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D531R



# CONCEPTUAL OPEN PIT MINE DESIGN AND SCHEDULING ON THE RIVIERA TUNGSTEN PROSPECT FOR BONGANI MINERALS (PTY) LIMITED (BONGANI) BY VENMYN RAND (PTY) LIMITED (VENMYN)

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Final Report:

**CONCEPTUAL OPEN PIT MINE DESIGN AND SCHEDULING**

**ON THE**

**RIVIERA TUNGSTEN PROSPECT**

**FOR BONGANI MINERALS (PTY) LIMITED**

**BY**

**VENMYN RAND (PTY) LIMITED**

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Dear Sirs

## EXECUTIVE SUMMARY

Venmyn was requested by the Directors of Bongani Minerals (Bongani) to prepare a conceptual open pit mine design and scheduling scoping study (scoping study) on the Riviera Tungsten Project (Riviera) (Greenfield project), located approximately 150km north of Cape Town in the Western Cape Province, South Africa. Bongani potentially focuses on the exploitation of tungsten and molybdenum occurring on the Riviera Project area, subject to the granting of a mining right. This report summarises the results of an open pit mine design and scheduling study which was undertaken during the period from November 2008 to February 2009. The purpose of the study was to determine the technical practicalities of open pit mining and financial merits on the Riviera property in order to enable Bongani Minerals to make an informed decision on whether to invest further in developing the project into a mining operation and to establish whether there were reasonable prospects of eventual economic extraction under current commodity prices and macro-economic parameters. The Whittle shells shows that the Riviera deposit can be mined profitably using open pit mining as detailed in this report. It should be noted that the depth of the mine design and scheduling conducted on the project is of a pre-feasibility standard, however due to lack of precise data in the geological model, it was considered to be of conceptual study standard.

This deposit has previously been drilled by Anglo American Prospecting Services (AAPS), and the initial resource estimation was based on this historical exploration programme. The Riviera project team intends to establish an open pit mining operation hence the need for a conceptual mine design scoping study of the open pit potential being investigated in this report.

Venmyn estimated an unqualified Minable Inventory for Riviera based on input parameters supplied by the client and a high level block model in a csv file format used to generate the geological block model as the basis of the open pit design and scheduling. The geological block model showed block grade of Tungsten oxide ($WO_3$) and excluded other relevant details of Molybdenum (Mo) grade, rock types, density and any geological structures useful in determining the geotechnical regimes of the area or deposit. An average specific gravity (SG) of 2.6 was used throughout the ore regions and the country waste rock.

Pit optimisation using Whittle software was conducted to determine the ultimate pit shell for use in the design of a practical pit and then develop a mine schedule. The estimated mineralised block tonnages was categorised as an Inferred Resource for the purpose of the exercise, since no resource classification was defined in the geological block model. Had the Mo grade been included, there is a greater chance of realising improved pit economics depending on its grade. The main economic and practical pit design parameters applied included a ($WO_3$) price of US$250 per metric tonne unit (mtu), mining cost of ZARR28 per tonne, a processing cost of ZAR122.50 per tonne and a discount rate of 17%. Mo price was not included and no royalty or selling cost was included in the Whittle run. These parameters were later included in the life of mine (LoM) schedule financials at an annual ore production of 700,000 tonnes per annum (tpa). The Riviera ore is assumed sold as ammonium paratungstate (APT) whereas if sold as a concentrate; it will attract a fraction of the ATP price. The open pit with the highest open pit value from Whittle was used to determine an ultimate pit for design purposes.

Based on the discussed approach, the unqualified Mining Inventory estimate for the Riviera is 11.55 million tonnes (Mt) at an average grade of 0.31% ($WO_3$). The table below shows a summary of the ore tonnages including the resource classification of the material within the delineated ore boundaries used to estimate the minable inventory. Refer to Figure 4.5 for Riviera ore body with topography.

| RESERVE CATEGORY | RESOURCE CATEGORY | ORE (TONNES) | $WO_3$ (%) | Mo (%) |
|---|---|---|---|---|
| Proven | Measured | - | - | - |
| Probable | Indicated | - | - | - |
| - | Inferred | 12,000,000 | 0.31 | - |
| | **TOTAL** | **12,000,000** | **0.31** | **-** |

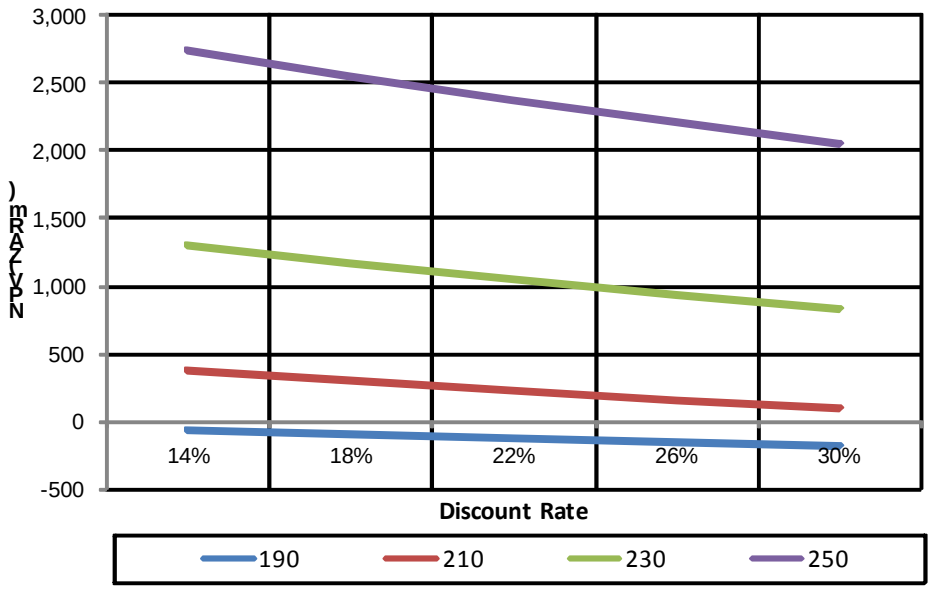
The reported maximum undiscounted cash flow estimate of R2.5billion (bn) for the Riviera open pit was based on the maximum open pit value coinciding with Whittle optimum pit 10. The NPV is then calculated using the conventional discounted cashflow (DCF), the summarised results are shown below. This was based on the mining schedule and the pushback strategy adopted, and is detailed in this report.

The mining schedule for Riviera is based on processing 348,000 tpa of ore in the second year of operation and increasing to 700,000 tpa throughout the LoM. A LOM of 17 years is anticipated at the stated mining rate. The table below shows the production profile for the first 8years indicating the first year and a half solely dedicated to pre stripping 20Mt of waste. The full detailed mine schedule is given in section 4.6.

| PARAMETER | UNITS | YR01 | YR02 | YR03 | YR04 | YR05 | YR06 | YR07 | YR08 |
|---|---|---|---|---|---|---|---|---|---|
| Total mined (W &O) | tonnes | 10,000,000 | 10,348,385 | 14,611,295 | 16,606,736 | 17,752,215 | 18,021,764 | 7,738,944 | 6,009,347 |
| Waste mined | tonnes | 10,000,000 | 10,000,000 | 13,911,295 | 15,906,736 | 17,052,215 | 17,321,764 | 7,038,944 | 5,309,347 |
| Ore mined | tonnes | - | 348,385 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| | | | | | | | | | |
| Ore Processed | tonnes | - | 348,385 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| ROM feed grade | $WO_3$ % | - | 0.28 | 0.29 | 0.30 | 0.31 | 0.31 | 0.30 | 0.30 |

The Riviera Project is viable based on the open pit design and the resulting mine schedule was then used to calculate NPV of ZAR 1.3bn which does take into account initial capital expenditure and does not include cost escalations, commodity prices escalations, inflation and selling costs. The sensitivity of the project's NPV to the changes in the discount rate and the commodity prices of the resulting mine schedule is graphically illustrated in the figure below. The figure also illustrates that the project is more sensitive to the commodity prices than the discount rate. One of the constraints on cashflow is the high upfront stripping of almost 20 Mt that has to be mined before exposing ore. Operationally this can capitalised in order to promote the project. The second cut back has equally high tonnages of waste stripping that have to be mined as soon as the starter cut is exposed for mining. It is recommended that the pre strip benches be mined in a double benching fashion to increase the waste sink rate. Once ore is intercepted it then becomes critical to revert back to a single 5 metre bench in order to improve grade control sink rate.

**Variation of the NPV with Changes in Discount Rates and Commodity Prices (APT)**



In conclusion, the Riviera deposit can be exploited profitably using open pit mining methods, based on the estimated grade, tonnages and the nature of mineralisation. Venmyn is of the option that an open pit mining is the best way of exploiting this deposit to maximise the value of the project, given the ore body characteristics.

The confirmatory and additional bulk sampling exploration programme must be carefully planned before the final investment decision is made and should systematically lead the company to the eventual preparation of a pre-feasibility or feasibility study and the confirmation and classification of SAMREC Code compliant tungsten mineral resources.

## DISCLAIMER AND RISKS

This Conceptual Open Pit Mine Design and Scheduling Report have been prepared by Venmyn Rand (Pty) Ltd (Venmyn). In the preparation of the report, Venmyn has utilised information relating to operational methods and expectations provided to them by Bongani Minerals. Where possible, Venmyn has verified this information from independent sources after making due enquiry of all material issues that are required in order to comply with the SAMREC Code and the JSE Listings Requirements, wherever possible. Venmyn and its directors accept no liability for any losses arising from reliance upon the information presented in this report.

## OPERATIONAL RISKS

The business of mining and mineral exploration, development and production by their nature contain significant operational risks. The business depends upon, amongst other things, successful prospecting programmes and competent management. Profitability and asset values can be affected by unforeseen changes in operating circumstances and technical issues.

## POLITICAL AND ECONOMIC RISK

Factors such as political and industrial disruption, currency fluctuation and interest rates could have an impact on Riviera future operations, and potential revenue streams can also be affected by these factors. The majority of these factors are, and will be, beyond the control of Riviera or any other operating entity.

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Venmyn was requested by the Directors of Bongani Minerals (Bongani) to prepare a conceptual open pit mine design and scheduling scoping study (scoping study) on the Riviera Tungsten Project (Riviera) (Greenfield project), located approximately 150km north of Cape Town in the Western Cape Province, South Africa. Bongani potentially focuses on the exploitation of tungsten and molybdenum occurring on the Riviera Project area, subject to the granting of a mining right from the Department of Minerals and Energy (DME). This report summarises the results of an open pit mine design and scheduling study which was undertaken during the period from November 2008 to February 2009 by Venmyn and its associates. The purpose of the study was to determine the technical practicalities of open pit mining and financial merits on the Riviera property in order to enable Bongani Minerals to make an informed decision on whether to invest further in developing the project into a mining operation and to establish whether there were reasonable prospects of eventual economic extraction under current commodity prices and macro-economic parameters. The Whittle shells shows that the Riviera deposit can be mined profitably using open pit mining as detailed in this report.

A review of all documented geological, mining, and metallurgical information was conducted in view of market and technological developments that have taken place since the previous appraisal study of 1983 at which time the project was considered marginal and uneconomical. To the contrary, Venmyn conducted a preliminary scoping study on the project in April 2008, with the results showing that the project was technically and financial viable under the current market economics. This study investigates the open pit mining practicality and the associated project economics.

Bongani aims to start producing in late 2011, processing approximately 700,000 tonnes of $WO_3$ oxide ore per year. The Riviera open pit mine is a Greenfield project that Bongani intends to develop, after purchasing the mineral asset from AAPS. Riviera project is a tungsten molybdenum deposit still in the mineral resource definition stage,

Venmyn independently constructed a financial model based on the designed open pit and scheduling to evaluate the merits of the proposed open pit. The basis of the project was to investigate whether the deposit had economic potential under the current business conditions using open pit designed, with the potential to develop the prospect into a viable open pit operation.

The location of the Riviera Project area is shown in Figure 1 in relation to the Western Cape Province in South Africa. The designed open pit and schedule cases appear to be economically robust, even under high nominal discount rates and sensitive to the commodity prices. The project is worthy developing further through a bulk sampling programme followed by the mine development.

## 2 SCOPE OF THE OPINION

Venmyn has prepared this study for indicative purposes for Bongani Minerals to enable them to make an informed decision regarding the technical mining feasibility of exploiting the Riviera deposit using open pit mining method. The mineral resources contained and used in this study are non-SAMREC or JORC code compliant but have been used as an indication of potential only.

In November 2008, Venmyn was asked by Bongani to conduct a pit optimisation using Whittle software, practical pit design and a conceptual mine production schedule for the Riviera deposit. The result of this work will be used by Riviera to apply for a mining license for the deposit and extend the study to pre feasibility or feasibility study.

In the execution of is mandate, Venmyn undertook a comprehensive review of the geological model, progress reports and historical information on the drilling and exploration work and this formed the input into the Whittle open pit shell and subsequently the mine design using Datamine Software.

The site visit was undertaken to the target sites by one of the authors of this report.

Venmyn could not sign off the estimated minable inventory as an Ore Reserve because of lack of resource classification within the block model which should be considered under the SAMREC (2007) code in the first place. The SAMREC guidelines are considered by Venmyn to be a concise recognition of the best practice open pit extraction methods for this type of mineral deposit and accord with the principles of open and transparent disclosure that are embodied in internationally accepted Codes for Corporate Governance.

**Figure 1: Regional Setting, Location and Infrastructure of the Riviera Project in South Africa.**

# 3 COMPETENT PERSONS' DECLARATION

Venmyn is an independent advisory company. Its consultants have extensive experience in preparing competent persons', technical advisers,' mine design and scheduling and valuation reports for mining and exploration companies. Venmyn's advisors have, collectively, more than 100 years of experience in the assessment and evaluation of mining projects and are members in good standing of appropriate professional institutions. The signatories to this report are qualified to express their professional opinions on the values of the mineral assets described. To this end, Competent Persons Certificates are presented in Appendix 1.

Neither Venmyn nor its staff, have or have had any interest in this project capable of affecting their ability to give an unbiased opinion, and, have not and will not, receive any pecuniary or other benefits in connection with this assignment, other than normal consulting fees. Bongani has warranted in writing that it has openly provided all material information to Venmyn, which, to the best of its knowledge and understanding, is complete, accurate and true.

# 4 PROJECT GENERAL INFORMATION

## 4.1 Location and Access

The Riviera Project is located some 170km to the north of Cape Town on the Farm 297 and Namaquasfontein 76 (32°42'0.00"S, 18°43'0.00"E) far ms at an altitude of about 105m in the Piketberg Magisterial District of the Western Cape Province in the Republic of South Africa (Figure 1). The nearest town is Piketberg which is approximately 53km from the site by road. Currently the land use of the area is farming with the production of corn, potatoes and portions of the farms are used as vineyards since the area is a significant wine producer.

Access from Cape Town to the central portion of the project area is via a national highway (N7) to the town of Piketberg and then via a tarred road to an intersection with a gravel road, north of the project area. The gravel road is in good condition and leads eastwards for approximately 45km, to the project area (Figure 1). Access to the site is by paved gravel road which runs for about 14km to the R365 tarred road. The main rail road north from Cape Town passes within 15km of the site at Het Kruis. The export harbour of Saldanha, is being used for iron and manganese export by Kumba Resources located approximately 80km to the west and is reachable by tarred road or construction of a 40km rail link to the existing infrastructure. The road and rail networks are shown in Figure 1.

## 4.2 Topography and Drainage

The Riviera Project is situated along the western slopes of the Piketberg range of mountains at an altitude of approximately 105 metres. It lies within a valley that generally trends north/south and is drained by a perennial stream. The area is well drained with streams which flow into the Kon Antiones stream in a trellis drainage pattern indicating uniform resistance to water of the ground.

## 4.3 New Order Prospecting Rights

The mineral title to the properties that were considered in this report were based on the report carried out by by Rock Ventures in April 2007 titled "A Review of the Prospecting Rights of the Riviera W-Mo Deposit" and the prospecting right granted to Bongani Minerals, a subsidiary of Batla Minerals. Venmyn has reviewed the rights and the status of the prospecting rights is in good standing. The following information relates to the legal title of the properties for the Riviera Project and are listed below in Table 1 and the boundaries of the portions included in the prospecting right are outlined in Figure 2.

**Table 1: Legal Title Information for Riviera Tungsten Project Properties.**

| LICENCE OWNERSHIP | FARM NAME | MINERAL RIGHT | TYPE OF LICENCE | DATE OF ISSUE | EXPIRY DATE | LICENCE NUMBERS | AREA (Ha) |
|---|---|---|---|---|---|---|---|
| Bongani Minerals (Pty) Limited | Namaquasfontein 76 Ptn 1 & 2or 6 and Ptn 1 of Farm 297 | Tungsten and Molybdenum | New Order Prospecting Right | 3rd April 2007 | 2nd April 2009 | WC30/5/1/1/3/ 2/238PR | 555.21 |

The holder of the prospecting right must commence with prospecting operations within 120 days from the date on which the prospecting right becomes effective, in terms of section 17(5) of the MPRDA, or any later date, as may upon a written request by the holder be authorised in writing by the Minister in terms of the Act, failing which this right will automatically lapse. The holder must furnish the Regional Manager with all prospecting results and information, as well as the general evaluation of the geological, geophysical and borehole data, in respect of an abandoned area, in so far as it applies to the mineral found in respect of the right.

**Figure 2: Photographic Aerial View and Prospecting Right Boundary for Riviera Tungsten Project Area.**

# 5 GEOLOGY AND MINERAL RESOURCE ESTIMATES

All tungsten deposits are of magmatic or hydrothermal origin. During cooling of the magma, different crystallisation occurs and scheelite and wolframite often occur in veins where magma has penetrated the earth's crust. The main factor affecting the location of tungsten deposits is the proximity to orogenic belts rather than geological age. A marked correlation exists between orogenic (younger) mountain belts and hence many of the world's tungsten mines are found in the Rockies/Andes, Pyrenees, Alps, and Hercyian (Hemerdon) and Caledonian (Carrock) mountain belts.

## 5.1 Local Geology and Mineralisation

The orebody is restricted to the granite rocks and occasionally the immediate contact area of the Malmesbury rocks. The Riviera Interim Report by AAPS reported that several types of ore were present in the orebody. Potentially economic mineralizations in the granite consist of three ore types namely greisen, endoskarn and vein ore types and are related to the different overlapping modes of genesis proposed for the deposit. The geological model utilised for this study did not segregate the different ore types, hence modelled as just one ore type. In general, one type of ore is dominant in a particular zone but the characteristics of one or more of the other types maybe present as well.

The greisen ore has an estimated grade in the order of 0.05% $WO_3$ to 0.015% $WO_3$ and very little molybdenite is present. The endoskarn ore has a grade ranging from an estimated 0.25% right up to more than 2%. In general, 0.3% or 0.45 can be expected. The quartz veins have grades of up to 10% $WO_3$ and 5% Mo. The veins supply the least of the ore tonnage but are very important as a sweetener and are chiefly responsible for the nugget effect of assay data. These veins are a major source of molybdenite whose economical extractability could not be ascertained.

## 5.2 Mineralisation of the deposit

The tungsten and its molybdenum by-product ore zones occur in the granite and occasionally in the contact area of the Malmesbury rocks. Occasional silver and very low gold values have been recorded beyond the granite intrusive. This ore zone is flanked by steep angled faults on the western and possibly on the northern sides. The pluton was shown to be a NW-striking, dome shaped interference structure related to the Saldania orogeny.

The economic concentrations of scheelite are spatially connected by the cross-cutting of granitoid intrusions which produced wall rock xenoliths of various dimensions. The deposit could be loosely classified as of an endo-granitic skarn. The ore bearing veins of the deposit are developed along the roof zone of the granite and commonly extend into the wall rocks. The Malmesbury Group rocks do not constitute part of the orebody but a layer of them that is in them forms an envelope around the Riviera Granite pluton. The Riviera Granite is associated with tungsten, molybdenum, zinc, lead and copper. Silver and very low gold values have been reported in some exploration holes. Tungsten and molybdenum only appear potentially economic given the current ore zones drilled to-date.

Greisen ore occurs in a zone approximately 50m thick immediately below the top contact. This type of ore has an estimated grade range of 0.05% to 0.15% $WO_3$ and has the best continuity. Endoskarn ore occurs as disseminated scheelite and minor molybdenite associated with pyrrhotite rich and amorphously shaped bodies with diffusion boundaries with the enclosing granite and of unknown size. The endoskarn ore has an estimated grade ranging from 0.25% to more than 2% $WO_3$ averaging 0.35%. High grades of tungsten are correlated with high concentration of pyrrhotite. Several sets of veins occur with the best mineralized ones being the steeply dipping and being 0.5cm to 5cm thick of clear quartz. The quartz veins have grades of up to 10% $WO_3$ and 7% Mo. These three types of mineralization maybe present in a single intersection. Minor mineralization also occurs as exoskarn ore with a few centimeter thick intersections that have poor continuity between boreholes.

## 5.3 Riviera Mineral Resource Estimate

The various historical resource estimates prepared for the Riviera deposit have been calculated from the results of the historical surface diamond drilling and from core samples taken for mineralogical analysis and metallurgical processing test work. A total of 71 drillholes and a total of 17,600m of drilling were available from the historical mineral resource estimate, the high grade part of this resource was utilised for the open pit mine design and scheduling and formed the basis of this scoping study and documented in this report.

The average grades used in the mineral resource statement were arrived at by various methods, most of them being manual calculations involving decreasing the grade of single high assays. These high assays are usually due to the influence of veins running parallel or sub-parallel to the core. The influence of high grade sections introduced some degree of uncertainty in the true average grade of the deposit. In the mineral resources estimation, the high grade problem was handled by assuming that the ratio of the number "high grade vein" assays to the total number of assays bears the same relationship that tonnes of vein ore does to total tonnes of ore. Simple arithmetic averages of equal 1m length samples were used to calculate borehole intersection grades. A global cut-off grade of 0.10% $WO_3$ was used to calculate the intersections, which must have a minimum thickness of 15m to be included in the mineral resource. Polygonal block estimation was used. The area of each block was calculated using a planimeter and multiplied by the true vertical thickness of the ore intersection to obtain cubic metres and a specific gravity of 2.6t/$m^3$ was used to obtain the tonnage. Mineral resources have been estimated using standard arithmetic techniques incorporating each individual intersection as an independent sample point.

**Table 2: Riviera Polygonal Block Global Mineral Resources by Palmer 28th May 1983 (non SAMREC Compliant)**

| BOREHOLE | BLOCK AREA | THICKNESS (m) | TONNES | GRADE ($WO_3$) % | $WO_3$ TONNES | Mo GRADE(ppm) | Mo (kg) |
|---|---|---|---|---|---|---|---|
| REV 23 | 8,443.00 | 18 | 395,132.00 | 0.26 | 1,027.34 | 260 | 102,734.00 |
| REV 24 | 6,916.00 | 17 | 305,687.00 | 0.1 | 305.69 | 290 | 88,649.00 |
| REV 27 | 8,766.00 | 17 | 387,457.00 | 0.29 | 1,123.63 | 150 | 58,119.00 |
| REV 29 | 15,197.00 | 13 | 513,659.00 | 0.28 | 1,438.24 | 612 | 314,359.00 |
| REV 33 | 7,944.00 | 34 | 702,250.00 | 0.13 | 912.92 | 70 | 49,158.00 |
| REV 37 | 13,832.00 | 23 | 827,154.00 | 0.29 | 2,398.75 | 85 | 70,308.00 |
| REV 38 | 11,145.00 | 17 | 492,609.00 | 0.33 | 1,625.61 | 700 | 344,826.00 |
| REV 39 | 19,103.00 | 63 | 3,129,071.00 | 0.18 | 5,632.33 | 200 | 625,814.00 |
| REV 40 | 12,055.00 | 36 | 1,128,348.00 | 0.28 | 3,159.37 | 310 | 349,788.00 |
| REV 46 | 20,366.00 | 16 | 847,226.00 | 0.13 | 1,101.39 | 70 | 59,306.00 |
| REV 48 | 16,710.00 | 64 | 2,780,544.00 | 0.28 | 7,785.52 | 320 | 889,774.00 |
| REV 53 | 18,207.00 | 23 | 1,088,779.00 | 0.19 | 2,068.68 | 135 | 146,985.00 |
| REV 56 | 22,730.00 | 18 | 1,063,764.00 | 0.13 | 1,382.89 | 40 | 42,551.00 |
| REV 58 | 23,670.00 | 51 | 3,138,642.00 | 0.29 | 9,102.06 | 450 | 1,412,389.00 |
| A0 | 21,966.00 | 44 | 2,512,910.00 | 0.16 | 4,020.66 | 80 | 201,033.00 |
| A+100 | 13,729.00 | 35 | 1,249,339.00 | 0.25 | 3,123.35 | 225 | 281,101.00 |
| C0 | 21,408.00 | 63 | 3,506,630.00 | 0.15 | 5,259.95 | 160 | 561,294.00 |
| D+100 | 17,561.00 | 65 | 2,967,809.00 | 0.2 | 5,935.62 | 100 | 296,781.00 |
| E0 | 25,813.00 | 25 | 1,677,845.00 | 0.15 | 2,516.77 | 80 | 134,278.00 |
| AA+200 | 11,982.00 | 14 | 436,145.00 | 0.2 | 872.29 | 135 | 58,880.00 |
| A+400 | 12,775.00 | 31 | 990,063.00 | 0.27 | 2,673.17 | 300 | 297,019.00 |
| AA+400 | 12,775.00 | 42 | 1,395,030.00 | 0.39 | 5,440.62 | 256 | 357,128.00 |
| BB+200 | 18,119.00 | 22 | 1,036,407.00 | 0.17 | 1,761.89 | 110 | 114,005.00 |
| BB+300 | 8,399.00 | 16 | 349,398.00 | 0.14 | 489.16 | 67 | 23,410.00 |
| BB+400 | 7,004.00 | 43 | 783,047.00 | 0.26 | 2,035.92 | 240 | 187,931.00 |
| BB+500 | 18,604.00 | 53 | 2,563,631.00 | 0.23 | 5,896.35 | 443 | 1,135,689.00 |
| BB/CC+350 | 3,862.00 | 27 | 271,112.00 | 0.2 | 542.22 | 163 | 44,191.00 |
| CC+200 | 17,884.00 | 33 | 1,534,447.00 | 0.45 | 6,905.01 | 10 | 0 |
| CC+400 | 11,747.00 | 17 | 519,217.00 | 0.35 | 1,817.26 | 140 | 72,690.00 |
| DD+200 | 19,008.00 | 16 | 760,320.00 | 0.16 | 1,216.51 | 23 | 17,487.00 |
| DD+600 | 31,408.00 | 33 | 2,694,806.00 | 0.2 | 5,389.61 | 188 | 506,624.00 |
| FF+400 | 32,509.00 | 20 | 1,690,468.00 | 0.12 | 2,028.56 | 88 | 148,761.00 |
| FF+600 | 37,061.00 | 15 | 1,445,379.00 | 0.16 | 2,312.61 | 118 | 170,555.00 |
| FF+800 | 45,592.00 | 17 | 2,015,166.00 | 0.17 | 3,425.78 | 33 | 66,500.00 |
| **TOTAL** | **594,290.00** | **30.62** | **47,199,491.00** | **0.2176** | **102,727.73** | **6,651.00** | **9,230,117.00** |

The global mineral resource of the Riviera tungsten deposits were initially reported at 47Mt in March 1983 at an average grade of 0.216% $WO_3$ and 0.020% Mo (Table 2).

Grades were estimated into a Datamine block model (BMMPL.dm) with a block size of 25 mN by 25 mE by 5 mRL using ordinary kriging. Areas drilled at spacing less than the ranges of continuity were classified into the Indicated category and areas drilled at spacing greater than the ranges of continuity into the Inferred category. In this case the whole deposit was considered as an inferred category, even though in the previous Venmyn report the resource could not be classified to lack of auditable historical exploration data. The Mineral Resource for Riviera is reported in accordance with the guidelines of the SAMREC (2007) code and above a total $WO_3$ cut-off grade of 0.2%. The confidence in Mo assays was low and this element was therefore not included in the resource statement.

**Table 3: Riviera Mineral Resource above 0.2% $WO_3$ cut-off used in the Open Pit Mine Design**

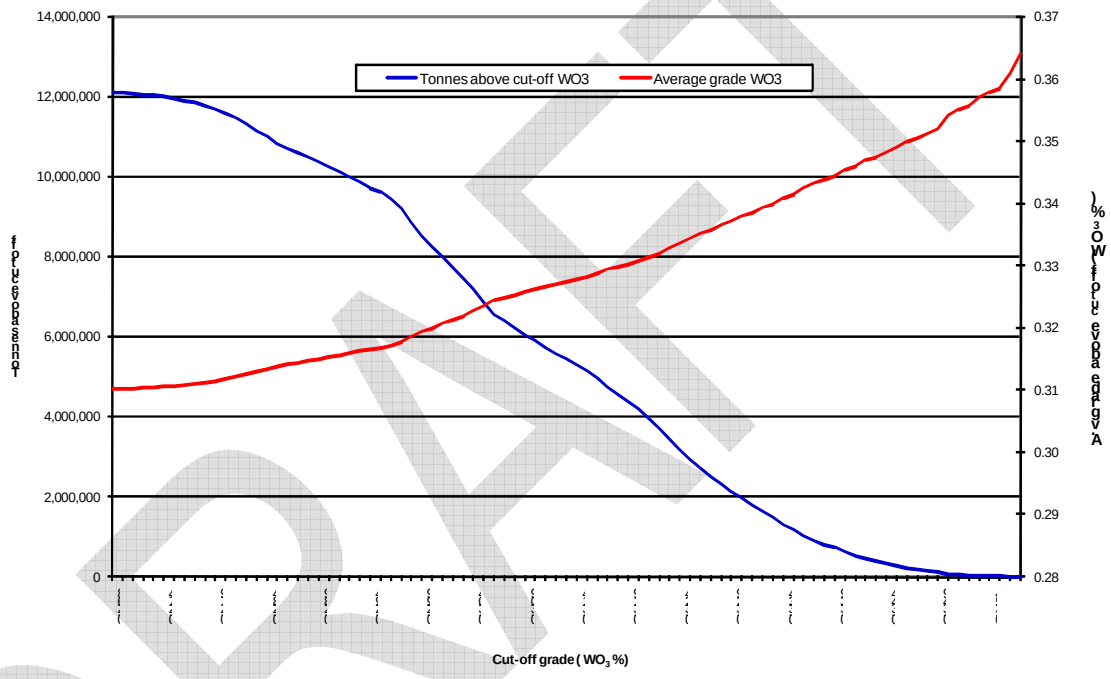
| RESOURCE CATEGORY | MILLION TONNES (Mt) | DENSITY ($t/m^3$) | $WO_3$ (%) | Mo (%) | WO3 (mtu) | Mo (mtu) |
|---|---|---|---|---|---|---|
| Measured | - | - | - | - | - | - |
| Indicated | - | - | - | - | - | - |
| Inferred | 12 | 2.60 | 0.31 | - | 31,567 | - |

Notes:

1. All tabulated data has been rounded to zero decimal place for tonnage and metric tonne unit and two decimal places for grades and density.
2. Although 0.2% $WO_3$ is considered a likely cut-off grade for this deposit based on comparisons to other similar deposit types, it has not been confirmed by the appropriate economic studies.

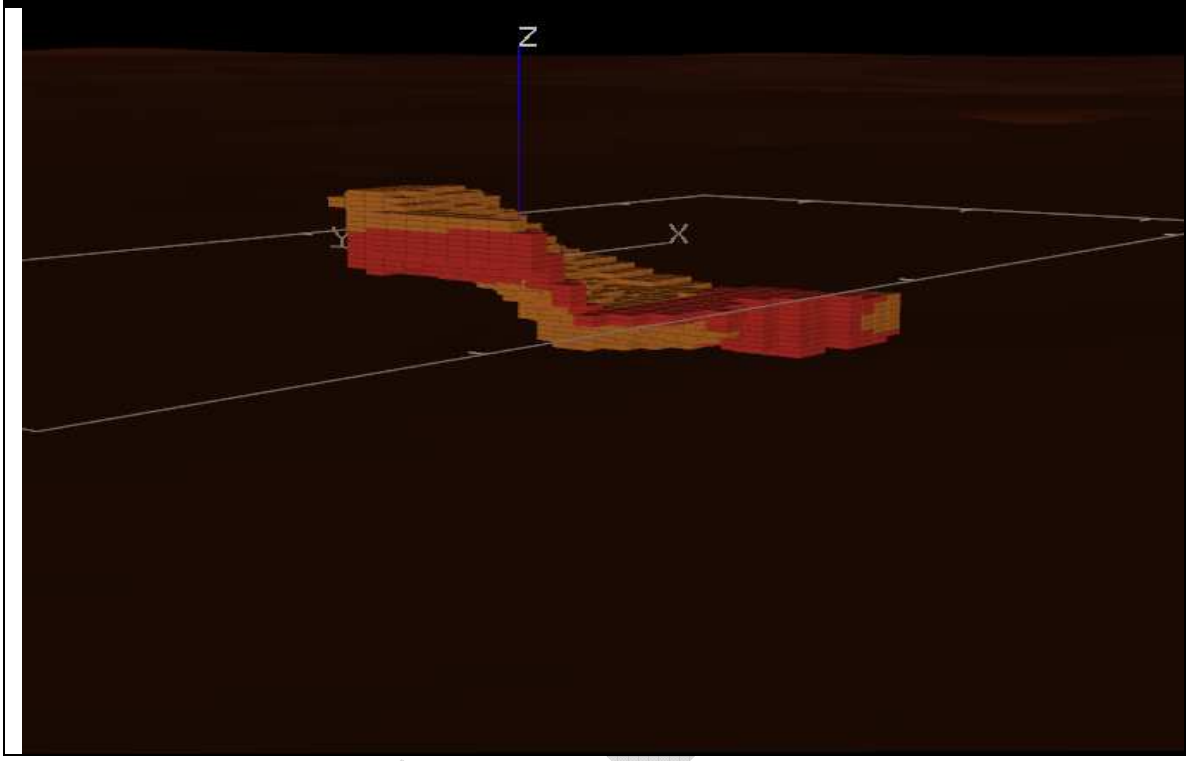
The resource grade tonnage curve for Riviera project is shown in Figure 3 depicting the ore tonnage at various cut-off grades. For a $WO_3$ cut-off grade of 0.294% there is approximately 10 Mt of mineralisation at an average grade of 0.325%.

**Figure 3: Grade Tonnage Curve based on the Tungsten Grade**




The ore body model of Riviera has three main zones as described in the geology section of this report. Metallurgically these different rock types will be treated the same way at the processing plant. Figure 4 shows a diagrammatic presentation of the ore body with lithology model showing the relationship to the existing Riviera topography.

**Figure 4: Riviera Geological Ore Body Model Lithology with Topography**




## 6 MINERAL RESERVE ESTIMATION

### 6.1 Process

This part of the conceptual open pit mine design and scheduling study describes in detail the methods used and reporting of the results used to derive a Mineral Reserve estimate. Venmyn has completed the work required to estimate an unqualified minable resource inventory for Riviera Tungsten Project. The end product is assumed to be sold as ATP $WO_3$ at a price of US$250 per mtu. If sold as Tungsten concentrate; only a fraction of the ATP price will be realised. The remainder of this report describes the methods used and the results of the estimation of the potential mineral reserve.

The mineral reserve was estimated in the following way:-

- analysing the mineral resource block model;
- selecting the appropriate mining method for the deposit;
- completing whittle optimisation on the deposit and selecting an optimum pit shell;
- preparing a detailed mine plan consistent with the ultimate pit outline;
- reporting of material above a cut-off grade within this pit; and
- conceptual schedule of mining waste and ore throughout the life of mine.

The Mineral Resource used to prepare the mine plan and potential Mineral Reserve estimate was obtained from Wiaan Basson as CSV file which was used to generate the resource block model in Surpac. The Mineral Resource estimate is represented by a three dimensional geological block model (Figure 4), without any wireframes representing different rock types of mineralisation.

### 6.2 Mining Method

The Riviera deposit is a Greenfield project currently in resource definition stage, through a bulk sampling programme and intends to adopt open pit mining method using conventional truck and shovel to extract the deposit. This mining method has been adopted for the exercise although there is limited possibility to mine this deposit using underground mining methods. The underground mining methods will be highly inappropriate for this deposit due to the following factors:-

- the deposit is known to extend to a depth of -115mRL (over 225 m below surface), with the first ore at approximately 60m below surface which is considered too shallow for underground mining;
- underground mining methods will significantly limit the ore extraction factors due to rock mechanics and ground control in the mining stopes, rendering the deposit unviable to extract; and
- the overall shape of the mineralisation and thickness of the deposit adds on the complexity of extracting the deposit using underground mining methods, making this deposit highly unlikely to mined using underground mining.

Bongani considered ore production rates of 348,000t in the second year and 700,000t in the third year and throughout for the determination of LoM. This study assumes production material will be delivered to a concentrator within the area and processed to ATP. Any requirements for feed blending will be managed by short term in pit scheduling and Run of mine (RoM) draw down strategies. There is no requirement for any other significant mining, stockpiling or feed blending activity or dump designs at this stage.

A one-day site visit was conducted by Venmyn on 11th February 2009. The title to this deposit is held by Bongani Minerals. On the mining phase Bongani can opt to either engage contractor mining or establish an owner operated mine using their own fleet. A recommended approach is engaging contract mining to limit the amount of capital outlay if as compared to owner operated. The waste dumps location will still need to be designed in the second phase of work. The final pit depth will be approximately 200m at an approximate level of -110mRL. The ore is mined from the pit and transported directly to the processing plant which will be constructed close to the pit.

## 6.3 Pit Optimisation

Bongani's re-coded geological block model that included waste, ore zone tonnages with resource categories were imported into Whittle. The original tonnages from Datamine were compared to the Whittle report to confirm the transfers were successful.

The ultimate pit outline was derived using Whittle 4X. Milling was selected as the primary processing method for application in the optimisation.

## 6.4 Pit Optimisation Parameters

### Pit Slope Angles

Venymn used high level estimates of an overall slope angle of 40degrees for the optimisation exercise. This angle was then reduced by 1 degree to 2 degrees to allow for the inclusion of ramps and catch berms resulting in a final slope angle of 39 degrees applied in Whittle for pit optimisation. Detailed geotechnical work still needs to be done to come up with a geotechnical report on Riviera that will be used in further studies.

### Mining Parameters

A summary of the mining parameters used in the optimisation are shown in Table 4. Mining costs at 110RL were supplied by a reputable open cast mining contractor based on high level operating cost estimates of similar projects. It has been assumed that the waste and ore material will have the same mining cost of ZAR28.00 per tonne at surface (RL of 110 and above) with additional cost for ore haulage applied to processing costs. There was no mining cost increases applied for every 5m of increasing depth. Mining dilution of 5% and a mining recovery of 95% were used, which Venmyn agrees are appropriate parameters for this style of mining operation.

**Table 4 : Mining Open Pit Optimisation Parameters used in the Whittle Models.**

| PARAMETER | UNIT | VALUE | SOURCE |
|---|---|---|---|
| Mining cost | ZAR/t | 28.00 | Venmyn Scoping Study (ore and waste) |
| General and Admin | ZAR/t | Included | Venmyn Scoping Study |
| Mining dilution | % | 5% | Estimate from similar projects |
| Mining recovery | % | 95% | Estimate from similar projects |

### Tungsten Processing Costs and Recoveries

Any ore material transport cost to the plant was included in the processing cost for use in the optimisation. The processing parameters for costs including general and administrative (G & A) and recoveries supplied by consultants are shown in the Table 5. The $WO_3$ recoveries in Table 5 express the total $WO_3$ expected to be recovered from the ore given the planned feed.

All the ore is assumed to be hosted in one rock type. A production rate of 700,000 tpa of ore processed was applied in the study.

**Table 5 : Processing Parameters used in the Whittle Models**

| PARAMETER | UNIT | VALUE | SOURCE |
|---|---|---|---|
| Processing cost | R/t ore | 120.00 | Eurus Mineral Consultants |
| Environmental Rehab. of slimes | R/t ore | 1.00 | Venmyn Scoping Study |
| Extra Ore mining cost | R/t ore | 1.50 | Venmyn Scoping Study |
| Total Processing Cost | R/t ore | 122.50 | Eurus Mineral Consultants |
| General and Admin | R/t ore | 0.00 | Venmyn Scoping Study |
| Ore process recovery $WO_3$ | % | 86% | Eurus Mineral Consultants |
| Production rate | t/yr | 700,000 | Riviera |

**Commodity Prices, Exchange Rate, Discount Rate and Royalty**

Various estimates were advised the following metal prices, Tungsten ATP price adjustment, discount rate and royalty for the pit optimisation as shown in Table 6. The metal ATP price was not adjusted to incorporate the fact that the metal might be sold as a concentrate hence will only attract a percentage of the metal value. Neither selling cost nor royalty was included in the optimisation. The optimisation work was completed in ZAR, dollars with an exchange rate conversion of ZAR10 per US$1.00 on the metal ATP price.

**Table 6 : Commodity Prices, Discount Rate, Selling Cost and Royalty**

| PARAMETER | METAL UNIT | VALUE | CONVERSION METAL TO CONC. | CONCENTRATE UNIT | VALUE | SOURCE |
|---|---|---|---|---|---|---|
| Discount rate | % | 17% | | % | none | Venmyn |
| Tungsten price | ZAR/mtu | 2500 | ATP Price | ZAR/t | none | Venmyn Estimate |
| Transport cost | ZAR/mtu | 0.00 | not included | ZAR/t | none | |
| Royalty | % | 3% | not included in Whittle | % | none | |

It should be noted no cost or revenue escalation were used in the Whittle runs, thereby disregarding the effect of inflation and hence the inflation factor of 8% was deducted from the discount rate. With the uncertainty in the market in general and in forecasting commodity prices, Venmyn decided to analyses the project without these effects.

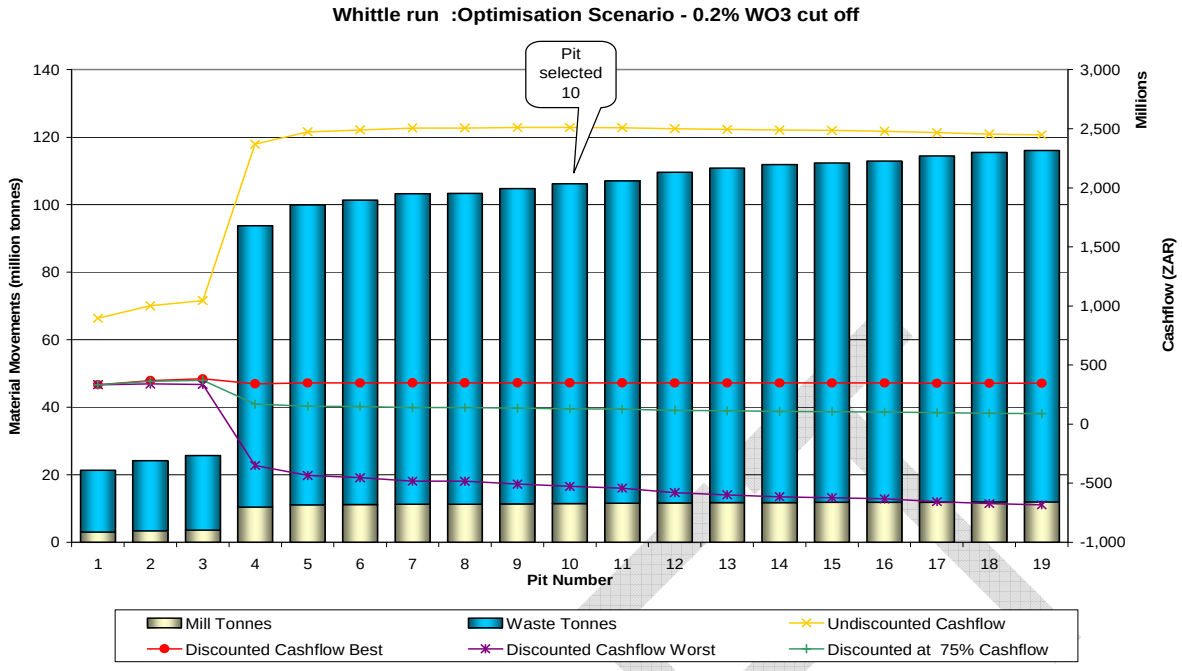
## 6.5 Pit Optimisation Results

The open pit optimisation for Riviera Project at a 0.20 % $WO_3$ cut-off grade resulted in an optimum pit shell 10 with the following results:-

| | |
|---|---|
| Ore mined and processed | 11.515 Mt |
| Waste | 94.674 Mt |
| Strip ratio | 8.22 |
| Mine life | approximately 16 years (at 0.7Mt of ore per annum) |
| Un-discounted cashflow or open pit value | ZAR2.510billion . |

All the Inferred Resource material within the pit of 11,515 Mt is treated as ore hence entirely included in the pit optimisation and the low 40 degree slope angle which attracts more waste. The outputs from the optimisation are shown in Figure 5 with the optimum pit shell being 10. For detailed tabulated Whittle shell results refer to Appendix 2. The chart shows that each optimum pit shell has had the base case revenue parameters applied to produce the value curve. The Whittle output shows a dropping discounted cashflow curve indicating that successive larger pits expand in a lateral extent as well as at depth causing substantial increases in waste mined to produce more ore. This results in substantial decreases in discounted cashflow as larger pits are mined. A view of the Whittle optimum pit wireframe looking towards the north is shown in Figure 6.

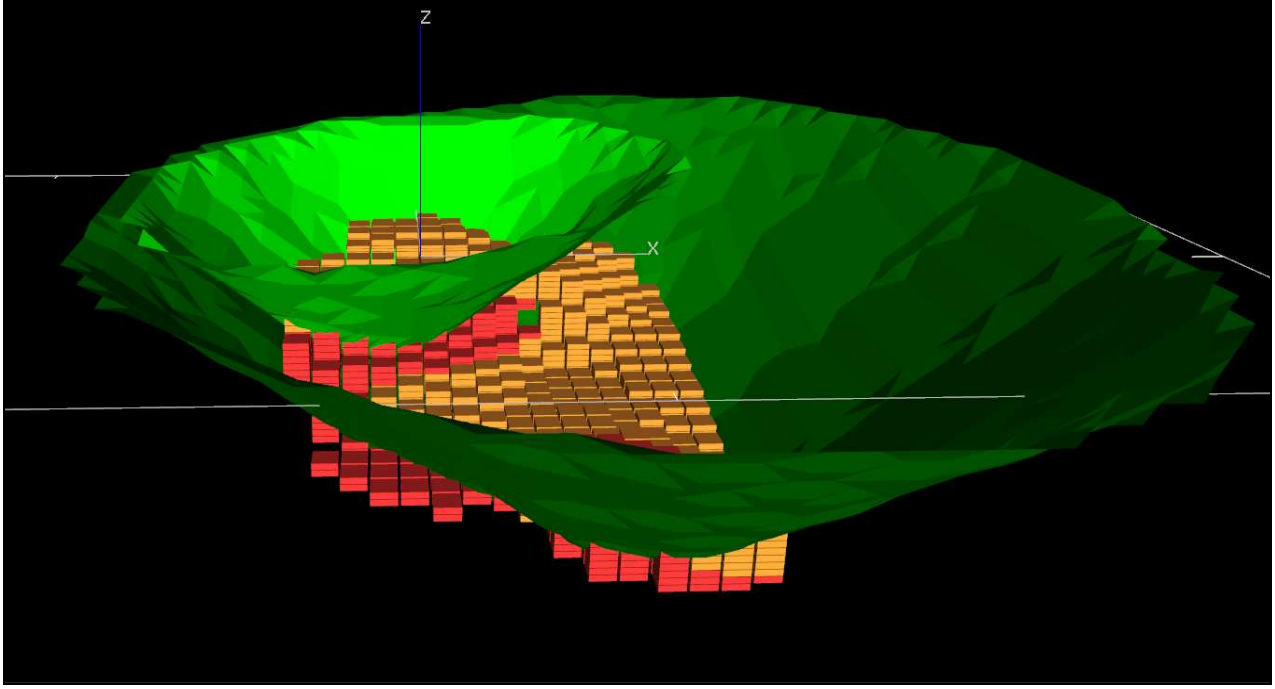
**Figure 5: Graph of Pit Optimisation and Cashflow Value for the Riviera Open Pit Operation**




The Whittle optimisation process selects a combination of resource blocks that can be exposed to deliver the greatest NPV in an open pit mine for a given set of design, operating and economic assumptions. The resultant pit shell represents the optimum pit shell based on the criteria used. This optimum pit shell is then used as a basis for preparing the detailed mine plan with the optimum pit. The selected optimum pit shell 10 is shown in Figure 6.

The pit shell selected is shell 10 of the optimisation sequence which contains 94,674Mt of waste and 11,515 Mt of ore grading at 0.30% $WO_3$, with an overall striping ratio of 8.22. A 5% dilution factor and 95% mining recovery factor was applied to the Whittle inputs on the resource model.

**Figure 6: The Graphical Illustration of the Optimum Pit Shell 10 including Pit Shell 1**



## 6.6 Cut-off Grade Calculation

A cut-off grade value is required for Riviera Project pit design work to determine the material that can be processed economically. Material mined from the designed optimum pit has the same mining cost for ore and waste as the haul distances are assumed to be similar. The extra hauling distance of the ore material to the plant is treated as an additional processing cost. The economic cut-off value is calculated by estimating the total downstream cost after mining that the metal content in the material must meet.

The $WO_3$ price used to calculate the value of the material is assumed to be the same as that used in the pit optimisation which is US$250/MTu. The cut-off grade can be calculated as follows:-

$$\text{Element cut-off grade} = \frac{\text{(Dilution x Processing cost)}}{\text{Recovery x (Price - Selling Cost)}}$$

WO3 cut-off grade = 0.065%

No Mo grade is optimised within the block model hence no practical cut-off grade for Mo was estimated.

## 6.7 Pit Design and Mineral Reserve Estimate

Pit designs were prepared using Datamine software based on the Whittle optimum pit shell 10 for Riviera, re-coded resource model including additional waste material around the ore, mining costs and processing cost adjustment factors. A specific gravity (SG) of 2.6 supplied by Riviera was applied to all additional waste blocks. Topographical contours updated with the existing pit excavation were supplied by Riviera.

**General Design Method**

The design process was based on viewing the Whittle shell in horizontal planes at increments common with mining benches spaced at intervals determined by mere bench heights in the model and very little geotechnical guidelines. Floor outlines were digitised at the lowest mining depth at a minimum practical mining width. LoM pit ramps were simulated to find the best starting point on the lowest pit floor. Benches and associated ramps were then designed progressively from the bottom up from toe to crest and bench to bench using the following parameters:-

- Geotechnical pit wall slopes of 40 degrees and berm width of 4.0 m as estimated by Venmyn for all rock types;
- minimum mining width of 15 m to 20 m to incorporate the mining fleet (CAT785C and CAT777);
- haul ramps design at 1 in 10 gradient;
- double lane ramp of 20 m width to accommodate a CAT 785C 136 tonne trucks clearance either side with a bund axle height of 0.6 m;
- ramp outside turning radius of 20 m or greater in accordance with CAT recommendations;
- final inventory of pit within an acceptably low variance of inventory of the optimal Whittle pit shell 10;
- pit exit was designed to coincide closely to the surface low pit exit ramp location; and
- groundwater inflows were not considered since water management consultants required no specific provisions within the detail design apart from the pit boundary to help them locate permanent dewatering borehole around the pit edges.

**Pit Wall Angles**

Venmyn preliminary slope design recommendation of overall wall angle of 40 degrees was adopted for the exercise. The inter ramp pit slopes (excluding ramps) are measured in terms of slope angle from bench crest to crest and are:

- 40 degrees for All Rock type zone (fresh and weathered)

These angles are derived with reference to final pit bench and berm dimensions and are identical for both ore and waste zones due to limited geotechnical work on the Riviera pit. No geotechnical report for Riviera is available:-

- bench height is 5 m;

- berm width is 6 m; and
- batter or face angle is 90 degrees.

Special design considerations were made for the design of narrow sections at the base of the open pit. The following method were used to access as much mineralised material at the base of the pit without widening the overall base design and incurring excessive waste material:

- ramping down to ore for the final benches and alternative temporary ramps within pit stages; and
- retreating by taking a final cut (good-bye cut) with an excavator with dimensions 5 m deep and 15 m or greater mining width.

**Pit design for Riviera**

A practical pit design based on the above parameters was generated showing the final pit design. Detailed short term design will be done based on the stages used to exploit the reserve. The detailed pit design for the starter pit is shown in Figure 7 and the final pit pushback 1 is shown combined in Figure 8.

**Figure 7: The Graphical illustration of the Practical Pit Design Starter Pit Shell**

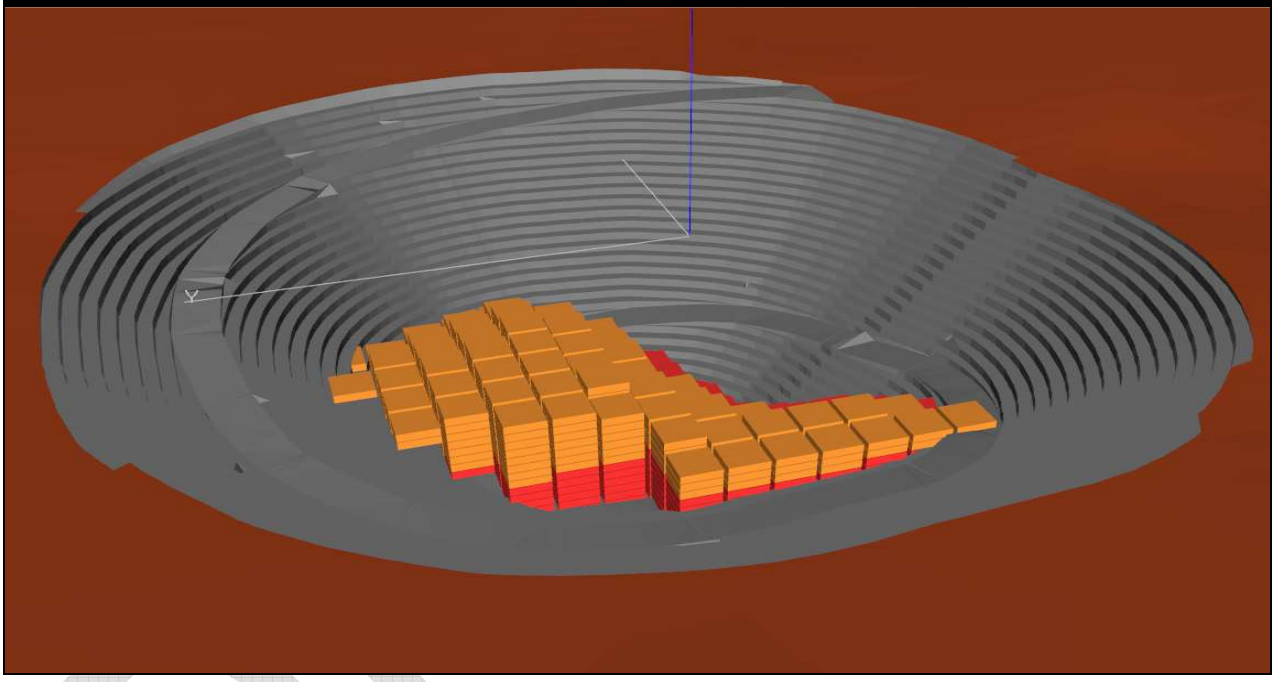
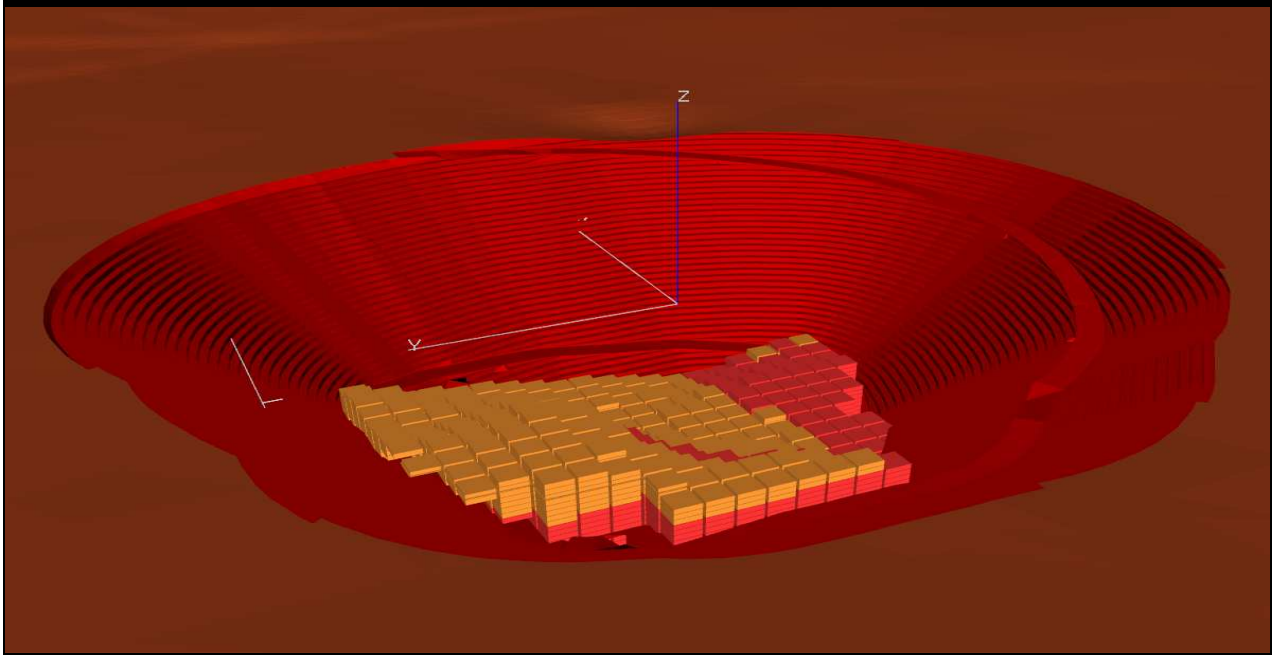
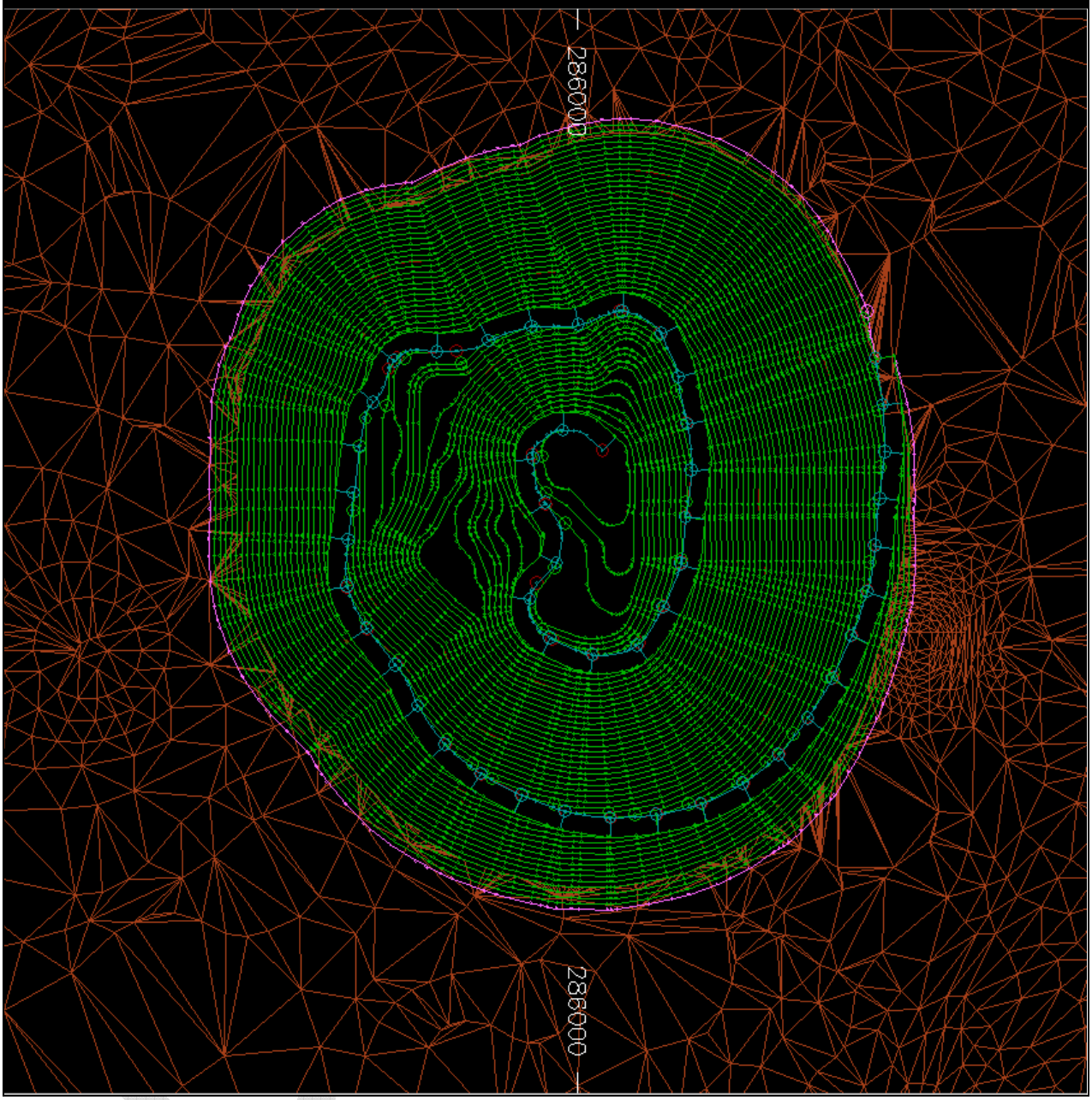


**Figure 8: The Graphical illustration of the Practical Final Pit Shell**



A pit plan view of the final pit not to scale is shown in Figure 9. The final pit average pit width for starter pit and pushback 1 is approximately 750 m and 460 m respectively.

**Figure 9: Plan View of the Final Riviera Project Pit Design**



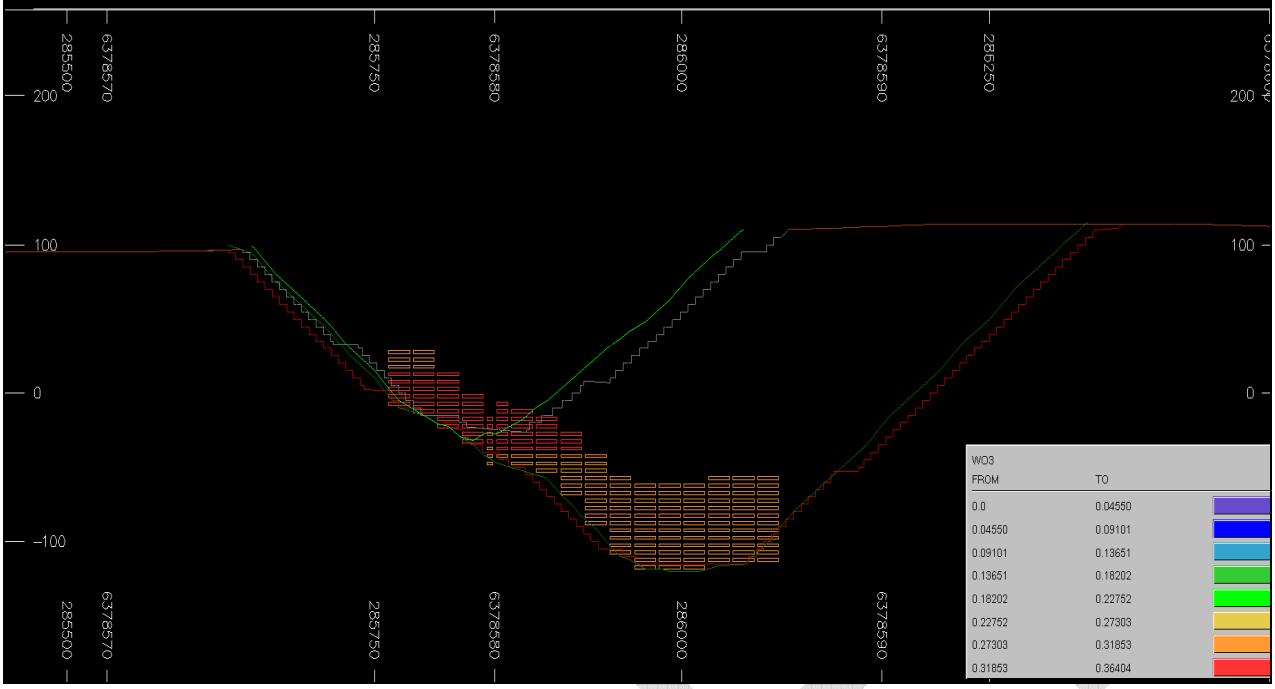

A comparison of pit design and the Whittle optimum shell is shown in Table 4.5. The variance in the design and Whittle boundaries is within 5% which is considered to be acceptable.

**Table 7 : Comparison of Waste and Ore Tonnages Riviera (pit design versus Whittle shells)**

| DESCRIPTION | SHELL | ORE (TONNES) | WASTE (TONNES) | ROCK (TONNES) |
|---|---|---|---|---|
| Whittle Optimisation | Pit shell 10 | 11,515,139 | 94,674,061 | 106,189,200 |
| Datamine Pit Design | Practical Pit design | 10,860,167 | 102,258,636 | 113,118,803 |
| Variance | | -654,972 | 7,584,575 | 6,929,603 |
| Variance (%) | | -5.69% | 8.01% | 6.53% |

A sectional view of the Riviera pit design is shown in Figure 10. The colours show grade distribution of the deposit at a particular section line along the length of the pit. The high grade tungsten oxide is mainly located close to the designed starter pit bottom.

**Figure 10: A Sectional View of the Pit Design Showing Pit 1 and 2 along the Pit Length**




## 6.8 Mineral Reserve Estimate (Mineable Inventory)

Based on the applied modifying factors and the pit design outline, the available Minable Inventory for Riviera is 10,860 Mt of ore at an average grade of 0.30% $WO_3$ i.e. including dilution and mining recovery. All of the ore resource blocks come from an Inferred Resource category hence the reserve classification of this resource can only be a Minable Inventory as summarised in Table 8.

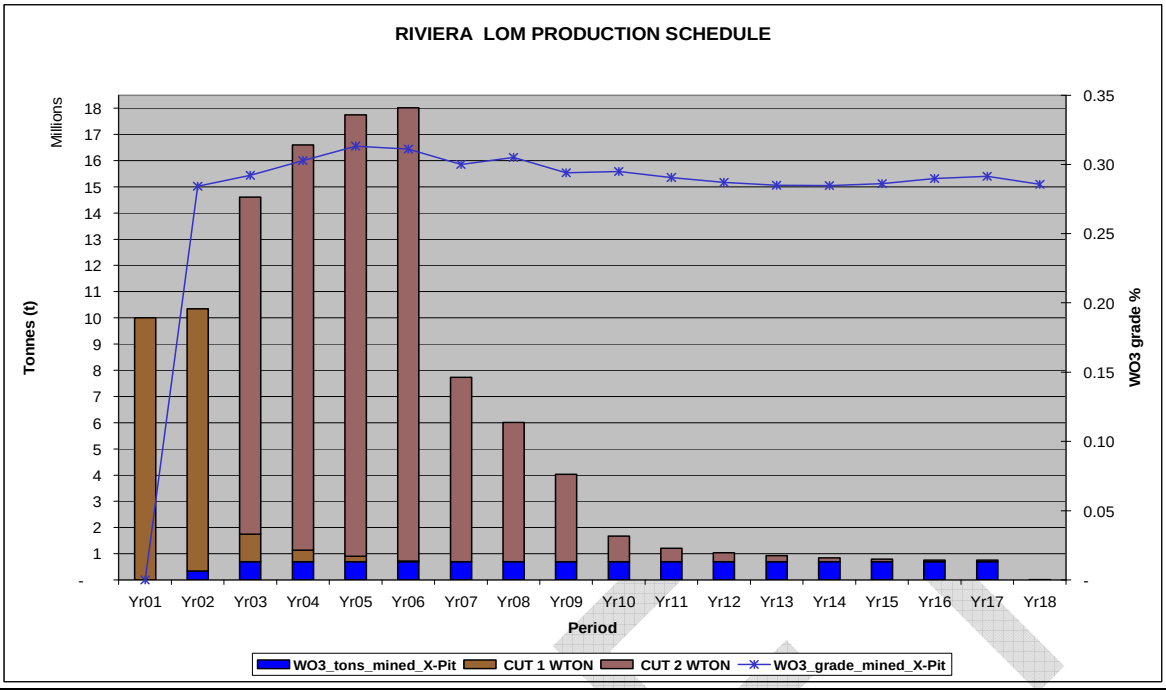
**Table 8 : Riviera Mineral Reserve Estimate, at a 0.2 % $WO_3$ Cut-off Grade**

| RESERVE CATEGORY | 4XCODE /RESOURCE CATEGORY | ROCK (TONNES) | ORE (TONNES) | WO3 (%) | MO (%) |
|---|---|---|---|---|---|
| | ROCK03 | - | - | - | - |
| | ROCK02 | - | - | - | - |
| | ROCK01 | 10,860,167 | 10,860,167 | 0.30 | - |
| | WAST | 102,258,636 | - | - | - |
| | Total | 113,118,803 | 10,860,167 | 0.30 | - |
| | | | | | |
| Proven | Measured | | - | - | - |
| Probable | Indicated | | - | - | - |
| - | Inferred | | 10,860,167 | 0.30 | - |
| | Total | | 10,860,167 | 0.30 | - |
| | | | | | |
| Probable | ROCK03 | | - | - | - |
| Probable | ROCK02 | | - | - | - |
| Minable Inventory | ROCK01 | | 10,860,167 | 0.30 | - |
| | **TOTAL** | | **10,860,167** | **0.30** | **-** |

## 6.9 Mining Schedule Based on the Optimised Pit

The final pit design was divided into two stages pit shell 1 and pit shell 10 according to required annual ore tonnage from Whittle. A practical bench by bench production schedule was then created on a yearly basis. The stripping ratio varies from the highest in the first one and half years due to the pre stripping and nature of the deposit to an average of 8.2. There is room to adjust production as the stripping ratio of the pit dictates. Molybdenum grade is not reported in the production schedule because it has been omitted in the grade model estimation process. The Riviera deposit can sustain an ore production profile of 700,000 tpa throughout the LoM but with varying waste stripping tonnages as shown in Figure 11.

**Figure 11: Life of Mine Production Schedule on the Riviera Project Open Pit**




The graph above shows the life of mine production profile and Tungsten Oxide grade. The waste stripping as been differentiated from starter cut waste which is labelled CUT 1 WTON on the legend and the first pushback labelled CUT 2 WTON. The starter cut has about 3,4Mt of ore and approximately 20Mt of waste. Mining the starter cut only will result in a short life of mine of less than 5 years, hence the reason for considering cut 2 as well in order to extend the life of mine to just over 17 years. Details of the annual production profile are shown in the following list figures divided into 8 year periods:

- LOM production profile A for the first 8years;
- LOM production profile B from year 8 to year 16; and
- LOM production profile C for year 17 and 18.

**Table 9 : LoM Production Profile A for the Riviera Open Pit**

| PARAMETER | UNITS | YR01 | YR02 | YR03 | YR04 | YR05 | YR06 | YR07 | YR08 |
|---|---|---|---|---|---|---|---|---|---|
| Total mined | tonnes | 10,000,000 | 10,348,385 | 14,611,295 | 16,606,736 | 17,752,215 | 18,021,764 | 7,738,944 | 6,009,347 |
| Waste mined | tonnes | 10,000,000 | 10,000,000 | 13,911,295 | 15,906,736 | 17,052,215 | 17,321,764 | 7,038,944 | 5,309,347 |
| Ore mined | tonnes | - | 348,385 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| | | | | | | | | | |
| Ore Processed | tonnes | - | 348,385 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| ROM feed grade | $WO_3$ % | - | 0.28 | 0.29 | 0.30 | 0.31 | 0.31 | 0.30 | 0.30 |

**Table 10 : LoM Production Profile B for the Riviera Open Pit**

| PARAMETER | UNITS | YR09 | YR10 | YR11 | YR12 | YR13 | YR14 | YR15 | YR16 |
|---|---|---|---|---|---|---|---|---|---|
| Total mined | tonnes | 4,035,957 | 1,668,736 | 1,202,173 | 1,038,007 | 932,471 | 844,270 | 790,895 | 753,712 |
| Waste mined | tonnes | 3,335,957 | 968,736 | 502,173 | 338,007 | 232,471 | 144,270 | 90,895 | 53,712 |
| Ore mined | tonnes | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| | | | | | | | | | |
| Ore Processed | tonnes | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 |
| ROM feed grade | $WO_3$ % | 0.29 | 0.29 | 0.29 | 0.29 | 0.28 | 0.28 | 0.29 | 0.29 |

**Table 11 : LoM Production Profile C for the Riviera Open Pit**

| PARAMETER | UNITS | YR17 | YR18 | YR19 | YR20 | YR21 | YR22 | YR23 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| Total mined | tonnes | 751,524 | 12,373 | - | - | - | - | - | **113,118,803** |
| Waste mined | tonnes | 51,524 | 591 | - | - | - | - | - | **102,258,636** |
| Ore mined | tonnes | 700,000 | 11,782 | - | - | - | - | - | **10,860,167** |
| | | | | | | | | | **-** |
| Ore Processed | tonnes | 700,000 | 11,782 | - | - | - | - | - | **10,860,167** |
| ROM feed grade | $WO_3$ % | 0.29 | 0.29 | - | - | - | - | - | **0.29** |

## 6.10 Mining Equipment Fleet Estimate

Mining at a production rate of 700,000t of ore per year can be attained using a hauling and loading fleet selected as in Table 12. It is recommended that the pre stripping of waste can be done using a double benching fashion, i.e. mining at 10m benches whilst sinking the waste and revert back to 5m bench when mining the ore in order to have a good handle on grade control

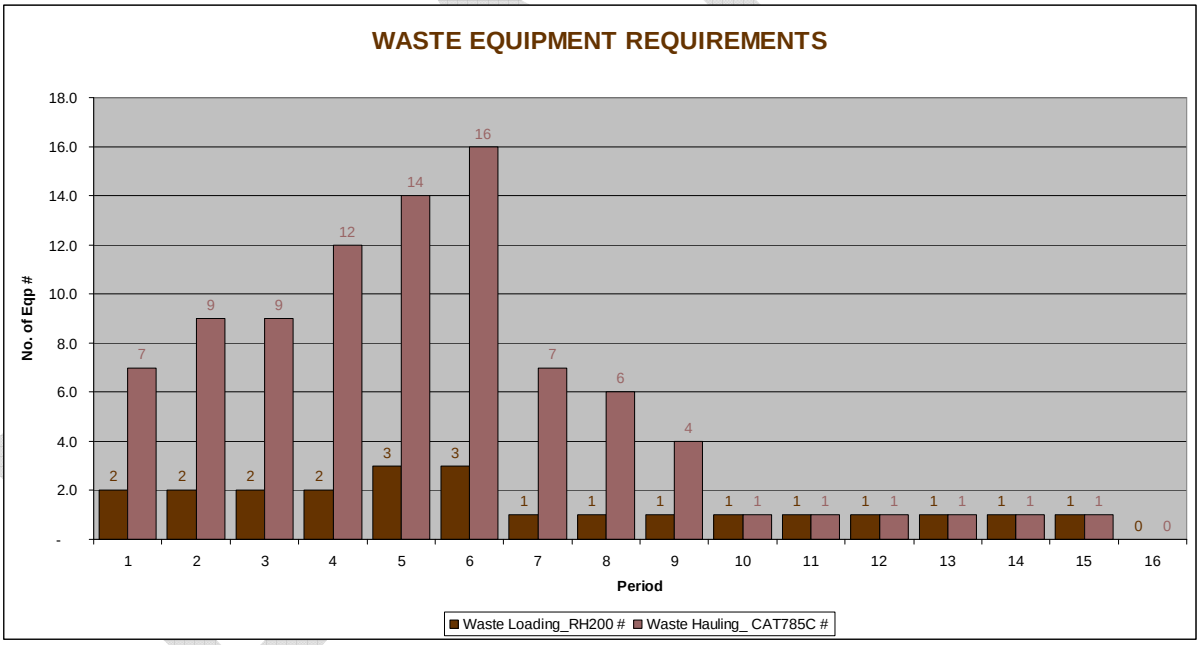
Ore from Riviera can be sent to Processing plant, an estimated distance of 1.5 km using 90.9 tonne off highway CAT 777 and CAT992 wheel loaders with a bucket capacity of 12 $m^3$. The waste can be moved by Terex RH 200 loaders with a bucket size of 26 $m^3$ bucket versus CAT 785C. Ancillary equipment estimates have not been evaluated and these include graders, water bowsers, chain and wheel dozers, drills, explosive trucks and supervisory vehicles such as light diesel vehicles (LDV's) bakkies.

**Table 12: Riviera Project Proposed Loading and Hauling Equipment Fleet**

| EQUIPMENT / MATERIAL | FLEET | | MAKE | CAPACITY | COMMENTS |
|---|---|---|---|---|---|
| Loader waste | 2 to 3 | x | RH 200 | 26 $m^3$ | Hydraulic excavator |
| Loader ore | 1 to 2 | x | CAT992 | 12.3 $m^3$ | Hydraulic excavator |
| Trucks waste hauling | 7 to 16 | x | CAT 785C | 136 t | Off-highway truck |
| Trucks ore hauling | 2 | x | CAT 777 | 90.9 t | Off-highway truck |

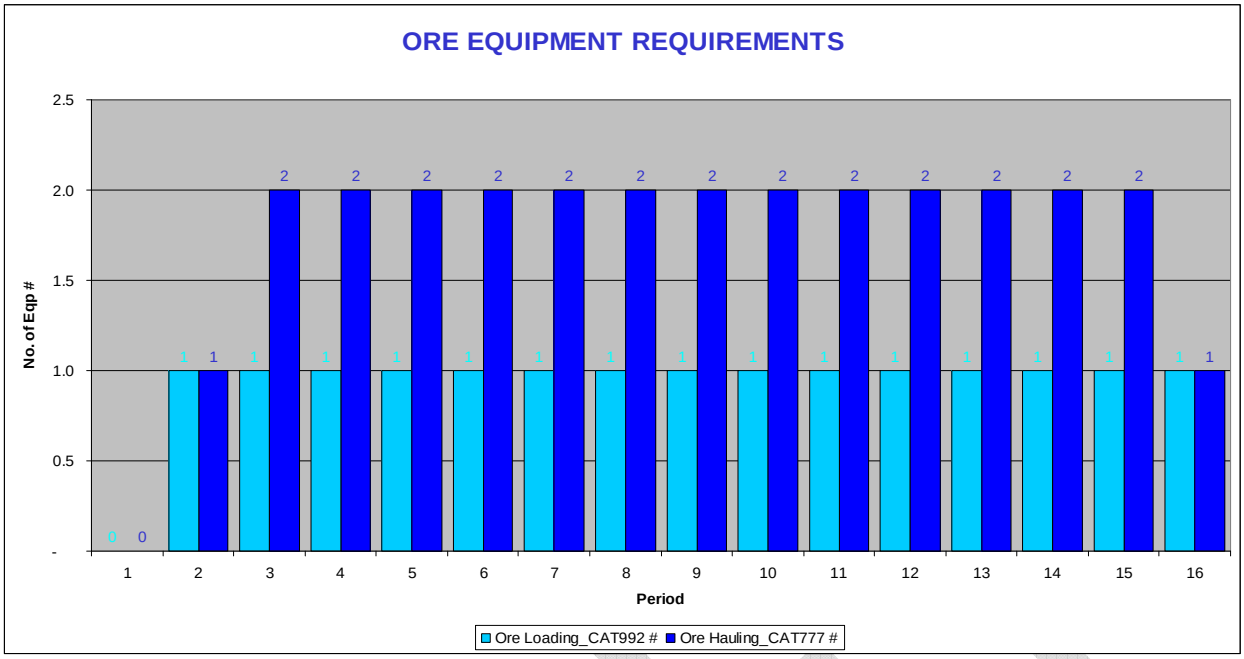
The equipment requirements for each period are based on a continuous (contops) shift arrangement as shown in the Figure 12 below. From year one a total of 7 x CAT785C trucks are needed to move 10Mt of waste using two RH 200 hydraulic shovels.

**Figure 12: Estimate Waste Handling Equipment Requirements for Riviera Project**




The equipment requirements for each period are based on a continuous (contops) shift arrangement as shown in the Figure 13 below. From year one a total of 2 x CAT77 trucks are needed to move 0.7Mt of ore using one CAT 992 Loader with bucket capacity of 12$m^3$.

**Figure 13: Estimate Ore Handling Equipment Requirements for Riviera Project**

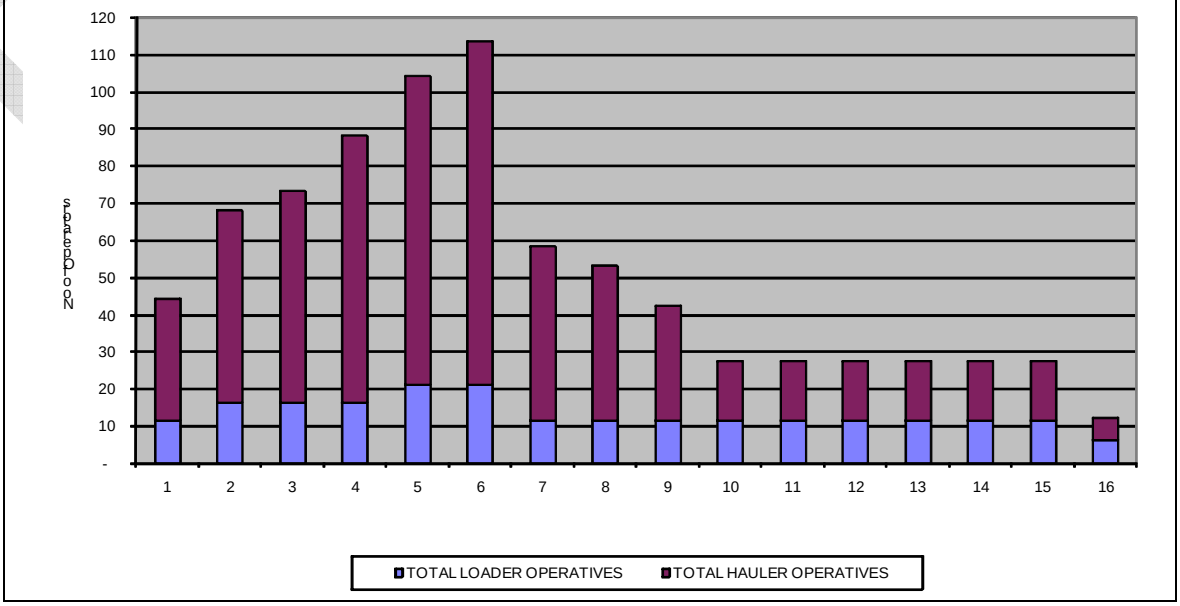



## 6.11 Estimate Labour Operatives

The estimate labour operative is based on contops shift arrangement where there are a total of 4 shifts at any one time. In addition to the exact compliment required a float on both Loader operatives and hauler operatives applied is 29% and 15% respectively. The loader operatives have a higher float of 29% because of their criticality to the operation. The term float means additional relief or spare operators that should be available.

Figure 14 shows the total number of main labour operatives for loading and hauling. Ancillary equipment operators for example dozers, graders, water bowsers etc can be estimated as percentage of the total labour operatives estimate. A rule of thumb applied ranges from 40% to 50% of the total labour operatives. Therefore the indicated totals need to be inflated by such a actor.

**Figure 14: Estimated Total Labour Operatives Summary in Ore Handling Only**



## 7 BASIC FINANCIALS FOR OPEN PIT MINING

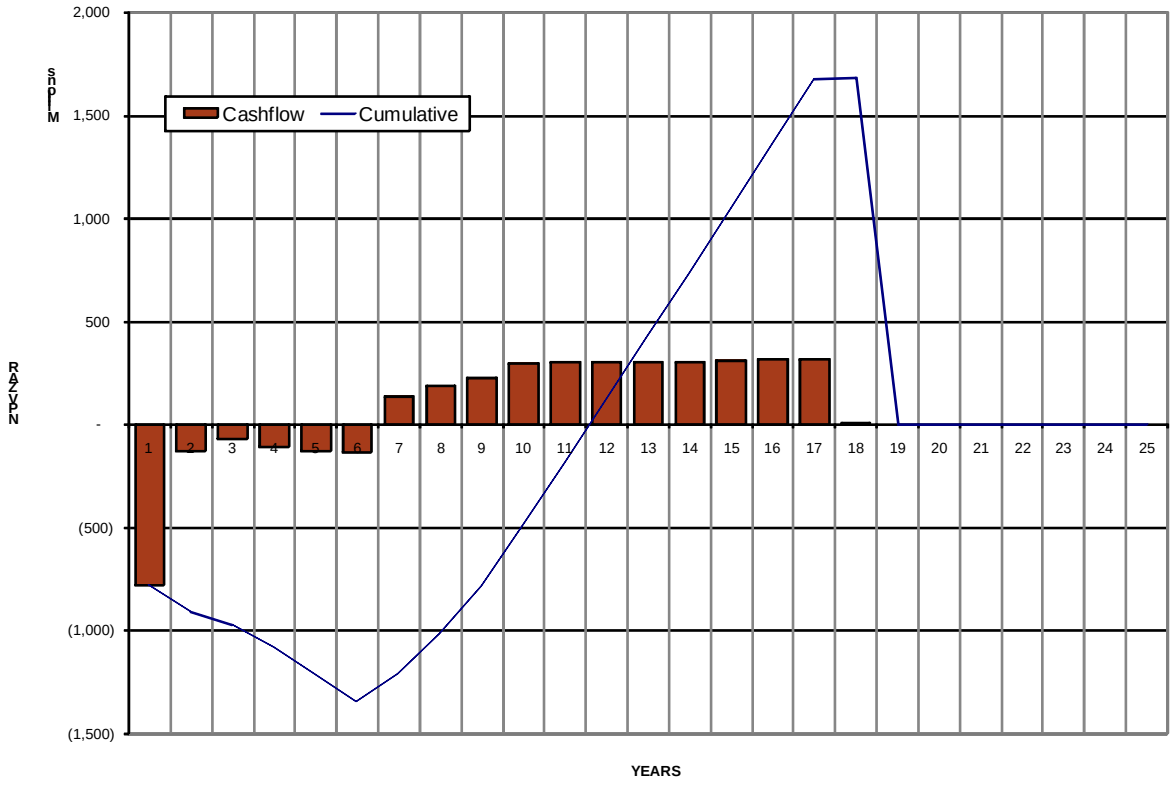
Figure 15 shows the financial viability of the open pit. Please note that the cash flow shown in the graph does not include any capital or cost escalation. The payback period is quite long because of the upfront pre stripping for two years. Another option that can be considered is increasing the ore treated to say 1Mt, 1.5Mt and evaluate the cashflows that will be generated from these scenarios.

The summary DCF valuation results are presented in Table 13.

**Table 13: Valuation Results for the Base Case for the Two Scenarios**

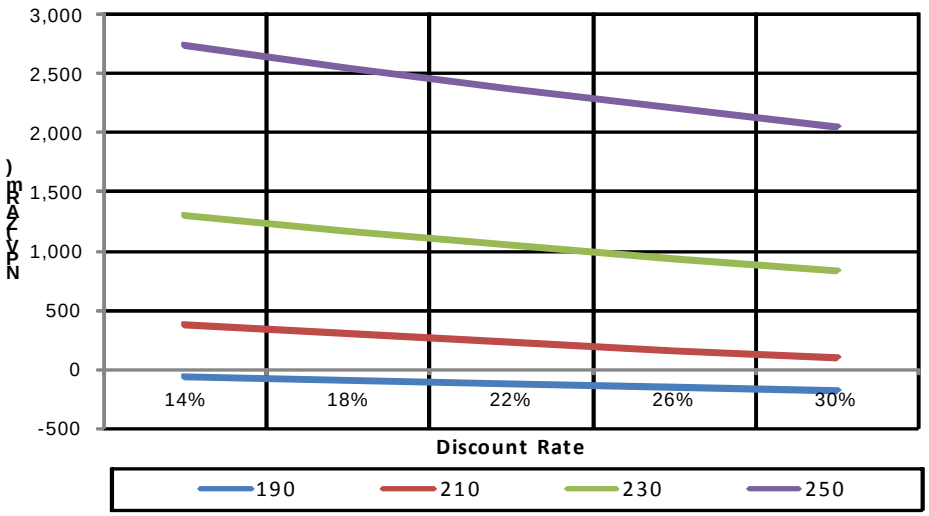
| VALUATION RESULTS | DESIGNED AND OPTIMISED OPEN PIT RESULTS |
|---|---|
| NPV (ZARm) | 1,386.45 |
| Discount Rate (%) (Constant Money Terms) | 17 |
| Payback Period (Years) | 11.3 |

**Figure 15: Riviera Project Periodic Discounted Cashflow and Cumulative Discounted Cashflow**



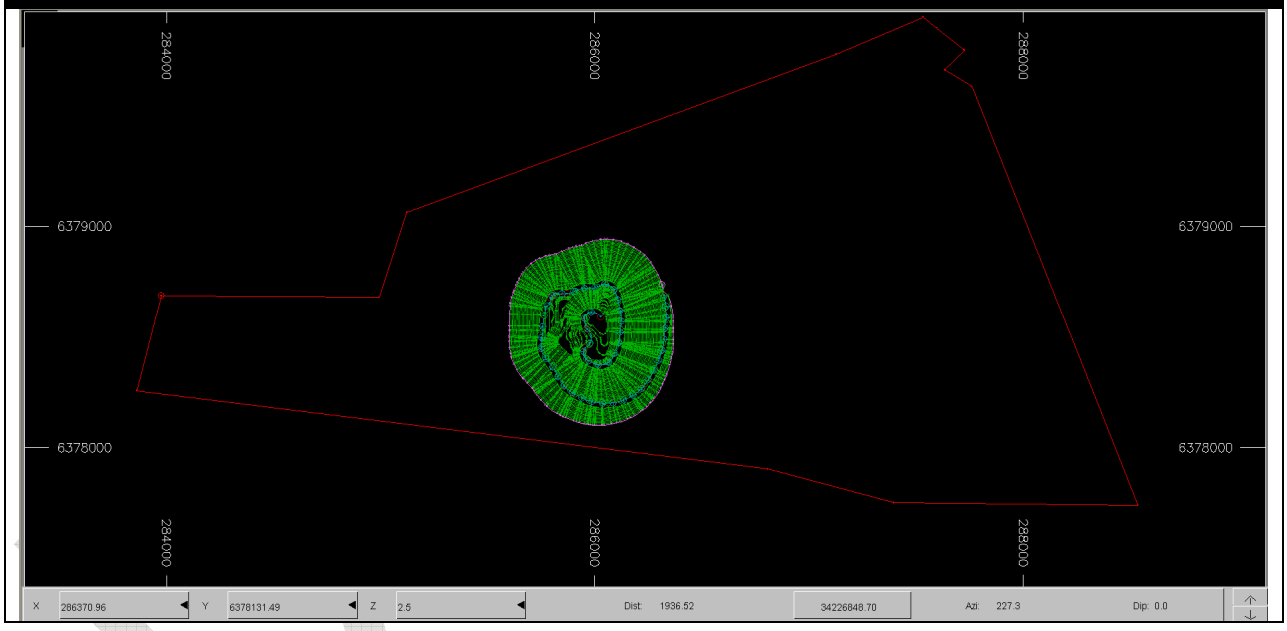

The Riviera Project is viable based on the open pit design and the resulting mine schedule was then used to calculate NPV of ZAR 1.3bn which does take into account initial capital expenditure and does not include cost escalations, commodity prices escalations, inflation and selling costs. The sensitivity of the project's NPV to the changes in the discount rate and the commodity prices of the resulting mine schedule is graphically illustrated in the Figure 16 below. The figure also illustrates that the project is more sensitive to the commodity prices than the discount rate. One of the constraints on cashflow is the high upfront stripping of almost 20Mt that has to be mined before exposing ore. Operationally this can capitalised in order to promote the project. The second cut back has equally high tonnages of waste stripping that have to be mined as soon as the starter cut is exposed for mining. It is recommended that the pre strip benches be mined in a double benching fashion to increase the waste sink rate. Once ore is intercepted it then becomes critical to revert back to a single 5m bench in order to improve grade control sink rate.

**Figure 16: Variation of the NPV with Changes in Discount Rates and Commodity Prices (APT)**




The final mining layout is graphical illustrated in Figure 17.

**Figure 17: The Estimated Position of the Open pit in relation to the Prospecting Right Area**



## Table 14: An Extract of the Financial Model Base Case on the Optimised Riviera Open Pit

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mining cost** | **Total** | **R 28.00** | **280,000,000** | **289,754,792** | **409,116,269** | **464,988,612** | **497,062,011** | **504,609,394** | **216,690,429** | **168,261,710** | **113,006,786** | **46,724,603** | **33,660,841** | **29,064,207** | **26,109,194** |
| | Unit cost R/ton mined | | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 | 28.00 |
| | Escalation % | 0% | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| **Processing cost** | **Total** | **R 122.50** | **-** | **42,677,217** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** | **85,750,000** |
| | Unit cost R/ton Ore Processed | | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 | 122.50 |
| | Escalation % | 0% | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| **Total cost** | **Total** | | **280,000,000** | **332,432,009** | **494,866,269** | **550,738,612** | **582,812,011** | **590,359,394** | **302,440,429** | **254,011,710** | **198,756,786** | **132,474,603** | **119,410,841** | **114,814,207** | **111,859,194** |
| | Unit cost R/ton Ore Processed | | - | 954 | 707 | 787 | 833 | 843 | 432 | 363 | 284 | 189 | 171 | 164 | 160 |
| | | | | | | | | | | | | | | | |
| **Revenue** | WO3 MTU ------ ----- R/ MTU | $250.00 | - | 213,005,596 | 439,704,485 | 455,592,295 | 471,475,262 | 468,179,204 | 451,551,048 | 458,923,749 | 442,302,938 | 443,679,407 | 437,438,756 | 431,862,110 | 428,723,102 |
| Exchange Rate | R : US$ | **R 10.00** | | | | | | | | | | | | | |
| | **Total** | **R** | **-** | **213,005,596** | **439,704,485** | **455,592,295** | **471,475,262** | **468,179,204** | **451,551,048** | **458,923,749** | **442,302,938** | **443,679,407** | **437,438,756** | **431,862,110** | **428,723,102** |
| | | | | | | | | | | | | | | | |
| **Royalty** | **Total Royalty cost** | **3%** | **-** | **6,390,168** | **13,191,135** | **13,667,769** | **14,144,258** | **14,045,376** | **13,546,531** | **13,767,712** | **13,269,088** | **13,310,382** | **13,123,163** | **12,955,863** | **12,861,693** |
| | | | | | | | | | | | | | | | |
| **Capital** | | **R** | 500,000,000 | | - | - | - | - | - | - | - | - | - | - | - |
| | | | | | | | | | | | | | | | |
| Cashflow | Period | 1,679,434,376 | (780,000,000) | (125,816,581) | (68,352,918) | (108,814,085) | (125,481,007) | (136,225,566) | 135,564,087 | 191,144,326 | 230,277,064 | 297,894,422 | 304,904,753 | 304,092,040 | 304,002,215 |
| | Cumulative | R | (780,000,000) | (905,816,581) | (974,169,499) | (1,082,983,585) | (1,208,464,592) | (1,344,690,158) | (1,209,126,071) | (1,017,981,745) | (787,704,681) | (489,810,259) | (184,905,506) | 119,186,533 | 423,188,748 |
| **Discounting** | | | | | | | | | | | | | | | |
| Period number | | 18 | - | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Discount factor | | | - | 0.11 | 0.17 | 0.22 | 0.28 | 0.33 | 0.39 | 0.44 | 0.50 | 0.56 | 0.61 | 0.67 | 0.72 |
| Discount rate | | 17% | | | | | | | | | | | | | |
| Discounted cashflow - period | | 1,386,449,249 | (780,000,000) | (123,640,762) | (66,587,506) | (105,083,058) | (120,126,128) | (129,279,601) | 127,534,572 | 178,261,100 | 212,891,221 | 273,011,749 | 277,009,751 | 273,872,112 | 271,413,474 |
| Discounted cashflow - cumulative | | | (780,000,000) | (903,640,762) | (970,228,268) | (1,075,311,326) | (1,195,437,454) | (1,324,717,054) | (1,197,182,482) | (1,018,921,382) | (806,030,161) | (533,018,412) | (256,008,661) | 17,863,450 | 289,276,924 |

## 8 CONCLUSIONS

An unqualified Minable Inventory was estimated by Venmyn to be 10.8 Mt at an average grade of 0.30% WO3. This reserve estimate was calculated based on a 0.2% WO3 cut-off grade. A detailed geotechnical study for Riviera still needs to be done for use in further studies.

It should be noted that the depth of the mine design and scheduling conducted on the project is of a pre-feasibility standard, however due to lack of precise data in the geological model, it was considered to be of conceptual study standard.

The saleable product is assumed to be ATP not an intermediate Tungsten concentrate. Inclusion of Mo in the optimisation process might further improve the economics of the Riviera open pit project. Since there is a significant amount of pre stripping to be done prior to exposing ore, it is recommended that the operating or mining bench height be increased to 10m in the first one and a half years until ore is exposed. The approach will assist in increasing the waste sink rate. Once ore is exposed the mining height can be reduced to 5m in order to have a good handle on grade control.

The Riviera tungsten project is a viable open pit operation based on evaluations carried out. Further studies need to be done when a detailed block model has been developed with all the major elements like Mo also included, different rock types modelled together with the associated SG's. Any faults and direction of slip planes also need to be evaluated to assist in deriving slope angles of various domains within the pit. Based on the supplied block model and geotechnical parameters applied the results of this study can best be classified at scoping level of accuracy.

Summary of the key success factors for the Riviera Tungsten Project, given that the tungsten is not openly traded, would include the following:-

- Typically low tungsten grade deposits tend to be marginal under low commodity prices and very sensitive to prices. It would important that before a decision to develop the operation, an off-take agreement should be in place. This will enable the project owners to easily access project finance and guarantee success of the project;
- It was concluded that contract mining will be the better alternative in terms of operating and capital costs; and
- Further exploration drilling to firstly confirm the drilling results carried out by Union Carbide and Anglo American Prospecting Services and then delineate SAMREC compliant mineral resources and increase geological confidence in both grade and tonnages.

Given the lack of available drill core from previous drilling campaigns, it is recommended that several confirmation holes be drilled on the Riviera deposit. Given the extreme nugget effect of at least the tungsten mineralization it is recommended that large diameter (NQ or HQ) drill core be utilized. Special attention should be paid to geological logging and sampling of the core so that individual vein systems can be identified, documented, measured and assayed. The entire vein system(s) should be sampled across its entirety and not just the mineralized quartz vein material.

**Yours faithfully**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## 9 REFERENCES:


| AUTHOR | TITLE |
|---|---|
| Brewster, N.E., 1981 | Summary of the Work Program 1980/81 on the Burnt Hill Project for Canadian International Paper Limited. A.C.A. Howe International Limited, Report No. 432. |
| Howe, A.C.A., 1974a | Summary Report on Burnt Hill Tungsten and Metallurgical Limited, York County, New Brunswick for Canadian International Paper. A.C.A. Howe International Limited, report No. 362. |
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| A. B.T Merner, W.D Sinclair & A. B Amey | International Strategic Mineral Issues Summary Report-Tungsten, US Geological Survey Circular 930-0 |
| W. A Basson | Review of the Prospecting Rights of the Riviera W-Mo Deposit |
| SAIMM | Mineral Resources Management Colloquium 2007, held at the South African National Museum of Military history by South African Institute of Mining and Metallurgy |
| SAMREC Code | The SAMREC code (2000) prepared by the South African Mineral Resource Committee under the auspices of the South African Institute of Mining and Metallurgy |
| Websites | http://www.metalseconomics.com/catalog/pages/Worldwide%20Exploration%20Budgets%20-%20Targets,%20and%20Stages%20of%20Development.pdf<br>StrataGold Corporation. http://stratagold.co/s/Mar-Tungsten.asp |

**Appendix 1: Competent Persons Certificates**

**Name of Firm:** Venmyn Rand (Pty) Limited

**Name of Staff:** Mr Andrew Clay

**Company Responsibility:** Managing Director

**Profession:** Geologist

**Date of Birth:** 16th April 1955

**Years with Firm/Entity:** 19 years

**Nationality:** British

**Membership in Professional Societies:**

| CLASS | PROFESSIONAL SOCIETY | YEAR OF REGISTRATION |
|---|---|---|
| Member | Canadian Institute of Mining, Metallurgy and Petroleum | 2006 |
| Advisor | JSE Limited Listings Advisory Committee | 2005 |
| Associate Member | American Association of Petroleum Geologists | 2005 |
| Member | South African Institute of Directors | 2004 |
| Fellow | Geological Society of South Africa | 2003 |
| Member | American Institute of Mineral Appraisers | 2002 |
| Member | South African Institute of Mining and Metallurgy | 1998 |
| Fellow | Australasian Institute of Mining and Metallurgy | 1994 |
| Member | Natural Scientist Institute of South Africa | 1988 |
| Member | Investment Analysts Society of South Africa | 1990 |

**Involvement in Code Writing:**

| POSITION | PROFESSIONAL CODE | DATE OF INVOLVEMENT |
|---|---|---|
| Advisor | JSE Listing Requirements (Section 12) | 1990 – present |
| Advisory Committee Member | JSE Limited | 2005-present |
| Working Group Member | SAMREC Code (First Version) | 1996 - 2001 |
| Working Group Member | SAMREC Code (Re-write) | 2003 - present |
| Chairman | SAMREC Code (Re-write Sections 1 – 5) | 2005 - present |
| Working Group Member | SAMVAL Code | 2001 – present |
| Working Group Member | SAMREC Code (Oil & Gas) | 2005 - present |
| Advisor | JSE Listing Requirements (Section 3 On-going obligations) | 2002 - present |
| Initiator & Panel Member | SAMREC / IAS Award | 2002 - present |
| Member | South African (SAICA) extractive industries deliberations | 2003 - present |
| Chairman | Venmyn Advisory Checklist | 2000 - present |

Mr Clay currently has a special interest in incorporating oil and gas reporting procedures into the general application of mineral asset valuation.

**Detailed Tasks Assigned:**

| YEAR | CLIENT | COMMODITY | PROJECT DESCRIPTION |
|---|---|---|---|
| 2007 | Crushco | Industrial Minerals | Independent valuation |
| 2007 | Kimberley Consolidated Mining | Diamonds | Independent valuation |
| 2007 | LionOre Mining | Nickel. PGEs | Technical and economic valuation |
| 2007 | PBS Group | PGEs | Project review |
| 2007 | Western Areas | Au | Independent valuation |
| 2007 | Harmony Gold Mining | Au. Uranium | Independent scoping and valuation |
| 2007 | Great Basin Gold | Au | Independent valuation for BEE transaction |
| 2007 | BRC/Diamondcore Resources | Diamonds | Valuation and Opinion provider |
| 2007 | Urals Investors | Diamonds Au. PGEs and Oil and Gas | Independent Transaction Report |
| 2007 | Energem | Diamonds | Indepndent Technical Statement for Koidu |
| 2007 | Xstrata | Cr | Independent CGT and Valuation advice |
| 2007 | PWC Magnetite Mine Review | V | Independent Mineral Resource Review and Valuation for apportionment calculations |
| 2007 | Magnum Resources | Ta | Independent Mineral Resource Review |
| 2007 | Gaanahoek Coal Deposit | Coal | Prospectivity Review |

| | | | |
|---|---|---|---|
| 2007 | DRDGold | Au | Emperor Gold Mines independent forensic review |
| 2007 | Kimberley Diamonds Corporation | Diamonds | Independent Listings Documentation |
| 2007 | Rockwell | Diamonds | Transhex Transaction Documentation |
| 2007 | Rockwell | Diamonds | Independent Mineral Resource Review |
| 2007 | Caledonia Mining | Au | Independent Disposal Documentation Eersteling |
| 2007 | Caledonia Mining | Au | Independent Disposal Documentation Barbrook |
| 2007 | Adsani Tantalite Refinery | Ta | Independent Technical Report |
| 2006 | LionOre | Ni Base Metals | Independent Valuation of Falconbridge International and Nikkelverk Refinery |
| 2006 | LionOre/BCL | Ni Base Metals | Independent Technical and Economic Valuation |
| 2006 | Vanamin | V | Independent Report for disposal |
| 2006 | Kurils Islands | Au | Independent Technical Report NI43-101 |
| 2006 | Mgart Armenia | Au | Independent Assessment and Valuation for AIM |
| 2006 | Zimbabwe Mining Bill | All | Preparation of industry submission to government |
| 2006 | Energem | Oil & Gas | Preparation of National Instrument Compliance |
| 2006 | Ncondedzi Coal | Coal | Technical & Corporate Listing Documentation |
| 2006 | Metallon International - Armenia | Gold & Base Metals | Prospectivity & Exploration Programme Preparation |
| 2006 | Hood Tantalite | Tantalite | Independent Techno Economic Valuation Report |
| 2005 | Harmony Randfontein 4 Shaft | Gold | Independent Valuation |
| 2005 | Letseng | Diamonds | Independent Competent Person's Report for disposal |
| 2005 | Zimplats Tenements | Platinum Group Metals | Independent Competent Person's Report for disposal |
| 2005 | DRD | Gold | Fair & Reasonable |
| 2005 | ARM Madikwa | Platinum Group Metals | Independent Valuation for Impairment Calculation |
| 2005 | Harmony Competitions Tribunal | Gold | Independent Expert Witness |
| 2005 | Ecca Holdings | Bentonite | Independent Industry Review |
| 2005 | Gallery Gold | Gold | Independent Competent Person's Report for disposal |
| 2005 | Stuart Coal | Coal | Independent Competent Person's Report for disposal |
| 2005 | Elementis Chrome | Chrome | Independent Industry Review |
| 2005 | Diamond Core | Diamonds | Independent Competent Person's Report |
| 2005 | Diamond Core | Diamonds | Fair & Reasonable Statement |
| 2005 | Kensington Resources | Diamonds | Independent Inspection & Certification of Laboratory |
| 2005 | Bayer Valuation | Chrome | Independent Valuation for Economic Empowerment Transaction |
| 2005 | Pangea Diamonds | Diamonds | Independent Competent Person's Repor |
| 2005 | LionOre International | Nickel | Tati Nickel Review of Mineral Resources. |
| | Aquarius PSA2 | | Independent Competent Person's Repor |
| 2005 | Aquarius | Platinum | Marikana Mineral Resources Review. |
| 2005 | LionOre International | Nickel | Nkomati Due Diligence and Transaction Value Calculations. |
| 2005 | LionOre International | Nickel | World Nickel market study for group corporate work. |
| 2004 | Avgold Limited | Gold | Fair & Reasonable Opinion on the Methodologies applied and Values attributed to the Mineral Assets of ET Cons |
| 2004 | Aquarius | Platinum | Update of Independent Valuation of Mimosa |
| 2004 | Aquarius | Platinum | Independent Techno-Economic Report and Fair and Reasonable Opinion tot the PIC, DBSA and IDC on the 26% BEE Transaction for AQPSA – Document waived by the JSE. |
| 2004 | Mimosa Mining Company | Platinum | Mineral Resource and Ore Reserve Review |
| 2004 | Zimplats | Platinum | Zimplats Makwiro Valuation and Corporate Restructuring |
| 2004 | Assmang | Manganese | CGT Valuation |
| 2004 | Aquarius | Platinum | CGT Valuation |
| 2004 | Sishen South | Iron | CGT Valuation |
| 2003 | Unki Platinum Project | Platinum | CGT Valuation |
| 2003 | Hernic Ferrochrome (Pty) Ltd, Itochu Corporation | Chromite | Independent valuation of the Stellite Chromite Mine Joint Venture. |
| 2003 | African Diamond Holdings (Pty) Ltd | Diamonds | Independent techno-economic due diligence and valuation of African Diamond Holdings marine diamond concessions and diamond cutting operation in Walvis Bay, Namibia. |
| 2003 | Unki Platinum Project, Zimbabwe | Platinum | Techno-Economic Valuation Report & Fair & Reasonable Opinion |
| 2003 | Transvaal Ferrochrome Ltd | Ferrochrome | Independent Competent Person's Report and Valuation as a bankable Document for Australian Stock Exchange |
| 2003 | Aquarius Platinum (SA) (Pty) Ltd | Platinum | Independent Competent Person's Report and Valuation for the Everest South Project |
| 2002 | Zimbabwe Platinum Mines Ltd | Platinum | Independent valuation of Zimplats relative to the value of the Impala Platinum Ltd/AurionGold Ltd transaction. |
| 2002 | Mitsubishi Corporation | Ferrochrome | Expansion Report and Valuation on Hernic Ferrochrome (Pty) Ltd. |
| 2002 | Aquarius Platinum Ltd | Platinum | Acquisition Report on ZCE Platinum Ltd including the due diligence and valuation of Mimosa Mine in Zimbabwe. |
| 2002 | Freddev | Gold | Valuation of Mineral Rights & Royalties |
| 2002 | Barnex | Gold | Valuation of Mineral Rights & Royalties |
| 2002 | Western Areas | Gold | WA4 Project : Valuation of Mineral Rights & Royalty Agreement |
| 2002 | Mitsubishi | Ferrochrome | Expansion report and valuation |

| | | | |
|---|---|---|---|
| 2002 | Aquarius | Platinum | Acquisition Report |
| 2001 | Northam | Platinum | Valuation |
| 2001 | Mitsubishi Corporation | Ferrochrome | Due Diligence, Valuation and Acquisition Report |
| 2001 | Amcol Due Diligence | Bentonite | Independent due diligence and valuation on G&W |
| 2001 | Zimplats Impala Raising | Platinum | Circular to shareholders valuation report |
| 2000 | African Minerals | Varied | Independent competent person's report |
| 2000 | Barnato Exploration Limited | Varied | Competent person's report |
| 2000 | Durban Deep | Gold | Independent valuation report |
| 2000 | Iscor Limited | Varied | Independent valuation of exploration assets |
| 1999 | Harmony Gold Mining Co Ltd | Gold | Harmony / Kalgold / West Rand Cons |
| 1999 | Leighton Contractors | Tin | Pre-feasibility study Pemali Tin (Indonesia) |
| 1999 | Mitsubishi | Ferro-Chrome | Techno-economic valuation of Hernic Chrome |
| 1998 | Barnex Ltd | Wits Gold | Due diligence |
| 1998 | Camco | Diamonds | Independent Competent Person's Report and valuation |
| 1998 | Crown Mines and DRD | Wits Gold | Valuation |
| 1998 | Egyptian Government | Phosphate | Due diligence and valuation |
| 1998 | Great Fitzroy Mines | Copper | Competent Person's Report and Valuation |
| 1998 | Iscor Mining | Greenstone Gold | Due diligence and valuation |
| 1998 | JCI Ltd | Wits Gold | Competent Person's Report |
| 1998 | Randgold & Exploration Co Ltd | Gold | Competent Person's Report |
| 1998 | Western Areas | Wits Gold | Competent Person's Report |
| 1997 | CBR Mining | Coal | Due diligence |
| 1997 | Durban Roodepoort Deep Ltd | Wits Gold | Competent Person's Report |
| 1997 | G&W Base | Bentonite | Due diligence |
| 1997 | JCI Ltd | Wits Gold | Competent Person's Report |
| 1997 | Opaline Gold | Greenstone Gold | Competent Person's Report |
| 1997 | Penumbra | Coal | Due diligence |
| 1997 | Randgold & Exploration Co Ltd | Greenstone Gold | Competent Person's Report |
| 1997 | Rondebult Colliery | Coal | Due diligence |
| 1996 | African Mining Corporation* | Alluvial Gold | Project valuation |
| 1996 | Australian Platinum Mines NL | Platinum | Due diligence |
| 1996 | Benoni Gold Holdings Ltd | Wits Gold | Competent Person's Report |
| 1996 | Consolidated Metallurgical Industries | Ferrochrome | Competent Person's Report and valuation |
| 1996 | Durban Roodepoort Deep Ltd | Wits Gold | Competent Person's Report |
| 1996 | Harmony Gold Mining Co Ltd | Wits Gold | Competent Person's Report |
| 1996 | JCI Ltd | Wits Gold | Valuation |
| 1996 | Rand Leases Properties Ltd | Wits Gold | Competent Person's Report and valuation |
| 1996 | Randgold & Exploration Co Ltd | Wits Gold | Due diligence |
| 1995 | African Mines Limited* | Greenstone Gold | Project valuation |
| 1995 | Barney-Seidle Arbitration | Granite | Project valuation arbitration |
| 1995 | Mopet Oil* | Oil and Gas | Market analysis facilitator |
| 1995 | Randgold & Exploration Co Ltd | Wits Gold | Competent Person's Report and valuation |
| 1995 | Randgold Durban Deep | Wits Gold | Competent Person's Report and valuation |
| 1995 | Randgold Harmony Unisel Merger | Wits Gold | Competent Person's Report and valuation |
| 1994 | Aurora Exploration | Varied - Industrials | Competent Person's Report and valuation |
| 1994 | Consolidated Mining Corp | Wits Gold | Due diligence and valuation |
| 1994 | CRA (Australia) | Iron Ore | Due diligence |
| 1994 | Durban Roodepoort Deep Ltd | Wits Gold | Competent Person's Report and valuation |
| 1994 | Ghana Gold Mines* | Greenstone Gold | Due diligence and valuation |
| 1994 | Gold Fields of SA Ltd | Wits Gold | Competent Person's Report and valuation |
| 1994 | Hernic Chrome | Ferro-Chrome | Valuation and Strategic Analysis |
| 1994 | Inca | Magnesium | Due diligence and valuation |
| 1994 | Mitsubishi | Ferrochrome | Due diligence and valuation |
| 1994 | Namco* | Diamonds | Competent Person's Report and valuation |
| 1994 | Randgold & Exploration Co Ltd | Wits Gold | Due diligence |
| 1993 | Namibia Oil & Gas licence applications | Oil & Gas | Working with Paul Blair licence applications |
| 1993 | Atomic Energy Commission | Uranium | Strategic Analysis |
| 1993 | Eskom | Base metals | Strategic Analysis |
| 1993 | JCI | Wits Gold | Financial Planning Analysis (Rehabilitation) |
| 1993 | Lonrho | Platinum | Financial Planning Analysis (Rehabilitation) |
| 1993 | Rand Mines Properties | Varied | Mineral rights evaluation |
| 1992 | Barbrook Gold Mines | Greenstone Gold | Ore resource modelling and mine valuation |
| 1992 | Rand Merchant Bank | Copper | Ore resource modelling and project valuation |
| 1992 | Rembrandt | Platinum | Mine valuation (Northam Platinum) |
| 1992 | West Rand Cons | Wits Gold | Ore resource modeling and mine valuation |
| 1991 | Rand Merchant Bank | Wits Gold | Ore reserve evaluation (Westonaria Gold Mine) |
| 1991 | Rembrandt (Gold Fields of SA) | Varied | Due diligence, valuation and strategic analysis |
| 1991 | Standard Merchant Bank | Greenstone Gold | Due diligence and valuation (Eersteling Gold Mine) |
| 1990 | Sequence Oil and Gas | Oil & Gas | Due Diligence Report |
| 1990 | Atomic Energy Corporation | Nuclear Fuels | Strategic analysis |
| 1990 | Consolidated Mining Corp | Wits Gold | Due diligence and valuation |
| 1990 | Eskom | Copper/Zinc | Strategic Market Analysis (Toll Smelter potential) |
| 1990 | Freddies Minerals | Feldspar - Industrials | Due diligence |
| 1990 | Industrial Machinery Supplies | Coal | Strategic analysis and valuation (Bricketting plant) |
| 1990 | Knights Gold Mine | Wits Gold | Competent Person's Report |

| | | | |
|---|---|---|---|
| 1990 | Rand Merchant Bank | Diamonds | Due diligence and valuation (Alluvial Mine) |
| 1990 | Corex | Oil & Gas | Evaluation of prospectivity |
| 1990 | Rand Merchant Bank | Lead/Zinc | Due diligence and valuation (Miranda Mine) |
| 1990 | Rand Mines | Varied | Corporate Strategic Analysis |
| 1990 | Rhogold | Wits Gold | Ore resource modeling |
| 1990 | Rice Rinaldi | Coal | Due diligence and valuation |
| 1990 | Sub Nigel Gold Mine | Wits Gold | Due diligence and valuation |
| 1990 | Zaaiplaats Tin Mine | Tin | Due diligence and valuation |
| 1989 | Avontuur Diamond Mines | Diamonds | Due diligence and valuation |
| 1989 | Granite Consolidated Mining | Granite | Due diligence and valuation |
| 1989 | Osprey Gold Mine | Greenstone Gold | Due diligence and valuation |
| 1989 | Rand Leases Gold Mine | Wits Gold | Ore resource modeling |
| 1989 | Rand Merchant Bank* | Varied | Mineral portfolio analysis (Swanson Rights) |
| 1989 | Rhovan | Vanadium | Competent Person's Report and valuation |
| 1989 | Vanamin Severrin Mining | Vanadium | Due diligence and valuation |
| 1989 | Zimco | Andalusite | Competent Person's Report and valuation |
| 1988 | Mullet Slate | Slate | Due diligence and valuation |
| 1988 | Rand Merchant Bank | Wits Gold | Risk assessment analysis (Peritus Exploration) |
| 1988 | Wit Nigel Gold Mine | Wits Gold | Ore resource modelling |

**Fair and Reasonable Opinions:**

| YEAR | CLIENT | Securities Exchange Jurisdiction | Transaction Type | Implied Value (US$m) | DESCRIPTION |
|---|---|---|---|---|---|
| 2007 | Diamondcore/BRC | JSE | Acquisition | 50 | Independent F&R for Diamondcore |
| 2006 | LionOre International | TSX | Acquisition notification documentation. | 650 | Independent Technical and Valuation Fatal Flaws Report and F&R opinion for the Board of LionOre. Not published as an F&R. |
| 2005 | Diamond Core | JSE | Category I Merger | 10.0 | Independent CPR on the mineral assets of Samadi Resources SA (Pty) Ltd and Diamond Core Resources Limited. |
| 2005 | LionOre International | TSX | Acquisition notification documentation. | 110.0 | Tati Nickel Review of Mineral Resources. |
| 2005 | Aquarius | JSE | 26% BEE | 150.0 | Independent Techno-Economic Valuation and Fair and Reasonable Opinion on the PIC, IDC, DBSA 26% Empowerment Transaction. Documents waived for the secondary listing. |
| 2004 | Barplats | JSE | Offer to Barplats Minorities | 60.0 | Offer by Platinum Consortium to take out Implats. The SRP insisted our report be prepared in full. In the end Investec wrote the Fair and Reasonable but was fully reliant upon the Venmyn work as demonstrated in the circular. |
| 2004 | Zimplats | ASX | Collapse of the Makwiro Structure for shares to Implats. | 38.0 | Fair Value calculation in a corporate restructure. |
| 2003 | Amplats | JSE | Acquisition price calculation for Unki Platinum. | Confidential | Preparation of an Independent Techno-Economic Valuation Report and Fair and Reasonable Opinion. Document not used as the transaction became immaterial for reporting purposes. |
| 2003 | Aquarius Platinum (South Africa) (Pty) Ltd | ASX | Opinion on the value of a Refinery Agreement. | 10.0 | Fair & Reasonable Opinions for Aquarius Platinum for the Impala Refinery Commitments. |
| 2002 | Consolidated African Mines Limited. | JSE | CAM acquired 40% of the Letseng diamond mine for CAM shares. | 10.0 | Preparation of an Independent Techno-Economic Valuation Report and Fair and Reasonable Opinion. Document used in full. |
| 2002 | Zimplats | ASX | Implats aquired a controlling interest in Zimplats by acquiring Aurion Gold shares. | 50.0 | Preparation of an Independent Techno-Economic Valuation Report and Fair and Reasonable Opinion. Document used in full. |
| 2002 | Aquarius | ASX | Aquarius aquires 65% in ZCE Platinum Limited. | 50.0 | Preparation of an Independent Techno-Economic Valuation Report and Fair and Reasonable Opinion. Document used in full. |
| 2000 | DiamondWorks | TSX | Lyndhurst a South African Company takes control of Canadian junior Diamondworks. | 20.0 | Preparation of an Independent Techno-Economic Valuation Report and Fair and Reasonable Opinion. Document used in full and special representation required in Toronto to explain the transaction and the assets. |
| 1999 | New Mining Corporation | JSE | Listing and acquisition documentation. | 50.0 | Complicated transaction and full Independent Techno-Economic Valuation prepared with Fair and Reasonable Opinion included in our report. This satisfied the JSE and the SRP. |
| 1996 | West Witwatersrand Gold Holdings Limited | JSE | Section 440k Offer | 20.0 | Independent Competent Persons Report on the Offer by Durban Deep to West Wits under Section 440k. Document included in circulars to both shareholders. Our Fair and Reasonable Opinion was specifically requested by the SRP. |

**Key Qualifications and Description:**

Mr Clay has been a serving professional in the Minerals Industry since 1977 when he undertook field mapping and a professional apprenticeship within the Rhodesian Geological Survey. This was at a time when fieldwork and practical application of geological principals was still fundamental to the development of geology as a science. Following this, Mr Clay has dedicated his career to the commercial incorporation of first principles scientific process to the description, reporting and valuation of mineral assets.

Having worked for a number of years with mining companies, both underground and in corporate, Mr Clay was a founding member of Venmyn in 1988 whereby the company was associated with Rand Merchant Bank. This relationship enabled him to pursue the process of linking technical and financial valuation. Since that time Mr Clay has been involved in growing Venmyn and is presently the Managing Director.

He has been involved in developing a style of reporting at Venmyn which has become internationally recognised as compliant shorter form reporting. The emphasis of the work is on tables, bullet points and descriptive grahics for ease of presentation and shareholder appreciation.

He has been involved in the writing of numerous codes the South African Code for the Reporting of Mineral Resources and Reserves (SAMREC Code) and is currently on the committee writing the South African Code for the Valuation of mineral projects (SAMVAL Code). He is presently involved in the oil and gas industry where his expertise in valuation is being used to determine the relationship between the reporting methodologies in this industry relative to the rest of the mineral industry.

Mr Clay's key areas of expertise lie in the detailed financial valuation of mineral and mining projects using discounted cash flow models. In this regard he has undertaken over 25 valuations for eight different commodities over the last four years. Details of the valuations and other assignments are tabled above. These valuations have been used in listing and merger documentation both in local and international stock exchanges and for the private use of the companies concerned.

**Education:**

| DEGREE/DIPLOMA | FIELD | INSTITUTION | YEAR |
|---|---|---|---|
| B. Sc Hons. | Geology | University College Cardiff | 1976 |
| M. Sc. Econ. Geol. | Economic Geology<br>(awarded Corstorphine Medal for Best M.Sc. Thesis) | University of the Witwatersrand | 1981 |
| GDE | Graduate Diploma in Mining Engineering | University of the Witwatersrand | 1986 |
| M. Sc. | Mining Engineering | University of the Witwatersrand | 1988 |
| Dip. Bus. M. | Diploma in Business Management | Damelin College | 1983 |
| Tax Mgmt | Tax Management and Planning | University of the Witwatersrand | 1988 |

**Employment Record:**

| POSITION | COMPANY | JOB DESCRIPTION | DURATION |
|---|---|---|---|
| Managing Director and Founding partner | Venmyn Rand (Pty) Ltd | • Mr Clay serves as the Managing Director of Venmyn and is responsible for the company's strategic process as well as finances, budgeting and operations;<br>• Venmyn operates as a techno-economic consultancy for the resources industry on a world wide basis;<br>• Mr Clay has been a key member of the SAMREC Working Group, responsible for compiling the SAMREC Code;<br>• Served on the JSE/SAMREC working committee for the development of the JSE Section 12 requirements;<br>• Serves on the Readers Panel for the JSE;<br>• Mr Clay is director of the advisory business and provides hands-on services to all the company's major clients;<br>• His expertise in financial valuation is particularly appropriate for ensuring market to market presentation of both the technical and financial issues of resources projects;<br>• Course leader for the Witwatersrand University and Continuing Education programme on Compliance in the Minerals Industry; and<br>• Mr Clay has a special interest in the proposed International Accounting Standards "IAS" Extractive Industries rules for determining NAV and NPV calculations in the minerals industry. | 1997 – present |
| General Manager | RMB Resources<br>Rand Merchant Bank | • Continuing business functions detailed below;<br>• Also valuing, managing and marketing investment projects of the Resources division including deal structuring and corporate finance. | 1996 – 1997 |
| Managing Director and founding partner | Venmyn Rand (Pty) Ltd | • Techno-economic evaluation of a wide range of mineral resource projects using cashflow, market capitalisation, option pricing and other comparative methods. | 1987 – 1996 |

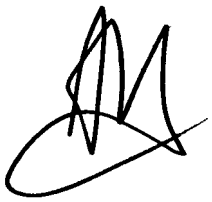
| | | | |
|---|---|---|---|
| Senior Geologist | Rand Mines Ltd | • Resident senior gold mine geologist responsible for the development and implementation of modern computerised ore reserve evaluation techniques at Harmony Gold Mine and Durban Roodepoort Deep Gold Mine.<br>• Transferred to head office where he was responsible for all gold mine ore reserve valuation functions. This computer work involved the development and planning of very large databases for orebody modelling. | 1981 – 1988 |
| Senior Geologist | Zimro (Pty) Ltd (Industrial Minerals Division of AAC) | • Market development and application of a wide range of industrial and base minerals. | 1979 – 1981 |
| Geologist | Geological Survey of Zimbabwe | • Mapped a 100 km² area of granite-greenstone terrain and assisted in the compilation of a Bulletin over the area.<br>• Assisted the small mining sector with geological advice on gold, copper, gemstones and industrial minerals. | 1975 – 1979 |

**Languages:**

English: Excellent
Afrikaans: Fair

**Certification:**

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and my experience.



Date: 10th March 2008

Full name of staff member: Andrew Neil Clay

**Proposed Position:** Mineral Project Analyst

**Name of Firm:** Venmyn Rand (Pty) Limited

**Name of Staff:** Mr Godknows Njowa

**Profession:** Mining Engineer

**Date of Birth:** 4th June 1978

**Years with Firm/Entity:** Two years

**Nationality:** Zimbabwean

**Membership in Professional Societies:**

| CLASS | PROFESSIONAL SOCIETY | YEAR OF REGISTRATION |
|---|---|---|
| Candidate Engineer | Engineering Council of South Africa | 2007 |
| Associate | South African Institute of Mining and Metallurgy | 2006 |
| Graduate | Institute of Chartered Secretaries and Administrators | 2004 |
| Graduate | Zimbabwe Institute of Engineers | 2000 |

**Involvement in Code Writing:**

| POSITION | PROFESSIONAL CODE | DATE OF INVOLVEMENT |
|---|---|---|
| Working Group Member | JSE Listing Requirements (Section 12 and 8) | 2007 – present |
| Working Group Member | SAMREC Code (Re-write) | 2007 - present |
| Working Group Member | SAMVAL Code | 2007 – present |
| Panel Member | SAMREC / IAS Award | 2007 - present |

**Detailed Tasks Assigned:**

| YEAR | CLIENT | COMMODITY | PROJECT DESCRIPTION |
|---|---|---|---|
| 2006 | Western Areas | PGE | Valuation Report |
| 2006 | Mintek | Chromite | Strategic Industry Review |
| 2006 | Rhovan | Vanadium | Valuation report |
| 2006 | Imbani Resources | Coal | High Level Review of Resource and Reserve held by Imbani |
| 2006 | Salestalk 32 | Vanadium | Resources and Reserve Statement |
| 2006 | Various | Mineral Policy Review | An Independent opinion on the Zimbabwe Amendment Bill |
| 2006 | Anglo Platinum | PGE | An Independent Mineral Asset Valuation on the Union Section |
| 2006 | Xstrata | PGE | An Independent Mineral Asset Valuation on the Mototolo JV |
| 2006 | LionOre International | Nickel | Independent Technical and Economic Assessment of BCL Ltd |
| 2006 | Worldwide Coal | Coal | Techno-Economic Valuation Report for the RBCT Tender |
| 2006 | Crushco | Aggregates | Independent Techno-Economic Assessment |
| 2007 | Caledonia Mining | PGE | Technical Information memorandum and Independent Valuation on Eersteling and Barbrook for disposal |
| 2007 | Highveld Steel | Iron and Vanadium | An Independent Valuation of Mineral Assets held by Highveld Steel |
| 2007 | Mintek | Mineral Policy Review | SA system for Mine Closure Financial Provision Legislation |

**Key Qualifications:**

Mr Njowa's key areas of expertise lie the combination of skills in Financial Accounting, Corporate Governance and Mining Engineering. Coupled with experience in both technical and corporate finance he has consolidated his expertise in detailed financial valuation of mineral and mining projects using discounted cashflow models.

Mr Njowa has special interests in the public reporting of mineral assets and their valuation, with focus on the following codes and standards:- International Accounting Standards (IAS), International Financial Reporting Standards (IFRS), South African Code for the Reporting of Mineral Resources and Reserves (SAMREC Code) and the current draft of The South African Code for the Valuation of mineral projects (SAMVAL Code).

He has been involved in the writing of numerous codes the South African Code for the Reporting of Mineral Resources and Reserves (SAMREC Code) and is currently on the committee writing the South African Code for the Valuation of mineral projects (SAMVAL Code) and on JSE Listing requirements committee and involved in the drafting of the JSE listing requirements for the minerals and exploration companies.

**Education:**

| DEGREE/ DIPLOMA | FIELD | INSTITUTION | YEAR |
|---|---|---|---|
| B. Sc Hons | Mining Engineering | University of Zimbabwe | 2003 |
| Professional Qualification | Corporate Governance and Financial Accounting | Institute of Chartered Secretaries and Administrators | 2004 |
| GDE | Graduate Diploma in Mining Engineering specialising in Mineral Resources Management and Mineral Asset Valuations | University of the Witwatersrand | 2005 |
| M. Sc | Mining Engineering specialising in Mineral Resources Management *(Cum Laude)* | University of the Witwatersrand | 2007 |

**Employment Record:**

| POSITION | COMPANY | JOB DESCRIPTION | DURATION |
|---|---|---|---|
| Mineral Project Analyst | Venmyn Rand (Pty) Ltd | Part of the consulting team, with the majority of assignments being Due Diligence and valuation exercises. Also undertaking capital gains tax, mineral rights, projects and mine valuations in the minerals industry. Projects worked on include:-<br>• Valuation and strategic analysis of mining companies and mineral projects using the discounted cashflow and other comparative methods;<br>• Valuation of various mineral rights and projects. | Jan 2006 - Present |
| Head Office Accountant (Mining Analyst) | Rio Tinto imbabwe (Head Office) | Management responsibilities as outlined below but now at the Corporate level involving four different mining and processing operations. Further responsibilities include:-<br>• Processing foreign payments through the reserve bank;<br>• Statutory tax, royalties provisions, calculations and payments<br>• Arranging project and working capital funding; and<br>• Group cash flow management in liaison with the Group Accountant. | November 2004 – January 2005 |
| Assistant Accountant Mining | Rio Tinto Zimbabwe (Renco Mine) | Mining Responsibilities:-<br>• Part of the Mine planning and cost control team;<br>• Carry out internal investment appraisal for mining and engineering projects;<br>• Conversion of Resources to Mineral reserves and estimation;<br>• Economic evaluations on future mining blocks; and<br>• Budgeting, production analysis and doing mining cost management reports.<br><br>Accounting Responsibilities:-<br>• Preparation of monthly management reports and accounts;<br>• Personnel deployment and management of five sub sections (stores, creditors, payroll, amenities and IT);<br>• Production planning, management and quality control;<br>• Total cost control, capital budgeting and cashflow management;<br>• Maintenance of the company's records and bookkeeping;<br>• Authorisation of foreign and local payments, banking, PGE declaration and other statutory responsibilities. | October 2003 – November 2004 |
| Graduate Mining Engineer Internship | Rio Tinto Zimbabwe (Renco Mine) | Thin reef, hard rock underground PGE production on the Nyagena PGEfield reef seams using conventional longwall mining method and rail tramming system.<br>Responsibilities included:-<br>• Drilling, blasting, loading and hauling operations;<br>• Support installation, track work installation and maintenance;<br>• Daily mine production and machine scheduling;<br>• Safety and health systems management;<br>• Production planning, management and grade control;<br>• Total cost control and capital budgeting;<br>• Equipment maintenance and condition monitoring;<br>• Development of secondary orebody access through twin sub-declines, including project management of ancillary infrastructure development and installations;<br>• Technical computerisation using Datamine (data processing, block modelling and ore reserve estimation); and<br>• Mineral processing and dressing of sulphides ores through cynidation and carbon in leach PGE extraction. | August 2001 – August 2002 |
| Student Mining Engineer | AA Mines (Shabanie Mine) | • Massive ore body production management;<br>• Safety and quality management;<br>• Sub-level block caving with a trackless tramming system;<br>• Chystolite asbestos production. | October 1999 – February 2000 |

**Languages:**

English: Excellent
Shona: Excellent

**Certification:**

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe me, my qualifications, and my experience.

Date: 10th March 2008

Full name of staff member: Godknows Njowa
Full name of authorised representative: N/A

**Appendix 2: Whittle Optimisation Outputs and Financials for Riviera Project**

## Appendix 3: Glossary of Terms and Abbreviations

The following glossary contains definitions of certain technical terms used in this report. These definitions may differ from those ascribed to similar terms under applicable legislation.

| | |
|---|---|
| **Actinolite** | A green silicate metamorphic mineral. |
| **Aeromagnetic** | A method of geophysical exploration in which an aircraft carries instruments that record the magnetic signatures of the rocks beneath its flight path. |
| **Ag** | The chemical symbol for the metallic element silver. |
| **Alluvium** | Detrital sediment laid down by water, especially by rivers or streams. |
| **Alteration** | Change in mineralogical composition of a rock commonly caused by reactions with hydrothermal solutions. |
| **Amphibole** | A mineral group, an alumino –silicate, green in colour. |
| **Amphibolite** | A metamorphic rock composed mainly of amphibole. |
| **APT** | Ammonium Paratungstate, a saleable compound of tungsten made form leaching scheelite ore |
| **Barite** | A mineral, of composition BaSO4. |
| **Basalt** | An extrusive igneous rock; dark coloured, fine-grained, composed mainly of feldspar and pyroxene. |
| **Basin** | A general term for an originally depressed area that has been filled with sedimentary rocks. |
| **Batholith** | A large mass of plutonic igneous rocks. |
| **Bi** | The chemical symbol for the element bismuth. |
| **Calc-silicate** | A metamorphic rock consisting largely of carbonate and calcium bearing silicate minerals; formed by the metamorphism of carbonate sediments |
| **Carbonate** | A mineral compound containing the radical CO3 anion; especially calcium carbonate (calcite). |
| **Chalcopyrite** | A sulphide mineral; composed of copper, iron, and sulphur (CuFeS2). |
| **Chlorite** | A platy hydrous silicate related to mica. |
| **Clastic** | Rocks composed of fragmental material derived from pre-existing rocks. |
| **Cobalt (Co)** | The element cobalt (its chemical symbol). |
| **Colluvium** | Surficial sheet-form relatively recent deposits emplaced by sheet wash or gravity. |
| **Concentrate** | A concentration of valuable minerals obtained from lower grade mineralisation (especially of sulphides). |
| **Conjugate set** | Set of related fractures which intersect and have dissimilar orientations. |
| **Copper (Cu)** | The metallic element (its chemical symbol). |
| **Costean** | An elongate pit. |
| **Diamond drilling** | Method of obtaining cylindrical core of rock by drilling with a diamond-set or diamond-impregnated bit. |
| **Dip** | The angle that a rock unit or structure makes with the horizontal. |
| **Disseminated** | Mineralisation in which mineral grains (especially sulphides) are dispersed throughout a host rock (as against being concentrated in a massive band). |
| **Dolerite** | A dark coloured fine to medium-grained intrusive igneous rock. |
| **Dyke** | A tabular igneous intrusion that cuts across the intruded rocks. |
| **Electromagnetic** | A geophysical exploration method utilising the electrical or magnetic properties of rocks or minerals |
| **En echelon** | Parallel but offset structures or veins. |
| **Epithermal** | A hydrothermal mineral deposit formed within about 900m of the surface within the temperature range of 50o to 200oC: characterised by veins. |
| **Extrusive** | Igneous rocks that have been formed, from volcanic action, on the surface of the Earth. |
| **Fault** | A fracture in rock along which there has been relative displacement of the two sides either vertically or horizontally. |
| **Feldspar** | A silicate mineral group formed in igneous and metamorphic rocks; light coloured |
| **Felsic** | Descriptive of light coloured rock containing an abundance of feldspar (generally potassium rich) and quartz. |
| **Flotation** | A metallurgical technique for the separation of (especially) sulphide minerals from finely ground rock. |
| **Fluorite** | A mineral, of composition CaF2. |
| **Fold** | A bend in strata or any planar structure. |
| **Formation** | A rock unit; often sedimentary; may be given a formal name; capable of its distribution being mapped either at or below the surface of the earth |
| **g/t** | Grams per tonne. |
| **Galena** | The lead sulphide mineral (PbS). |
| **Garnet** | A alumino-silicate metamorphic mineral. |
| **Geochemistry** | The study of the abundance of elements in rocks by chemical methods. |
| **Geophysics** | The science of the physical properties of the Earth, e.g. the magnetic properties and signatures of rock units. |
| **Geotechnical** | The science that includes the physical properties and responses of rocks and rock formations to strains and stresses; especially in mine situations. |
| **GIS** | Geographic information system. A computer based system that enables various sets of data that have known geographical positions to be viewed, compared, and manipulated. |
| **Gneiss** | High grade metamorphic rock composed of alternating bands respectively rich in light and dark coloured minerals. |
| **Gold** | The metallic element (chemical symbol Au). |
| **Grade** | Expression of relative quality (e.g high grade) or of numerical quality (e.g.3.0g/t Au). |
| **Granite** | Light coloured, coarse-grained, intrusive igneous rock; comprises large sections of the Earth's continental crust. |
| **Granulite** | A high-grade metamorphic rock composed of interlocking granular minerals. |
| **Ground magnetics** | A geophysical exploration method based on the detection of buried rockbodies of different magnetic properties to those surrounding them |
| **Hematite** | An oxide of iron; red in colour. |
| **Hydrothermal** | Minerals formed in situ by the action of hot aqueous fluids. |
| **Igneous** | Formed by solidification of hot mobile material termed magma. |
| **Indicated resource** | That part of a resource for which tonnage, densities, shape, physical characteristics, grade, and mineralogy can be estimated with a reasonable level of confidence. |
| **Inferred resource** | That part of a resource for which tonnage, grade, and mineralogy can be estimated with a low level of confidence. |

| | |
|---|---|
| **Intrusion** | A body of igneous rock that invades older rocks. |
| **Lateritised** | Rocks altered and enriched in iron by weathering. |
| **Mafic** | Descriptive of rocks composed dominantly of magnesium and iron forming silicates. |
| **Magnetite** | An iron oxide mineral; Fe3O4. |
| **Metallurgy** | The science of the extraction or processing of metals. |
| **Metamorphosed** | A rock that has been altered by physical and chemical processes involving heat, pressure and derived fluids. |
| **Metasediment** | A metamorphosed sedimentary rock. |
| **Mica** | A platy mineral. |
| **Mineralisation** | The concentration of metals and their minerals within a body of rock. |
| **Mn** | The chemical symbol for the metallic element manganese. |
| **Mo** | The chemical symbol for the metallic element molybdenum. |
| **Molybdenite** | The sulphide mineral of molybdenum (MoS2). |
| **Molybdenum** | A metallic element (chemical symbol Mo). |
| **Neoproterozoic** | The youngest of the three Proterozoic eras; between about 580 and 1,000 million years ago. |
| **Palaeozoic** | The era of geological time from the end of the Proterozoic to the beginning of the Mesozoic; between about 580 and 250 million years ago. |
| **Paleoproterozoic** | The oldest of the three Proterozoic eras; between about 2,500 and 1,600 million years ago |
| **Petrology** | The study of rocks, especially in terms of the arrangement and origin of their mineral components. |
| **Plunge** | The downward direction of the long axis of a rock unit or lineation. |
| **Plutonic** | Igneous rocks formed at great depth. |
| **Porphyry** | Igneous rock containing conspicuous phenocrysts (large crystals) in a fine grained groundmass; usually intrusive. |
| **ppb or ppm** | Parts per billion (1,000 million) or parts per million. |
| **Proterozoic** | The younger portion of the Precambrian; from about 2,500 to 580 million years ago. |
| **Pyrite** | A mineral composed of iron sulphide (FeS2); “fools gold”. |
| **Pyroxene** | A mineral group of alumino-silicate composition. |
| **Pyrrhotite** | An iron sulphide mineral. |
| **Quartz** | A mineral composed of silicon dioxide. |
| **RAB** | See Rotary Air Blast. |
| **Radiometric** | Measurement of radiation. An airborne radiometric survey may distinguish different rock units on the basis of their inherent radioactive minerals. |
| **RC** | See reverse circulation. |
| **Reef** | A tabular or vein like deposit of valuable mineral between well defined walls. |
| **Resource** | In-situ mineral occurrence for which there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics, and continuity are known, estimated, or interpreted from specific geological evidence and knowledge. |
| **Reverse circulation (RC)** | A percussion drilling technique in which the cuttings are recovered through the drill rods thus minimising sample losses and contamination. |
| **Rotary air blast (RAB)** | Rotary drilling technique in which sample is returned to surface outside the rod string by compressed air. |
| **Sandstone** | A sedimentary rock composed primarily of sand-sized grains. |
| **Scheelite** | A tungsten mineral, of composition CaWO4. |
| **Sediment** | Rock formed by the deposition of solid grains from water. |
| **Shaft** | Vertical opening to underground workings. |
| **Shear** | A zone in which rocks have been deformed, primarily in a ductile manner, as a result of applied stress. |
| **Siltstone** | A very fine-grained sedimentary rock composed predominantly of silt-sized grains. |
| **Skarn** | A metamorphic rock formed by the addition of elements to a carbonate rock by contact metamorphism from an igneous intrusion. |
| **Slate** | A very fine- grained medium-grade metamorphic rock formed from shale. |
| **Soil sampling** | Systematic collection of soil samples at a series of different locations in order to study the distribution of soil geochemical values. |
| **Strike** | The direction of a rock layer or structure on a level surface. |
| **Structural** | Pertaining to geological structure; including folds, faults, shears, cleavage, and joints. Structures range from regional scale to microscopic. |
| **Sulphide** | A mineral compound containing sulphur and metal. |
| **Tungsten** | The metallic element (chemical symbol W). |
| **Twinned holes** | A pair of parallel holes drilled close together. |
| **Vein** | A thin sheet-like intrusion into a fissure or crack, commonly bearing quartz. |
| **Volcanic** | Descriptive of rocks originating from volcanic activity. |
| **W** | The chemical symbol for the element tungsten. |
| **Weathering** | The processes by which rocks at or near the Earth’s surface change in mineralogical and chemical composition due to the action of air, water, plants, and temperature changes. |
| **Wolfram** | The element tungsten. |
| **Wolframite** | A tungsten mineral, of composition (Fe, Mn)WO4. |
| **Workings** | Minor scrapings, pits, or shafts dug by prospectors or small scale miners; mostly historical. |
| **Zinc** | The metallic element (its chemical symbol is Zn). |
| **Zn** | The chemical symbol for the element zinc. |

## Abbreviations and Measures

| | |
|---|---|
| **tpa** | Tonnes per annum |
| **tpm** | Tonnes per month |
| **g/t** | Gramme per tonne |
| **ppm** | Parts per million |
| **ZAR/t** | Rands per tonne |
| **US$/oz** | US dollars per ounce |
| **km** | Kilometre |
| **m** | Metre |
| **$m^3$** | Cubic metre |
| **µm** | Microns |
| **ha** | Hectare |
| **Mt** | Million tonnes |

Conversion factors from metric units to imperial units are provided below.

| **Metric unit** | | **Imperial equivalent** |
|---|---|---|
| 1 gramme | =1 g | =0.03215 troy ounces |
| 1 gramme per tonne | =1 g/t | =0.03215 troy ounces per tonne |
| 1 kilogramme per tonne | =1 kg/t | =32,15 troy ounces per tonne |
| 1 hectare | =1 ha | =2.47105 acres |
| 1 kilometre | =1 km | =0.621371 miles |
| 1 metre | =1 m | =3.28084 feet |
| 1 centimetre | =1 cm | =0.39370 inches |

## List of Abbreviations:

| | |
|---|---|
| **amsl** | above mean sea level |
| **Au** | gold |
| **AusIMM** | Australian Institute of Mining and Metallurgy |
| **BEE** | Black Economic Empowerment |
| **BFS** | Bankable Feasibility Study |
| **bn** | billion |
| **cmg/t** | centimetre grams per tonne |
| **CPR** | Competent Persons Report |
| **Cu** | copper |
| **EIA** | Environmental Impact Assessment |
| **EMC** | Eurus Mineral Consultants |
| **EIS** | Environmental Impact Study |
| **EMPR** | Environmental Management Programme Report |
| **g** | gram |
| **g/t** | grams per tonne |
| **H** | hour |
| **ha** | hectares |
| **IRR** | internal rate of return |
| **JORC** | Joint Ore Reserves Committee |
| **JSE Limited** | Johannesburg Stock Exchange |
| **k** | kilo or thousand |
| **km** | kilometre |
| **l** | litre |
| **m** | metres |
| **MAICD** | Member of Australian Institute of Company Directors |
| **MAIG** | Australian Institute of Geoscientists |
| **mamsl** | metres above mean sea level |
| **MMRS** | Mineral and Mining Reclamation Services |
| **MPRDA** | Minerals Petroleum and Resources Development |
| **MPRRB** | Minerals Petroleum and Resources Royalty Bill |
| **Mt** | million tonnes |
| **my** | million years |
| **NPV** | net present value |
| **pa** | per annum |
| **ppb** | parts per billion |
| **ppm** | parts per million |
| **RC** | Reverse circulation |
| **SAIMM** | South African Institute of Mining and Metallurgy |
| **SAMREC** | South African Mineral Resources Code |
| **t** | tonnage |
| **tpa** | tonnes per annum |
| **tpd** | tonnes per day |
| **USD** | United States Dollars |
| **ZAR** | South African Rand |