



# SET

SIMULATION ENGINEERING TECHNOLOGIES

---

## COMPANY PROFILE

---

2019

[www.setec.co.za](http://www.setec.co.za)

Physical: Unit 2A Hazel Close, 141 Witch Hazel Avenue, Highveld Techno Park, 0169, South Africa

Postal: Postnet Suite 510, Private Bag X1007, Lyttelton, 0140

Tel: +27 (0)12 660 3772 | Fax: +27 (0)86 590 5074 | Email: [info@setec.co.za](mailto:info@setec.co.za)

Registration Number: 2018/079319/07

## Company Overview

### Who we are & what we do

Simulation Engineering Technologies (SET) is an independent consulting company and a leader specialising in creating accurate discrete-event computer simulation models of complex systems in mining, rail, logistics, manufacturing and service industries. Our team consist of a number of industrial engineers with a unique blend of experience in conducting simulation, scheduling and business improvement studies to provide maximum value to clients.

SET was established in 2004 and its senior staff have been in the simulation industry since 1995. We provide consulting services to the world's leading companies including Rio Tinto, Vale, BHP Billiton, Anglo American, Unilever, SAB and WorleyParsons.

SET is a supplier of the Simio® and SimMine® simulation software packages in Africa, Canada and the Middle East. Simio® is used to provide risk based planning and scheduling solutions that can integrate with MES systems. We also supply the Optislot® warehouse slotting optimisation software and ACT-OR optimisation software for the logistics and warehousing environment.

Our professional services include the application of various industrial engineering techniques and principles. Through our in-depth understanding of developing, improving, implementing and evaluating complex processes and systems, we offer world-class solutions for our clients, operating from our offices in Centurion and Cape Town.

Using simulation and optimisation technology has many advantages and has become mandatory for leading companies when performing due diligence studies of a new mine, process design or prior to changing current design or operational parameters. The following are some of the advantages of using computer simulation and optimisation:

- **Reduces risk:**
  - Avoid costly mistakes;
  - Test ideas on a computer without disrupting operations;
  - Understand the impact of a change before implementation;
- **Enables managers to make better decisions:**
  - View the system operation to generate ideas for improving productivity;
  - Use the model to test alternatives and select the best options;
- **Capital avoidance:**
  - Eliminate excess capacity or expenditure through operational improvement;
- **Captures randomness and variance:**
  - Incorporate randomness (most systems contain random components i.e. equipment failures and load times);
  - Accurately Quantify Queuing Time as a result of variance
- **Improves profits:**
  - Increase throughput by eliminating bottlenecks;
  - Optimize equipment fleet; and
  - High return on investment.

## Services Consulting

SET offers scalable simulation consulting for the mining, rail, logistics & warehouses, service and manufacturing industries. SET has a highly trained team of industrial engineers specializing in conducting simulation studies, operations management and general industrial engineering consulting.

## Capacity Planning

SET uses various industrial engineering techniques and industry tools to determine the production capacity needed while, simultaneously, considering changing demands for products and/or services.

## Operations Improvement

SET offers extensive experience of applying industrial engineering concepts and simulation in order to evaluate alternatives and provide decision support.

## Work Study

SET uses Work Study tools such as work measurement and method study techniques to determine standard times and methods for doing a specific job or task should such information not be available at the time. The values and methods obtained are then used to populate the input values of a simulation model.

## Training

SET offers training courses for both beginners and advanced users in various state-of-the-art simulation software packages, including Simio®, SimMine® and Optislot®. SET distinguishes their training courses by providing not only the standard vendor training course but rather custom workshops that are based on actual case studies.

## Software Sales and Support

SET also, sells and supports the Simio®, SimMine® simulation software, Simio® scheduling software, Optislot® warehouse slotting optimisation software and ACT-OR logistics optimisation software packages.



*Simio* breaks down the walls of traditional simulation software, giving you the power to rapidly build accurate 3-D animated models and objectively analyse alternatives in order to make informed decisions more quickly.

Unlike other scheduling solutions, *Simio Scheduling* allows you to perform Risk Analysis in Real Time. This invaluable production scheduling software allows you to build a simulation model that fully captures both the detailed constraints and variations within your system.



*SimMine* optimizes resource planning and scheduling of underground development. SimMine is easy-to-use and serves as powerful software to plan, simulate and evaluate the development process in underground mining.



*OptiSlot DC™* addresses the complexities of slotting by utilizing advanced mathematical algorithms which consider a product's dimensions, physical characteristics of your environment including slot configurations, pick path and material handling equipment, and operational goals like pallet building, seasonality requirements and retail groupings. As a result of implementing advanced slotting technology, your operations benefit from reduced labour expenses, improved order fulfilment cycle time, a reduction in partial order shipments, and improved space utilization.



*ACT-OR* offers a suite of products that combines sophisticated mathematical algorithms and simulation models to deliver unique optimisation solutions to the logistics, warehousing, retails and shipping industries. The product suite consists of the following products: BEFORE!, OPTNet, OPTRunner, OPTShipping, OPTLoading, OPTVessel, NET SOLVER and the OPTWarehouse suite.

## Core Competencies

### Mining

|                              |   |
|------------------------------|---|
| <b>Underground Mining</b>    |   |
| <b>Rock Handling Systems</b> | SET has vast experience in modelling rock handling systems to gain insight into potential bottlenecks, optimize bin / silo capacities, and determine rock handling system capacity and weigh-up alternatives. These models include, but are not limited to: conveyor and feeder systems, crushers (primary, secondary and tertiary crushing systems), hoisting systems, ore loading and ore handling. |
| <b>Truck Haulage Systems</b> | SET provides simulation models of truck haulage systems to determine overall system capacity, quantify potential queuing at truck dumps and optimize ore pass capacity. We have created numerous models of truck ramp systems to determine passing bay requirements, truck interference and ramp capacity.  |

|  |   |
|--|---|
| <b>Open Pit Mining</b>                     |   |
| <b>Excavator / Loader / Shovel Loading</b> | Open pit simulation studies can be performed to determine the optimal mining equipment fleet size and to maximize production capability by minimizing truck queuing for loader(s) or at crusher(s). |
| <b>Truck Queuing Models</b>                | Test the effect of additional equipment on queuing times or probability of interference.  |
| <b>Crushing and Conveying</b>              | Test the effect of downstream ore handling systems on your haulage fleet to optimize ore handling equipment maintenance philosophies.   |

|                                       |   |
|---------------------------------------|---|
| <b>Surface</b>                        |   |
| <b>Stockpiling and Blending</b>       | SET has been involved in studies to test different stockpile blending strategies based on ore grade quality and to determine surface stockpile size.  |
| <b>Processing Plants and Smelters</b> | SET has made capacity recommendations on numerous surface processing plants. The models gave insight into the stockpile requirements, equipment sizing and overall production capability of various alternatives. |

## Industrial Engineering

|  |   |
|--|---|
| <b>Work-study / TOC / Supply Chain / Business Analysis</b> |   |
| <b>Work Measurement</b>                                    | SET has been involved in work measurement studies such as time and activity sampling to establish standard times for operations. These studies was then used to establish base cases in order to measure and compare performance. |
| <b>Method Study</b>  | SET uses Method study techniques to determine the most effective and efficient processes to apply in order to optimise throughput. As a part of the Method study process The Theory of Constraints (TOC) is applied as well.      |
| <b>Supply Chain</b>  | Supply chain analysis, modelling and optimisation.  |

## Rail Transportation

SET has been involved with various rail network studies in order to optimize rail infrastructure requirements. The Simio 3-D software provides realistic models of rail loading facilities, rail traffic control and passing loop(s) locations, stockyard design and port operations. SET has formed a fundamental part of a project team investigating the capacity of a major freight rail artery in South Africa by setting up a simulation model for the rail loading / offloading operations and rail traffic control. The model enabled the client to test the feasibility of major capital expenditure alternatives on system capacity and to study and eliminate low-impact alternatives which resulted in significant capital savings.

## Manufacturing & Assembly lines

Simulation has a proven track record in achieving savings and optimizing logistics, manufacturing processes and assembly lines by providing decision support to the outcome and includes implementation of Just-in-Time (JIT) and other inventory strategies.

## Supply Chain, Logistics & Warehouses

SET has been involved in many logistics studies, utilising simulation technology to reduce inventory levels, optimise transportation fleet size and determining capacity requirements and optimise infrastructure layout. SET is a partner of the USA based Opricity, providing software solutions advancing warehouse design, optimization and analysis. SET is a also partner of the Italy based ACT Operations Research that have developed state-of-the art software for Transportation, Warehouse and Network design optimisation software.

SET has also developed break-through technologies to rapidly model any warehouse configuration to test the optimal placement of products, test various rack technologies and pallet handling equipment.

## Ports

SET has been involved with port studies to determine future terminal capacity based on client forecasts. The simulation models were able to indicate the expected ship loading delays for various capacity scenarios to minimize capital and demurrage costs.

Bulk material handling in Ports including stockyard requirements and Stacker / Reclaimer operations. Detailed Transshipment Models with Tug and barges. Typical model outputs enable our clients to optimize loading / offloading rate requirements, number of berths / ship loaders and stockyard capacity.

## Project Highlights

### 1. Rail, Port & Pipeline Projects

| Project   | Location   | Start | End  | Description  | Client                  |
|---|--|-------|------|--|-------------------------|
| Hillside Metal Stock Yard Logistics Study         | Richards Bay   | 2018  | 2019 | Validation and verification of the Hillside Metal Stock Yard and Richard Bay port loading facility in the form of a simulation model   | GIBB                    |
| Surface Rail Simulation Model                     | Western limb of the Bushveld Complex, Rustenburg, South Africa               | 2018  | 2018 | The modelling of an additional route (loop) will have the ability to test the logic and simulate the rail travel operations.   | Impala Platinum         |
| Railway system capacity analysis                  | Cherepovets, Russia  | 2018  | 2018 | Developed a high-level Simulation model for rail siding capacity analysis. System throughput statistics. Resource and equipment utilizations. Waiting and queuing times. Parking levels and parking utilization. Other measures of operational bottlenecks/constraints   | Partners in Performance |
| Manganese Plant and Port Logistics                | Northern Cape  | 2018  | 2018 | Simulation model for the flow of product from the plant stockpile to the port. A trade-off study between rail and trucking   | DRA Global              |
| Amandelbult Rail Complex Simulation Study         | Western Limb of the Bushveld Igneous Complex, Limpopo province, South Africa | 2018  | 2018 | The model incorporates elements, including, travelling speeds, equipment breakdowns, loading and tipping times, queuing for resources and other elements of interference and rail restrictions. The model has the ability to test hot seat changeover during shift changes. Ability to test auto switching on sections of the main rail. | Anglo American Platinum |
| Kola Potash Simulation Study                      | Democratic Republic of Congo   | 2018  | 2018 | Developed a computer simulation of the total pit-to-port operations  | Kola Potash             |
| Amandelbult - Internal Truck / Rail Logistics     | Western Limb of the Bushveld Igneous Complex, Limpopo province, South Africa | 2018  | 2018 | The objective of the model is to review the existing and new stockpile arrangement. To recommend the following: Optimal placement of Rail weigh bridges. Stockpile locations, Number of FEL's Required.  | Anglo American Platinum |
| Transnet Rail Waterberg Capacity Simulation Study | Waterberg Region, Limpopo, South Africa                                      | 2016  | 2016 | Theoretical grid estimation; Verification of train movements with high priority trains, passing loops and train lengths; Complex train movements including mainline blocking and shunting.   | Transnet Projects       |
| Skardon River Transhipment                        | Brisbane, Australia  | 2016  | 2017 | Skardon River port model of tug and barge operations integrating ship loading and detailed Vessel scheduling. Determine Stockpile Capacity Requirements and bulk material handling requirements..  |                         |
| Port of Mombasa Simulation Study                  | Mombasa, Kenya   | 2016  | 2016 | Determine the effect and quantify the value of several interventions through simulation. Interventions included, adding berths, reducing delays, adding STS cranes, deepening berths, extending quay length, increasing grab   | Aurecon                 |



| Project  | Location                                  | Start | End  | Description  | Client                                   |
|--|---|-------|------|--|--|
|  |   |       |      | size, and additional storage space allocation.   |  |
| Container Supply Chain Simulation Study            | Pretoria, South Africa                    | 2016  | 2016 | Simulation model of existing Durban to Gauteng Container Rail Corridor. Model includes logistics from inland to port container terminals. The model serves as a high level supply chain tool to perform logistical system analysis and provide insight into potential bottlenecks, impact on container quantities, yard and terminal capacities  | Transnet Projects                        |
| Container Terminal Simulation Model                | Pretoria, South Africa                    | 2015  | 2015 | Simulation model using a generic approach to determine container terminal TEU capacities, given various input parameters and operational rules. Changeable parameters utilised during scenario analysis included; Number terminal line, number RMGs, number TTs available as well as various operational parameter such as shunting restrictions, shift configurations and RMG availability. Providing the client with support updating and improving their existing terminal models, allowing for improved capacity forecasting capability. | Transnet Projects                        |
| Transnet Simulation Services                       | Pretoria, South Africa                    | 2015  | 2017 | Transnet simulation support, model evaluation and review, model development and simulation software services.  | Transnet Projects                        |
| Alufer - Bel Air Pit to Port                       | Guinea, West Africa                       | 2015  | 2017 | Pit to port operations for Bauxite mine including mine, port bulk material handling operations and vessel loading operations (Transshipment).  | Alufer                                   |
| Jansen Mine  | Saskatchewan, Canada                      | 2014  | 2015 | Rail Logistics from Mine to Port   | BHP Billiton                             |
| Ammonia Piping and Rail Transport Simulation Study | Sasolburg South Africa                    | 2014  | 2014 | Mainline rail, plant and port operations   | Omnia Nutriology                         |
| Bulk Loading Terminal                              | Constantia, South Africa                  | 2013  | 2014 | Rapid Loading Stockyard with stackers and reclaimers loading trains. Various stacking patterns and loading rates tested.   | FLSmidth                                 |
| SAB Dispatch                                       | Jhb, South Africa                         | 2011  | 2011 | Logistics  | SAB                                      |
| Coal Line  | JHB, South Africa                         | 2012  | 2013 | Supply Chain Model   | Transnet                                 |
| Impala Surface Rail Study                          | Rustenburg Area, North West, South Africa | 2017  | 2017 | Verification of train movements between various mine shafts to a central tipping location. Determine the effect of additional train trips and increasing the number of trains in the system, as well as introducing more passing loops.  | Impala Platinum                          |
| Copper Cliff Mine                                  | Sudbury, Canada                           | 2012  | 2013 | Surface rail loading terminal, transportation and shunting operations.   | Vale                                     |
| Nacala – Pit to Port                               | Rivonia, South Africa                     | 2011  | 2013 | Simulation model of coal line from loading site in Mozambique to Port.   | ENRC in collaboration with Mott McDonald |

| Project   | Location                | Start | End  | Description   | Client  |
|---|-------------------------|-------|------|---|---|
|   |                         |       |      | Model includes logistics from mine to loading site, rail loading and shunting via reclaimer, rail model to port, detailed port stacking and reclaiming to vessels for 10 different products.  |   |
| Sintokoula Potash                                 | Republic of Congo       | 2011  | 2013 | The model analyses and reports on potash storage requirements, at the mine, plant feed and product stockpiles. It also includes transportation logistics from the proposed mine to the port terminal, port barge loading via a conveyor system and vessel loading through barges.   | Elemental Minerals                                    |
| Coal Line Supply Chain Model Prefeasibility Study | Woodmead, South Africa  | 2009  | 2013 | Coal Line Supply Chain Prefeasibility Study - simulation model representing the existing coal rail corridor (Richcor) from the export coal and domestic loading sites to Richard's Bay Coal Terminal (RBCT). Model includes General Freight (GF) traffic, in addition to domestic and export coal traffic. The model serves as a high level tool to provide insight into potential bottlenecks in the logistical system and Port for forecasted, increased tonnages transported on the network. The model also indicates the performance of multiple scenarios in order to establish the optimum techno-economic solution to alleviate potential infrastructure or operational bottlenecks. | Transnet in collaboration with HMG-JV                 |
| Durban Car Terminal                               | Durban, South Africa    | 2008  | 2008 | Simulation model of Durban Car Terminal (DCT)'s import and export vehicle handling and storage operations. The objective of the model was to predict the future capacity requirements at the Durban Car Terminal, based on future import and export volumes and expected vessel size distributions. Included logistical operations from the terminal to and from vessel loading.  | Transnet Port Authority                               |
| Goldfields Beatrix mine Logistics                 | Welkom South Africa     | 2007  | 2007 | Product transport and ship loading  | Anglo Scorpion Zink Mine                              |
| Crude Oil Pipeline Project                        | Sasolburg, South Africa | 2008  | 2008 | Crude Oil and Diesel piping optimization study from Durban Airport Tank farm to Natref  | Sasol   |
| Grasberg Block Cave                               | Irian Jaya, Indonesia   | 2004  | 2009 | Underground rail model for the largest underground mine in the world.   | P.T. Freeport Indonesia in collaboration with Stantec |

## 2. Mining Projects – South Africa

| Project  | Location  | Start | End  | Description   | Client                  |
|--|---|-------|------|---|-------------------------|
| Zondereinde Mine – Level Haulage Trimming Study              | Thabazimbi, Limpopo, South Africa                   | 2019  | 2019 | The study's main objective is to determine the point at which it will no longer be feasible to utilise the existing infrastructure to service the new production requirements   | Northam Platinum        |
| Underground MTB Development Simulation Study                 | Elandsfontein, Brits, North West, South Africa      | 2019  | 2019 | The study evaluated the optimal loading support equipment to accompany the Mobile Tunnel Borer when cutting a single decline at various speeds  | Northam Platinum        |
| Grootgeluk Coal Mine   | Discard Conveyor Simulation Study                   | 2018  | 2019 | Analyse the various alternatives identified to replace the discard conveyor which has reached end of its design life  | Exxaro                  |
| Amandelbult Internal Truck and Rail Logistics Study          | Thabazimbi, Limpopo, South Africa                   | 2018  | 2019 | Simulate truck arrivals at the Amandelbult Chrome Recovery Plant (CRP) gate, weighbridge(s) operations, internal truck movements, chrome concentrate stockpile (Chrome concentrate arrival rate), and loading of trucks via front end loader (FEL) to verify planned operations | Anglo American          |
| Tumela 15 East – Material Hoisting Capacity Simulation Study | Thabazimbi, Limpopo, South Africa                   | 2018  | 2019 | Simulation model to indicate whether the Tumela 15 East will be able to achieve the required material hoisting if the monthly production is ramped up to 120ktpm  | Anglo American Platinum |
| Sishen Mining Operations – OMS Development                   | Kathu, Northern Cape, South Africa                  | 2018  | 2019 | Developed an Operating Master Schedule for the mining operations  | Kumba                   |
| Amandelbult, Mining Operations, OMS Development              | Thabazimbi, Limpopo, South Africa                   | 2018  | 2019 | An Operating Master Schedule was developed for Amandelbult. The complete Amandelbult Complex model will be divided into smaller sub-models to allow for individual analysis.  | Anglo American Platinum |
| Kolomela Mining Complex – OMS Simulation Model               | Northern Cape, South Africa                         | 2018  | 2019 | Developed an Operating Master Schedule for the mining operations  | Kumba                   |
| Mponeng Life of Mine Extension Prefeasibility Study          | Carletonville, North West, South Africa             | 2018  | 2018 | Prefeasibility study of the Life of Mine  | Anglogold Ashanti       |
| Grootegeluk Coal Mine Discard Conveyor Project               | Waterberg Coalfield, Limpopo province, South Africa | 2018  | 2018 | Analysis tool to accurately predict current and future conveyor capacities under various conditions and configurations  | Exxaro                  |
| Mogalakwena Operating Master Schedule                        | Limpopo, South Africa                               | 2018  | 2018 | Developed an Operating Master Schedule for the mining operations  | Anglo American          |
| Vlakfontein Coal Mine Change of Scope Simulation Study       | Ogies, Mpumalanga Province, South Africa            | 2018  | 2018 | Open cast coal mine, open pit operations for loading and hauling equipment. Road truck logistics.   | Thuthukani              |

| Project  | Location                           | Start | End  | Description  | Client                         |
|--|------------------------------------|-------|------|--|--------------------------------|
| Amandelbult Tumela Mine Complex Bus & Taxi Terminal  | Thabazimbi, Limpopo, South Africa  | 2018  | 2018 | Feasibility study pertaining to the Civil Engineering as well as the operational aspects of improving the existing traffic management strategy at Tumela for taxi's and busses.                  | Anglo American                 |
| Grootgeluk Mining Complex                            | Limpopo, South Africa              | 2018  | 2018 | Secondary Equipment Analysis   | Exxaro                         |
| Der Brochen Personnel Carrier Study                  | Steelpoort, South Africa           | 2018  | 2018 | Construct a dynamic simulation model to evaluate the personnel cycle times for different shift times at different mining depths  | Anglo American                 |
| Kumba – Sishen DMS                                   | Kathu, Northern Cape, South Africa | 2018  | 2018 | Dynamic simulator of their Sishen Dense Media Separation (DMS) and Jig Plants  | Kumba                          |
| Marula Optimisation Simulation Study                 | Limpopo, South Africa              | 2016  | 2016 | Underground logistics including personnel, material and ore handling   | Impala Platinum                |
| Maroela Mine Simulation Study                        | Limpopo, South Africa              | 2016  | 2016 | Decline and strike mining rate analysis  | Impala Platinum                |
| Dishaba Lower Total Logistics Study                  | Limpopo, South Africa              | 2016  | 2016 | Underground logistics operations for men, material and ore handling  | Anglo Platinum                 |
| Mponeng Horizontal Tramming Logistics                | North West, South Africa           | 2016  | 2016 | Horizontal logistics and ramp capacity analysis.   | Anglo Gold Ashanti             |
| Burnstone Shaft Logistics                            | Mpumalanga, South Africa           | 2016  | 2016 | Shaft logistics and men & material operations. Study included station layout evaluation.   | DRA                            |
| Venetia Truck Haul Micro Cycle                       | Limpopo South Africa               | 2015  | 2015 | Truck Haul Micro Cycle Analysis  | De Beers                       |
| No 1 Shaft Production Build-up Constraint Evaluation | Northwest South Africa             | 2015  | 2015 | No 1 Shaft Production Build-up Constraint Evaluation   | Royal Bafokeng Platinum        |
| Kamoto Life of Mine Project                          | Pretoria South Africa              | 2015  | 2016 | Underground logistics operations for men, material and ore handling  | Fox Projects                   |
| Ivanplat Platreefs Simulation Study                  | Sunninghill South Africa           | 2015  | 2015 | Men material and ore handling Simulation Study including development and production simulation study and trade-off studies. Includes underground and surface operations as well as benchmarking. | DRA                            |
| Goedehoop conveyor capacity study                    | Johannesburg South Africa          | 2015  | 2015 | Underground and surface conveyor system capacity analysis.   | Hatch Goba                     |
|  |                                    |       |      |  |                                |
|  |                                    |       |      |  |                                |
| Middellaagte Logistics                               | Pretoria South Africa              | 2015  | 2015 | Mining logistics operations  | Anglo American                 |
| Dishaba Shaft Logistics                              | Pretoria South Africa              | 2015  | 2015 | Shaft logistics and men & material operations  | Anglo American                 |
| Ventitia Underground Mine                            | Musina, South Africa               | 2015  | 2015 | Business Improvement Study   | Murray and Roberts Cementation |

| Project                                    | Location                                     | Start | End  | Description   | Client                            |
|--|--|-------|------|---|-----------------------------------|
| Greater Booyseendal Simulation Study       | Limpopo, South Africa                        | 2015  | 2015 | Conveyor system capability analysis with silo and stockpile effectiveness and size estimation. Included detailed room & pillar modelling. | DRA                               |
| Dishaba Upper Total Logistics Study        | Limpopo, South Africa                        | 2015  | 2015 | Underground logistics operations for men, material and ore handling   | Anglo Platinum                    |
| Ivanplat Platreefs SimMine Model           | Sunninghill South Africa                     | 2015  | 2015 | Decline and long-hole stoping rates as well as shift optimisation   | DRA                               |
| 14 Shaft Expansion Simulation Study        | North West, South Africa                     | 2015  | 2015 | Underground logistics operations for material and ore handling.   | Impala Platinum                   |
| Bathopele SimMine Model                    | Objective Innovation Bathopele SimMine Model | 2014  | 2014 | Bathopele SimMine Model   | Objective Innovations             |
| Beisa - Beatrix 4 Shaft Simulation         | Beisa - Beatrix 4 Shaft South Africa         | 2014  | 2014 | Beisa - Beatrix 4 men ,material and ore model   | Biecon                            |
| Hulamin Logistics Simulation               | Hulamin South Africa                         | 2014  | 2014 | Hulamin Logistics Simulation  | AMS / Hulamin                     |
| Maseve Block 11 SimMine Model              | Maseve Mine South Africa                     | 2014  | 2014 | Maseve Block 11 SimMine Model   | Platinum Group Metals             |
| Sampling Study Extension                   | Sampling Study South Africa                  | 2014  | 2014 | Sampling Study Extension  | De Beers Marine                   |
| SimMine LOM Simulator - Sequencing         | Anglo American South Africa                  | 2014  | 2014 | SimMine LOM Simulator - Sequencing  | Anglo American                    |
| Tumela 1 Shaft Optimisation                | Tumela 1 Shaft South Africa                  | 2014  | 2014 | Tumela 1 Shaft Optimisation   | Anglo American - Tumela           |
| Venetia Open Pit Model                     | Limpopo South Africa                         | 2014  | 2014 | Venetia Open Pit Model  | De Beers                          |
| Sishen Dust Supression Simulation          | Sishen South Africa                          | 2014  | 2014 | Dust Supression and Surface Vehicle Logistics Model   | Anglo American Technical Services |
| Optimum Complex Conveyor Simulation        | Germiston South Africa                       | 2014  | 2014 | Overland material handling system   | CEDO Tech                         |
| Unki Logistics Study                       | Johannesburg South Africa                    | 2014  | 2014 | Logistics Operations Evaluation   | Anglo American                    |
|  |  |       |      |   |                                   |
| Twickenham & Hackney Simulation            | Limpopo South Africa                         | 2014  | 2015 | Men, Material and Ore Handling Operations and Consolidation   | Worley Parsons                    |
| Mamatwan Truck and Rail Loading Operations | Hotazel, South Africa                        | 2013  | 2013 | Truck Logistics, Train Loading, Rail Yard logistics, Stockpiling, Schedule optimisation   | BHP Billiton                      |
| Multi-purpose shaft simulation             | Doornkop Mine South Africa                   | 2013  | 2013 | Multi-purpose shaft simulation  | Doornkop                          |
| Pandora Shaft Model Update                 | Pandora Shaft South Africa                   | 2013  | 2013 | Pandora Shaft Model Update  | WorsleyParsonsTWP                 |
| Phakisa Decline                            | Welkom, South Africa                         | 2013  | 2013 | Men-, material- and rock hoisting/logistics, decline winding  | Harmony Gold                      |

| Project                       | Location                            | Start | End  | Description   | Client                  |
|-------------------------------|-------------------------------------|-------|------|---|-------------------------|
|                               |                                     |       |      | operations, decline rail operations, rail veyor   |                         |
| Shaft Operations              | Krugersdorp, South Africa           | 2013  | 2013 | Men hoisting, material hoisting, rock winding, shaft scheduling, winder synchronisation | Harmony Gold            |
| Tumela 1 Shaft                | Tumela 1 Shaft South Africa         | 2013  | 2013 | Tumela 1 Shaft Men. Material Ore handling   | Anglo Platinum          |
| Wessels East Block Review     | Wessels Mine South Africa           | 2013  | 2013 | Wessels East Block mining Review  | BHP                     |
| ARDC                          | Cape Town, South Africa             | 2012  | 2012 | Sampling Rate Study   | De Beers Marine         |
| Bathopele Mine                | Rustenburg, Northwest, South Africa | 2012  | 2012 | Underground Mining  | Anglo American          |
| Black Mountain                | Aggeneys, South Africa              | 2012  | 2012 | Truck Haulage Study   | Vedanta                 |
| Brakfontein logistics         | Rustenburg South Africa             | 2012  | 2012 | Simulate men material ore handling  | Anglo Platinum          |
| BRPM North Shaft Ore Handling | Rustenburg South Africa             | 2012  | 2012 | Rock Handling   | LONMIN                  |
| DRA Boabab Feasibility        | Rustenburg South Africa             | 2012  | 2012 | Long hole stoping method  | DRA                     |
| Hackney logistics             | Steelpoort South Africa             | 2012  | 2012 | Simulate men material ore handling  | Anglo Platinum          |
| Harmony Elandsrand Logistics  | Fochville Area South Africa         | 2012  | 2012 | Men material rock handling  | HARMONY                 |
| Harmony Evander Logistics     | Evander South Africa                | 2012  | 2012 | Men Material Rock Handling  | HARMONY                 |
| Lonmin Hossy Shaft Logistics  | Brits South Africa                  | 2012  | 2012 | Men material Rock Handling  | LONMIN                  |
| Lonmin Pandora mine Logistics | Brits South Africa                  | 2012  | 2012 | Men material Rock Handling  | LONMIN                  |
| Palabora Lift 2               | Phalaborwa, South Africa            | 2012  | 2012 | Material Handling Study   | Palabora Mining Company |
| Styldrift Mine                | Pilansberg, Northwest, South Africa | 2012  | 2012 | Men & Material Logistics  | BRPM                    |
| Styldrift No 1 Shaft          | Pilansberg, Northwest, South Africa | 2012  | 2012 | Ore Handling simulation study   | BRPM                    |
| Styldrift No 2 Shaft          | Pilansberg, Northwest, South Africa | 2012  | 2012 | Shaft Sink study  | BRPM-JV                 |
| Twickenham logistics          | Steelpoort South Africa             | 2012  | 2012 | Simulate men material ore handling  | Anglo Platinum          |
| De Beers Venetia mine         | South Africa                        | 2011  | 2011 | Block caving mining method simulation   | De Beers                |
|                               |                                     |       |      |   |                         |

| Project                         | Location                            | Start | End  | Description                              | Client          |
|---------------------------------|-------------------------------------|-------|------|--|-----------------|
| Makhado                         | South Africa                        | 2011  | 2011 | Open pit coal mining                     | Coal of Africa  |
| Tumela 10 East                  | Thabazimbi, South Africa            | 2011  | 2011 | Underground Mining, Logistics            | Anglo American  |
| Waterval Smelter                | Rustenburg, Northwest, South Africa | 2011  | 2011 | Logistics                                | Anglo Platinum  |
| Zibulo                          | Ogies, Mpumalanga, South Africa     | 2011  | 2011 | Material Handling / Conveyor Study       | Anglo American  |
| Styl drift Mine                 | Pilansberg, Northwest, South Africa | 2011  | 2012 | Underground Mining, Logistics            | BRPM            |
|                                 |                                     |       |      |  |                 |
| Hlanganai                       | Welkom South Africa                 | 2010  | 2010 | Simulate men material ore handling       | Goldfields      |
| Impala 11C Shaft                | Rustenburg, Northwest, South Africa | 2010  | 2010 | Underground Mining, Logistics            | Impala Platinum |
|                                 |                                     |       |      |  |                 |
| Nkwe Mine Logistics             | Rustenburg South Africa             | 2010  | 2010 | Simulate men material ore handling       | ANGLO/TWP       |
| Tumela 10 West                  | Thabazimbi, South Africa            | 2010  | 2011 | Underground Mining, Logistics            | Anglo American  |
| Bafokeng Rasimone Platinum Mine | Rustenburg, South Africa            | 2009  | 2009 | Underground Mining                       | Anglo Platinum  |
| Decline development             | South Africa                        | 2009  | 2009 | Decline development simulation           | Grinaker        |
| Impala Platinum 11C shaft       | Rustenburg, South Africa            | 2009  | 2009 | Underground Mining                       | Impala Platinum |
| Kopano underground robot system | Welkom South Africa                 | 2009  | 2009 | Simulate underground transport system    | Anglo platinum  |
| Lonmin Newman Shaft Logistics   | Brits South Africa                  | 2009  | 2009 | Men material Rock Handling               | LONMIN          |
| Baobab Mine                     | Limpopo, South Africa               | 2008  | 2008 | Underground Mining                       | Lonmin          |
| Boxhole Development             | South Africa                        | 2008  | 2008 | Mining method                            | Sandvik         |
| Breast mining model             | Rustenburg South Africa             | 2008  | 2008 | Breast mining with no fish belts         | Lonmin          |
| Frank Shaft mining method model | Rustenburg South Africa             | 2008  | 2008 | Stoping with extra low profile equipment | Sandvik         |
| Khutala surface belt model      | South Africa                        | 2008  | 2008 | Surface conveyor belt capacity           | MCS             |
| Kloof mine 23 level simulation  | Randfontein South Africa            | 2008  | 2008 | Men material Rock Handling               | Goldfields      |
| Lonmin Saffy Shaft Logistics    | Brits South Africa                  | 2008  | 2008 | Men material Rock Handling               | LONMIN          |

| Project                         | Location                 | Start | End  | Description                             | Client                                     |
|---------------------------------|--------------------------|-------|------|---|--|
| Modikwa shaft model             | Steelpoort South Africa  | 2008  | 2008 | Decline shaft logistics model           | Anglo Platinum                             |
| Ridge mining Model              | South Africa             | 2008  | 2008 | Men material Rock Handling              | Blue Ridge Mining                          |
| Union Section                   | Northam South Africa     | 2008  | 2008 | Men material Rock Handling              | Anglo Platinum                             |
| Vhumbejani surface plant        | South Africa             | 2008  | 2008 | Men material Rock Handling              | Anglo Platinum                             |
| Black Mountain                  | South Africa             | 2007  | 2007 | Men material Rock Handling              | Sandvik                                    |
| Frank Shaft                     | Rustenburg, South Africa | 2007  | 2007 | Underground Mining                      | Anglo Platinum                             |
| Goldfields Driefontein          | South Africa             | 2007  | 2007 | Underground and surface belt simulation | Goldfields                                 |
| Goldfields Kloof mine Logistics | South Africa             | 2007  | 2007 | Men material Rock Handling              | Goldfields                                 |
| Goldfields South Shaft          | South Africa             | 2007  | 2007 | Underground and surface belt simulation | Goldfields                                 |
| Nkomati                         | South Africa             | 2007  | 2007 | Men material Rock Handling              | Sandvik                                    |
| Phoenix Mine – Mining Model     | Thabazimbi, South Africa | 2007  | 2007 | Open Cast                               | Kumba Iron Ore                             |
| Sedibelo Mine model             | South Africa             | 2007  | 2007 | Open cast mining model                  | Barrick                                    |
| South and Twins shafts model    | Carletonville            | 2007  | 2007 | Tramming between two shafts             | Gold Fields                                |
| Tavistock coal mine             | Witbank                  | 2007  | 2007 | Underground and surface belt simulation | MCS  |
| Brakspruit Mine                 | Rustenburg, South Africa | 2007  | 2008 | Underground Mining                      | Anglo Platinum in collaboration with TWP   |
| Coal mining model               | South Africa             | 2006  | 2006 | Continuous miner model                  | MCS  |
| Ga-Pasha mine                   | South Africa             | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Kroondal mine                   | Rustenburg South Africa  | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Kumba Phoenix                   | South Africa             | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Lebowa Platinum                 | South Africa             | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Modikwa mine feasibility        | Steelpoort South Africa  | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Paardekraal                     | Rustenburg South Africa  | 2006  | 2006 | Men material Rock Handling              | Anglo Platinum                             |
| Potgietersrust Platinum Mines   | Mokopane, South Africa   | 2006  | 2006 | Open Cast                               | Anglo Platinum                             |
| Mototolo Platinum Mine          | Steelpoort, South Africa | 2005  | 2006 | Underground Mining                      | Anglo Platinum in collaboration with Hatch |
| Wessels Mine                    | Hotazel, South Africa    | 2005  | 2006 | Underground Mining, Surface             | BHP Billiton                               |
| Amandelbult Platinum Mine       | Northam, South Africa    | 2004  | 2005 | Underground Mining                      | Anglo Platinum in collaboration with Hatch |



| Project                   | Location                 | Start | End  | Description        | Client                                     |
|---------------------------|--------------------------|-------|------|--------------------|--|
| AUC Project               | Cullinan, South Africa   | 2004  | 2005 | Underground Mining | De Beers                                   |
| BAW Project               | Cullinan, South Africa   | 2004  | 2005 | Underground Mining | De Beers                                   |
| Centenary Cut Project     | Cullinan, South Africa   | 2004  | 2005 | Underground Mining | De Beers                                   |
| Der Brochen Platinum Mine | Steelpoort, South Africa | 2004  | 2005 | Underground Mining | Anglo Platinum in collaboration with Hatch |

### 3. Mining Project Highlights – International

| Project  | Location                           | Start | End  | Description   | Client                  |
|--|------------------------------------|-------|------|---|-------------------------|
| Wood Project Blue Sky – Tamp Haulage Logistics Trade-off Study | Orissa Province, India             | 2019  | 2019 | Haulage trade-off study between truck and conveyor in the main decline for both north and south   | Wood                    |
| Subika Expansion – Underground Haulage Logistics Study         | Western Ghana                      | 2019  | 2019 | Constructed a simulation model of the underground ramp/decline haulage logistics to provide insights into the design capacity requirements  | DRA                     |
| Kakula Project – Logistics Study                               | Democratic Republic of Congo       | 2019  | 2019 | Simulation model of the underground mining system, infrastructure, and associated personnel and material logistics to evaluate potential design bottlenecks or risk areas. Furthermore, a holistic logistics simulation will assist in determining optimum capacity utilisation and vehicle fleet size requirement, including men and materials | Ivanhoe Mines           |
| Avalabe Ramp Haulage Capacity                                  |                                    | 2019  | 2019 | Completed a simulation model of the Ramp Haulage capacity   | Cementation             |
| Alufer Bel Air Pit to Port                                     | Bel Air, Guinea                    | 2015  | 2016 | Pit to port operations for Bauxite mine including mine, plant and port operations and logistics.  | Alufer                  |
| Mindola_North Shaft Ore and Water Scenario Evaluation          | Mopani Copper Mines Zambia         | 2015  | 2015 | Mindola_North Shaft Ore and Water Scenario Evaluation   | Mopani Copper Mines PLC |
| Moropule Coal Mine – Value Stream Analysis                     | Palapye, Botswana                  | 2015  | 2015 | Total value stream analysis   | Moropule Coal Mine      |
| Mopani Mufulira and Mindola Shaft Scenario Evaluation          | Mopani Copper Mines Zambia         | 2014  | 2014 | Mopani Mufulira and Mindola Shaft Scenario Evaluation   | Mopani Copper Mines PLC |
| Mopani North Shaft decline model                               | Mopani Copper Mines Zambia         | 2014  | 2014 | Mopani North Shaft decline model  | Fox Projects Mopani     |
| Open Pit simulation  | Mopani Copper Mines Zambia         | 2014  | 2014 | Open Pit simulation   | Mopani Copper Mines PLC |
| Mufulira Waste Handling Simulation                             | Mopani Copper Mines Zambia         | 2014  | 2014 | Mufilira Mine Waste Handling Analysis   | Mopani Copper Mines PLC |
| Khoemacau / Simulation   | Khoemacau / Simulation             | 2014  | 2014 | Khoemacau / Simulation  | Turner and Townsend     |
| Turquoise Ridge Pvt / Public Shaft Scenarios                   | Turquoise Ridge Nevada             | 2014  | 2014 | Turquoise Ridge Pvt / Public Shaft Scenarios  | Barrick                 |
| Jansen Mine Simulation   | BHP Billiton, Saskatchewan, Canada | 2014  | 2014 | Jansen Mine to Port Simulation  | BHP Billiton            |
| Vale Copper Cliff Logistics                                    | Vale Copper Cliff Mine Canada      | 2014  | 2014 | Vale Copper Cliff Logistics   | Stantec                 |

| Project  | Location                      | Start | End  | Description  | Client   |
|--|-------------------------------|-------|------|--|--|
| Stillwater Mine New Layout                                     | Stillwater, Montana, USA      | 2014  | 2015 | Stillwater Mine New Layout Logistic Study  | Labrecque Technologies                             |
| Debswana - Jwaneng Cut 9 Open Pit Model                        | Debswana - Jwaneng Botswana   | 2013  | 2013 | Debswana - Jwaneng Cut 9 Open Pit Model  | TENOVA Takraf                                      |
| Musonoi Ramp System Simulation                                 | Musonoi DRC                   | 2013  | 2013 | Musonoi Ramp System Simulation   | Metorex DRA  |
| Ore- and Waste Handling  | Mufulira, Zambia              | 2013  | 2014 | Underground Logistics, Storage, Conveyors, Locomotives, Multiple hoisting, stockpiling | Mopani Copper Mines PLC                            |
| Mindola Shaft Simulation                                       | Mopani Copper Mines Zambia    | 2013  | 2013 | Mindola Shaft Men, Material and Ore Simulation   | Mopani Copper Mines PLC                            |
| Mopani Copper Mine's Synclinorium Project Study and Simulation | Mopani Copper Mine Zambia     | 2013  | 2013 | Copper mine Men, Materials Ore handling  | Murray & Roberts                                   |
| Mufulira Ore and Waste Handling System                         | Mopani Copper Mines Zambia    | 2013  | 2013 | Mufulira Ore and Waste Handling System   | Mopani Copper Mines PLC                            |
| Catalao Mine   | Catalao, Brazil               | 2012  | 2012 | Plant Simulation   | Anglo American                                     |
| Cortez   | Elko, Nevada, USA             | 2011  | 2012 | Ramp Logistic Study  | Barrick Gold                                       |
| Chibuluma  | Zambia                        | 2011  | 2011 | Men material Rock Handling   | METOREX  |
| Kittila Mine   | Lapland Province, Finland     | 2011  | 2011 | Ramp Logistic Study  | Agnico-Eagle                                       |
| Meliadine Mine   | Nunavut, Canada               | 2011  | 2011 | Ramp Concept Study   | Agnico-Eagle                                       |
| Stillwater Mine  | Stillwater, Montana, USA      | 2011  | 2012 | Stillwater Logistic Study  | Labrecque Technologies                             |
| Turquoise Ridge  | Winnemucca, Nevada, USA       | 2011  | 2012 | Ramp Logistic Study  | Barrick Gold                                       |
| Diavik   | Northwest Territories, Canada | 2010  | 2011 | Ramp Logistic Study  | Rio Tinto  |
| Morelos Gold Project   | Guerrero, Mexico              | 2010  | 2011 | Material Handling Concept Study  | Torex Gold   |
| Mutanda Plant operation  | DRC                           | 2010  | 2010 | Simulate plant operations  | SENET  |
| Trekkopje Mine   | Swakopmund, Namibia           | 2009  | 2009 | Surface, Ore Processing  | Areva Resources Southern Africa                    |
| Pebble Project   | Bristol Bay, Alaska, USA      | 2008  | 2008 | Underground Mining   | Anglo American / NDM in collaboration with Stantec |
| Konkola Copper   | Zambia                        | 2007  | 2007 | Water reticulation system  | Anglo base metals                                  |
| Scorpion Zink Tramming   | Namibia                       | 2007  | 2007 | Product transport and ship loading   | Anglo Scorpion Zink Mine                           |
| Bulyanhunlu  | Tanzania                      | 2007  | 2007 | Study various stoping methods  | Barrick  |
| Snap Lake Project  | Yellowknife, Canada           | 2007  | 2008 | Underground Mining   | De Beers   |

| Project                    | Location              | Start | End  | Description        | Client  |
|----------------------------|-----------------------|-------|------|--------------------|---|
| DOZ / ESZ Block Cave Mines | Irian Jaya, Indonesia | 2004  | 2009 | Underground Mining | P.T. Freeport Indonesia in collaboration with Stantec |
| Unki Platinum Mine         | Great Dyke, Zimbabwe  | 2005  | 2006 | Underground Mining | Anglo Platinum in collaboration with TWP              |
| Grasberg Block Cave        | Irian Jaya, Indonesia | 2004  | 2009 | Underground Mining | P.T. Freeport Indonesia in collaboration with Stantec |

## 4. Processing Plants

| Project   | Location   | Start | End  | Description  | Client                      |
|---|--|-------|------|--|-----------------------------|
| Mogalakwena South Concentrator – Dynamic Simulation Study | Limpopo, South Africa                              | 2018  | 2019 | Predict the current and future plant production performance under various conditions and/or configurations   | Anglo Platinum              |
| Amandelbult Concentrator Simulation Model                 | Thabazimbi, Limpopo, South Africa                  | 2018  | 2018 | Constructed simulation model of the completed processing plant to identify possible problem areas  | Anglo American              |
| Kolomela DSO Plant Simulation Model                       | Northern Cape, South Africa                        | 2018  | 2018 | Simulation of processing plant to identify bottlenecks and potential risks. Develop and investigate different alternative to alleviate the identified bottlenecks  | Kumba                       |
| Orapa Processing Plant Simulation                         | Botswana   | 2018  | 2018 | Developed and construct a simulation model of the processing plant to be used as an analytical tool to identify bottlenecks  | Debswana                    |
| Venetia Processing Plant Phase 2                          | Alldays, Limpopo Province, South Africa            | 2018  | 2018 | Increase throughput at their Venetia Processing Plant  | De Beers Group of Companies |
| Venetia Diamond Mine, OMS                                 | Alldays, Limpopo Province, South Africa            | 2018  | 2018 | Operating Master Schedule, phase 1 and 2 of the Process plant.   | De Beers Group              |
| Anglo Platinum Converting Process, logistics              | Waterval Smelter complex, Rustenburg, South Africa | 2018  | 2018 | Improving the current internal logistics of matte at the Anglo Platinum Converting Process (ACP) Treatment Furnace.  | Anglo American              |
| Unki Plant Simulation                                     | Selukwe District, Zimbabwe                         | 2017  | 2018 | Developed and construct a simulation model of the processing plant to be used as an analytical tool  | Anglo American Platinum     |
| Orapa Plant Simulation                                    | Botswana   | 2017  | 2018 | Simulation of the processing activities at the Orapa processing plant  | Debswana                    |
| Jwaneng Processing Plant Simulation Model                 | Botswana   | 2017  | 2018 | Simulation of the processing activities at the Jwaneng processing plant  | Debswana                    |
| Tshipi Plant  | Pretoria South Africa                              | 2015  | 2015 | Tshipi Plant and Flow Operations   | EPCM                        |
| Tshipi - Secondary Processing Plant                       | Sunninghill South Africa                           | 2015  | 2015 | Tshipi - Secondary Processing Plant  | DRA                         |
| Makhado Coal Processing                                   | Pretoria South Africa                              | 2015  | 2015 | Surface handling, processing plant and rail load out operations.   | DRA                         |
| Mogalakwena North Concentrator Simulation                 | Limpopo, South Africa                              | 2014  | 2014 | The project consisted analyzing several design options to quantify the concentrators' throughput and identify bottlenecks. The project identified that a lower capital expenditure could achieve the same throughput, saving an approximately a Billion rand in capital expenditure. | Anglo Platinum              |
| Mogalakwena   | Potgietersrus, Limpopo, South Africa               | 2011  | 2011 | Surface Plant  | Anglo Platinum              |
| Middelpunthill logistics                                  | Rustenburg South Africa                            | 2010  | 2010 | Simulate plant operation   | PPC                         |

| Project                        | Location                         | Start | End  | Description              | Client |
|--------------------------------|----------------------------------|-------|------|--------------------------|--------|
| PPC Dwaalboom plant simulation | Dwaalboom South Africa           | 2010  | 2010 | Simulate plant operation | PPC    |
| Grootegeeluk                   | Lephalale, Limpopo, South Africa | 2009  | 2010 | Plant Optimization       | E+PC   |

## 5. Warehousing and Scheduling

| Project   | Location                       | Start | End         | Description   | Client                |
|---|--------------------------------|-------|-------------|---|-----------------------|
| Warehouse Slotting Study                          | Midrand, Gauteng, South Africa | 2019  | In progress | Develop a slotting model for the warehouse operation to demonstrate the benefits and potential savings that can be unlocked through slotting optimisation | DSV Solutions         |
| Pretoria Mills Packaging Lines – Simio Scheduling | Pretoria, South Africa         | 2016  | 2016        | Develop a simulation-based solution for Foodcorp's Pretoria West milling and packing operations   | RCL Foods             |
| Level Capacity Analysis                           | Pretoria South Africa          | 2015  | 2015        | Level Capacity Analysis   | Objective Innovations |
| PPC Riebeeck Plant                                | Eastern cape South Africa      | 2008  | 2008        | Cement plant packaging model  | PPC SA                |
| Sasol Mafuta                                      | Secunda                        | 2008  | 2008        | Storage capacity model  | Hatch Africa          |

## 6. Manufacturing

| Project  | Location                            | Start | End  | Description  | Client          |
|--|-------------------------------------|-------|------|--|-----------------|
| Sishen Central Workshop – Operating Master Schedule Simulation Model | Kathu, Northern Cape, South Africa  | 2019  | 2019 | Analyse the capacity of the workshop as well as evaluate the equipment and human resource requirements to ensure the workshop can service all parts of the Sishen mine, plant, and external customer customers | Kumba           |
| AATCCW   | Middelburg, South Africa            | 2012  | 2012 | Assembly Workshop  | Anglo Technical |
| Klipfontein Workshop   | Rustenburg, Northwest, South Africa | 2011  | 2011 | Facilities Planning  | Anglo American  |



## 7. BI Solutions

| Project   | Location                                | Start | End  | Description   | Client            |
|---|---|-------|------|---|-------------------|
| Venetia Underground Project                         | Alldays, Limpopo, South Africa          | 2018  | 2018 | Develop Power BI control charts for the underground project | De Beers          |
| Mponeng Life of Mine Extension Prefeasibility Study | Carletonville, North West, South Africa | 2018  | 2018 | Database Write-out Connection                               | Anglogold Ashanti |

## Contact Details

**JACO BOTHA**

Senior Project Manager

Pr. Eng

Centurion

Unit 2A Hazel Close, 141 Witch Hazel Avenue, Highveld Techno Park, 0169  
Postnet Suite 510, Private Bag X1007  
Lyttelton, 0140, South Africa

Tel: +27 12 660 3772

Fax: +27 86 590 5074

Cell: +27 82 416 7076

Email: [jaco@setec.co.za](mailto:jaco@setec.co.za)

[www.setec.co.za](http://www.setec.co.za)