

# CAPABILITY STATEMENT

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CREATING  
THE FUTURE OF LIFE  
TODAY



**iX**engineers  
Infrastructure Excellence

# OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE TODAY

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# ABOUT US

iX engineers is a proudly South African engineering design and consulting firm that focuses on eight key market solutions. These are:



DIGITAL



WATER AND  
SANITATION



SMART CITIES



TRANSPORT



ENERGY



MINING

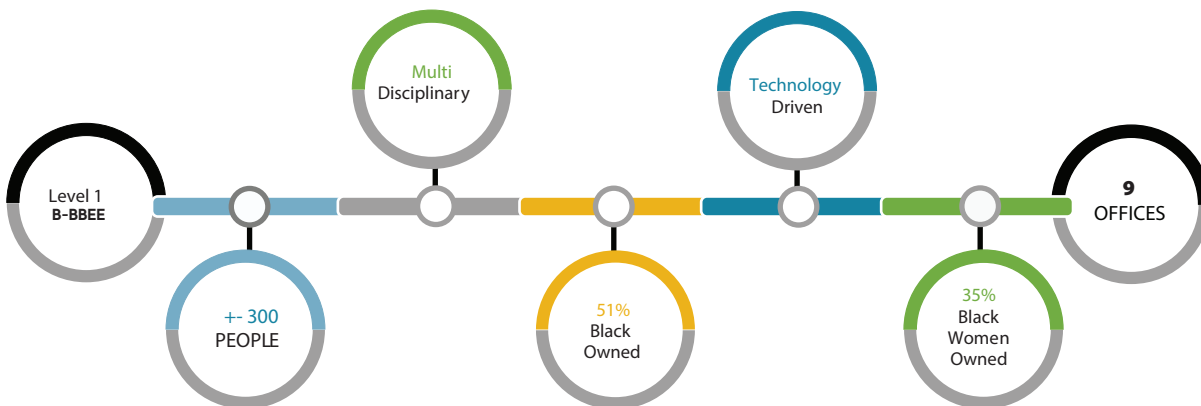


BUILDINGS



HUMAN  
SETTLEMENTS

With operations in Southern and East Africa, our passion is to design and advise on infrastructure development projects that enable the creation of the future of life. Simply put, we get excited at carving out business-driven solutions that directly and positively impact humanity. Our DNA, which is distinctly African, is harnessed by the concept of Ubuntu - an African proverb meaning "I am because you are." Ubuntu embraces the idea that humans cannot exist in isolation and that we depend on connections, community, and caring. We cannot be without each other.



At iX engineers, we fuse science and art to solve big problems. Our skilled professionals specialise in civil, structural, chemical, process, electrical, and mechanical engineering, as well as instrumentation and project management.

Our teams possess an intricate knowledge of the African continent's socio-political and socio-economic terrain, using their diverse experiences to deliver ground-breaking and significant projects on the continent. These projects are executed with a zero-harm tolerance in safety, health, and risk for human life, assets, and the environment under the guidance of the iX engineers' SHERQ support team.

**OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE TODAY**

# PERSPECTIVE FROM THE CEO

## WE ARE OBSESSED WITH CREATING THE FUTURE OF LIFE



The South African economy has been under pressure for some time resulting in a substantial increase in the unemployment rate and the number of jobless households.

The South African operating business landscape continues to be a massive challenge for most local businesses, which often wrestle with higher prices, power shortages, and a depressed workforce. (The Seventh World Happiness Report found that South Africans are some of the world's unhappiest people. Out of 156 countries, South Africa was placed 106th).

Like the rest of the world, South Africa finds itself at an interesting intersection. The country needs to deliver economic and job growth while also supporting the country's most vulnerable citizens, who are on the social welfare programme. The tax base is shrinking, the gap between those who have and those who do not is widening, the levels of corruption are unprecedented, and the truth is that the moral compass of South Africans has taken a beating, and there is pessimism in the air.

When the country's moral compass is at its lowest point, the onus is on leaders (both in the private and public sectors) to step up and give motivating words, followed by decisive actions, to encourage us all to move forward and achieve our best standards.

We are a vibrant and resilient nation; what keeps us going is the fact that for every challenge, there is a uniquely South African solution. At iX engineers, we remain optimistic about this place we call home, South Africa.

Leaders and people who learn from the past stay focused on the future. iX engineers is the face, voice, and personality of the future of infrastructure solutions on the African continent. Our role is much deeper than just providing engineering solutions. We are obsessed with today because we desire the lessons that will prepare us for tomorrow.

Our tomorrow is about technology-driven solutions.

We have a "hands-on" engineering methodology and style to deliver holistic infrastructure solutions that are both non-traditional and traditional as we continuously strive to add value to our customers, communities, businesses, and stakeholders.

Our service offering focuses on six carefully identified market sectors to best bolster our customers' needs, the environment they operate in, and the goals they wish to achieve.

Kind regards

*Ms Lebo Leshabane*

Chief Executive Officer  
iX engineers Pty Ltd

# iX ENGINEERS LEADERSHIP



## MS LEBO LESHABANE

### CHIEF EXECUTIVE OFFICER

- o BSc. Eng. Civil, Honours: Wits University
- o Business Management: UNISA
- o GDE Civil - Project Management, Property Law, Maintenance Engineering: Wits University
- o Innovation is strategy - Harvard School of Business
- o Business Analytics: Wharton University of Pennsylvania
- o IOT - Massachusetts Institute of Technology



## MS AFRIKA MSIMANG

### CHAIRPERSON OF THE BOARD

- o Master of Public Administration: University of Cape Town
- o Bachelor of Arts: Development Studies & Political Science: University of Johannesburg
- o Bachelor of Arts, Honours: Political Science: University of Johannesburg



## MR NDINDE MASHEGANA

### DIRECTOR

- o BCom, Honours: RAU
- o BCom and Diploma in Education (UED): University of Venda
- o Certificate in International Import/Export Trade Promotion for RSA: Pacific Resource Exchange (Prex): Osaka, Japa
- o Certificate in Public Private Partnerships (PPP) Professional CP3P: APMG-International



## MR JANNIE VAN DER MESCHT

### DIRECTOR

- o BTech (Civil): Pretoria Technikon
- o National Higher Diploma (Civil): Pretoria Technikon
- o National Diploma (Civil): Pretoria Technikon



## MR ADRIAN COETZEE

### DIRECTOR

- o BTech (Civil): Cape Peninsula University of Technology
- o National Diploma (Civil): Cape Peninsula University of Technology

Our leaders embody the characteristics of

**ONE THRIVING AFRICAN  
CONTINENT**



**INTEGRITY & TRUST**



**WEALTH IN KNOWLEDGE**



**HUMAN CAPITAL & TALENT**





## OUR VALUES



Futuristic

Respect  
& Integrity

Playfulness

Participation

## SOCIO-ECONOMIC DEVELOPMENT

iX engineers believe in and support Skills Development and Social Upliftment and therefore give back to society and communities through programmes such as:

Young engineers' initiative providing mentorship and training to graduates; social upliftment and development projects across various communities focusing on education, young talent, and development.

Accreditations;  
Associations  
and Membership  
Development



# OUR DIGITAL SOLUTIONS



Eager to disrupt the engineering industry, iX engineers is incorporating emerging technologies into everything we do.

From smart water management through the Internet of Things (IoT) to risk-free visual inspections powered by Drone Technology, we are digitally-led in our problem-solving approach allowing our clients to enjoy their assets for longer and ensuring our engineers are free to create the future of life.

Our cutting-edge Digital division is currently focusing on core competencies that span Smart Cities, Transport, Mining, Energy, Water & Sanitation.



Our Service offerings include:

#### Virtual Reality

- Interactive Design Review
- Pipe System Analysis
- Immersive Training

(Maintenance, Disaster response, physical damage - simple and complex tasks)

In addition, we provide our clients with interactive tours or virtual site inspections using 3D technology.

#### Drone Technology is enabling our engineers to conduct

- AI Geographic Surveys
- Risk-free Visual Inspections
- Intelligent Asset Management/Condition Assessments

#### Internet of Things

- Smart Water Solutions
- Predictive Maintenance
- Energy Optimisation

#### Big Data & Analytics

- Geographic Information Systems
- Predictive Analytics
- Machine Learning

All of these are underpinned by the user-friendly design of interactive digital platforms

## DIGITAL REFERENCES

### Examples

#### Virtual Reality for General Electric (GE)

GE appointed iX engineers to assist in creating a Virtual Reality (VR) training module. The developed module aimed at training technicians on installing turbine blades into a rotor disk. The training module enabled technicians to learn procedures, learn tricks of the trade, and hone their skills in the VR world prior to real-life practical work. The module consisted of three parts: an introduction to navigating the VR world, a step-by-step tutorial on the installation of turbine blades with the trainee performing the installations in the VR world, and an assessment consisting of a series of questions. The project highlighted the advantages of using the latest technology to increase training quality and reduce costs for our clients. This proof of concept was done in collaboration with STS3D.



#### Virtual Reality for Desalination Plant

iX engineers was appointed to improve various design and construction limitations for a complex desalination plant using Virtual Reality (VR). Using the tools developed by our engineers and the VR model, the client could walk through the desalination plant and experience the design from a first-person perspective, thus allowing insight into many design aspects, such as space constraints and accessibility. Integrating data into the VR model allowed the various engineers and stakeholders to simultaneously analyse and troubleshoot the plant design. Furthermore, the construction plans and documents were incorporated into the VR model to fast-track the review of the pipe systems. In large complex plants, the VR software developed by our team proved to be a time- and cost-saving tool, which could then be used throughout the project cycle.



#### Drone Solutions for eThekweni Municipality (Kranskloof Hostel)

We had a challenge - our contract would be concluding in three weeks. It would have taken land surveyors five weeks for the procurement process, the site work and the survey. Using our drones, our pilot was sent out to conduct the survey and a visual inspection of a hostel spanning 31 hectares.

We conducted the survey within a day and produced results that informed a multitude of engineering solutions. These included structural analyses, civil works and planning, and stormwater management at the site. 3D maps with an immense amount of data accompanied by high-resolution photos were produced that could also enable further investigations without returning to the site. We maximised value for the client by drastically limiting the safety risk and providing a wealth of information within a very short amount of time. This meant the client could make well-informed decisions and be highly responsive to the needs of their community.





# WATER & SANITATION



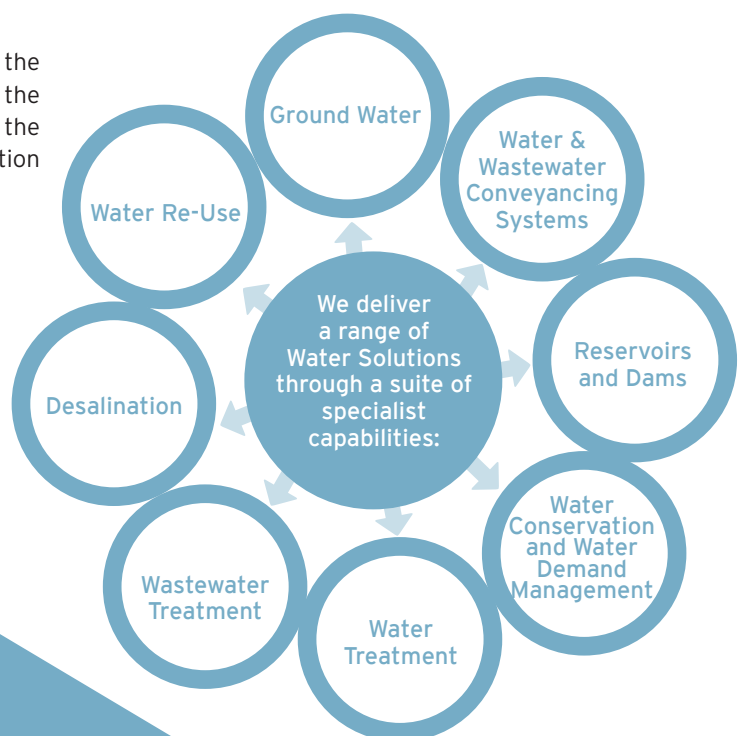
## SOUTH AFRICA IS A WATER SCARCE COUNTRY WITH FREQUENT SEVERE DROUGHTS

iX engineers is well equipped to provide solutions to present and future challenges. Our skills and experience combine to deliver well-planned and cost-effective infrastructure and environmentally sensitive solutions.

We apply our expertise in the fields of Water Resources, Water Quality and Water Treatment Processes to identify potential sources of water and match these with demands to develop reliable and sustainable solutions.

*Imagine a future where we are able to proactively maintain all our water equipment using the Internet of Things (IoT), reducing downtime of our most vital resources. Imagine a future where we are able to eradicate water shortages completely. This future is not that far away. INTERESTED? Come and chat with us.*

iX engineers specialise in providing integrated solutions for the management of water treatment systems by incorporating the Internet of Things (IoT) which allows operators to monitor the functioning of the works in real-time, resulting in early detection of problems.



# Groundwater

We apply our expertise in the fields of Water Resources, Water Quality and Treatment Processes to identify potential sources of water and match these with demands to develop reliable and sustainable solutions.

Our Service offerings include:

- Pre-Development Water Modelling
- Water Resource Studies  
(Ground water, sea water and surface water)
- Water Transfer Feasibility Studies
- Hydrogeological Assessment
- Hydrological and Flood Risk Assessment
- Water Accounting and Valuation
- Water Quality and Disposal
- Integrated Water Management
- Water Use Efficiency
- Water Demand Management

- Master Planning
- Water Re-use & Recycling
- Regulatory Commitments
- Floodlines
- Asset Management
- Project Management
- Programme Management
- Environmental Compliance & Planning Studies
- Social Assessment, Planning, Needs & Impact Studies
- Social License to Operate and Permitting

## WATER REFERENCE

### Cape Flats Aquifer



**CUSTOMER**  
City of Cape Town



**LOCATION**  
Cape Town  
Western Cape  
RSA

Groundwater is a key water resource, and iX engineers, in conjunction with the support of specialised sub-contractors, has successfully developed numerous Well Fields, each consisting of exploration, monitoring, production, and recharge boreholes with related conveyance systems and treatment plants.

The Managed Aquifer Recharge (MAR) strategy follows a masterplan development, in which iX engineers has professional experience. The MAR challenge is to ensure the Aquifer's sustainability while implementing further Well Field exploration and development. iX engineers has the capability and experience for the development and management of Well Fields



### Assmang's Khumani Mine Water Resource Augmentation



**CUSTOMER**  
Assmang Khumani Iron Ore



**LOCATION**  
Kathu, Northern Cape,  
RSA

The project included groundwater source development. The groundwater was required to augment Khumani Iron Ore Mine's (KIOM) existing water source from the Vaal Gamagara bulk water scheme (VGWS) operated by Sedibeng Water. The scope included option analysis, review of residual gravity data and structural information, dewatering abstraction from mines, geophysical surveys (gravity measurements by 2D resistivity imaging to identify optimal drilling sites), gravity survey traverses, assessing geophysical datasets to identify exploration drilling sites, cost analysis, detail design, and phased implementation.



# Water and Wastewater Conveyancing

iX engineers has extensive specialist experience, skills, and knowledge of water and wastewater conveyancing systems involving all project stages, namely, Inception, Concept and Viability (Preliminary Design), Design Development (Detail Design), Documentation and Procurement, Contract Administration and Inspection and Close-Out in urban, industrial, resources, and rural environments.

Our experienced engineers plan, model, and design bulk water supply and distribution systems using state-of-the-art computer software programs, 3D modelling and Virtual Reality applications, and intelligent computing tools for public, resources, and industrial facilities.

iX engineers have completed numerous pre-feasibility and bankable feasibility studies in the water sector for both government and private clients.

Our service offerings include:

- Bulk Pipelines
- Network Reticulation
- Pump Stations
- Canals
- Diversion Tunnels, Streams & Rivers
- StormWater Drainage
- Feasibility Studies
- Bulk Water Transfer Schemes

## WATER REFERENCES

### New N2 Gateway Delft Bulk Sewer



**CUSTOMER**

Sobambisana Community Development



**LOCATION**

Delft  
Western Cape  
RSA

iX engineers was appointed as Lead Consultant for the design and construction monitoring of the Delft bulk sewer outfall servicing approximately 2.5 million users. The 11.4 km bulk sewer pipeline ranged in diameter from 1200 mm to 1900 mm and included a pipe jacking section under a six-lane highway with a 2400 mm diameter concrete sleeve pipe. The connection to the existing Wastewater Treatment Works was made with a new inlet structure designed and constructed using the caisson structure method.



### Mokolo and Crocodile River (West) Augmentation (Phase 1)



**CUSTOMER**

Trans Caledon Tunnel Authority  
(TCTA)



**LOCATION**

Lephalale  
Limpopo  
RSA

The Crocodile River (West) Water Augmentation Project (MCWAP) is strategically important. It transfers water to predominantly support energy and mining activities in the Limpopo province, especially for Eskom's Medupi coal-fired power station and various coal mines in the Lephalale area.

MCWAP Phase 1 consisted of a 1000 mm ND suction steel pipeline, a 900 mm ND steel rising main 4.6 km long, and steel gravity pipelines of 800 mm - 1100 mm ND (37 km long) as well as a 75 m pipe jack below the R510 road delivering a flow of 1258 /s to end users.



# Water and Wastewater Storage

iX engineers provide innovative, cost-effective, and practical solutions to real-world engineering challenges by combining advanced analytical techniques with sound engineering judgment.

Our service offerings include:

- Dams
- Water Storage - Reservoirs and Towers
- Pollution Control Dams
- Stormwater Attenuation Dams

## WATER REFERENCES

### Lanseria 20 Mℓ Reservoir and 1,2 Mℓ Tower



#### CUSTOMER

Johannesburg Water SOC



#### LOCATION

Lanseria  
Gauteng  
RSA

The project entailed the design and construction of a new reservoir site serving the increased demand for water due to the expanding residential and commercial development around Lanseria Airport. The reservoir has a capacity of 20 Mℓ and the tower 1.2 Mℓ, serving different areas, whilst the site makes future provision for an additional 15 Mℓ reservoir.

The tower's unique design resulted in an elevated and extremely flat top. The objective behind the elevated flat top design was two-fold. Firstly, the design incorporated restricted airspace requirements, taking into account the taking-off and landing of aircraft at the Lanseria Airport. Secondly, the design ensured the maximum volume of water at an elevated height to improve water pressure for end users.



# Water and Waste Water Treatment



iX engineers has substantial experience, capability and knowledge of water and wastewater treatment systems involving all project cycles. We implement water and wastewater systems through innovative design solutions, 3D modelling and Virtual Reality applications for optimised designs. These are for public resources and industrial facilities. We have a proven track record of delivering technically outstanding and cost-effective projects

Our Service offerings include:

- Water Treatment
- Wastewater Treatment
- Industrial Wastewater Treatment

## WATER REFERENCES

### Upgrading of Zeekoegat Wastewater Treatment Works



**CUSTOMER**  
City of Tshwane



**LOCATION**  
Pretoria  
Gauteng  
RSA

This upgrade expansion project increased the capacity of the existing Zeekoegat Wastewater Treatment Works from 30 Mℓ/d to 85 Mℓ/d in four stages:

- Stage 1: Construction of a new 40 Mℓ/d activated sludge plant
- Stage 2: Construction of a new 85 Mℓ/d sludge handling facility
- Stage 3: Construction of a new 85 Mℓ/d tertiary treatment facility
- Stage 4: Increase the capacity of the existing 30 Mℓ/d plant to 45 Mℓ/d.



## Wastewater Re-Use

Water Crisis  Solution **Wastewater Re-Use**

iX engineers has considerable experience in Wastewater Re-use technology, which includes the provision of consulting engineering, project management and business/project services. Our in-house Professionals provide the best sustainable solutions to our customers and the environment over the full life-cycle of the asset. iX engineers also has the capability and experience to offer solutions to Acid Mine Drainage.

## WATER REFERENCES

### De Doorns Water Re-Use Plant



**CUSTOMER**  
Hex Valley Water Users Association



**LOCATION**  
De Doorns  
Western Cape  
RSA

iX engineers was appointed by Hex Valley Water Users Association to investigate and implement a strategy for augmenting their current irrigation water supply. This phase represented the implementation of a 1.5 M /d plant while making allowance for a second phase to double the plant capacity. The plant is located at the existing De Doorns WWTW site, and is currently operating successfully regardless of variation in the feed water quality.



# Desalination

iX engineers' knowledge of Sea Water Reverse Osmosis (SWRO) Desalination plants was demonstrated with the City of Cape Town's Emergency Water Resilience Project during the City's worst drought recorded in history.

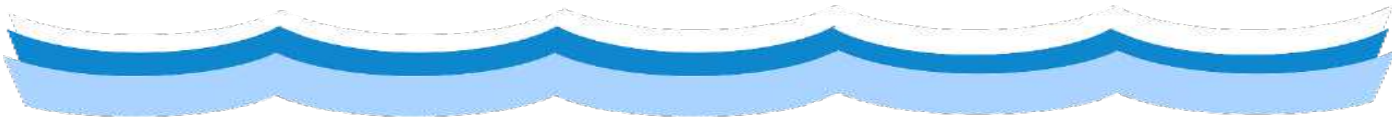
A major part of this project was to investigate and implement temporary Sea Water Reverse Osmosis (SWRO) Desalination plants as emergency measures, with a larger (long term) permanent SWRO plant to be planned for implementation at a later stage.

The following three temporary SWRO plants were constructed and successfully implemented for the City of Cape Town:

- Monwabisi (7 Mℓ/d) commissioned in June 2018

- Strandfontein (7 Mℓ/d) commissioned in May 2018

- V&A Waterfront (2 Mℓ/d) commissioned in May 2018



# Water Conservation & Non-Revenue Water

Conservation and Water Demand Management (WC/WDM) involves measures to reduce non-revenue water and water losses for water distribution systems. Our staff have the necessary expertise and experience to advise clients on which interventions are the most appropriate to a specific area and how best to implement them.

Supply systems can be monitored and controlled via remote access using computers, mobile phones, or tablets displaying real-time data of:

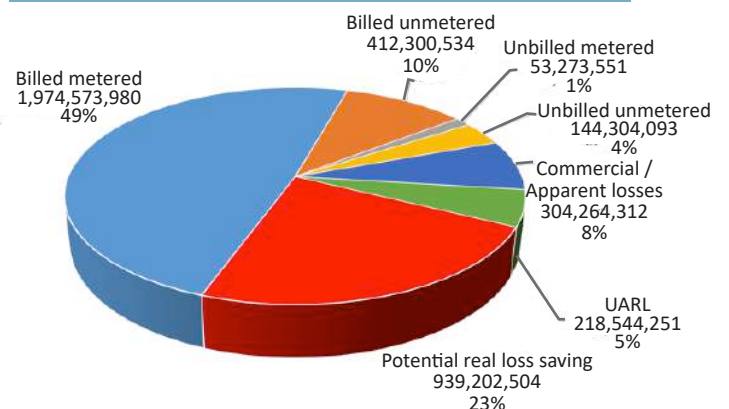
The most common mistake made by many institutions/municipalities worldwide is to believe that water-loss reduction is achieved only through leak detection and repair. In such cases, large budgets are often used to search for unreported leaks using the latest hi-tech and expensive equipment. If the water losses are due to inaccurate metering or background leakage, the leak detection activities will yield few or no results.

- Quality
- Flow Rates
- Reservoir Levels
- Pump Station Activities
- System Pressure
- Possible Leaks
- Water Consumption and Water Balance

## Potential Savings:

A breakdown of the 2015/16 water balance for Municipalities in South Africa indicated a potential real-loss saving of 939 million m<sup>3</sup>/annum and a potential income of 197 million m<sup>3</sup>/annum, which is currently unbilled.

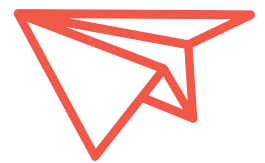
**Most WC/WDM activities will pay for themselves, and financial institutions will fund these projects if a good business case can be compiled. iX engineers has the capacity and capability to assist in this regard, including revenue enhancement programmes.**



# TRANSPORT

iX engineers plays in the Airports, Rail, Road, and Highway spheres

## Roads & Highways



iX engineers has extensive engineering capabilities in roads and stormwater infrastructure on international and local levels.

Our wealth of experience across all phases of road projects includes national roads and highways, provincial and municipal roads, for all transport infrastructure and site servicing solutions.

- Roads and highways
- Haul roads
- Major transport corridors
- Bridges
- Culvert structures
- Detailed optimisation
- Interface requirements
- Hydrology and hydraulic expertise
- Transport Master Planning
- Maintenance works on road networks

We provide services to the National Roads Agency (SANRAL), provincial governments, and local municipalities.

### Upgrade of National Route N2 Murchison to Marburg Interchange



**CUSTOMER**

South African National Roads Agency SOC Ltd (SANRAL)



**LOCATION**

KwaZulu-Natal  
RSA

The project entailed the upgrading of National Route 2 Section 22 from Murchison (Km 18.6) to Marburg Interchange (Km 29.3). We increased safety features on the road, which included the reduction of accidents due to the added lanes and median barriers over certain sections, and adequate pedestrian accommodation using protected sidewalks



### Improvement of the N7 between Cederberg and Kransvleikloof



**CUSTOMER**

South African National Roads Agency SOC Ltd (SANRAL)



**LOCATION**

Cederberg, Western Cape,  
RSA

The project entailed the improvement of National Route 7 Section 3 starting at Km 102.66 at the Cederberg T-Junction and ending at Kransvleikloof at approximately Km 120.88, between the towns of Citrusdal in the south and Clanwilliam in the north. The project's objective was to improve the existing road asset by re-aligning and widening the existing road to be adequate for approximately 20 years.



### Rehabilitation of Camps Bay Drive



**CUSTOMER**

South African National Roads Agency SOC Ltd (SANRAL)



**LOCATION**

Camps Bay, Western Cape,  
RSA

The project originally consisted of localised road widening to accommodate the proposed MyCiti buses. However, due to the substantial number and size of the proposed buses, a geometric analysis resulted in the entire portion of the road being widened by 1.4m. The proposed pavement design involved a light rehabilitation with the widened area requiring full-depth construction. This was a flagship project for the City of Cape Town because Reclaimed Asphalt (RA) materials had not previously been used as high-quality road construction material.





# Airports



iX engineers has extensive experience in airport design and has participated in various design projects with a focus on modern international airport infrastructure development and project management.

We have a wide range of aviation experience and have successfully completed several airport projects in South Africa and abroad.

Our project experience, in collaboration with specialists, includes technical and economic feasibility studies for airports and traffic demand, as well as forecasting and transaction advisory services to potential airport developers.

## AIRPORT REFERENCES

### St Helena Airport



#### CUSTOMER

- Basil Read/St Helena Government
- DfID Department for International Development, British Government



#### LOCATION

The Island of St Helena (middle of Atlantic Ocean, 1950 km west of Luanda, Angola)

St Helena is one of the most geographically isolated islands in the world. It is located approximately 1950 km from the South-West Coast of Africa and 2900 km from South America.

The scope of work under Phase 1 of this greenfield project was the design, construction monitoring, and certification of a new airport, plus appurtenant works on Prosperous Bay Plain to support the operations of Code 4D aircraft, Boeing 737-800W, or similar aeroplanes for passenger transport.

#### Our work included the following deliverables (but was not limited to):

- Bulk earthworks
- PQC aircraft pavements with a geometric design to ICAO international standards and structural capacity to support Code 4D aircraft, complying with UK Ministry of Defence and FAA standards
- Civil/structural engineering works, aeronautical ground lighting, and navigational aids (Nav aids)
- Surface water drainage, foul water drainage systems including sewage treatment, and water supply including separate fire-fighting facilities
- 14.5 km Connector road from the airport across the island to Rupert's Bay, haul roads, and parking facilities
- Terminal building of 2500 m<sup>2</sup> incorporating cargo facilities, fire station, and ATC tower
- Bulk fuel storage facilities of 6 million litres at Rupert's Bay
- Provision of communication systems, fencing, and security systems
- Environmental mitigation and certification of the aerodrome.



### Upington International Airport – New Terminal, Upington, Northern Cape, RSA

The project entailed the design and construction of a new terminal building for departing and arriving international and domestic passengers, replacing the very old terminal building. The project also included the design of a new domestic water supply to the terminal building. New water supplies for irrigation and fire protection were also part of the scope. The terminal building was completed in three phases during construction, as a section needed to remain operational to serve all arriving and departing passengers.



# Rail



iX engineers' integrated design capability for rail infrastructure ensures optimisation and coordination through the Concept, Definition, Detailed Design, and Construction Management stages.

We provide services to both the public and private sectors creating and delivering solutions for specific rail requirements in urban metropolitan and metro systems, long haul intermodal railway networks, heavy haul minerals railways, and specialised rail transport for the rail industry and logistics providers.

## RAIL REFERENCE

### Gautrain - Rapid Rail Link



#### CUSTOMER

Bombela Civils Joint Venture



#### LOCATION

Johannesburg,  
Gauteng  
RSA

iX engineers, in association with WS Atkins International, were appointed by the Bombela Civil Joint Venture (BCJV) for the preliminary and detailed design of the South-North Section.

As part of the ongoing National Transport Development and preparation for the 2010 International Soccer World Cup, a total of 55 km high-speed rail on the standard gauge was constructed, including both above and below-ground sections.

iX engineers provided structural engineering services related to the construction of temporary pedestrian and pipe bridges to facilitate the relocation of utilities and the construction of the below-ground elements of the rail network, including the implementation of tunnel ventilation.



### Nacala-A-Velha Workshops



#### CUSTOMER

CLN / Vale



#### LOCATION

Nacala-a-Velha, Nampula  
Province, Mozambique

Detail Design and construction management of the Railway Maintenance and Provisioning Yard for the Moatize to Nacala Corridor, located at Nacala-a-Velha in Mozambique. The maintenance facility included the marshalling yard lines, complete with crossovers, a building for locomotive fuel refilling and sand refill, a maintenance building for light locomotive maintenance, a wash bay, a paint facility, a wagon maintenance workshop, a wagon storage yard, effluent and sewerage treatment plant, power supply, Gas store, Lubrication farm, wheel house facility, water supply, access road and bus terminal.



### Kusile Power Station northern rail access



#### CUSTOMER

Eskom



#### LOCATION

Mpumalanga Province  
South Africa

iX engineers' scope included the route determination and design of the new private siding to connect the new Kusile Power Station to the Transnet Freight Rail Lines. The 36 km new rail line included a viaduct bridge with a 350 m long deck, crossing the N4 toll road with bridges underneath both carriageways. The optimised design included earthworks and drainage, concrete structures, perway, signalling and overhead electrical traction equipment designs (OHE).



# Smart Roads



Smart Road technologies and applications will shape the future of transportation in the Fourth Industrial Revolution. There cannot be a Smart City without a Smart Road, and together a Smart City with Smart Roads can provide citizens with Smart Mobility.

The road infrastructure and mobility sectors face major challenges for the next century; a new paradigm is required to make Smart Roads a reality and to ensure that Smart Roads are integrated into the future.

iX engineers is currently developing and testing technology through our Digital Solutions team to find ways of making South African roads smarter and safer for all users through the use of IoT (Internet of Things).

The Smart Roads concept is more than just sensors and feedback loops. Smart roads include:

- Smart pavements with sensors and feedback loops
- Smart electronic asset management systems
- Eco-friendly roads (made from recycled materials)
- Climate change-resilient roads
- Integrated systems adapted for future travel demand
- Green roads - sustainable and low-cost (use of recycled materials)
- Self-healing roads (concrete and asphalt)
- Solar panel road surfaces, inductive charging roads and innovative loadbearing blocks

**OUR PURPOSE IS TO  
CREATE THE FUTURE  
OF LIFE TODAY**

# SMART CITIES



iX engineers has considerable experience in building and infrastructure development projects, including the provision of consulting, engineering, project management and business/project services. Our in-house Accredited Green Building Professionals and Certified Energy Managers work within the design team providing the best sustainable solutions to customers and the environment over the full lifecycle of their assets.

**The delivery of Smart Cities is complex and not solely limited to innovation and technology.**

Urban design principles, which respond to the local context, should be integrated and shouldered by a concrete business case. iX engineers takes on the role of connecting applied technology, infrastructure, city planning and design solutions when crafting Smart City methodologies.

**iX engineers offer the following Smart City solutions:**

- Smart demand management and water conservation
- Smart bulk water and groundwater management
- Smart water distribution and metering
- Smart stormwater management
- Smart energy and smart grids
- Smart roads
- Smart solid waste
- Smart buildings
- Smart hospitals and schools
- Housing and land development



The Buildings & Services Division offers our customers a “one-stop-shop” solution.

## Green Building Design



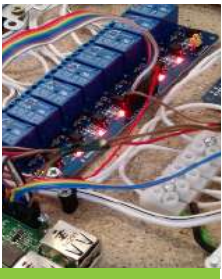
iX engineers is registered with the Green Building Council of South Africa (GBCSA) and has several Green Star SA Accredited Professionals with many years of experience in the design of energy-efficient infrastructure.

iX engineers provides specialist services in the building infrastructure field, including industrial and business park developments, industrial plants (light and heavy), warehouses, service stations, abattoirs, telecom towers, commercial and mixed-use developments (offices, hotels and shopping centres), institutional facilities (schools, hospitals, clinics, prisons, airports, police stations, community halls, etc.), sport and recreational facilities (stadiums and indoor facilities), and residential buildings.

We also provide specialist services in the electrical distribution and reticulation fields, including sub-stations, switching stations, distribution networks (underground and overhead), electrification, master planning, telemetry, and SCADA systems.

The various Engineering disciplines of the Buildings & Services Division, which are discussed separately, specialise in all the technical aspects of building and services projects.

## Electrical and Electronic Engineering



- Building Electrical Systems
- Building Electronic Systems
- Lighting
- Power Generation (PVI Gas, Energy Storage, Co-generation, Tri-generation)
- Transmission lines and Networks
- Substations and Switching Stations
- Reticulation and Distribution
- Analysis of Electrical Networks and Systems
- Energy efficiency

## Mechanical Engineering



- Heating, ventilation, and air conditioning [HVAC]
- Fire Protection detection
- Wet services
- Vertical Transportation
- Gas and Compressed Air Installations
- Refrigeration Installations
- Steam generation
- Medical gas
- Medical infrastructure

## Civil Engineering



- Bulk Earthworks Designs, where our approach is always to optimise cost by balancing cut and fill volumes as far as possible but taking cognisance of ground conditions.
- Roads and Stormwater Designs for building projects are always done in conjunction with the appointed Architects, Landscape Architects, and Green building Consultants.
- Water and Sewer Designs, which make provision for both internal (on-site) and external (bulk off-site), with cooperation and coordination with the Architects being of vital importance. On-site solutions and the re-use of effluent water are critical considerations at the planning stage of a project.

# Structural Engineering



## High Rise Buildings

- Offices
- Apartment blocks
- Hospitals

## Low Rise Buildings

- Schools
- Correctional Facilities
- Apartments

## Industrial

- Factories and manufacturing areas
- Dedicated Industrial Structures
- Sport and Recreational Facilities
- Indoor facilities
- Outdoor facilities

## Revitalising the Built Environment

- Investigation and reporting on the structural integrity of damaged buildings
- Restoration, reinstatement, or alteration of existing building structures for alternative use

## BUILDING REFERENCE

### Nelson Mandela Stadium



#### CUSTOMER

Nelson Mandela Bay Municipality



#### LOCATION

Gqeberha, Eastern Cape  
RSA

The five-tier, R2 billion (approximately \$159 million) Nelson Mandela Bay Stadium was built overlooking the North End Lake at the heart of the city. It is one of three new coastal stadiums built for the 2010 FIFA World Cup. It regularly hosts large-scale football (soccer) and rugby union matches. The stadium is also used as a concert venue.

The stadium seats 45,000 in addition to 4,000 extra seats, temporarily installed for the 2010 FIFA World Cup. There are also two conference rooms, which can accommodate 200 people, situated on the 5th level. WorleyParsons PI BU (now iX engineers) was the lead consultant in the JV appointed to conduct the Structural Detail Design. In addition to the structural design, iX engineers was also responsible for the construction management of the reinforced concrete structure.



### Menlyn Maine



#### CUSTOMER

Menlyn Maine Investment  
Holdings



#### LOCATION

Pretoria, Gauteng, RSA

iX engineers provided the management, civil, and electrical services to establish all engineering infrastructure for the precinct. This included roads, water and sewer reticulation, stormwater, and electrical networks.



## Cape Town International Airport



### CUSTOMER

Airports Company of South Africa



### LOCATION

Cape Town, Western Cape, RSA

The project comprised the re-development of the old terminal to a new integrated world-class terminal for processing all departing and arriving, domestic and international passenger traffic. It was planned to provide for the increased traffic volumes of the 2010 FIFA World Cup and exceeded all expectations. For design approval, a 3D model was created to calculate and present illumination levels, including the shadowing effects of various aircraft structures. The electrical services included substations with redundant capacity to cater for plant failure, standby power generation, bulk supplies to HVAC and baggage processing systems, and UPS systems to dedicated users.



## Corobay Corner Office



### CUSTOMER

Eris/Emira



### LOCATION

Menlyn, Pretoria  
South Africa

Design and construction of a new four-storey high-spec office building of approximately 15,000 m<sup>2</sup> office space and 3,000 m<sup>2</sup> basement parking area, incorporating Green features. The iX engineers' design scope included hot water generation via heat pumps with high COP, thermal heat recovery wheels for fresh air, heat recovery 4-pipe high-efficiency type chillers, energy-efficient light fittings and effective lighting controls, variable-volume chilled water and heating water pumping with pressure-independent valves to accurately match the building load and reduce energy wastage, individual control of HVAC units for high comfort levels, a complete BMS system with features such as the reading of utility meters, historic logging, internal temperature adjustment, fault-finding, alarms and many more, with a flexible design to allow for easy adaptation to suit the tenant's requirements. Civil infrastructure, structural design, and three levels of underground parking were also included.



## Hibernian Towers



### CUSTOMER

Quaypower Properties



### LOCATION

Strand, Western Cape, RSA

The 22-storey building's shape illustrates how effectively concrete can be used to bring to life an architect's vision, with the curved lines being key features of the architectural style. This theme is carried through to the inside of the building. This luxury multi-storey apartment building also has office and retail spaces. The podium has a 3,840 m<sup>2</sup> footprint, above which are two individual towers and an atrium.



## The Edge Office Development



### CUSTOMER

Cubimanzi Investments (Pty) Ltd



### LOCATION

Tyger Waterfront, Bellville  
Western Cape, RSA

This building development's design criteria included the "Green Building Council Guidelines for Offices" to achieve a 5-star Green Building rating. The building consisted of four levels of covered parking, five levels of offices, and retail space on the ground floor. The building has three lifts and is equipped with a 400 kVA emergency generator which provides power for lighting and all the office computers.



# ENERGY



## CREATING A SUSTAINABLE WORLD FOR OUR FUTURE GENERATIONS

Imagine a future where all energy supplied matches demand in real time or where every solar farm is monitored ensuring optimal energy capture thus significantly reducing dependence on other energy sources. This future is not that far away. INTERESTED? Come and chat to us.

Increasing droughts and cyclone activities expose Africa's vulnerability to the intensifying consequences of climate change. Considering that about 60% of people who lack access to electricity live in Africa, it is our moral imperative to uplift these struggling communities.

Especially in view of Africa's vast solar resource, Sustainable Energy is the solution to both mitigating climate change and providing access to clean electricity in remote rural areas.

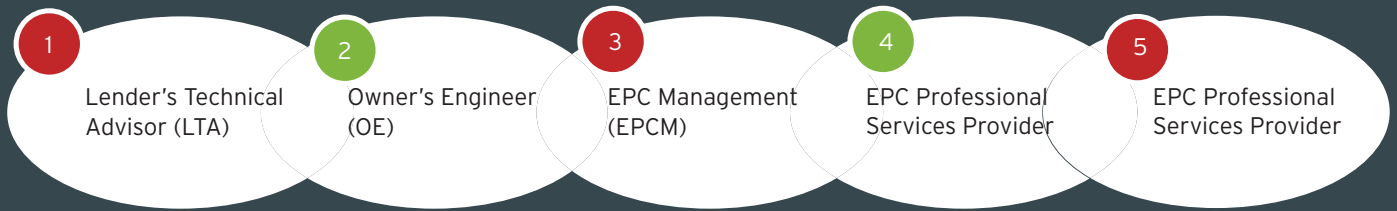
To enable a planet powered by renewable resources with its intermittent supply, energy storage must be at the forefront of technological innovation.

The industry must expand and advance its creativity and development to enable the complete replacement of fossil fuel generation with clean energy.

In response to the need for cost-effective storage solutions, we have identified innovative energy storage technologies, which will enable further deployment of renewable energy.



## KEY ROLES includes:



## KEY ENERGY SOLUTIONS

- Energy storage (kinetic, thermal, chemical)
- Renewable Energy
- Solar PV
- Solar Thermal (including CSP)
- Wind
- Co-/Tri-/Quad-generation
- Energy Efficiency

## RENEWABLE ENERGY SERVICES

iX engineers has vast experience to support Renewable Energy projects through all phases:



### Feasibility Studies & Master Planning

A sound business case is the basis for every good investment decision. Our team is skilled to develop Pre-Feasibility and Feasibility Studies considering latest technology developments to support your investment. Putting investment decisions in the bigger picture is critical for long-term investment success. iX engineers will assist you with integrating technologies and developing a master plan solution.

#HowToMoveToCarbonNeutrality

### LTA Services

Project funding is a key element to successfully build and implement Renewable Energy projects. iX engineers will perform design reviews, technology choice evaluation, review of financial model inputs and project risk analysis to provide comfort to lenders

### Engineering Services - Wind

Electrical, Reticulation, Grid Connection, Substation Layout, Grid Code Compliance, Voltage Selection, Conductor and Cable Sizing, Single Line Diagrams, Utility Connection, Wheeling Calculations, EIA Inputs, etc.

Model ground and soil interaction with mass concrete pad foundations with advanced Finite Element software, Optimise the use of reinforcement by utilising advanced reinforcement CAD based detailing software.

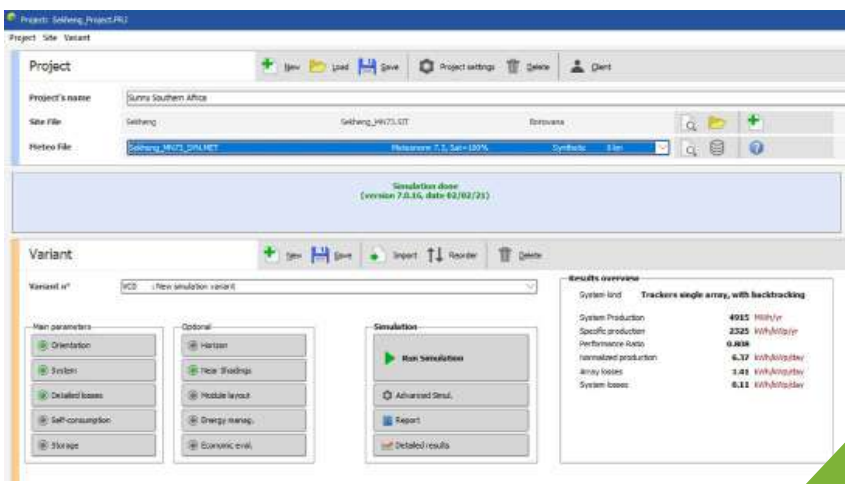
Further full bulk and internal infrastructure engineering services including civil, roads, mechanical, water, stormwater and ICT.



## Engineering Services - Solar

Modelling (PVsyst, Helioscope), Design and Optimisation of mounting structures, modules, inverter and transformer sizes, voltages and layout, EIA Inputs, Grid Connection, Wheeling Calculations, etc.

Further full bulk and internal infrastructure engineering services including civil, roads, mechanical, water, stormwater and ICT.



## Health & Safety

Our SHERQ department is ready to provide support services for the safe implementation of your projects.

## Project Management and Document Control

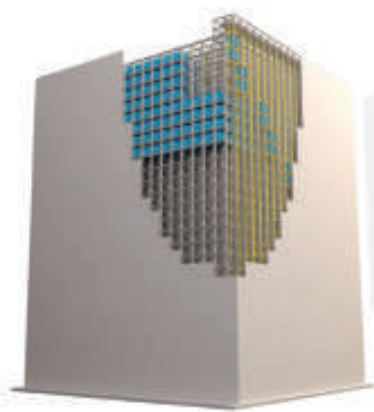
As EPCM iX offers extensive Project Management and Project Supervision services including resident engineers as well as on-site and off-site document control.

# INNOVATIVE ENERGY STORAGE SOLUTIONS

Apart from traditional Battery Energy Storage Systems (BESS), which are typically based on Lithium Ion technology, stationary grid-linked energy storage systems have a lesser requirement for energy density and allow other cost-effective, integrative and value-adding storage solutions.

Gravity Energy Storage Systems (GESS) was inspired by the integral use of gravity and kinetic energy relied upon to move water and generate power in pumped storage hydro plants but replaces water with innovative 60-ton blocks made from low-cost waste materials. Using the fundamental principles of science, a storage solution that is as compassionate to the planet as it can be built anywhere, whilst cleaning up the environment. This solution is ideally suited for the rehabilitation of coal-fired power stations, water treatment plants and mining sites.

High temperature Thermal Energy Storage Systems (TESS) have traditionally been combined with Concentrating Solar Power (CSP) plants. However, due to improvements of the economics, resistive heating driven TESS can also be a viable solution for Solar PV energy storage, making TESS true energy storage. Apart from molten salt, South African rocks can also be a suitable medium for thermal energy storage. This technology is particularly interesting for industry, where electricity meets waste heat, steam and process heating & cooling. Energy can easily be transferred from one form to another, whilst being stored in high-exergy heat. The system is modular and space-efficient.



Simplified " Building Design"  
(compliant with all  
international building codes)



Modular and Flexible  
(duration and size)



Fully Recyclable  
(waste material)

## ENERGY REFERENCES

### LOERIESFONTEIN/KHOBAB 2\* 140 MW WIND FARMS



#### CUSTOMER

Murray & Roberts (Mainstream)



#### LOCATION

Hantam Municipality area  
60km north of Loeriesfontein  
Northern Cape.

The project entailed the construction of two 140 MW Wind Farms, consisting of 61 wind turbines each and generating a combined 1,127,000 MWh/year of clean renewable energy per year.



Each turbine had a height of 100m above the ground (excluding the blades). Every component had to be delivered and assembled on site. This meant that a route analysis had to be done to determine the optimal route by which the turbine components could be delivered. Each turbine had to have a hardstand constructed with enough storage space for all the components, with sufficient space for all the cranes required for assembly and while still limiting the environmental impact of the hardstands.

The bases of the turbines had to be founded on suitable foundation material and have the required strength and durability in order to counteract all static and dynamic loads applied to the turbine.

### KAXU SOLAR ONE 100 MW SOLAR THERMAL PLANT



#### CUSTOMER

Kaxu Solar One  
100 MW Solar  
Thermal Plant



#### LOCATION

Pofadder,  
Northern Cape  
RSA

EPCM Contract for a 100 MW Concentrated Solar Power (CSP) plant, with parabolic trough collector (PTC) technology with molten salts thermal energy storage (TES) system. The plant is located approximately 50 km North East of Pofadder in the Northern Cape province of South Africa. The plant uses PTC technology and works by tracking the sun from east to west, concentrating the direct irradiance and converting it into thermal energy.



The thermal energy is transferred through a closed Heat Transfer Fluid (HTF) circuit to produce steam, which drives a 100 MW steam turbine. The electricity generated is transmitted through a high voltage substation and exported to the grid. The plant includes a thermal energy storage system that allows extending the electricity generation after sunset, the equivalent of 2.5 hours at nominal capacity.

### JASPER SOLAR 96 MW SOLAR PV PLANT



#### CUSTOMER

Solar Reserve for Jasper Power  
Company



#### LOCATION

Postmasburg,  
Northern Cape  
RSA



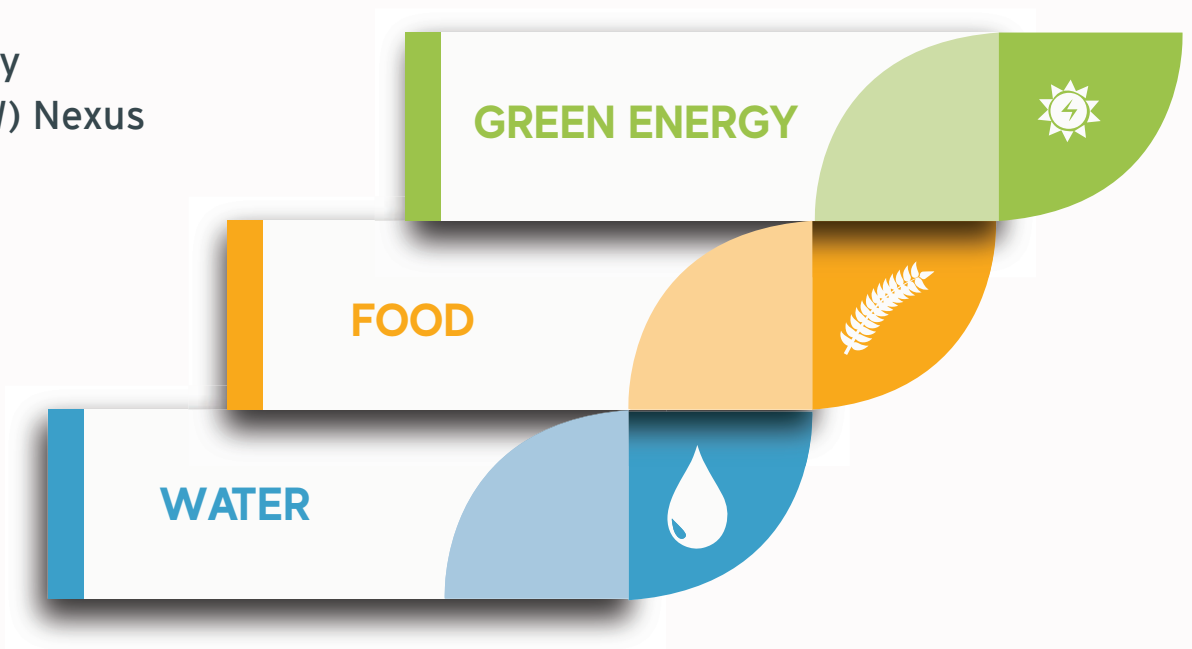
The Jasper PV Project is situated in the Northern Cape, east of Postmasburg in the Tsantsabane Local Municipal area. Blessed by an abundance of sunshine, resources and local and municipal stakeholder support, the site falls in the Northern Cape Solar Area and ideal to supply clean, renewable energy. The Jasper PV Plant comprises of 39 units of 2 MWac Ingeteam central inverter stations (each central inverter station consists of 2x 1,019 kW inverters\*).

WorleyParsons was appointed as Owners Engineer by Solar Reserve for the 96 MWac PV project. The project was selected in the second round of the Renewable Energy Energy Independent Power Producers Programme (REIPPP), the brief was for the preliminary design, design review as well as project, management and construction supervision of the work by EPC Iberdrola - Group 5 Consortium during the course of the project. The Jasper Power Project was named the 2015 EMEA Best Renewable Energy Project of the Year (California, June 10, 2015).

\* Data © of Jasper Power Company

*“Key engineers currently in the employ of iX Engineers (Pty) Ltd gained the experience on projects listed whilst employed by iX engineers’ predecessors in title, KV3 Engineers (Pty) Ltd incorporated by WorleyParsons RSA (Pty) Ltd. iX engineers (Pty) Ltd acquired the Public Infrastructure Business Unit from WorleyParsons RSA in September 2016, including all personnel and projects of the business unit as a going concern, to continue with service delivery”.*

## Food Energy Water (FEW) Nexus



### Agrivoltaics and Floating Solar PV

On the global path to decarbonisation, many new renewable energy plants will have to be built to supply the increasing demand in electrical energy. Resources, such as land and water need to be used intelligently to address the Food Energy Water (FEW) Nexus. Innovative technologies, such as Agrivoltaics and Floating Solar PV, will be part of the solution.

Agrivoltaics is the dual land use for agriculture and Solar PV. This can lead to higher crop yield, less water consumptions and higher energy output. It also provides farmers with an additional potential source of income during adverse weather periods resulting in lower harvest outputs.

Floating Solar PV makes use of otherwise underutilised water bodies for electricity generation. The energy yield is increased, whilst at the same time reducing water evaporation from dams and lakes, preserving this precious resource in our water-scarce country.

Higher land utilisation and income generation will have a positive impact on municipal revenues and will uplift impacted local communities.



Stationary Battery Energy Storage Systems (BESS) are becoming more and more cost-effective, assist with grid stability and provide behind-the-meter energy security as well as maximum demand and tariff arbitrage opportunities

# SMART GRID

**BESS**

1

By lifting blocks to elevated heights Gravity Energy Storage Systems (GESS) store kinetic energy and turn waste materials into an energy asset, whilst cleaning up the environment. This solution is ideally suited for the rehabilitation of coal-fired power stations, water treatment plants and mining sites.

**GESS**

2

High-temperature Thermal Energy Storage Systems (TESS) can be viable solution for Solar PV energy storage, making TESS true energy storage. South African rocks can also be a suitable medium for thermal energy storage. This technology is particularly interesting for industry, where electricity meets waste heat, steam and process heating & cooling. Energy can easily be transferred from one form to another, whilst being stored in high-exergy heat.

**TESS**

3

Renewable energy supply is intermittent. Vehicle-to-Grid (V2G) technology will play a pivotal role in balancing supply and demand in the future smart grid, as they are essentially an energy asset, a big battery resource on wheels that is stationary 90% of the time.

**V2G**

**Power Fuels**

4

Green Power Fuels will be critical part of decarbonising the heavy transport and industry sectors. The production of these fuels (eg: Green Hydrogen & Ammonia) can also be strategically produced at times when renewable energy resources are abundant and cheap

**5**

Supply Authorities will play a critical role in the design and management of distributed future smart grids. This will also create new business opportunities for municipalities and its customers.

# FUNDING & IMPACT INVESTING



Through our exposure in infrastructure projects, iX engineers is well-positioned to match-make sustainable project opportunities for infrastructure as identified within the municipal frameworks with suitable funding sources. Such projects can have a profound socio-economic impact in the region and could attract impact investment funding.

iX engineers can assist municipalities in identifying qualifying projects and guide municipalities through the Pre-financial Close phase to take these projects to fruition.

## Just Energy Transition and Carbon Emission Reductions

Globally, industry trends are moving towards carbon neutrality by 2050. Our business is a part of shaping this Just Energy Transition (JET) by identifying opportunities that combine the move to a world powered by renewable energy with immense socio-economic benefits to the regions wherein we are active. Carbon dioxide (CO<sub>2</sub>) emissions are the main contributor to global warming, which poses a threat to humanity as a whole.

To create a world in which our future generations can enjoy living, we need to ensure that we are able to curb climate fluctuation within a temperature band that is suitable for human life. It is, therefore, important to proactively set targets for carbon emission reductions and monitor progress to achieve the ultimate goal of a carbon-neutral economy.

iX engineers is well positioned to assist municipalities in developing a carbon emission reduction and JET masterplan and provide guidance for its successful implementation.

## Opportunities for Supply Authorities: Self-generation

HOW CAN iX engineers ASSIST?

### Master Planning

- Revise electricity masterplans in terms of RE opportunities
- Revise the electricity masterplans in terms of EV opportunities
- Develop maps of Renewable Energy opportunities
- Grid assessment for ESS opportunities
- Develop maps of EV infrastructure (Vehicle-2-Grid)
- Develop a wheeling and financial revenue model
- Water infrastructure assessment for power generation opportunities
- Assess opportunities for Floating Solar PV
- Assess opportunities for Agrivoltaics
- Develop integrated energy (electricity and thermal energy) masterplans



## Generation & Supply-side Management

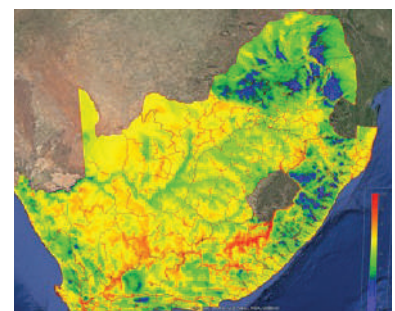
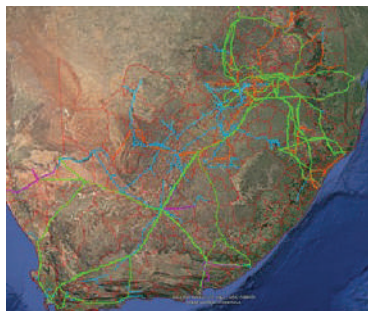
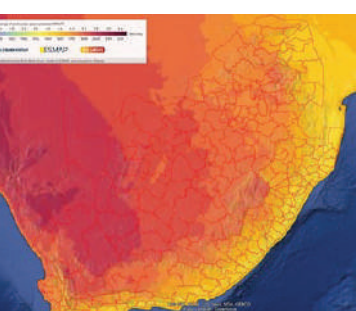
- Develop renewable energy policies
- Co-develop renewable energy and/or energy storage projects for municipalities (Owner's Engineer for the Municipalities, Source funding)
- Purchasing renewable energy from IPPs outside the Municipality
- Purchasing renewable energy from generators within the Municipal network
- Hybrid desalination and renewable energy plants

## Load & Demand-side Management

- Demand shifting by thermal energy load control
- Tariffs, shift to time-of-use and introduce real-time pricing
- Power factor correction

## Energy Efficiency

- Wastewater treatment (aeration), streetlights (high efficiency and correctly designed lenses LED)
- LED traffic lights
- Energy efficiency in buildings
- Reduced system technical losses
- Public awareness of energy usage





# MINING



## Water in Mining

iX engineers traditionally provides an engineering service to the public and private sector and has now extended its service offering to the mining sector. iX engineers' services in the mining industry include the following:

- Water
- Energy
- Resettlements
- Roads and underground ramps
- Storm water
- Bulk earthworks
- Buildings and process plants
- Condition assessments
- Other supporting engineering disciplines



### Water Solutions in Mining

As water is one of the scarcest resources in South Africa, iX engineers has identified water as a priority area that requires innovative thinking and solutions. In mining, water plays a major role in the operations and processing of minerals; therefore, iX engineers has set itself a target to assist and support the mining industry to save water consumption by up to 50%. This will be achieved by offering an orchestrated mix of solutions, systems and technology that will be integrated to deliver the desired target.



### Water Solutions in Mining

- Water supply options
- Water balance
- Water resource development
- Conveyance systems and pump stations
- Water storage systems
- Water treatment
- Water distribution systems
- Internal water and sewer reticulation
- Storm water management
- Demineralised water
- Acid mine drain solutions
- Desalination

### Water Conservation & Demand Management

- Water monitoring system using “Internet of Things” (IoT) and smart water systems
- Reduced environmental impact
- Reduced operations and maintenance costs
- Reduced plant capacity requirements
- Improved level of service end efficiency
- Reduced water losses and NRW
- Reduced return flows
- Possibilities for re-use and recycling
- Pressure management

## Energy in Mining



iX engineers' electrical services department provides specialist services in the electrical distribution and reticulation industry. iX engineers is an affiliated member of the Association of Municipal Electrical Utilities (AMEU) and International Council on Large Electric Systems (CIGRE).

iX engineers' diverse experience and exposure is evident through our success in the electrical transmission and distribution industry, which includes but is not limited to services such as the following:

- Sub-stations and switching stations up to 132 kV (indoor and outdoor)
- Distribution and transmission networks up to 132 kV (underground and overhead)
- Electrification of townships, low-cost housing, upmarket residential and resort developments
- Master planning and analysis of High, Medium and Low Voltage Networks
- Telemetry & SCADA systems
- Refurbishment, upgrades, and maintenance of all electrical infrastructure
- Emergency Power Generation
- Lighting of streets, roads, stadiums, and sports fields
- Renewable Energy
- Solar PV and Thermal (including CSP)
- Wind
- Energy storage
- Energy efficiency

## Resettlement in Mining



iX engineers' resettlement solutions in the mining sector minimise risks for both the mining companies and the community, with the aim of developing a long-term partnership that can lead to improved community stability and a diversified local economy. We follow the World Bank's IFC Standard 5 guidelines and local and national legislation to manage such resettlement.

Our alliance with world-known specialists enables us to comprehensively deal with stakeholder relations management whilst simultaneously managing the social side of resettlement projects with dignity and care. We provide mining companies with specialised skills to effectively manage resettlement projects through the different project phases to get final project approval for implementation whilst embedding the social economics, training, and well-being of the community throughout the process.

iX engineers offer the following resettlement solutions and benefits in the mining sector:

- Project management through the different project phases
- Experience in managing the full scope of a typical resettlement project, from inception to final close-out
- Compilation of resettlement action plans (RAP)
- Stakeholder management (Engineering vs Community)
- Managing community acceptance (No risk for Government)
- Risk management
- Upliftment, training and establishment of SMMEs in the affected communities
- Job creation
- Multidisciplinary engineering services to do the design of all typical bulk and internal infrastructure, town planning, houses, and other buildings
- Construction management

*\*And all the other supporting engineering disciplines.*

## Shondoni Mine Early Works



**CUSTOMER**  
Sasol  
**VALUE**  
R285 million



**LOCATION**  
Secunda  
Mpumalanga Province  
RSA



The project entailed the construction of 4 km of 400 mm NB steel potable water pipeline, 5 km of 350 mm NB HDPE service water pipeline, an elevated 392 k pressed steel tank and raft pump station.

The proposed potable water pipeline was connected to Rand Water Board's existing N1/ N4/ N6 pipeline, following the route of an existing 230 mm NB Rand Water pipeline. The pipeline route had a highway road crossing that required pipe jacking. The proposed service water pipeline conveyed water from the Ithembaletu mine to an elevated tank at the Shondoni mine. The project had the following phases:

- Feasibility study
- Preliminary design
- Detailed design
- Tender documentation
- Construction
- Close out

## Dingleton Resettlement Project



**CUSTOMER**  
Hatch Goba on behalf of  
Anglo-American  
**VALUE**  
R1.1 billion



**LOCATION**  
Dingleton Host Site  
Kathu  
Northern Cape  
RSA



iX engineers was appointed as civil and structural engineers on the Dingleton township resettlement project for Anglo-American in Kathu. iX engineers completed the project following the acquisition of the Public Infrastructure (PI) Business unit of WorleyParsons RSA.

The appointment entailed the construction of 504 houses with outbuildings and the servicing of 820 new stands to accommodate the relocation of residents from land earmarked for open pit mining. Deliverables achieved were the investigation of bulk services availability, design of residential roads and provincial road intersections, gravitational sewer networks and water reticulation, preparation of construction drawings, specifications and quantities, application of a quality management system during construction, and assisting the client, project managers, quantity surveyors, architects, and other engineering disciplines from feasibility phase to close-out.

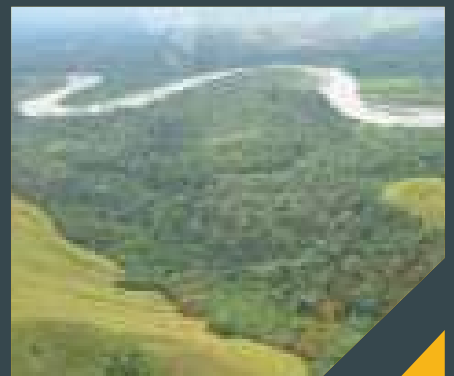
## Northern Access Road, Wafi-Golpu Mine



**CUSTOMER**  
Wafi-Golpu Joint Venture  
**VALUE**  
R1.1 billion



**LOCATION**  
Morobe Province, Papua New  
Guinea



A new access road of 26 km with five new river bridge crossings in the mountainous area of Papua New Guinea to the new Wafi-Golpu mine. The road travels through forest areas and floodplains, making it a challenging design regarding road alignment, safe driving conditions, reduced travelling time and cost, and ensuring sustainable material and equipment supplies and exports to and from the site.



# BUILDINGS

iX engineers has extensive experience in the Buildings Market Sector. iX engineers is a company which started in 2016, but our history began over 40 years ago. During this time, we underwent mergers and name changes, but our core staff complement and experience were carried through from 1989, the original company being KV3 Engineers.

Our intimate knowledge of the region's unique challenges, particularly Buildings, which offer value for money and embrace energy efficiency, enable us to tailor our solutions to deliver maximum value to our customers.

iX engineers concentrates on the full spectrum of engineering, tender and documentation, construction supervision, and management services associated with the development of various types of buildings.

iX engineers provides specialist services in the building infrastructure field, which includes industrial and business park developments, airports, industrial projects (light and heavy), warehouses, service stations, abattoirs, telecom towers, commercial and mixed-use developments (offices, hotels and shopping centres), institutional facilities (schools, hospitals, clinics, prisons, police stations, community halls, etc.), sport and recreational facilities, and residential buildings. iX engineers is also registered with the Green Building Council of South Africa (GBCSA) and has several Green Star SA Accredited Professionals with many years of experience in the design of energy-efficient infrastructure.

We complement the Building Industry in the following areas, but not limited to:

- Assistance with feasibility assessments
- Provision of cost estimates
- Research studies associated with the type of project or technology
- Energy studies to facilitate energy-efficient buildings
- Due diligence investigations and reports
- Tender documentation and evaluations
- Engineering designs and construction supervision
- Maintenance protocols and specifications
- BIM and associated modelling, and digital technologies
- Renewable technologies such as PV for buildings, Geothermal applications for HVAC, rain/grey/black water recycling
- Energy-saving measures through improved controls systems to accurately match building requirements, peak lopping of electricity usage to reduce customer bills, ice storage, efficient and automated lighting systems, heat recovery systems, variable speed/volume systems, digital energy metering, BMS

## Engineering Disciplines

The Buildings Market Sector is serviced by the following key engineering disciplines:

- Civil and Structural engineering
- Electrical and Electronic engineering
- Mechanical engineering

Where required, iX engineers also engage other in-house departments such as Roads and Transport, Bulk Water and Sanitation, Project Management, Project Packaging and Digital Innovation.

Services provided by the individual engineering disciplines are:



### Structural Engineering Services

- All building-related structural engineering elements
- Bulk earthworks
- Stormwater and sewers
- Fire water and domestic water incoming supplies and site reticulation, including boreholes
- General engineering structures such as reservoirs, water towers, culverts, and retaining walls
- Investigation and reporting on the structural integrity of damaged buildings
- Restoration, reinstatement, or alteration of existing building structures for alternative use
- Roads Engineering



### Electrical and Electronic Engineering

- Power supply connections
- Metering
- Substations
- Power distribution and cabling
- Emergency power generation
- Uninterrupted power supplies
- Lighting
- Lighting protection systems
- Load control systems
- Power factor correction systems
- Telemetry control systems
- Fire detection and alarm systems
- Public address systems
- Security systems
- Building management and control systems
- Communications network and systems
- Energy Audits
- Photo Voltaic (PV) Power Systems
- Energy Storage Systems



### Mechanical Engineering

- General building HVAC services for comfort
- Industrial and laboratory process cooling/heating and fume ventilation
- Alternative/low energy systems incorporating earth-tubes, ice storage, seawater cooling and heat recovery systems
- Close control air conditioning systems, including humidification and dehumidification
- Kitchen canopies and kitchen equipment
- Smoke ventilation systems
- Air conditioning of sterile environments, such as hospital theatres with pressure control and special filtration
- Fire Protection, including wet fire protection and gaseous systems
- Domestic Hot and Cold Water storage, pumping and reticulation
- Heat pump installations
- Solar heating installations (domestic, commercial and industrial)
- Special water provision (RO, distilled or other treated water)
- High pressure water systems, e.g. for wash bays, including recycling and filtering
- Internal Sanitary waste drainage
- Passenger lifts, Escalators, Goods lifts, Dumb waiters, Baggage handling equipment and conveyors
- Medical gas for hospitals, LPG, Oxygen and acetylene for central workshops, Laboratory gas services
- Compressed air for factories and processes, including instrument clean air
- Cold and Freezer rooms

# PROJECTS

## Menlyn Maine



### CUSTOMER

Menlyn Maine Investment Holdings



### LOCATION

Pretoria, Gauteng, RSA

iX engineers provided the management, civil, and electrical services to establish all engineering infrastructure for the precinct. This included roads, water and sewer reticulation, stormwater, and electrical networks.



## Cape Town International Airport



### CUSTOMER

Airports Company of South Africa



### LOCATION

Cape Town, Western Cape RSA

The project comprised the re-development of the old terminals to a new integrated world-class terminal for the processing of all departing and arriving, domestic and international passenger traffic. It was planned to provide for the increased traffic volumes for the 2010 FIFA World Cup and exceeded all expectations. For design approval, a 3D model was created to calculate and present illumination levels, such as the shadowing effects of various aircraft structures. The electrical services included substations with redundant capacity to cater for plant failure, standby power generation, bulk supplies to HVAC and baggage processing systems, and UPS systems to dedicated users.



## Hibernian Towers



### CUSTOMER

Quaypower Properties



### LOCATION

Strand Western Cape RSA

The 22-storey building's shape illustrates how effectively concrete can be used to bring to life an architect's vision, with the curved lines being key features of the architectural style. This theme is carried through to the inside of the building. This luxury multi-storey apartment building also has office and retail space. The podium has a 3,840 m<sup>2</sup> footprint, above which are two individual towers and an atrium





# HUMAN SETTLEMENTS

## Human Settlements - Urban and Rural Infrastructure, Residential, Industrial, Commercial, Sports & Recreation, Education, and Utilities

Our Human Settlements Division has a combined number of years of experience. Over this period, we have gained intimate knowledge of the country's unique challenges, enabling us to innovatively tailor our solutions to deliver maximum value to our customers. The team, consisting of several professionals, specialises in the design, procurement, project management, and construction monitoring of infrastructure projects for the municipal and private sectors.

### The expertise of the Human Settlements Team includes, but is not limited to, the following:

- Input and reporting during the pre-feasibility and feasibility stages of projects, including cost estimations and comparisons, and planning inputs.
- Liaison with various interested and affected parties regarding the availability and capacities of existing and future bulk civil engineering
- Infrastructure services.
- Three-dimensional modelling for mass earthwork designs, water and sewer analysis and design, and urban and rural roads with associated stormwater designs.
- Multi-faceted roles in the green building space with integrated sustainability goals built into every step of the design stage.
- Management of projects in terms of planning, scheduling, execution, cost control, and completion.
- Construction monitoring ensuring adherence to design and quality specifications with an added focus on safety and the environment.
- Closing out of projects and follow-up services.

Our diverse experience and exposure are supportive evidence of our success in the human settlements industry, which includes, but is not limited to, project and building types such as the following:

- Residential Developments
- Commercial Developments
- Industrial Parks, including Special Economic Zones (SEZs) and Industrial Development Zones (IDZs)
- Municipal Services (roads, sewer, stormwater, water, electricity, and gas reticulation)
- Utilities including Telecommunications (optic fibre) and other Utilities
- Infrastructure support for the Buildings & Services Division
- Resettlement Villages
- Sport and Recreation Facilities
- Education buildings, i.e., schools, colleges, and universities
- Construction Camps



## PROJECTS

### University of Venda



**CUSTOMER**  
University of Venda



**LOCATION**  
Thoyandou  
Limpopo  
RSA



### ASIDI A3 Schools



**CUSTOMER**  
Department of Public Works



**LOCATION**  
Cape Town  
Western Cape  
RSA



### Gugulethu Infill Housing



**CUSTOMER**  
City of Cape Town, Human  
Settlements



**LOCATION**  
Gugulethu  
Western Cape  
RSA







# OUR FOOTPRINT

## LOCATIONS IN SOUTH AFRICA

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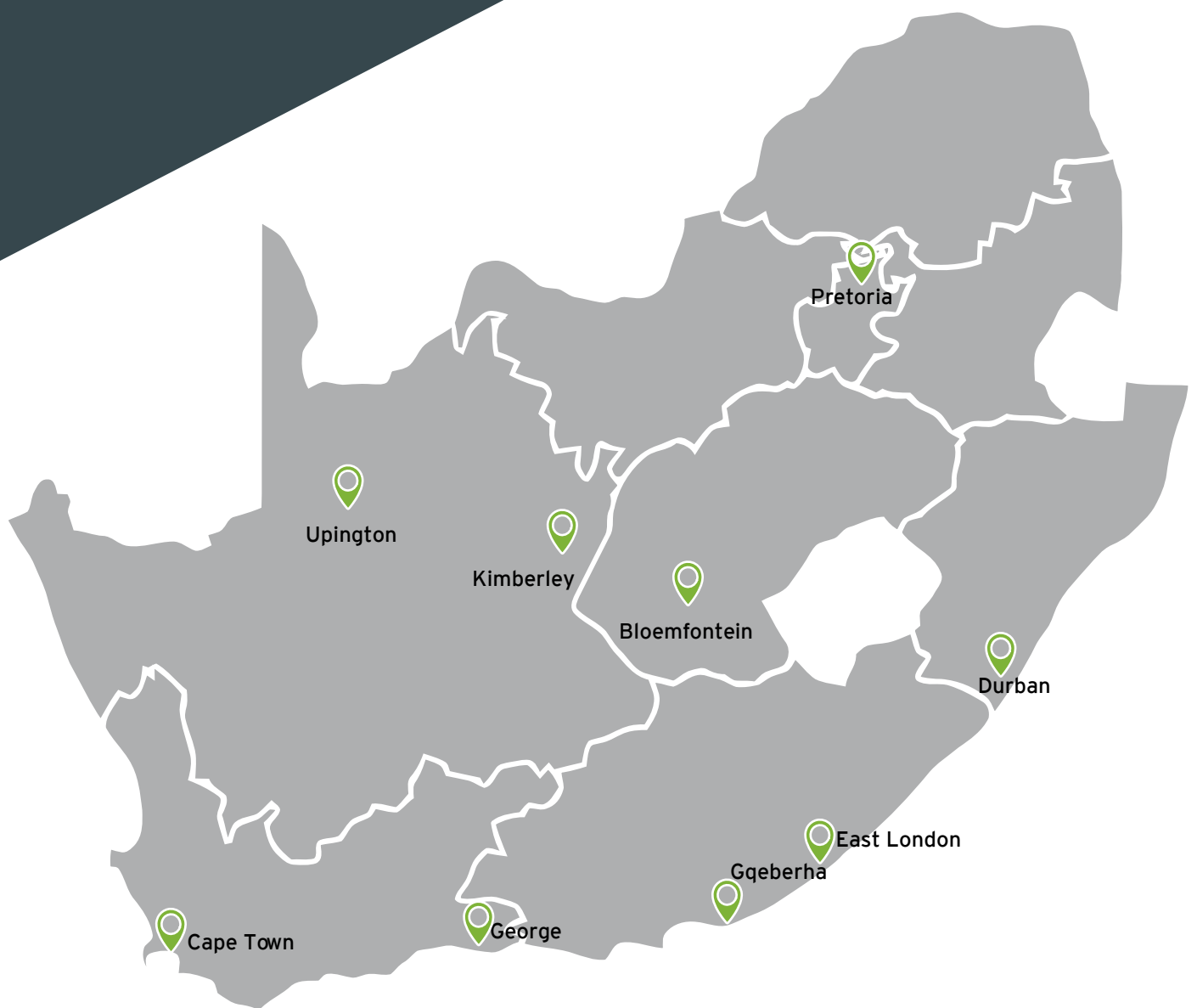
#### Project Offices

**Polokwane:**

**Office Manager:** Brendan van Schoor

☎ 082 611 9775

# OUR PURPOSE IS TO CREATE THE FUTURE OF LIFE TODAY





**iX**engineers  
Infrastructure Excellence