

Title: **Gumeni Substation 2<sup>nd</sup>  
400/132kV 500MVA  
Transformer - Basic Design  
Report with Scope of Work**

Unique Identifier:

**Gum22P02-SE-C16**

Alternative Reference Number:

**N/A**

Area of Applicability:

**Engineering**

Documentation Type:

**Report**

Revision:

**1**

Total Pages:

**27**

Next Review Date:

**N/A**

Disclosure Classification:

**CONTROLLED  
DISCLOSURE**

**Compiled by**

  
pp. A LE GRANGE

**Functional Responsibility**



**Authorised by**



**A Le Grange**

**Senior Technologist  
(Electrical)**

Date: 08/08/2023

**E Naicker**

**Chief Engineer (Electrical)**

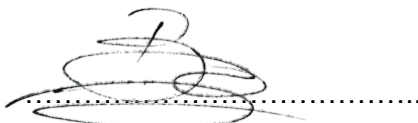
Date: 04/08/2023

**S Maharaj**

**Senior Manager (Substation  
Engineering)**

Date: 21/8/2023

**Co-compiled by**



**B Ndlovu**

**Engineer (Civil)**

Date: 07/08/2023

**Functional Responsibility**



**A Maneli**

**Middle Manager (Civil)**

Date: 07.-08.-2023

## **CONTENTS**

	<b>Page</b>
<b>1. INTRODUCTION .....</b>	<b>4</b>
1.1 SYSTEM IDENTIFICATION .....	4
1.2 SYSTEM OVERVIEW .....	4
<b>2. DESIGN PROJECT .....</b>	<b>4</b>
2.1 SCOPE OF WORK .....	4
2.2 ROLES AND RESPONSIBILITIES .....	5
2.2.1 The EPC Consultant .....	5
2.2.2 Eskom .....	6
<b>3. SUPPORTING CLAUSES .....</b>	<b>6</b>
3.1 NORMATIVE / INFORMATIVE REFERENCES .....	6
3.1.1 Normative .....	6
3.1.2 Informative .....	7
3.2 DEFINITIONS .....	7
3.2.1 Classification .....	7
3.3 ABBREVIATIONS .....	7
<b>4. DESIGN REQUIREMENTS .....</b>	<b>8</b>
4.1 SCOPE OF DETAIL DESIGN .....	8
4.1.1 Scope of Work .....	8
4.2 DESIGN APPROACH .....	8
4.2.1 Design Inputs .....	8
4.2.2 Design Process .....	8
4.2.3 Design Outputs .....	8
4.2.4 Design Verification .....	9
4.3 DESIGN CRITERIA .....	10
4.3.1 Codes and Standards .....	10
4.4 DESIGN BASIS .....	10
4.5 ELECTRICAL DETAIL DESIGN .....	11
4.5.1 Design Philosophies .....	11
4.5.2 Substation Design Specifications and Configuration .....	12
4.5.2.1 Fault Level Studies .....	12
4.5.2.2 Primary Plant Equipment .....	12
4.5.2.3 Busbar Design .....	12
4.5.2.4 Conductor Selection .....	13
4.5.2.5 Electrical Clearances and Clearance Constraints .....	13
4.5.2.6 Station DC Voltage .....	13
4.5.2.7 Insulator Type .....	13
4.5.2.8 Station Construction Supply .....	14
4.5.2.9 Station Auxiliary Supply .....	14
4.5.2.10 Yard Lighting .....	14
4.5.2.11 Direct Lightning Stroke Protection .....	14
4.5.2.12 AC Reticulation .....	15
4.5.2.13 Bill of Material for Major Equipment .....	15
4.5.2.14 Substation Earthing .....	16
4.5.2.15 External Interfaces .....	16
4.5.2.16 Facilities Required .....	16
4.5.2.17 Maintenance Concept .....	16
4.5.2.18 Operating Concept .....	17
4.5.2.19 Safety Concept .....	17
4.6 SITING .....	18
4.6.1 Site Selection .....	18
4.6.2 Site Characteristics .....	18
3.8.2.1 Geotechnical .....	18

### **CONTROLLED DISCLOSURE**

When downloaded from the EDS database, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorized version on the database.

---

3.8.2.2 Topographical Survey .....	18
3.8.2.2 Hydrological Characteristics .....	18
4.6.3 Site Layout .....	18
4.7 CIVIL AND STRUCTURAL DESIGN .....	19
4.7.1 General .....	19
4.7.2 Buildings .....	19
4.7.3 Earthworks .....	19
4.7.4 Foundation, plinths and trenches .....	19
4.7.5 Fencing .....	19
3.9.6 Roads .....	19
3.9.7 Structural Steel .....	19
3.9.8 Drainage .....	20
4.8 DESIGN ASSESSMENT .....	20
4.8.1 Operability Assessment .....	20
4.8.2 Reliability, Maintainability, Availability Assessment .....	20
4.8.3 Constructability Assessment .....	20
4.8.4 Inspectability and Testability Assessment .....	20
4.8.5 Expandability Assessment .....	20
4.8.6 Dismantling and Demolition Requirements .....	20
4.9 SAFETY ASSESSMENT .....	21
4.9.1 Industrial Safety Assessment .....	21
4.9.2 Fire Safety Assessment .....	21
4.10 PLAN OF IMPLEMENTATION .....	21
4.10.1 Project Outage Requirements .....	21
4.10.2 Transportation Plan .....	21
4.10.3 Construction Plan .....	21
5. AUTHORISATION .....	21
6. REVISIONS .....	22
7. DEVELOPMENT TEAM .....	22
8. ACKNOWLEDGEMENTS .....	22
APPENDIX A : CONCEPT DESIGN DRAWINGS/DOCUMENTATION .....	23
APPENDIX B : GUMENI MTS – AS-BUILT DRAWINGS (AS AT 9 JUNE 2023) .....	24
APPENDIX C : GUMENI MTS – AS-BUILT DOCUMENTATION .....	25
APPENDIX D : GUMENI MTS – PROJECT INPUT DOCUMENTATION .....	26
APPENDIX E : TEMPLATES .....	27

**CONTROLLED DISCLOSURE**

When downloaded from the EDS database, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorized version on the database.

## **1. INTRODUCTION**

The Gumeni Substation 2<sup>nd</sup> 400/132kV 500MVA Transformer Project has been selected to follow the Eskom EPC implementation strategy.

This scope of the project will increase station capacity from 500MVA to 1000MVA by adding a second 400/132/22kV 500MVA transformer on an existing busbar and terrace and comprises:

- Equipping Transformer 2 – 400 kV Bay
- Equipping Transformer 2 – 132 kV Bay
- Equipping Transformer 2 – 22 kV Bay
- Installation of 1 x 500MVA 400/132/22kV Transformer
- Installation of 1 x 315kVA 22kV/400V Auxiliary Transformer

This document specifies Eskom's requirements and provides direction to the EPC Contractor on the specific design outcomes required for the detail design phase. It includes:

- Project scope of work,
- The EPC Consultant's scope of work,
- Design Requirements for the scope of work,
- Eskom design review / acceptance processes and requirements, and
- Design Output deliverables to be produced by the EPC Contractor.

This document only covers the scope, requirements, and deliverables as it relates to substation site infrastructure, buildings, yard and primary plant equipment.

### **1.1 SYSTEM IDENTIFICATION**

The project for the second 400/132kV 500MVA at Gumeni 400/132 kV Substation in Mpumalanga is provisionally identified by the Station Electric Diagram (SED) Gum22P03-SE-C3 Revision 0 and Key Plan Gum22P03-SE-C4 Revision 0 (Appendix A).

### **1.2 SYSTEM OVERVIEW**

The 400/132kV Gumeni MTS was initially equipped with 1x 400/132/22kV 500MVA power transformer with the terrace constructed large enough for the second 500MVA power transformer. The second transformer is to be established in the position as catered for in the original design of the Gumeni MTS establishment and is indicated on the Approved SED and Key Plan Drawings (Appendix A) and on the as-built SED and Key Plan Drawings (Appendix B).

## **2. DESIGN PROJECT**

### **2.1 SCOPE OF WORK**

This scope of the project is to install the second 400/132kV Transformer at Gumeni MTS in the Eskom Transmission North-East Grid and comprises:

- Equipping Transformer 2 – 400 kV Bay
- Equipping Transformer 2 – 132 kV Bay
- Equipping Transformer 2 – 22 kV Bay
- Installation of 1 x 500MVA 400/132/22kV Transformer
- Installation of 1 x 315kVA 22kV/400V Auxiliary Transformer

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

## **2.2 ROLES AND RESPONSIBILITIES**

### **2.2.1 The EPC Consultant**

The EPC Consultant is required to perform the detail design of the Gumeni Substation 2<sup>nd</sup> 400/132kV 500MVA Transformer which entails the scope of work as indicated in Section 2.1 above and to capture all information pertaining to the design in the detail design report (Appendix E), detail design presentation (Appendix E), as well as in the relevant design drawings.

The EPC Consultant is further required to present the detail design presentation to the Substation Engineering and Transmission Design Review Team (DRT) committee meetings for design review, as well as to prepare and issue the full detail design package to Eskom, at the following milestones:

- Twenty-Five (25) working days prior to the Substation Engineering DRT meeting at which the EPC consultant wishes to present the project. All civil designs must be presented to the Civil DRT at least seven (7) working days prior to the presentation at the Substation Engineering DRT,
- An updated design package at least ten (10) working days prior to the Substation Engineering DRT meeting at which the EPC consultant wishes to present the project, with all queries addressed and all corrections completed,
- After addressing and resolving any additional requirements/clarifications/amendments requested by the Substation DRT chairperson/committee during the deliberation for support at the Substation Engineering DRT, but still prior to the Transmission DRT meeting, and
- Within twenty-five (25) working days after the detail design acceptance of the project at the Transmission DRT meeting, after addressing and resolving any additional requirements/clarifications/amendments requested by the Transmission DRT chairperson.

The full detail design package components are detailed in Section 4.2.3 further below.

The EPC Consultant is also required to submit the following to Eskom Transmission:

- Construction Package, including a Bill of Equipment (BoE) and Bill of Material (BoM), once the detailed designs are verified/validated with the equipment that has been sourced for the project,
- Revisions of affected drawings as and when new construction drawings are issued to the construction site on an ad hoc basis,
- As-Built Drawings, reflecting final construction details, upon completion of the project and within a timeframe as stipulated by Eskom Transmission, not exceeding four weeks after completion,
- Completed Quality, Inspection and Test Plans (QITP's) with supporting evidence (e.g. photos, test results etc.), and
- Operating Diagram to enable commissioning of the project.

Any deviation from the accepted design, must be submitted to Eskom for review and support, prior to executing the deviation.

All aspects of responsibility, accountability and liability lies with the EPC Consultant for the engineering, design, construction and construction safety, operational safety, and commissioning, of the project.

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

### **2.2.2 Eskom**

Eskom's role is to receive and accept or reject the detail design of the Gumeni Substation 2<sup>nd</sup> 400/132kV 500MVA Transformer, as performed by the EPC Consultant.

Receiving the design will refer to the transmittal of the design package from the EPC Consultant to the Eskom Project Manager, thereafter to Integration Engineering and further to the individual COE's.

Accepting the design will refer to the final acceptance of the project design package by the Transmission DRT, subsequent to the EPC consultant receiving provisional support from all the relevant Centre of Excellence (CoE's) i.e. Substation Engineering, Lines Engineering and PTMC (Protection, Telecommunications, Metering and Control) via the CoE DRT committee meetings.

## **3. SUPPORTING CLAUSES**

### **3.1 NORMATIVE / INFORMATIVE REFERENCES**

#### **3.1.1 Normative**

- [1] South African Grid Code
- [2] Occupational Health and Safety Act (OHS Act) 85 of 1993
- [3] Eskom Maintenance Management Policy (32-1205)
- [4] Substation and Facility Maintenance (TST41-794)
- [5] Eskom Generation and Wires Operating policy (240-43008621)
- [6] Eskom Safety, Health, Environment and Quality policy (32-727)
- [7] Operating Regulations for High Voltage Systems (32-846)
- [8] The application of the National Building Regulations (SANS 10400-XA)
- [9] Energy efficiency in buildings (SANS 204)
- [10] Standardized Specification for Civil Engineering Construction (SANS 1200)
- [11] IEEE Guide for Safety in AC Substation Grounding (IEEE STD 80)
- [12] Standard for Labelling Outdoor High Voltage Equipment within Eskom Transmission (TSP41-1009)
- [13] Soil Resistivity Testing for Substation Applications (240-96393507)
- [14] Earth Electrode Resistance Measurement standard (240-101940513)
- [15] The Transmission Substation Earth Fault Application Guide (240-95773230)
- [16] Design Review Procedure (240-53113685)
- [17] Terms of Reference for Design Review Teams presiding over Power Delivery Infrastructure Designs in Eskom (240-606480018)
- [18] Direct Lightning Stroke Protection of Substations (240-109589380)
- [19] Standard for operational floodlighting in substations (240-83382076)
- [20] Replace With New 132 kV Circuit-Breakers Rated For 50 kA and Above at The Substations with Fault-Levels 30 kA And Above (240-148617190)
- [21] Engineering Instruction to Install Pantographs On 132 kV and 88 kV Busbar Selection Upon Design Layout Requiring Inline Arrangement (240-180000653)

### **CONTROLLED DISCLOSURE**

- [22] Install Surge Capacitors On 88 kV and 132 kV Feeder Bays to Mitigate Overstress of CB's by Switching Transients upon Permanent Faults (Sustained Faults) (240-180000036)
- [23] Guideline On How Contractors Can Choose Material to Use to Build the Substations or Infrastructure on The Self-Build or Turnkey (240-180000668)
- [24] Transmission: Substation Engineering: Primary Plant: Functional Parameters (240-170001073)
- [25] Transmission Standard Electrical Package
- [26] Transmission Standard Civil Package

### 3.1.2 Informative

- [27] Health and Safety Specification Form for Gumeni Substation (TPDMAN-SP-84) – 02/02/2023
- [28] TPD Baseline Risk Assessment: Gumeni Substation (Electrical Works) – 02/02/2023
- [29] TPD Baseline Risk Assessment: Gumeni Substation (Civil Works) – 02/02/2023

## 3.2 DEFINITIONS

### 3.2.1 Classification

**Controlled disclosure:** controlled disclosure to external parties (either enforced by law, or discretionary).

## 3.3 ABBREVIATIONS

Abbreviation	Description
BoE	Bill of Equipment
BoM	Bill of Material
CLN	Customer Load Network
CoE	Centre of Excellence
DRT	Design Review Team
EIA	Environmental Impact Assessment
EPC	Engineer, Procure and Construct
GPR	Grid Potential Rise
MTS	Main Transmission Substation
PI	Post Insulator
PTMC	Protection, Telecommunication, Metering and Control
QITP	Quality, Inspection and Test Plan
RE	Renewable Energy
SLDG	Substation Layout Design Guideline
TPD	Transmission Project Delivery
URS	User Requirement Specification

**Table 1: List of Abbreviations**

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.



## **4. DESIGN REQUIREMENTS**

### **4.1 SCOPE OF DETAIL DESIGN**

#### **4.1.1 Scope of Work**

The scope of work for Gumeni Substation 2<sup>nd</sup> 400/132kV 500MVA Transformer Project includes the following (Refer to the SED and Key Plan included in Appendix A):

- Equipping Transformer 2 – 400 kV Bay
- Equipping Transformer 2 – 132 kV Bay
- Equipping Transformer 2 – 22 kV Bay
- Installation of 1 x 500MVA 400/132/22kV Transformer
- Installation of 1 x 315kVA 22kV/400V Auxiliary Transformer

### **4.2 DESIGN APPROACH**

The EPC consultant shall be provided with the relevant concept design outputs which is to be used as design inputs for the detail design phase, to culminate in the detail design deliverables.

A guideline on the high-level substation engineering design process to be followed, for this project specifically, is provided below in 4.2.2.

#### **4.2.1 Design Inputs**

A basic design as indicated herein and:

- Station Electric Diagram (Appendix A), and
- Key Plan Drawing (Appendix A)

must be used as inputs by the EPC Consultant for the detail design development.

#### **4.2.2 Design Process**

Since Gumeni MTS is an existing MTS, with an existing busbar and terrace at the position where the 2<sup>nd</sup> transformer is required, the standard practice is to use the existing transformer bays (400kV, 132kV and 22kV) as a reference and to update it with the latest applicable specifications and standards, as well as with the latest HV Equipment as per the Primary Plant Selection Guideline [23], and current standard steelwork and foundation design base [26].

The original Gumeni MTS design allocated a specific bay for the spare second transformer. The existing design base for Gumeni MTS is provided in Appendix B. The expected design changes to the design base are discussed in further sections.

#### **4.2.3 Design Outputs**

The detail design package comprises specific design outputs for the detail design of this project and shall include but are not limited to:

- Substation Engineering Detail Design Report including specialised studies
- Substation Engineering Detail Design Presentation
- Station Electric Diagram
- Key Plan Drawing
- Foundation and Trench Drawing
- Earthmat Layout Drawing

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.



- Steelwork Marking Plan
- Overhead Earthwire Drawing
- Bay Layout Schedule
  - 400 kV Transformer 2 Bay
  - 132 kV Transformer 2 Bay
  - 22 kV Transformer 2 Tertiary Bay
  - 400 kV Transformer 2 Earthing Bay
  - 132 kV Transformer 2 Earthing Bay
  - 400 kV Transformer 2 Plinth Earthing Bay
  - 22 kV Transformer 2 Tertiary Earthing Bay
- Detailed Bill of Equipment (BoE) and Bill of Materials (BoM),

All drawings, reports and presentations are to be provided in its original format (MS Word, MS Excel, MicroStation), as well as in Adobe (pdf) format. Simulation models, that may be referenced in the reports, must also be provided in its original format (e.g.CDEG's, RELUX).

All design reports and drawings may only be signed by engineers and technologists registered with and/or recognised by the Engineering Council of South Africa (ECSA) as competent signatories. Draughtspeople must be registered with and/or recognised by the South African Institute for Draughting (SAID) and/or equivalent international bodies recognised by the SAID to perform such work in the RSA. Membership numbers must be indicated on all sign-offs.

The project has been assigned a unique identifier number, Gum22P03, and all deliverables are to be identified according to the Substation Engineering Document Issue Checklist for this project (Appendix E).

Upon completion of the project and finalisation of the As-Built Drawings, the drawing numbers (using unique identifier numbers) are to be reverted to the original drawing numbers as per the original design base (Appendix B), or with numbers as provided by Eskom (as will be the case for new drawings).

#### **4.2.4 Design Verification**

The outputs shall undergo a peer review within the Substation Engineering Centre of Excellence, prior to presentation at Substation Engineering DRT and Transmission DRT.

Some of the aspects considered during the design review are:

- Compliance of design to stakeholder (user, regulatory, statutory, environmental) requirements.
- Compliance of designs to design standards, philosophies, practices and codes.
- Demonstration of sound engineering thinking where a unique solution has to be provided (design approach, rationale, assumptions, modelling, calculations, simulations).
- Practicality of the implementation proposal for the design solution.
- Ensure that all documents required to procure, construct, install, commission, operate and maintain the designed system or component have been submitted for review and acceptance.
- Safety in design (design is safe to construct, operate, maintain and dismantle).
- The design has considered and incorporated all aspects of constructability, procurement, operability, maintainability, sustainability, reliability, availability, testability, expandability, disposability also and including inspection and commission capabilities.
- Risks have been identified, assessed, documented and mitigated.
- Check if design is ready to proceed to the next design phase or to the execution phase.
- Recommendations of previous design reviews have been incorporated in the revised design.
- Design changes and modifications that are to be referred back from DRT.

#### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

It is important to note that the above-mentioned assurances were obtained at a level commensurate with the design level completed. It is incumbent upon the EPC Consultant to review the design for the aspects indicated above and ensure that all requirements are met prior to presenting at the Substation DRT committee meeting.

### 4.3 DESIGN CRITERIA

Detail designs for Gumeni Substation 2<sup>nd</sup> 400/132kV 500MVA Transformer are to be performed in accordance with the guidelines, criteria and general rules that are outlined in the Transmission Substation Engineering Functional Design Parameters [24]. All designs are to be performed using Eskom approved products.

#### 4.3.1 Codes and Standards

Designs are governed by South African Grid Code [1] and are additionally required to be in compliance with the Occupational Health and Safety Act [2], and any other relevant legislation.

### 4.4 DESIGN BASIS

The concept design approved at Substation and Transmission DRT is as follows:

- Equip Transformer 2 bay in the allocated position. See Figure 1 below for the Approved Station Electric Diagram (SED) and Figure 2 for the Approved Key Plan Drawing.

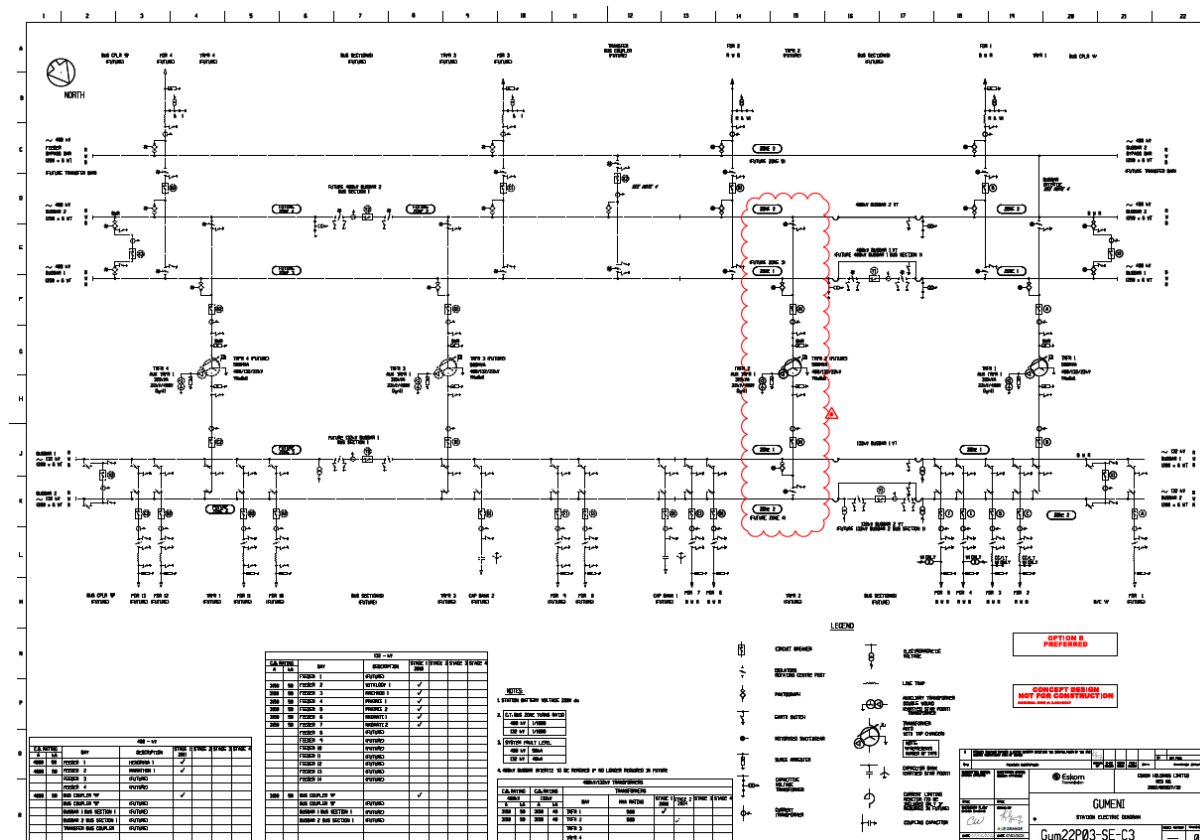


Figure 1. Approved Station Electric Diagram

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

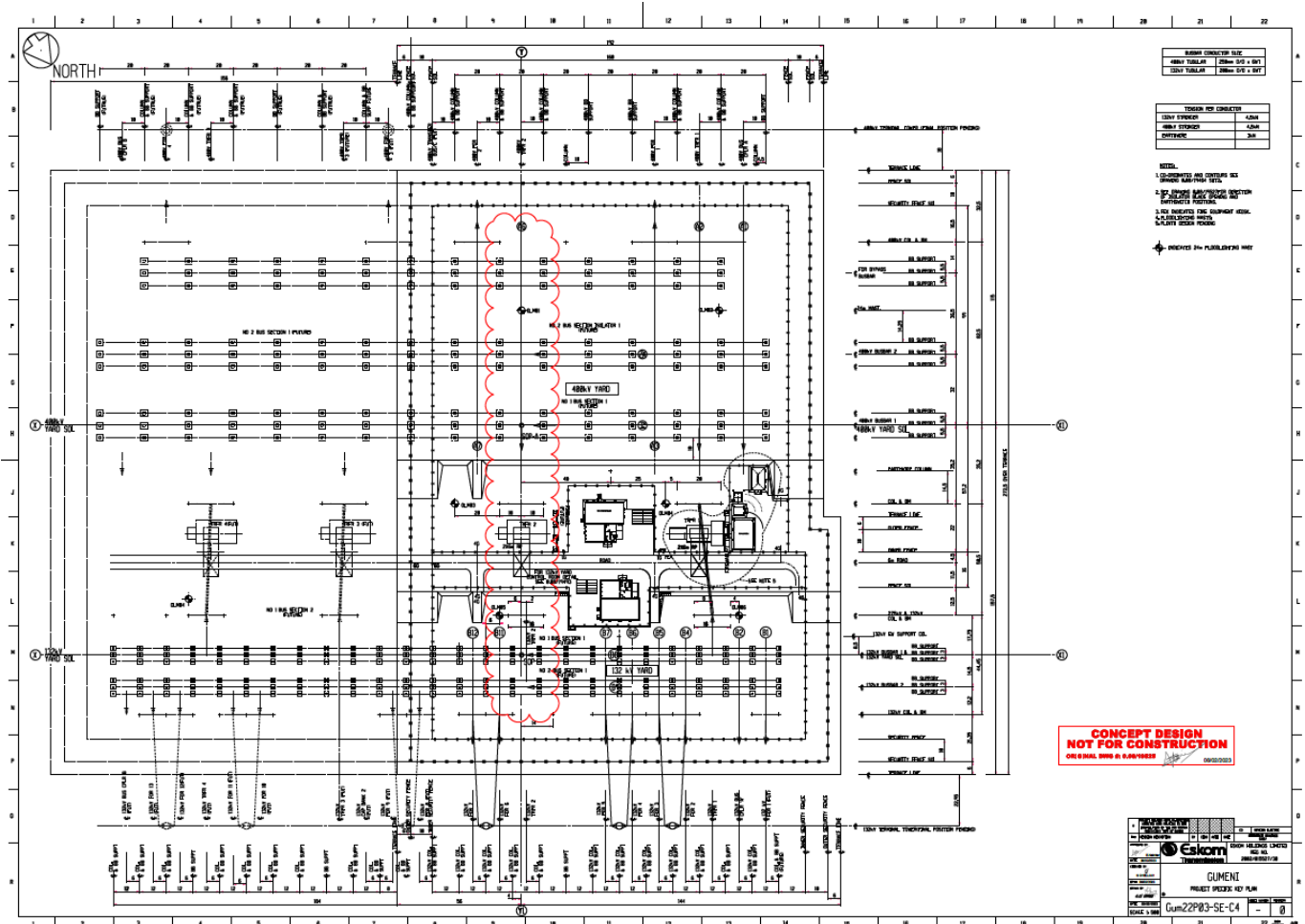


Figure 2. Approved Key Plan Drawing

## 4.5 ELECTRICAL DETAIL DESIGN

### 4.5.1 Design Philosophies

The design philosophy for this project is governed by the initial scope of works since the original Gumeni MTS design allocated a specific bay for the spare second transformer bay. For this reason, the drawings contained in Appendix B are provided to the EPC Consultant.

The EPC Consultant is also directed to reference the Transformer 1 Bay As-Built Drawings listed below, and as provided in Appendix B, for direction in the design of this project as the new Transformer 2 bays will be similar to the Transformer 1 bays:

- Bay Layout Schedule (0.08/19534-1)
- 400kV Transformer 1 Bay (0.08/19534-6)
- 132kV Transformer 1 Bay (0.08/19534-32)
- 400kV Transformer 1 Plinth (0.08/19568 and 0.08/19673)

The EPC Consultant is further directed to reference other as-built drawings as listed in Appendix B, which interface with the scope as contained in this project.

The arrangement of the substation consists of a 400 kV and 132 kV yard, with various other services such as buildings, security, etc.

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

The 400 kV yard is based on a standard double busbar with bypass arrangement with tubular busbars. The 132 kV yard is based on a standard tubular double busbar, with coupler arrangement and provides for future bus-sections when more than 2x400/132 kV transformers are installed. The arrangement and layout of the yard and all bays are in accordance with the Eskom standards.

#### 4.5.2 Substation Design Specifications and Configuration

##### 4.5.2.1 Fault Level Studies

System Voltage (kV)	Designed Fault Current (kA)
400	25
132	40

**Table 2: Fault level studies for the Gumeni MTS**

The fault levels indicated in Table 2 are to be used for earth tail determination and earth grid design.

##### 4.5.2.2 Primary Plant Equipment

The primary plant proposed for the design is based on technically pre-qualified plant equipment only. Selected equipment for the 400 and 132 kV yards will as a minimum comply with the ratings as summarised in the Table 3 below.

Voltage Level (kV)	Rated normal current (A, min)	Short-circuit withstand current (kA, min)	CT Bus Zone Ratio	BIL (kV, min)	Minimum Specific creepage distance (mm/kV, min)
400	3150	50	1/1600	1425	31
132	2500	40	1/1600	550	31

**Table 3: Equipment/Cable/Conductor Selection and Ratings**

All primary plant must be selected from the Primary Plant Selection Guideline [23] and may only be selected if the primary plant conforms to the Eskom standard steelwork and standard foundation design base.

##### 4.5.2.3 Busbar Design

The busbar design for Gumeni MTS is as follows:

System Voltage (kV)	Conductor Rating (A)		Conductor Type	Busbar Configuration
400	4370 @ 65°C	5780 @ 85°C	250mm x 6mm Al Tube	Double Busbar with Bypass
132	3590 @ 65°C	4750 @ 85°C	200mm x 6mm Al Tube	Double Busbar

**Table 4: Conductor and Tubes Selection and Ratings**

**CONTROLLED DISCLOSURE**

#### 4.5.2.4 Conductor Selection

Conductor Selection must be performed considering the maximum expected load, as well as Eskom typical design standards and alignment to existing selections in the substation.

Description	Maximum Load (A)	Conductor Rating (A)		Conductor Type
400kV Transformer Bay	722 A	1972 @ 75°C	2706 at 90°C	Twin Bull
132kV Transformer Bay	2187 A	1972 at 75°C	2706 at 90°C	Twin Bull

**Table 5: Cable/Conductor Selection and Ratings**

The EPC Consultant shall verify all selections prior to finalisation of the detail design phase.

#### 4.5.2.5 Electrical Clearances and Clearance Constraints

The minimum safe working clearances and electrical clearances are to be applied for the design are summarised in Table 6 below.

System Nominal Voltage (kV)	Minimum Electrical Clearances		Working Clearances	
	Phase to earth (mm)	Phase to Phase (mm)	Vertical (mm)	Horizontal (mm)
400	3200	4000	5700	4300
132	1200	1650	3700	2300

**Table 6: Electrical Clearances and Working Clearances**

#### 4.5.2.6 Station DC Voltage

The station DC voltage is 220 V.

#### 4.5.2.7 Insulator Type

Insulator assemblies that are to be used for Gumeni substation:

- 400 kV suspended connection of conductors to the primary bushings of the 400/132 kV power transformer
- 132 kV strain assemblies for the stringers between the 400 and 132 kV yards

Gumeni MTS is in a High/Very High pollution area, and as such:

1. Minimum specific creepage distance is 31mm/kV
2. Composite / silicone rubber insulation.
3. All porcelain surfaces are to be RTV silicone rubber coated.

All insulator hardware assemblies will be in accordance with the 0.54/412 [25] series of standard details. The 400 kV suspended connection will be a V-string assembly.

The insulator type that is to be used, is as per existing application at Gumeni MTS.

### CONTROLLED DISCLOSURE

#### **4.5.2.8 Station Construction Supply**

Transformer 1 and its auxiliary transformer is commissioned and energised; therefore, it is possible that the construction supply may be provided by the MTS.

There is also a Distribution pole mounted transformer off site next to Gumeni MTS, that was used as a construction supply during the establishment of Gumeni MTS. This pole mounted transformer is to be decommissioned as part of the project when the new auxiliary transformer is commissioned.

#### **4.5.2.9 Station Auxiliary Supply**

The primary source for auxiliary power supply to the substation is a 315 kVA 22/0.4 kV auxiliary transformer in accordance with the Eskom AC reticulation philosophy standard for substations. The auxiliary transformer is connected to the tertiary winding of the 400/132/22 kV auto transformer.

Once Transformer 2 is installed, the second 315kVA auxiliary transformer will provide backup to the Transformer 1 auxiliary transformer.

The existing back-up pole mounted transformer on the perimeter of the MTS, as mentioned in 4.5.2.8 above, is to be decommissioned.

The EPC Consultant is to reference the 22kV Transformer 1 Tertiary Bay Drawing (0.08/19534-44), as provided in Appendix B, for consideration in the design of this project, for alignment and uniformity within the station, as the new Transformer 2 Tertiary Bay is expected to be similar to the Transformer 1 Tertiary Bay.

#### **4.5.2.10 Yard Lighting**

The illumination levels for the substation is according to the design for the establishment of the MTS. No changes are expected to be made during this project. The EPC Consultant shall perform a lighting assessment and verify that no further changes are required, using RELUX software and ensuring that the relevant design requirements as required for floodlighting designs are satisfied as per the Transmission Substation Engineering Functional Parameters Standard [24]. If additional light masts and associated infrastructure are required, it is to be included in the design, and constructed.

The EPC Consultant is to reference the Foundation and Trench Drawing (0.08/19529), Operational Floodlighting Cable Route and Mast Location Layout (0.08/19500 Sheets 1-3), as well as Security Lighting Pole and Cable Route Layout (0.08/19501), as provided in Appendix B, for consideration in the design of this project, not only for the lighting assessment as mentioned above, but also to avoid clashes in underground services.

#### **4.5.2.11 Direct Lightning Stroke Protection**

The lightning protection for the substation is according to the design for the establishment of the MTS. No changes are expected to be made during this project. The EPC Consultant shall perform a lightning protection assessment and verify that no further changes are required as part of the detail design, by verifying that the existing design complies to the Direct Lightning Stroke Protection Standard [18], as per the Transmission Substation Engineering Functional Parameters Standard [24]. If additional lightning masts and/or associated infrastructure (OHEW spans) are required, it is to be included in the design, and constructed.

### **CONTROLLED DISCLOSURE**



The EPC Consultant is to reference the Overhead Earthwire Layout Drawing (0.08/19535), as provided in Appendix B, for consideration in the design of this project.

#### 4.5.2.12 AC Reticulation

The AC Reticulation design is detailed in the PTM&C report.

#### 4.5.2.13 Bill of Material for Major Equipment

Item No.	Equipment	Comment	Total Quantity
<b>400 kV Yard</b>			
1	500 MVA 400/132/22 kV Power Transformer	400/132/22 kV 500 MVA Auto Transformer	1
2	400 kV Surge Arresters	400 kV Metal Oxide Arrestor, 80% Effectively Earthed, 31mm/kV	3
3	400 kV Earth Switches	400 kV, 3150 A, (Motorised), 220 V DC, 31mm/kV	1
4	400 kV Double Side Break Isolators (LH ES)	400 kV, 3150 A, (Motorised), 220 V DC, 31mm/kV	1
5	400 kV Pantograph Isolators	400 kV, 3150 A, (Motorised), 220 V DC, 31mm/kV	1
7	400 kV CTs	400 kV, 3150 A, 6C [(2 x TPS, 2400/1, MRP), (2 x TPS, 1600/1, F-BZ), (2 x M, 2400/1, MR-M)], 31mm/kV	3
8	400 kV Circuit Breakers	400 kV, 3150 A, 3Φ ARC tripping, 220 V DC, 31mm/kV	1
9	400 kV Post Insulators	C6-1425, TBC in detail design, 31mm/kV	±13
<b>132 kV Yard</b>			
1	132 kV Surge Arresters	132 kV, Station Class, 31mm/kV	3
2	132 kV Earth Switches	132 kV, 40 kA, 3000 mm φ-spacing, Motorised, 220 V dc aux, 31mm/kV	1
3	132 kV CTs	132 kV, 2500 A, [(2 x TPS, 2400/1, MR-P), (2 x TPS, 1600/1, F-BZ), (2 x M, 2400/1, MR-M)], 31mm/kV	3
4	132 kV Circuit Breakers	132 kV, 3150 A, 40 kA, 3-φ ARC, 220 V DC Aux, 31mm/kV	1
5	132 kV Conventional Isolator with Earth switch	132 kV, 2500 A, 40 kA, 3000 mm φ-spacing, Motorised, 220 V DC aux, 31mm/kV	1
6	132 kV Pantograph Isolator	132 kV, 2500 A, 40 kA, Motorised, 220 V DC aux, 31mm/kV	1
7	132 kV Post Insulators	C6-550, TBC in detail design, 31mm/kV	±7
<b>22 kV Yard</b>			
1	22/0.4 kV Auxiliary Transformer	22/0.4 kV 315kVA Auxiliary Transformer	1
2	22 kV Surge Arresters	22 kV Station Class, 31mm/kV	3

#### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.



3	22 kV Post Insulators	TBC in detail design, 31mm/kV	3
---	-----------------------	-------------------------------	---

**Table 7: Bill of Material for Major Equipment (For Information Purposes Only - TBC in detail design)**

The equipment listed in Table 7 above was identified as suitable for the project. This high level list is to be reviewed and verified by the EPC Consultant, and thereafter used to select specific equipment from the Primary Plant Selection Guideline [23] during finalisation of the detail design phase and before procurement.

#### **4.5.2.14 Substation Earthing**

2 x Earthtails will be used to earth 400kV equipment whilst 3 x earthtails will be used to earth 132kV equipment, based on the fault levels indicated in Table 2 above.

The EPC Consultant is to reference the Earthmat Layout Drawing (0.08/19873), as provided in Appendix B, for consideration in the design of this project.

The EPC Consultant is to also reference the existing Transformer 1 Bay Earthing Drawings below, as provided in Appendix B, for consideration in the design of this project as the new Transformer 2 Earthing bays will be of a similar design as the Transformer 1 earthing bays:

- 400kV Transformer 1 Earthing Bay (0.08/19534-6A)
- 132kV Transformer 1 Earthing Bay (0.08/19534-32A)
- 400kV Transformer 1 Plinth Earthing Bay (0.08/19534-32B)

#### **4.5.2.15 External Interfaces**

None identified but to be reviewed during detail design development by EPC Consultant.

#### **4.5.2.16 Facilities Required**

All building facilities required for the housing and operation of electrical equipment have been established as part of the establishment of the MTS.

#### **4.5.2.17 Maintenance Concept**

The maintenance philosophy for this substation shall be strict adherence to [2], [3] and [7] in addition to the Original Equipment Manufacturers (OEM) requirements. The maintenance policy refers to a number of standard(s)/specification(s) documents that must be coherently adhered to achieve its purpose.

Safety of personnel is of paramount importance when designing a substation. The design must cater for maintenance needs by arranging equipment such that there are sufficient working clearances, and portions of the system that can be isolated to work on. While working clearance to live metal is desirable for the safety of personnel engaged on operations or maintenance, it is not practical to ensure that such clearance exists from every position in a high voltage yard which a person might conceivably be able to occupy. Since personnel cannot be prevented from getting off the ground it is concluded that working clearances shall apply at ground level only. A person stepping off the ground cannot rely on having working clearance and must take whatever other measures that may be necessary to ensure his own safety.

The EPC Consultant shall ensure that the final detail design package is submitted to the relevant Eskom Transmission Grid HV Plant Manager and Grid Chief Engineer via the Project Manager, for scrutiny, review and acceptance of all aspects prior to the project being submitted to the Substation DRT. Acceptance from the Grid must be obtained in writing, in the form of an email or official minutes of a

### **CONTROLLED DISCLOSURE**

suitable Grid meeting such as the Grid Operations Meeting which is held monthly by the Grid. This acceptance must be documented in the Detail Design Report.

Furthermore, the Operating Diagram is to be updated and submitted to the relevant Eskom Transmission Grid HV Plant Manager via the Project Manager, prior to submission to National Control as further outlined below, to ensure that maintenance aspects are considered by the Grid and the Grid is duly satisfied with the maintenance and operational aspects of the design.

#### **4.5.2.18 Operating Concept**

Operating philosophy for the substation shall be designed in accordance with [4] and [5]. The policy refers to several standard/specification documents that must be coherently adhered to in order to achieve its purpose.

Gumeni substation has double busbar with bypass (400 kV) and double busbar (132 kV) arrangements which is widely used within the Eskom network of substations. The arrangements are standard and is well known by designers, operators and National Control. Operating risks at these substations will therefore be no greater than at any other Eskom substation employing the same busbar configurations.

All controlling apparatus shall be permanently labelled to identify the system or part of the system on the electrical machinery which it controls, and where such control apparatus is accessible from the front and back these markings shall be on both the front and the back of the label.

An operating diagram shall be made available to the substation to assist with operating. This drawing serves to indicate all motorized switching equipment (e.g., circuit breakers, isolators, earth switches etc.) within the substation along with their relevant labels.

Operating requirements shall be in accordance with the requirements as set out in with [5].

The EPC Consultant is to reference the Operating Diagram (0.08/19873), as provided in Appendix B, for consideration in the design of this project.

The Operating Diagram must be updated and submitted to Eskom during the execution phase of the project, at an appropriate time, as advised by Eskom National Control and the Eskom Project Manager to ensure that the required schematics are updated timeously to commission the project.

The EPC Consultant is to consult directly with Eskom National Control via the Project Manager in this regard to verify the timing of the drawing update.

The operating diagram is to be updated and revised as per the Operating Diagram Standard, as indicated in the Transmission Substation Engineering Functional Design Parameters [24].

#### **4.5.2.19 Safety Concept**

It is important that substations be safe for the general public and for operating and maintenance personnel, as well as all employees who enter the substation. Practical approaches include the employment and training of qualified personnel, appropriate working rules and procedures, proper design, and correct construction. The safeguarding of equipment is also considered in substation design.

Personnel working standards are prescribed by regulations issued by [2],[3],[4]. Furthermore, all operating, and maintenance personnel should work within the rules and regulations stipulated in [5] and [7]. The substation designs are performed in accordance with relevant Eskom standards, including the South African Grid Code [1].

The earthing system design shall be performed in accordance with [15] and associated references. Effective earthing of a substation is of utmost importance in ensuring the safety of personnel and

### **CONTROLLED DISCLOSURE**

protection of equipment. This is achieved by providing a means to dissipate electric currents into the earth under normal and fault conditions without exceeding any operating/equipment limits or adversely affecting continuity of supply. The earthing design limits the touch and step voltages to within safe limits and the Grid Potential Rise (GPR) to acceptable limits.

The EPC Consultant is to reference the following drawings, as provided in Appendix B, for consideration in the earthing design for this project:

- Earthmat Layout Drawing (0.08/19873),
- 400kV Transformer 1 Earthing Bay (0.08/19534-6A)
- 132kV Transformer 1 Earthing Bay (0.08/19534-32A)
- 400kV Transformer 1 Plinth Earthing Bay (0.08/19534-32B)

The earthing design for the project shall be comprehensive and shall comply to the Transmission Substation Engineering Functional Design Parameters [24] and Substation Earth Grid Design Standard [240-134369472].

The earthing design shall include but shall not be limited to the following:

- Simulation Studies on an Eskom approved Earthing and Grounding Software Programme (CDEGs) only,
- Soil Resistivity Test,
- Earth Grid Test, and
- Earth Continuity Test.

All the above studies and test results are to be done according to Eskom Standards [13,14,15] and the results are to be documented and appended to the Detail Design Report.

Tests that are required to be conducted post construction, must be submitted in the As-Built package.

## **4.6 SITING**

### **4.6.1 Site Selection**

Not applicable. This is an existing site.

### **4.6.2 Site Characteristics**

#### **3.8.2.1 Geotechnical**

Not applicable. Geotechnical studies for this project are not required.

#### **3.8.2.2 Topographical Survey**

Not applicable. Topographical survey was conducted previously during site establishment.

#### **3.8.2.2 Hydrological Characteristics**

Not applicable. Hydrological characteristics were determined during the original design for this MTS.

### **4.6.3 Site Layout**

Not applicable. The optimal site layout was determined as per the original design for the MTS.

## **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

## **4.7 CIVIL AND STRUCTURAL DESIGN**

### **4.7.1 General**

The civil infrastructure for Gumeni Substation is existing in accordance with the SANS standards [8][9][10]. All new infrastructure will be designed in accordance with the SANS standards and will be identified and designed during the Detail Design phase by the EPC Consultant.

### **4.7.2 Buildings**

Not applicable. No additional buildings are required.

### **4.7.3 Earthworks**

Not applicable. No additional earthworks are required.

### **4.7.4 Foundation, plinths and trenches**

Standard foundations will be required for all new main and equipment steelwork. All new works will be done in accordance with the SANS standards [8] [9] [10]. New foundations to be considered in detail phase and selected according to the latest revision of the application guide 0.54/8829 and section 3.3.1.2 of [24]. All equipment purchased must be mechanically and electrically compatible with the design base stated in the application guide 0.54/8829 and section 3.3.1.2 of [24].

Trenches and cable trench entrances to control room are adequate for the proposed works. However, any need for additional trenches and/or trench entrance to the control room is to be designed in accordance to 0.54/390 SH 15H of the HV Yard Civil Work series and will form part of the detailed design package.

The EPC Consultant is to reference the Foundation and Trench Drawing (0.08/19529), as provided in Appendix B, for consideration in the design of this project.

Furthermore, the EPC Consultant is directed to reference other as-built drawings, which interface with the scope as contained in this project. These drawings are as follows:

- 400kV Cable Trench Down Embankment Layout and Details (0.08/19687)
- 132kV Yard - Cable Shaft at Embankment Plan, Section and Details (0.08/19537)
- Terrace Embankments and Road Ramps – Sections and Details (0.08/19564)
- 400kV Yard Level Schedule (0.08/19596)

Standard Foundations, Plinths and Trench Drawings are located in the civil standard issue package [26].

### **4.7.5 Fencing**

No additional fencing is required.

### **3.9.6 Roads**

No road modifications or additions are required.

### **3.9.7 Structural Steel**

It is not expected that any non-standard steelwork will be required to realise this project.

Standard steelwork will be required for new main structures and equipment and must comply with SANS

## **CONTROLLED DISCLOSURE**

standard [10]. New steelwork designs are to be used and selected according to the latest revision of the Application Guide (0.54/8829). Steelwork support designs are to be selected to interface directly to standard foundations and high voltage equipment as selected according to the Primary Plant Equipment Selection Guideline [23].

The EPC Consultant is to reference the Steelwork Marking Plan (0.08/19531), as provided in Appendix B, for consideration in the design of this project.

Standard Steel Drawings are located in the civil standard issue package [26].

### **3.9.8 Drainage**

It is not expected that additional sub soil drainage is required to realise this project.

Oil drainage for the new transformer is to be provided for and must be integrated into the existing oil drainage system. Further, cognisance must be taken of the existing oil drainage and sub soil drainage when placing equipment foundations, transformer plinths, etc. to ensure that any potential clashes with existing infrastructure are designed for.

The EPC Consultant is to reference the Drainage Layout (0.08/19498), as provided in Appendix B, for consideration in the design of this project.

## **4.8 DESIGN ASSESSMENT**

### **4.8.1 Operability Assessment**

Not applicable.

### **4.8.2 Reliability, Maintainability, Availability Assessment**

Not applicable.

### **4.8.3 Constructability Assessment**

The EPC Contractor is to supply a constructability assessment and a plan of how the scope will be executed.

### **4.8.4 Inspectability and Testability Assessment**

Since Gumeni substation consists of outdoor yards and equipment, inspection and status of the equipment, structures, foundations, conductors and the like are easily achieved. The EPC Consultant must ensure that structures and equipment are mounted at heights that will facilitate inspections of equipment (for instance monitoring SF6 gas in circuit breakers or oil level in transformers, etc.) from ground level.

### **4.8.5 Expandability Assessment**

Future expandability of the substation, including but not limited to accessibility, must not be limited in any way.

### **4.8.6 Dismantling and Demolition Requirements**

The existing pole mounted Transformer at Gumeni must be decommissioned as part of the scope.

## **CONTROLLED DISCLOSURE**

## **4.9 SAFETY ASSESSMENT**

### **4.9.1 Industrial Safety Assessment**

The Health and Safety Specification and the Baseline Risk Assessments (Civil and Electrical) [27], [28] and [29] have been received from the client and must be considered further explicitly in the detail design of the project.

The industrial safety and risk assessment compiled by the EPC Contractor must support Eskom's safety ideals, as well as Eskom's Value of Zero Harm.

### **4.9.2 Fire Safety Assessment**

A Fire Equipment Kiosk, as contained in the Standard Civil Issue Package [26], is to be provided for the new transformer.

## **4.10 PLAN OF IMPLEMENTATION**

### **4.10.1 Project Outage Requirements**

The following outages are envisaged:

- Outages will be required per 132kV and 400kV busbar to connect isolators
- And any other instances where clearances cannot be met, when doing construction

The preliminary outage requirements, on which the construction assessment is based, is to be discussed and confirmed with the relevant person at National Control via the Eskom Project Manager, prior to finalising the detail design for presentation to Eskom for acceptance.

All discussions and confirmations are to be documented in Detail Design Report.

### **4.10.2 Transportation Plan**

The substation access road is designed to accommodate conventional and abnormal loads transported by road.

The transportation plan external to the substation is to be developed by the relevant stakeholder as it falls outside the scope of Substation Engineering.

### **4.10.3 Construction Plan**

During the detail design, the EPC Consultant is to very carefully consider all risks pertinent to the project and in particular those highlighted in the Health and Safety Specification [27] and Baseline Risk Assessments [28,29], and ensure that risk treatments and risk controls are identified, documented and communicated to Eskom. Further risks identified during the detailed phase of the design should also be documented together with additional treatments, controls and mitigation measures.

The construction plan falls outside the scope of Substation Engineering and is to be developed by the relevant stakeholder.

## **5. AUTHORISATION**

This document has been seen and accepted by:

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

Name	Designation
Deepa Abraham	Senior Engineer: Integration Engineering
T Lekhuleni	Senior Advisor: Transmission Project Development

## 6. REVISIONS

Date	Rev.	Compiler	Remarks
3 August 2023	1	E Naicker	First Issue

## 7. DEVELOPMENT TEAM

The following people were involved in the development of this document:

E Naicker

B Ndlovu

## 8. ACKNOWLEDGEMENTS

None

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.



APPENDIX A: CONCEPT DESIGN DRAWINGS/DOCUMENTATION

Document Number	Rev.	Document Title	Remarks
Gum22P03-SE-C3	0	Station Electric Diagram	First Issue
Gum22P03-SE-C4	0	Key Plan Drawing	First Issue

CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

## APPENDIX B: GUMENI MTS – AS-BUILT DRAWINGS (AS AT 9 JUNE 2023)

Document Number	Rev.	Document Title	Remarks
<b>Electrical Drawings</b>			
0.08/19527	4	Station Electric Diagram	-
0.08/19528	4	Key Plan Drawing	-
0.08/19529	5	Foundation and Trench Drawing	-
0.08/19530	3	Earthmat Layout Drawing	-
0.08/19531	2	Steelwork Marking Plan	-
0.08/19535	0	Overhead Earthwire Layout	-
0.08/19533-1	0	400kV Busbar Layout	-
0.08/19533-2	1	132kV Busbar Layout	-
0.08/19534-1	2	Bay Layout Schedule	-
0.08/19534-6	1	400kV Transformer 1 Bay	-
0.08/19534-6A	0	400kV Transformer 1 Earthing Bay	-
0.08/19534-6B	0	400kV Transformer 1 Plinth Earthing Bay	-
0.08/19534-32	3	132kV Transformer 1 Bay	-
0.08/19534-32A	0	132kV Transformer 1 Earthing Bay	-
0.08/19534-44	3	22kV Transformer 1 Tertiary Bay	-
		22kV Transformer 1 Tertiary Earthing Bay	-
0.08/19534-45	0	22kV Transformer 2 Tertiary Bay (Future)	-
0.08/19873	2	Operating Diagram	-
<b>Civil Drawings</b>			
0.08/19498	1	Drainage Layout	-
0.08/19500	1	Operational Floodlighting Cable Route and Mast Location Layout	-
0.08/19501	1	Security Lighting Pole and Cable Route Layout	-
0.08/19568	3	Transformer 1 – Plinth, Bundwall and Drainage Details	-
0.08/19673	0	400/132kV Transformer 1 – Plinth, Bundwall and Drainage	-
0.08/19687	0	400kV Cable Trench Down Embankment Layout and Details	-
0.08/19537	1	132kV Yard - Cable Shaft at Embankment Plan, Section and Details	-
0.08/19564	0	Terrace Embankments and Road Ramps – Sections and Details	-
0.08/19596	0	400kV Yard Level Schedule	-

### CONTROLLED DISCLOSURE

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

**APPENDIX C: GUMENI MTS – AS-BUILT DOCUMENTATION**

<b>Document Number</b>	<b>Rev.</b>	<b>Document Title</b>	<b>Remarks</b>
-	-	Earth Continuity Tests	
-	-	- September 2015	Available
-	-	- October 2019	Available
-	-	Earth Grid Impedance Measurement, GPR Tests and Step/Touch Potentials Measurements	
-	-	- March/April 2013	Available
-	-	Earthing Design Report	Unavailable
-	-	CDEGS Simulation Model	Unavailable
-	-	Soil Resistivity Tests	Unavailable

**CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

## **APPENDIX D: GUMENI MTS – PROJECT INPUT DOCUMENTATION**

### **Normative References:**

27] Health and Safety Specification Form for Gumeni Substation (TPDMAN-SP-84) – 02/02/2023

28] TPD Baseline Risk Assessment: Gumeni Substation (Electrical Works) – 02/02/2023

29] TPD Baseline Risk Assessment: Gumeni Substation (Civil Works) – 02/02/2023

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.

## **APPENDIX E: TEMPLATES**

<b>Document Number</b>	<b>Rev.</b>	<b>Document Title</b>	<b>Remarks</b>
240-56364587	1	Site Visit Report Template	-
240-140073760	-	Detail Design Report Template	-
-	2023	Civil DRT Presentation Template	-
-	2023	SS and Tx DRT Presentation Template - Detail	-
240-111653940	2	Substation Engineering Document Issue Checklist	-

### **CONTROLLED DISCLOSURE**

When downloaded from the EDMS, this document is uncontrolled and the responsibility rests with the user to ensure it is in line with the authorised version on the database.