



MOTLA

INCEPTION REPORT

NEW MODIMOLLE 132/11KV, 2 X 20MVA SUBSTATION

ELECTRICAL ENGINEERING DESIGN INCEPTION REPORT

Inception Report

New Modimolle 132/11kV, 2 x 20MVA Substation

In Modimolle, Limpopo

For

Lim368, Limpopo

Address: OR Tambo Square

Harry Gwala Street

Modimolle

Issue Date: 9 September 2016

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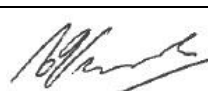
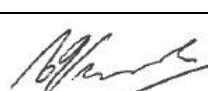
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GLOSSARY OF TERMS

MCE	Motla Consulting Engineers (Pty) Ltd
AC	Alternating Current
DC	Direct Current
LV	Low Voltage ($LV \leq 1kV$)
MV	Medium Voltage ($1kV < MV \leq 33kV$)
HV	High Voltage ($HV > 33kV$)
EHV	Extremely High Voltage ($EHV > 132kV$)
NRS	National Rationalized Specification
SANS	South African National Standards
NERSA	National Energy Regulator of South Africa
NER	Neutral Earthing Resistor
NEC	Neutral Electromagnetic Coupler
NEC3	New Engineering and Construction Contract
NECR	Neutral Electromagnetic Coupler with Neutral Earthing Resistor
NECRT	Neutral Electromagnetic Coupler with Neutral Earthing Resistor and Auxiliary Power Transformer
PE	Project Engineer
PPE	Personal Protective Equipment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
SHEQ	Safety, Health, Environment, Quality



1. BACKGROUND

1.1 Introduction

Modimolle currently has one main substation from where it distributes 11kV into the town. The High Voltage yard and the transformers belong to Eskom from where 11kV is supplied to the municipal 11kV switching substation. Due to the expansion of the town and subsequent overloading of the existing substation and network expansion, there is a need for a new distribution substation and Eskom intake point. The proposed position of the substation is indicated in the image below and is located close to the R101 and a Transnet railway line. The town is expanding towards a Northern direction and many new developments in the area are also still in the pipeline.

1.2 Site Location

The site is located at Modimolle, Limpopo.

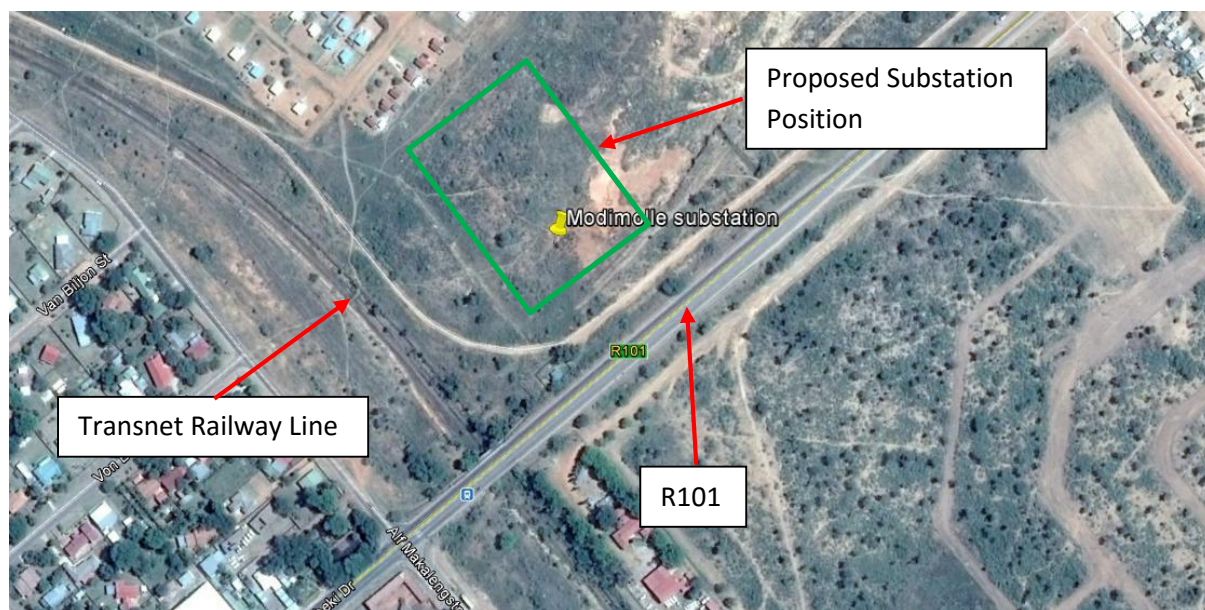


Figure 1 Proposed site position

2. SCOPE OF WORK

2.1 Terms of Reference

Motla Consulting Engineers (Pty) Ltd has been appointed for the design and project management of the new Modimolle Substation in Modimolle, Limpopo.

The following parties are the main parties of the contract:

- ▲ Motla Consulting Engineers (Pty) Ltd, hereunder referred to a “Motla” are the appointed consulting electrical engineers for the design and project



management of the new 132/11kV, 2 X 20MVA Substation in Modimolle, Limpopo.

- ▲ The client is the municipality, currently referred to as “LIM368” at the date of this report and after the amalgamation of Modimolle Local Municipality and Mookgophong Local Municipality until the new name has been established.

The scope of work and components of the substation will be as follows:

- ▲ Voltage levels will be 132/11kV. (It is anticipated that the primary voltage will be 132kV, however, there is also a 66kV network which may be used depending on what Eskom offers.)
- ▲ The transformers which will be installed will be 2 X 20MVA, 132/11kV outdoor ONAN transformers with on-load tap changer. It is anticipated at this stage that the vector group of the transformers will be YNd1.
- ▲ 2 X 132kV feeder bays. These will be conventional outdoor feeder bays with standard switchgear and CT's.
- ▲ 5 X 11kV feeder bays. These will also be conventional outdoor type with kiosk type circuit breakers and with a by-pass busbar.
- ▲ Control and battery room.
- ▲ Protection and Metering schemes. Conventional type swing frame panels per bay. Normal Overcurrent and Earth Fault protection for 11kV feeders, Differential protection for transformers and 132kV feeder bays.
- ▲ Telemetry or Telecontrol. RTU based telemetry with alarms and supervision of the substation.
- ▲ Auxiliary AC supply and AC distribution panel. Dual AC supply from the NEC/NER/AUX Transformers in the substation.
- ▲ Battery charger and battery bank with DC distribution panel. It is anticipated that NiCad batteries will be used. If lead-acid batteries are used, a separate battery room will be required.
- ▲ Substation platform, fence and access road. This will cater for water drainage of the substation platform. Access to the substation will mainly be from the R101 via the sand road.
- ▲ Eskom will build their own 132kV switching substation for control and billing purposes.

The proposed Substation Single Line Diagram is as follows:

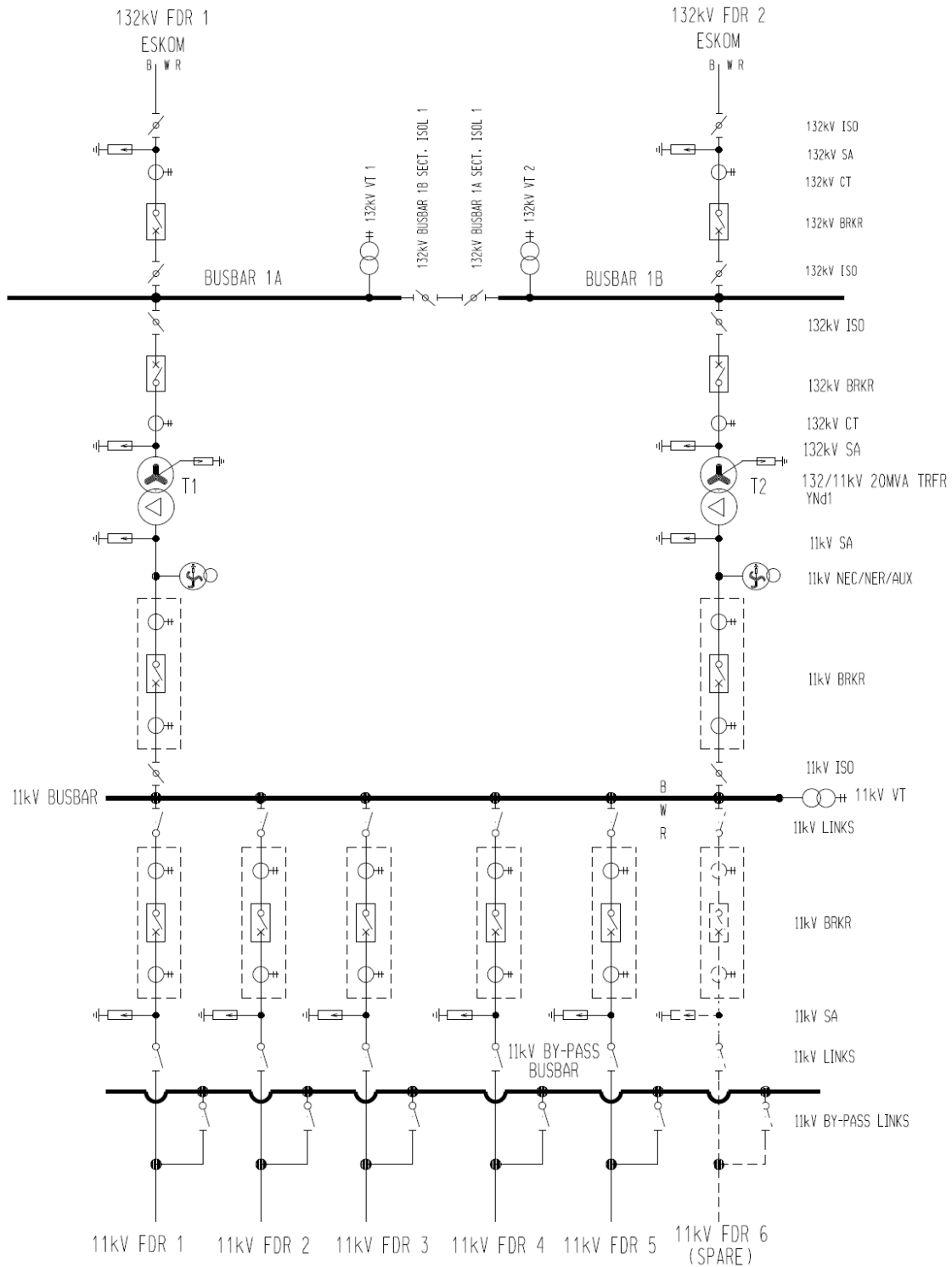


Figure 2 Proposed Substation Single Line Diagram

2.2 Battery Limits

The battery limits for the substation includes the complete design of the substation, as per the Scope of Work above, but excludes any line designs, other than closing



spans to the substation. The following additional sub-consultancy services are also included:

- ▲ Environmental – Basic Assessment.
- ▲ Land Survey and Servitude diagrams.
- ▲ Geotechnical Investigations.
- ▲ Occupational Health and Safety Services.
- ▲ All Civil Engineering related designs.

The following services are excluded:

- ▲ Application to Eskom for the new 132kV connection.
- ▲ Servitude and wayleave costs and registrations.
- ▲ Negotiations with landowners for servitudes and wayleaves.

2.3 Stakeholders

The following stakeholders will be involved in the project:

Table 1 Project Stakeholders

Institution / Organization	Role	Contact details
Lim368	Client	Madisha NJ
		Manager Electrical Services
		Modimolle Municipality
		014 717 5798
		083 287 2999 Madishanj@modimolle.gov.za
Lim368	Client	Muller AD
		Technician
		Modimolle Municipality
		014 717 5798
		084 556 3321 tsenafela@gmail.com
Motla Consulting Engineers	Electrical Consultant	Vermaak CJ
		Senior Engineer
		Motla Consulting Engineers
		012 663 1328
		082 744 3860 CharIV@motla.co.za
Motla Consulting Engineers	Electrical Consultant	Baloi HT
		Technician



Institution / Organization	Role	Contact details
		Motla Consulting Engineers
		012 663 1328
		071 363 6480
		thabob@motla.co.za
Eskom	New 132kV Connection	Key Customer Executive

2.4 **Eskom Connection**

Lim368 will apply for the two new 132kV Eskom connections to the substation through the Eskom Key Customer Executive for the area. All costs will be covered by Lim368. Motla will assist with any technical negotiations with Eskom and will present the substation design to Eskom and make recommendations to Eskom with regards to the 132kV line where necessary. It is further also anticipated that Eskom will build a new 132kV switching substation for control and billing purposes. This substation can be built adjacent to the new Modimolle substation with a fence separating the two substations and busbars crossing the fence between the two feeder bays.

2.5 **Wayleaves and Servitudes**

2.5.1 **Transnet**

A wayleave shall be submitted to Transnet for consideration regarding the existing and abandoned railway line next to the substation. It will be required to either drill underneath the railway or to utilize the bridge for cables or to cross the railway line with overhead conductors as the railway is much lower than the natural ground level.

2.5.2 **Civil Aviation Authority**

The requirements of the Civil Aviation Authority shall be taken into consideration as the substation will be located close to the air landing strip.

2.5.3 **Telkom**

Wayleaves shall also be submitted to Telkom for their consent regarding the position of the substation. This will allow Telkom to indicate any interference should it exist regarding their planned projects in close proximity to the proposed substation.

2.5.4 **Road Agency**

The access to the substation will be from the existing sand road which in turn connects to the R101. This access road will not be used for the substation only and it is not envisaged that a wayleave will be required from the roads agency.



2.5.5 Municipality

The municipality has indicated that they are the owners of the land intended for use for the substation. Thus only a servitude needs to be registered for the substation by the municipality.

3. STATUS QUO

3.1 Existing Infrastructure

Currently, Lim368 only has one main switching substation which distributes at 11kV.

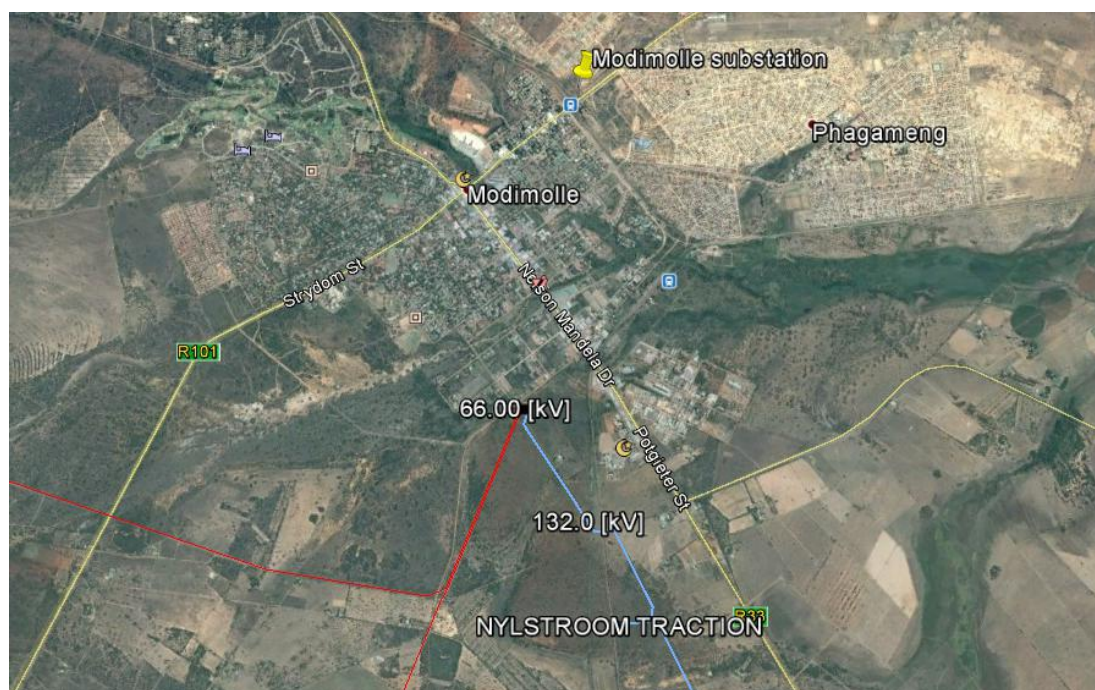


Figure 3 Existing 132kV and 66kV Lines to Nylstroom Substation

3.2 Load Requirement

The requirement of the substation is to have 2 X 20MVA Transformers installed. This means that there will be a safe and firm installation of 20MVA.

4. PROJECT APPROACH

4.1 Project Execution Stages

The project execution stages which will be followed will be as per the ECSA guideline and as per the quote and is as follows:

- ▲ **Inception Stage.** The acceptance of this report will serve as the Inception Stage.



- ▲ **Concept and Viability Stage (Preliminary Design).** Will contain more technical detail and calculations as well as the design philosophy and the types of technologies to be used as well as some preliminary layouts.
- ▲ **Design and Documentation Stage (Detail Design).** Will contain all project and general specifications, bill of quantities and drawings.
- ▲ **Procurement Stage.** Will be the tender stage which will include the tender briefing, tender process, tender adjudication and reporting as well as the appointment of the contractor.
- ▲ **Construction Stage.** Will be the construction supervision and project management stage. All safety, health, environmental and quality issues will be applicable here as well as progress monitoring of the contractor and contract management.
- ▲ **Close-out Stage.** Will include the final inspections and hand-over of the substation after commissioning and the submission of all hand-over documentation such as handing-over certificates and checklists, test certificates, operating and maintenance manuals and as-built drawings. Training will also be provided to the client's personnel.

4.2 **Deliverables**

As per the ECSA project stages above, the following deliverables will be compiled by Motla and submitted to Lim368:

4.2.1 **Design and Procurement Stage**

- ▲ Inception Report.
- ▲ Concept and Viability (Preliminary Design) Report. This will also include preliminary layout drawings.
- ▲ Detail Design Report. This will include all project specifications, general specifications and standards, bill of quantities and detail drawings as well as any annexures such as geotechnical reports, servitude diagrams etc.
- ▲ Tender documents. This will include 10 sets of tender documents with drawings.
- ▲ Tender adjudication report.

4.2.2 **Construction and Close-out Stage**

- ▲ Monthly Project Progress Reports



- ▲ Payment Certificates
- ▲ Monthly SHEQ Reports
- ▲ Hand-over documentation
- ▲ Project close-out report

5. PROJECT COST (HIGH LEVEL)

The high level project costs are as follows:

Table 2 High Level Project Costs

ITEM	DESCRIPTION	TOTAL
1	Preliminary & General cost	R 2 800 000.00
2	Substation Earthworks, Platform, Access road, Storm water drainage etc.	R 3 000 000.00
3	Earthmat	R 1 800 000.00
4	Power Plant Work	R 21 500 000.00
5	Site Works	R 1 600 000.00
6	Control Plant	R 5 209 000.00
7	SUB-TOTAL (EXCL VAT):	R 35 909 000.00
8	10% CONTINGENCIES:	R 3 590 900.00
9	TOTAL (EXCL VAT):	R 39 499 900.00

Note that these costs do not include the following:

- ▲ Professional Fees
- ▲ Servitude Registrations
- ▲ Eskom Application and connection

6. PROJECT PROGRAMME (KEY DATES)

The project programme is as follows:

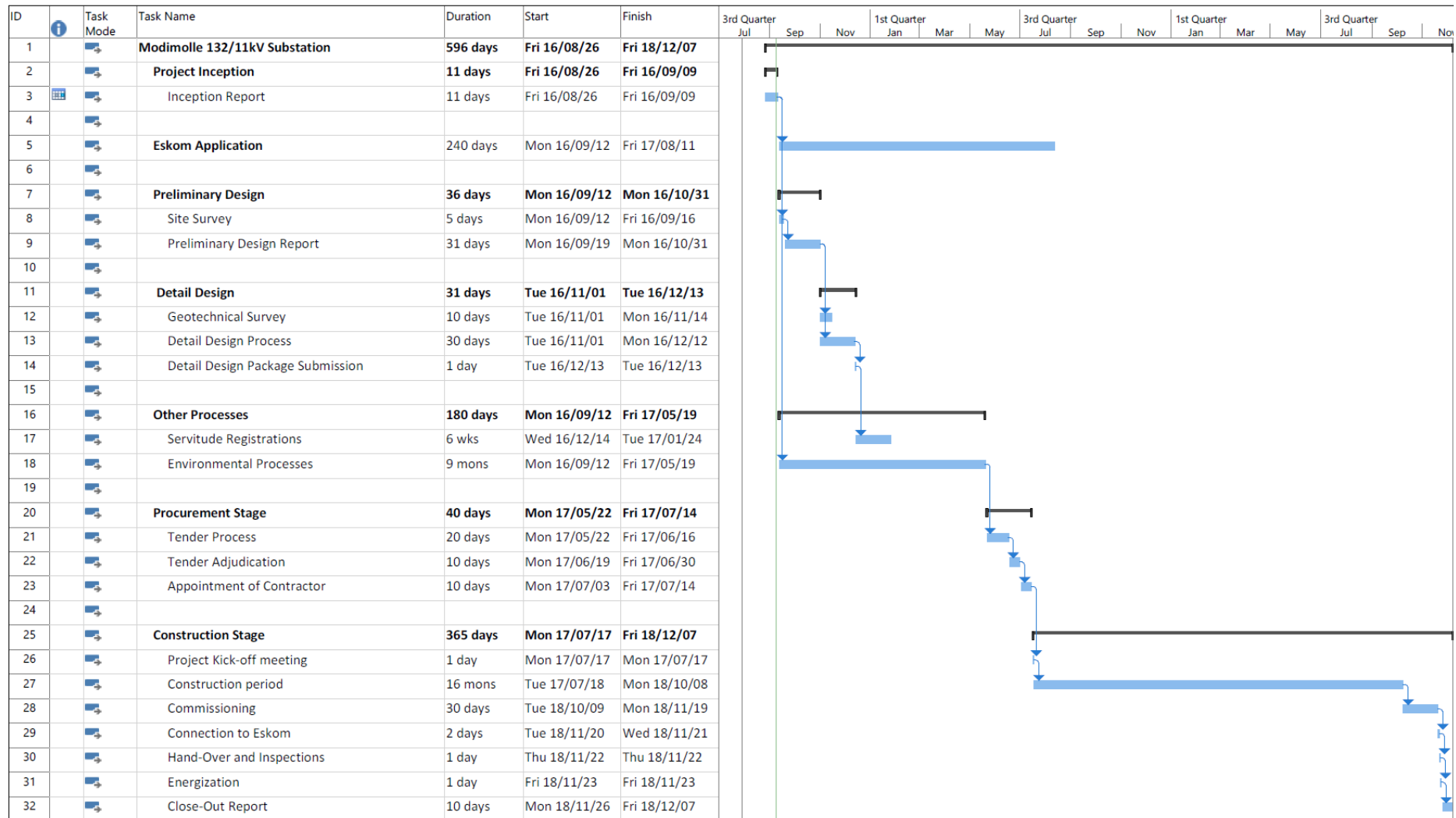


Figure 4 Project Programme



7. SUMMARY

- ▲ The project entails the design and construction of a new 132/11kV, 2 X 20MVA Substation in Modimolle, Limpopo.
- ▲ A new Eskom application will have to be made for a new 132kV bulk connection point with 2 X 132kV Feeders. A new Eskom 132kV switching substation will also have to be constructed for control and metering purposes.
- ▲ The substation will be a complete outdoor substation.

***** END OF REPORT *****



APPENDICES



A – LETTER OF APPOINTMENT



B – LETTER OF ACCEPTANCE