NURIZON CONSULTING ENGINEERS

GEOTECHNICAL ENGINEERING CAPABILITY

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NURIZON CONSULTING ENGINEERS
is a global engineering consultancy firm with offices in the UK and South Africa
We pride ourselves with our wide range of
GEOTECHNICAL ENGINEERING SERVICES
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GEOTECNICAL INVESTIGATIONS

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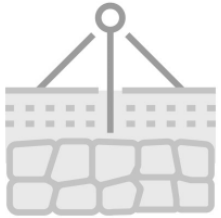

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- Pavement Investigation

ANALYSIS & DESIGN

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- Platform Design
- Retaining Structure Design
- Piling Design
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DAM DESIGN

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TAILINGS STORAGE FACILITY

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- Dry Stack Tailings Storage Facilities
- Waste Rock Dumps

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GEOTECHNICAL INVESTIGATIONS

We are a reputable company that provides comprehensive geotechnical investigation services to assess subsurface conditions and ensure the safety and stability of construction projects.

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Geotechnical Investigations

1. Near Surface Investigation

Near surface geotechnical investigations (up to 6m depths excavated using a TLB (Tractor Loader Backhoe) or Excavator), including soil profiling and sampling, DCP (Dynamic Cone Penetrometer) testing, analysis and reporting.

The purpose of the investigations will be to obtain and provide information regarding the site conditions in terms of (but not limited to):

- The geology of the site;
- Insitu soil parameters;
- The excavation conditions of the site;
- Identification of problematic soil conditions;
- The level of bedrock (if encountered);
- The suitability of the in-situ material for foundation design;
- Prediction of typical soil bearing capacities through DCP testing; and
- The presence of groundwater.

2. Deep Investigation

Similar to Near Surface Investigations, but including deep testing (up to 60 / 100m (or deeper)). This is typically undertaken by drilling of boreholes (percussion boreholes (air or cable), rotary core boreholes or auger boreholes) and / or DPSH (Dynamic Probe Super Heavy) testing.

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Geotechnical Investigations

3. Dolomitic Stability Investigation

Dolomitic Stability Evaluation according to the requirements of SANS 1936, including

- Desk study, including studying of existing / available geological and geotechnical information as well as preparation in terms of borehole positions and organizing of the required plant;
- Confirmation of the boreholes (typically air percussion boreholes to 60m or 100mm depths) and test pit positions;
- Collection of information regarding the site topography, vegetation, water sources, etc.;
- Gravity Survey;
- Site work. The aim of the geotechnical investigation is to determine the sub-surface soil conditions and hence quantify the Dolomitic Stability for the specific site; and
- Analysis of data and Technical Report.

The aim of the dolomite stability investigation is to provide feedback / recommendations in terms of:

- Land Use Designation;
- Receptacle Development, mobilising agencies, inherent susceptibility of the blanketing layer to mobilization and sinkhole development;
- Inherent Hazard Class;
- Dolomite Area Designation;
- Development Criteria; and
- Risk Management.

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Geotechnical Investigations

4. Borrow Pit Investigation

The assessment of the suitability of a borrow pit for providing construction materials, including soil type, strength, gradation, and potential environmental impacts.

5. Pavement Investigation

The evaluation of the subsurface conditions, pavement materials, and structural integrity to assess the performance and durability of a pavement system.

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GEOTECHNICAL ANALYSIS & DESIGN

Geotechnical design is the process of applying soil and rock mechanics principles to create safe and stable foundations and retaining structures for various construction projects.

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Geotechnical Analysis & Design

1. **Foundation Design**

   The selection and design of a foundation system that can support the structural loads and withstand the subsurface conditions in a safe and economical manner.

2. **Platform Design**

   The design of a stable and durable platform for construction projects, such as engineered fill platforms, roads, and bridges, by considering the subsurface conditions, structural loads, and environmental factors.

3. **Retaining Structure Design**

   The design of structures to support and restrain soil and rock masses, considering the subsurface conditions, structural loads, and environmental factors.

4. **Piling Design**

   The design of deep foundations using piles to transfer structural loads to the underlying soil or bedrock (or the use of friction piles).

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Geotechnical Analysis & Design

5. Slope Stability Design

The evaluation of the resistance of a slope to failure under the influence of gravitational and other forces.

6. Stockpile Design

The design of stable and efficient stockpiles for storing materials, considering the subsurface conditions, material properties, and operational requirements.

7. Dolomitic Stability Analysis

Dolomitic Stability Evaluation according to the requirements of SANS 1936, in order to provide recommendations in terms of (i) Development Criteria and (ii) Risk Management for a site underlain by dolomitic bedrock.

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TAILINGS STORAGE FACILITY (TSF)

Tailings storage facilities are engineered structures designed to safely contain and manage the residual waste material, known as tailings, generated from mining operations.

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Tailings Storage Facility (TSF)

1. **Conventional Slime Dams**
   Conventional slime dams are earthen embankments constructed to contain and store tailings; the liquid waste produced during mining operations.

2. **Dry Stack Tailings Facilities**
   The deposition and management of dewatered tailings in a stable, unsaturated state, minimizing water usage and environmental impact.

3. **Waste Rock Dumps**
   A large mound of waste rock material generated during mining operations, designed and constructed to ensure stability and minimize environmental impact.

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DAM DESIGN

Dam design, a specialized field within engineering services, encompasses the comprehensive planning, analysis, and structural design of dams to safely control water flow and storage.

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Dam Design

1. Earth Dam Design

The design of an earth dam involves assessing the stability of the foundation, selecting appropriate materials for the dam's core and shell and designing the dam's geometry to withstand the forces of water and sediment.

2. Pollution Control Dam (PCD)

A pollution control dam is a type of dam designed to retain and treat contaminated water, preventing the release of pollutants into the environment.

3. Storage Dams

Storage dams are embankments constructed to impound water for various purposes, including water supply, irrigation, hydroelectric power generation, and flood control.

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Dam Design

4. Return Water Dams

Return water dams are earthen structures constructed to store and recycle used water, reducing the need for freshwater withdrawals and minimizing environmental impacts.

5. Attenuation Dams

Attenuation dams are structures designed to reduce the flow velocity and erosive power of water, minimizing downstream flooding and sediment transport.

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Geotechnical Projects Experience

Client	Description	Country
BHM Construction International (UK) Ltd.	Design and Construction of the Tema - Aflao Road (17km) - Phase 1: Geotechnical investigation and bridges (4 off) foundation design (up to 800mm diameter piles, 19m deep) (2021 to 2023)	Accra, Ghana
Black Chrome Mine	Tailings Storage Facility (TSF) and associated infrastructure design, for a Chrome Beneficiation Plant sized for an input of 80,000 tonnes per month Run-of-Mine (ROM) with a feed grade of 33% to 34% (2023)	Limpopo Province of South Africa
Practara Metals& Mining Advisory	Khoemacau Copper Mine Techno Economic Fatal Flaw Assessment in terms of the Tailings Storage Facility and associated infrastructure (2023).	Kalahari Copperbelt in Botswana, Africa
Bauba Resources (Pty) Ltd.	Kookfontein Mine. Development of the Kookfontein Mine Tailings Storage Facility (TSF) (±30,000tpm), for tailings generated from the Chromite and PGM Beneficiation Facilities. The design also includes a detailed geotechnical investigation, access road and 21km raw water supply pipeline design. (2022 / 2023)	North West Province, South Africa
Sereti Green	Geotechnical Investigation for the Ummbila Wind Farm project, in terms of the Main Transmission Substation, Collector Substation and Overhead Line (2013)	Mpumalanga Province of South Africa
Mainstream Renewable Power South Africa	Geotechnical Investigations for the Varsfontein Substation and Overhead Power Line	Western Cape Province of South Africa
IQS Holdings	Geotechnical Investigation for the Robinson Deep Landfill Extension. Robinson Deep Landfill is an existing landfill site located in Turffontein, Johannesburg	Johannesburg, Gauteng Province of South Africa
OMI Solutions (Pty) Ltd.	Geotechnical Investigation in terms of Spitzkop Mine's Stormwater Management Plan, in support of the Mine's Water Use and Waste Licences and Stream Diversion (2023)	Limpopo Province of South Africa
ERO Copper / UMS	Boa Esperança Project. Owners Team (Tailings Storage Facility Expert). Tailings Disposal and Management Facilities of the Boa Esperança Copper Project, which comprises the development of an open-pit mine, and copper sulphides concentrator (2022)	Tucumã, Province of Pará, Brazil
OMI Solutions (PTY) Ltd.	Geotechnical Investigation for the Amatshe Central Gold Mine Operations (2021)	Gauteng Province of South Africa

Geotechnical Projects Experience

Client	Description	Country
Vanadium Resources (Pty) Ltd.	Steelpoortdrift Vanadium Mine - Design of the Concentrator and Salt Roast Plant's Tailings Storage Facilities (TSF) and associated civil engineering and stormwater management design (including geotechnical investigations and design) (2022).	Limpopo Province, South Africa
Anglo American Platinum	Mogalakwena Mine - Design and construction support for the upgrade of the Mogalakwena Mine's North Concentrator's final tailings infrastructure (2022)	Limpopo Province of South Africa
OMI Solutions (PTY) Ltd.	Kareevlei Diamond Mine's geotechnical investigation, focusing on the i) Infrastructure and Plant Area ii) TSF Area and iii) stockpile/dump area (2021)	Northern Cape Province of South Africa
Hatting and Ndzabandzaba Attorneys	Expert Witness – Dolomitic Stability (Irene X10) (2021)	Irene, Gauteng Province of South Africa
Anglo American / Practara	Twickenham Mine SWMP – Geotechnical Investigation (2021)	Mokopane, Limpopo Province of South Africa
Bauba Hlabirwa Mining Investments	Moeijelijk Chrome Mine - Tailings Storage Facility Monitoring (External Audit) (2021)	Limpopo Province of South Africa
Sefateng Chrome Valley Development	Sefateng Chrome Mine. Geotechnical, civil, structural, mechanical and electrical design for a material handling system at their Sefateng Chrome Mine (300t/hr Main Conveyor system), including an underground conveyor, overland conveyors, waste conveyor, transfer towers and Luffing / Slewing Conveyor (2021)	Near Steelpoort, Limpopo Province, South Africa
Red Kite Environmental Solutions (Pty) Ltd.	Mphahlele Mining Right Application Project - Geotechnical Investigation for the (i) Infrastructure and Plant area ii) TSF (tailings storage facility) area and iii) stockpile / dump area (2021)	Near Lebowakgomo in the Limpopo Province of South Africa
Motjoli Iron Ore Company (Pty) Ltd.	Meletse Iron Ore Project - Geotechnical Investigation (2020)	Thabazimbi, Limpopo Province of South Africa
Afritin Mining	Uis Tin Mine – Process Plant Upgrade – Geotechnical Investigation (2020)	Town of Uis, located in the Erongo region of Namibia

Geotechnical Projects Experience

Client	Description	Country
URU Metals Ltd.	Zebediela Nickel Project - Geotechnical Investigation for the (i) Infrastructure and Plant area (including roads) ii) TSF (tailings storage facility) area and iii) stockpile / dump area (2020)	Approximately 5.7km north east of Mokopane, Limpopo Province of South Africa
Lynca Meats	New Butchery – Geotechnical Investigation (2020)	Meyerton, Gauteng Province of South Africa
Anglo American Platinum	Mortimer Electrical Separation Project - Geotechnical Investigation (2019)	Approximately 15 km west of Northam, Limpopo Province of South Africa.
Eskom	Eskom, Merensky - Steelpoort Line - Electrical Overhead Support Foundations (2019)	Steelpoort, Limpopo province of South Africa
Lynca Meats	Industrial Waste Water Treatment Plant – Geotechnical Investigation (2019)	Meyerton, Gauteng Province of South Africa
Exxaro	Leeuwpan Coal Mine, Life of Mine ("Lifex") Project - Geotechnical, civil, structural and architectural detail design, project management, tender and construction documentation and construction support for the construction of 46 houses as part of the Leeuwpan Coal Mine resettlement plan. (2019)	Botleng, approximately 3km north of Delmas, Mpumalanga Province of South Africa
Eskom	Booysendal, Northam - Electrical Overhead Support Foundation Nominations (2019)	Northam, Limpopo province of South Africa
Mandlaglo Commodities (Pty) Ltd	Tala, Bethal Coal Mine - Geotechnical Investigation Report (2019)	Bethal area of Mpumalanga, South Africa
Erwat	Dolomitic Stability Investigations for 19 ERWAT (East Rand Water Care Works) Waste Water Treatment Plants – 2-year appointment (2017 – 2018)	Gauteng Province, South Africa
Evergreens	Dolomitic stability investigation, geotechnical investigation and foundation design for the new Evergreens Development, adjacent to the R21 (2016)	Gauteng Province, South Africa

Geotechnical Projects Experience

Client	Description	Country
Contracta	Geotechnical Investigation and foundation design for the new Kumasi International Airport's terminal building and extension of the runway and apron (2018)	Kumasi, Ghana
Erwat	Dolomitic Stability investigation for the new PST at the ERWAT Waterval Waste Water Care Works (2018)	Gauteng Province, South Africa
Rand Water / Mathosi	Geotechnical Investigation and foundation design for two substations at the Rand Water Zuikerbosh Pumping Station (2017)	Near Vereeniging, South Africa
Erwat	Dolomitic Stability investigation for the new PST at the Olifantsfontein Waste Water Care Works (2017)	Gauteng Province, South Africa
Patio Warehouse / Saiyl	Geotechnical Investigation and foundation design for the new Patio Warehouse in George (2018)	George, Western Cape Province
Transnet	Phalaborwa Line – Proposed New Loops at Brakspruitbrug and Palmloop - Geotechnical Investigation (2016)	Limpopo Province, South Africa
Coffey Mining	Lucunga Phosphate Project. Geotechnical Investigation for the (i) Tailings Storage Facility Area, (ii) Process Plant Area and (iii) IDZ (Industrial Development Zone) Area.	Zaire Province, Angola
Doosan Heavy Industries & Construction Co. Ltd	Geotechnical Investigation for the Thabametsi 600MW Coal Fired power plant. (2015)	Limpopo Province, South Africa
Transnet	Komatipoort Line – Proposed new Loops at Nagel and between Nagel and Mhlume - Geotechnical Investigation (2015)	Mpumalanga Province, South Africa
Lula Mining	KALUMINES MINE. Planning and detail design of the new Tailings Dam, Return Water Dam and Stormwater Management.	Lubumbashi, The Democratic Republic of the Congo
SA Lion Park	Geotechnical Investigation and Dolomitic Stability Investigation for the proposed new Lion Park. (2013)	Gauteng Province, South Africa

Geotechnical Projects Experience

Client	Description	Country
Trafigura Services South Africa (Luna Mining)	Mbola Mine - 1. Geotechnical Investigation and report regarding the stability of the existing Tailings Dam wall. 2) Design of the two new Tailings Storage Facilities (TSF). (2013)	Lubumbashi, The Democratic Republic of the Congo
Coal of Africa Limited	Mooiplaats Coal Project. Pollution Control Dam - Geotechnical Investigation	Mpumalanga Province, South Africa
Alufer Mining Ltd	Bel-Air Bauxite Mine. Geotechnical Investigation.	Republic of Guinea
Basil Read Matomo	Beaufort West Photovoltaic Plant. Geotechnical Site Investigation	Western Cape, South Africa
Trafigura Services South Africa (Luna Mining)	Kalumines Mine - Design of the new tailing dam. (2013)	Lubumbashi, The Democratic Republic of the Congo
Karoo Gateway Airport	Geotechnical Investigation for the upgrading of the existing runway and apron. (2013)	Western Cape, South Africa
Sable Mining	Nimba Iron Ore. Geotechnical Investigation for the shipping port - new iron ore mine. (2014)	Buchanan, Liberia
FibreCo - ZTE	Cable route geotechnical investigation for a new optical fibre cable. Total distance of the route is approximately 400km.	Western Cape, South Africa
Root 3 Consultants	Platform design for a proposed transformer yard.	Abidjan, Ivory Coast
GDF Suez	Kathu Solar Plant 1 & 2 - Geotechnical Investigations (2015)	Northern Cape, South Africa
EOH Power Systems	Geotechnical Investigation – 3 Series Capacitor Bank Project – FSC 1 Chimuara Substation 2	Chimuara, Mozambique

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NURIZON CONSULTING Pty Ltd

Route 21 Corporate Park
Regency Pavilion – Suite 6A
36 Regency Drive
Gauteng, South Africa

info@nurizon.co.za
+27 12 345 3649

NURIZON INTERNATIONAL Limited

Suite 6.03, 6th Floor
One Crown Square
Woking, GU21 6HR
United Kingdom

info@nurizon.co.uk
+44 1483 366 033