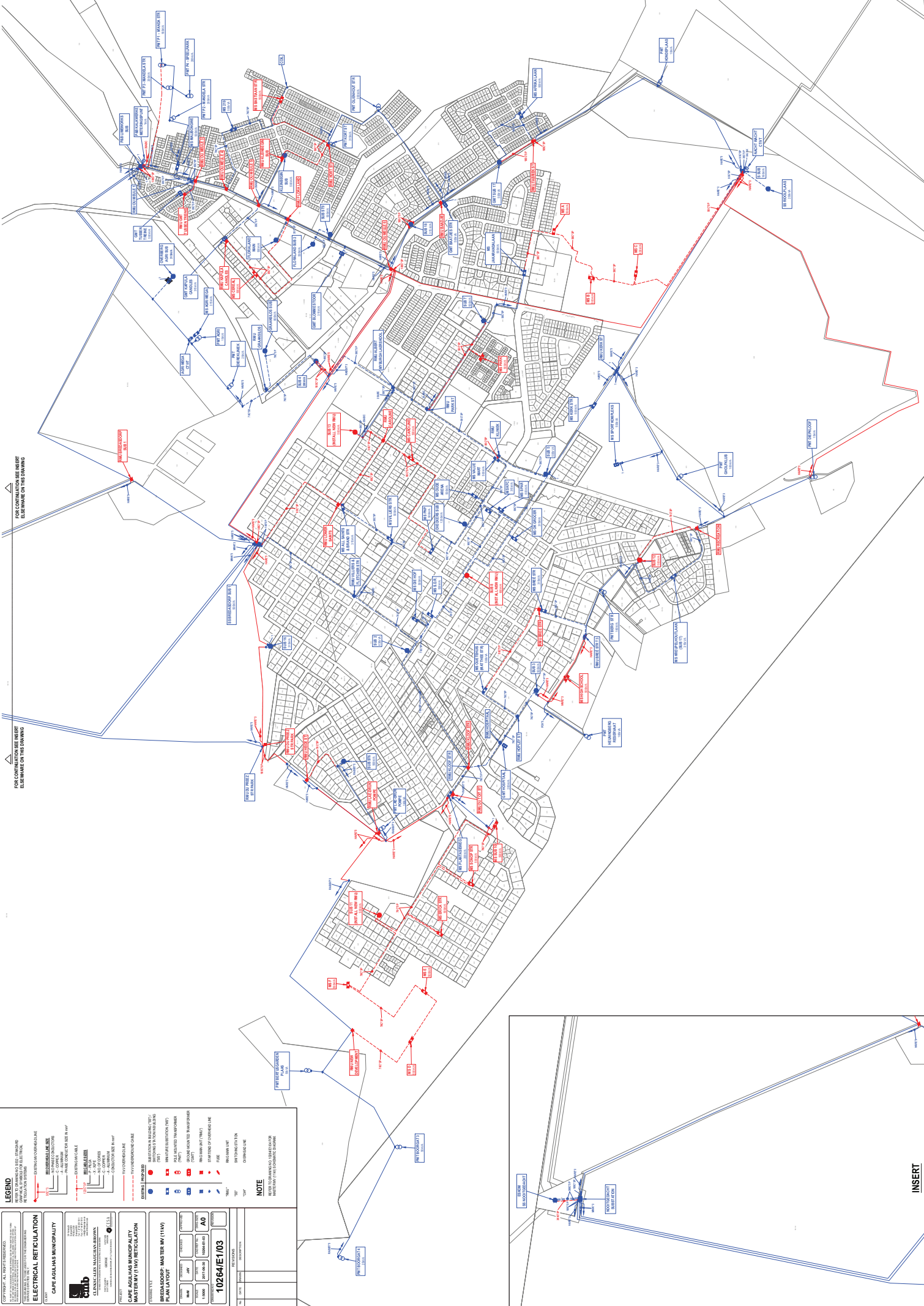
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INSERT

<b>CLIENT</b>	CAPE AGULHAS MUNICIPALITY	<b>PROJECT NO.</b>	10264/E/101
<b>PROJECT NAME</b>	CAPE AGULHAS MUNICIPALITY MASTER AV (11KV) RETICULATION PLAN LAYOUT	<b>DATE</b>	10/10/2024
<b>DESIGNER</b>	CLANVILLE ENGINEERING	<b>SCALE</b>	AS SHOWN
<b>DATE</b>	10/10/2024	<b>PROJECT</b>	CAPE AGULHAS MUNICIPALITY MASTER AV (11KV) RETICULATION PLAN LAYOUT
<b>PROJECT</b>	CAPE AGULHAS MUNICIPALITY MASTER AV (11KV) RETICULATION PLAN LAYOUT	<b>SCALE</b>	AS SHOWN





FOR ALL DIMENSIONS AND SPACING OF ELECTRICAL EQUIPMENT ON THE DRAWING REFER TO THE DRAWING

**LEGEND**

- 1. SUBSTATION (TRANSFORMER)
- 2. OVERHEAD LINE
- 3. UNDERGROUND CABLE
- 4. AIR TERMINAL
- 5. AIR TERMINAL WITH DOWN LEAD
- 6. AIR TERMINAL WITH DOWN LEAD AND GROUNDING
- 7. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE
- 8. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE
- 9. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL
- 10. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL
- 11. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 12. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 13. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 14. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 15. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 16. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 17. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 18. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 19. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL
- 20. AIR TERMINAL WITH DOWN LEAD AND GROUNDING AND OVERHEAD LINE AND UNDERGROUND CABLE AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL AND AIR TERMINAL

**NOTE**

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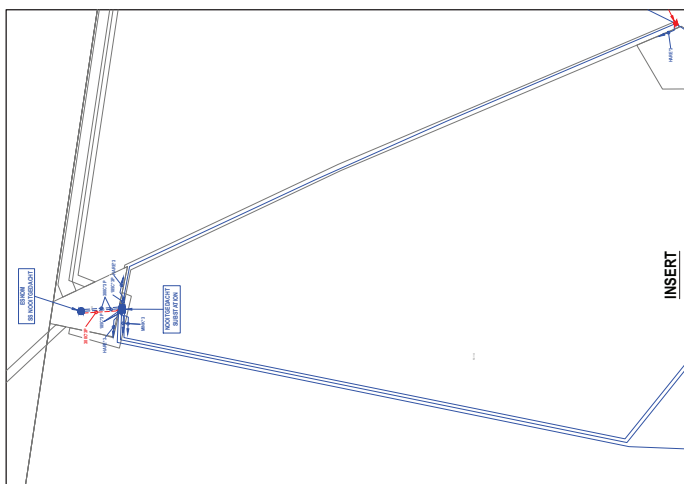
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INSERT

**ELECTRICAL RETICULATION**

**CAPE AGULHAS MUNICIPALITY**

**CAPE AGULHAS MUNICIPALITY**

**MASTER MV (11KV) RETICULATION**

**PLAN LAYOUT**

**10264/E/103**

**DATE: 10/05/2011**

**SCALE: 1:1000**

**PROJECT: 10264/E/103**

**CLIENT: CAPE AGULHAS MUNICIPALITY**

**DESIGNER: CAPE AGULHAS MUNICIPALITY**

**DATE: 10/05/2011**

**SCALE: 1:1000**

**PROJECT: 10264/E/103**

**CLIENT: CAPE AGULHAS MUNICIPALITY**

**DESIGNER: CAPE AGULHAS MUNICIPALITY**



**LEGEND**

- INDICATES ELECTRICAL CONNECTIONS
- INDICATES WIRING
- INDICATES CONDUCTORS
- INDICATES CONNECTIONS TO OTHER SYSTEMS
- INDICATES ELECTRICAL EQUIPMENT
- INDICATES ELECTRICAL EQUIPMENT
- INDICATES ELECTRICAL EQUIPMENT
- INDICATES ELECTRICAL EQUIPMENT
- INDICATES ELECTRICAL EQUIPMENT

**NOTE**

REFER TO DRAWINGS IN THIS SET FOR THE LOCATION OF THE EQUIPMENT AND THE LOCATION OF THE EQUIPMENT

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**CAVE AQUILA MUNICIPALITY**

**MADRID**

**10264/E/04**

**ELECTRICAL RETICULATION**

**CAVE AQUILA MUNICIPALITY**

**MADRID**

**10264/E/04**

