operational review

THE BEATRIX OPERATION

Beatrix is located in the Free State province of South Africa, some 240km south-west of Johannesburg, near Welkom and Virginia. Beatrix operates under mining rights covering a total area of 16,821ha.

It is principally an underground mine with nominal surface reserves represented by surface rock dumps accumulated during the operating history of the mine. Beatrix has three operating shaft systems, with two ventilation shafts to provide additional up-cast and down-cast ventilation capacity. Beatrix is serviced by two metallurgical plants.

Beatrix is a shallow to intermediate-depth operation, mining at depths of between 700m and 2,200m below surface. Beatrix has access to the national electricity grid and to water, road and rail infrastructure and is located near regional urban centres where it can routinely obtain supplies.

The present scope of operations is the result of the consolidation on 1 July 2002 of the adjacent Beatrix and Oryx mines (No 4 shaft, also known as West Section).

Gold mining commenced at Beatrix in 1985 and at Oryx in 1993.

Geology

Beatrix exploits the Beatrix Reef (BXR) at shafts No 1, 2 and 3, and the Kalkoenkrans Reef (KKR) at shaft No 4. The reefs are developed on the Aandenk erosional surface and dip to the north and north east at between four and nine degrees.

In general, the BXR occurs at depths of between 570m and 1,380m and the KKR at depths of between 1,800m and 2,200m. Both reefs are markedly channelised and consist of multi-cycle, upward-fining conglomerate beds with sharp erosive basal contacts. A general east-west trending pay-zone, some 500m to 800m wide, has been identified east of shaft No 4 and is known as the main channel. Zone 5 extends south of the main channel and represents the majority of the reserves at the operation.

Development at the Beatrix West Section has been reduced significantly since the 2013 underground fire. Further limited development has been approved for 2014 and the main focus areas will be the Syncline and North Block development.

Infrastructure

Beatrix has three producing shaft systems and two gold metallurgical plants with the following capacities:

Shaft system	Hoisting capacity
No 1 – North	138,000tpm
No 3 – South	170,000tpm
No 4 – West	120,000tpm

Processing plant, capacity and recoveries

Plant	Capacity	Recovery factor
No 1 plant (commissioned in 1983)	240,000tpm	95.5%
No 2 plant (commissioned in 1992)	130,000tpm	95.5%

‘Beatrix achieved a 64% reduction in the fatality rate.’

Processing occurs by way of carbon-in-leach (CIL) and carbon-in-pulp (CIP) treatment at the No 1 and No 2 plants respectively. In 2004 a Knelson concentrator was installed at No 1 plant which removes gold early in the metallurgical process. A gravity concentrating circuit, which was commissioned in November 2006, was installed at No 2 plant in order to reduce locked-up gold in the mills and to improve the overall recovery.

Operational review

Detailed below are the operating and production results for the past two financial years.

Production		2013			2012		
		u/g	Surface	Total	u/g	Surface	Total
Main development	m	**17,531**	**–**	**17,531**	20,117	–	20,117
Area mined	m^2	**434,438**	**–**	**434,438**	392,412	–	392,412
Tons milled	`000	**2,371**	**1,720**	**4,091**	2,069	1,299	3,368
Yield	g/t	**3.9**	**0.3**	**2.4**	4.2	0.3	2.7
Gold produced/sold	kg	**9,195**	**527**	**9,722**	8,656	325	8,981
	`000oz	**295.6**	**17.0**	**312.6**	278.3	10.4	288.7

Main development decreased year-on-year due to the fire at the West Section and the subsequent re-planning of the development during the Section 189 process. North and South sections increased by 892m and 241m respectively while West Section reduced main development by 3,719m.

The year-on-year increase in the area mined resulted in an increase in the tonnages milled and gold sold, despite a marginal decrease in the yield from underground material. The main reason for the increase in production was the prolonged duration of the industrial action in 2012.

Costs and margins		2013	2012
Operating cost	R/t	**731**	779
– underground	R/t	**1,201**	1,221
– surface	R/t	**84**	74
Operating profit	Rm	**1,223**	1,291
Operating margin	%	**29%**	33%
Capital expenditure	Rm	**537**	658
– sustaining	Rm	**201**	211
– ORD	Rm	**336**	447
All-in cost	R/kg	**377,206**	380,258
	US$/oz	**1,222**	1,444
All-in cost margin	%	**13%**	13%
Total cash cost	R/kg	**306,593**	294,277
	US$/oz	**993**	1,118

Operating costs increased by 14% due to the above-inflation wage increase effective from 1 July, the increased electricity tariffs, general inflation and the increased production (tons milled increased by 21%). Despite the increase in costs, the All-in cost figure decreased to R377,206/kg and the cost per ton milled decreased by 6% to R731/t.

Sustaining capital remained constant year-on-year. The reduction in the ore reserve development in 2013 was as a result of the impairment at Beatrix West Section in June 2013, whereafter all ore reserve development was expensed.

Improvements were achieved on all safety indices with the most notable being the 64% reduction in the fatality rate. The rollout of the auditing team's mid-2013 report resulted in a significant improvement in the physical condition of the underground workings, which contributed toward the achievement of the safety objectives.

During 2013, in consultation with the unions and other stakeholders a Section 189 process was conducted. A large number of employees left the Group by taking voluntary or early retirement packages as part of the Section 189 avoidance measures and forced retrenchments were minimised.

operational review continued

THE DRIEFONTEIN OPERATION

Driefontein is located on the Far West Rand, in the mining district of Oberholzer, some 70km south-west of Johannesburg and in Gauteng province. Driefontein operates under mining rights covering a total of 8,561ha.

It is an underground mine with surface reserves represented by rock dumps and tailings storage facilities (TSFs) that have been accumulated throughout the operating history of the mine.

Driefontein has seven operating shaft systems and three metallurgical plants, and operates at depths of between 700m and 3,420m below surface.

Driefontein has access to the national electricity grid and to water, road and rail infrastructure and is located near regional urban centres where it can routinely obtain supplies. Driefontein was formed from the consolidation in 1981 of the East Driefontein and West Driefontein mines.

Geology

Gold mineralisation at Driefontein is contained within three reef horizons: the Carbon Leader Reef (Carbon Leader), the Ventersdorp Contact Reef (VCR) and the Middelvlei Reef (MVR), which occur at depths of between 500m and 4,000m. Stratigraphically, the Carbon Leader is situated 40m to 70m below the VCR and MVR, and is a generally high-grade reef comprising different facies. It dips to the south at approximately 25 degrees. The Carbon Leader sub-crops against the VCR in the eastern part of the mine. The west-dipping Bank Fault defines the eastern limit of both reefs. The VCR is most-extensively developed in the east, and sub-crops to the west. The MVR is a secondary reef, situated approximately 50m above the Carbon Leader and, at present, is a minor contributor to reserves and production. The average gold grades vary with lithofacies changes in all of the reefs.

Infrastructure

Driefontein comprises seven producing shafts systems and three gold metallurgical plants with the following capacity:

Shaft system	Hoisting capacity
No 1	101,000tpm
No 2	165,000tpm
No 4	57,000tpm
No 5	159,000tpm
No 6*	26,000tpm
No 8	55,000tpm

* Shaft No 6 Tertiary and 6 Main are currently only operated on a limited scale, with the focus on reclamation and cleaning and shaft No 10 remains a pumping facility.

No 1 plant was upgraded in 2004 with a processing capacity of 240,000 tpm and treats underground ore from the Driefontein shafts. The upgraded circuit at No 1 plant consists of a semi-autogenous (SAG) mill circuit followed by cyanide leaching, CIP and a central Zadra elution facility.

No 2 plant underwent a modernisation and plant upgrade programme in 2003. Driefontein surface rock-dump material is delivered to No 2 plant by rail and truck to the plant feed bunkers. The plant flow incorporates two SAG mills and a ball milling circuit, cyanide leaching and a CIP plant.

No 3 plant, originally commissioned as a uranium plant, was converted to a low-grade surface rock-treatment gold plant in 1998. The plant was constructed using a combination of new as well as existing equipment on site. Similar to No 2 plant, ore is received from surface rock dumps by rail and truck. The plant has four SAG mills followed by cyanide leaching and CIP.

Loaded carbon from No 2 and No 3 plants is trucked to No 1 plant and processed at the central elution and smelting facility. Further upgrading of the No 2 plant is planned for 2014.

Operational review

Detailed below are the operating and production results for the past two financial years.

Processing plant, capacity and recoveries

Plant	Capacity	Recovery factor
No 1 plant (commissioned in 1972)	240,000tpm	97%
No 2 plant (commissioned in 1964)	150,000tpm	85%*
No 3 plant (commissioned in 1998)	100,000tpm	85%

* Currently at 78% due to decreased leach circuit residence time as a result of failure of two leach tanks. New CIL tanks will be constructed in 2014 to achieve a minimum of 90% recovery.

'Driefontein comprises seven producing shaft systems and three gold metallurgical plants.'

Production		2013			2012		
		u/g	Surface	Total	u/g	Surface	Total
Main development	m	**17,751**	**–**	**17,751**	20,136	–	20,136
Area mined	m^2	**397,579**	**–**	**397,579**	320,949	–	320,949
Tons milled	`000	**2,527**	**2,783**	**5,310**	1,886	2,849	4,735
Yield	g/t	**6.7**	**0.7**	**3.5**	5.9	0.9	2.9
Gold produced/ sold	kg	**16,927**	**1,848**	**18,775**	11,180	2,548	13,728
	`000oz	**544.2**	**59.4**	**603.6**	359.5	81.9	441.4

While the main development metres mined dropped by 12% year-on-year, the achievement exceeded plan for 2013 by 15%. Production volumes increased by 24% from 2012 with improvements shown at all mining units. This can partly be attributed to a recovery from the fire at mining unit 2 and from the industry-wide strike, which affected production during the latter half of 2012, together with a general increase in productivity at all shafts. Production volumes from surface were relatively unchanged but at a lower grade. The lower grades were aligned with the plan due to the depletion of available higher-grade surface rock dumps. Underground gold produced increased by 51% which, apart from the increase in underground volumes, was a result of an increase in the average mined face grades from 1,649cm.g/t to 1,847cm.g/t and an improvement in the mine call factor from 75% to 86%.

Costs and margins		2013	2012
Operating cost	R/t	**919**	909
– underground	R/t	**1,750**	2,057
– surface	R/t	**165**	148
Operating profit	Rm	**3,282**	1,644
Operating margin	%	**40**	28
Capital expenditure	Rm	**1,023**	1,091
– sustaining	Rm	**320**	241
– ORD	Rm	**703**	850
All-in cost	R/kg	**332,660**	404,881
	US$/oz	**1,078**	1,538
All-in cost margin	%	**23**	7
Total cash cost	R/kg	**265,997**	311,211
	US$/oz	**862**	1,182

As detailed above, with production significantly affected late in 2012 and the restructuring process undertaken since unbundling, unit costs and margins improved considerably during 2013. The operating margin increased to 40% from 28% and, more importantly, the All-in cost margin increased to 23% from only 7% achieved in 2012. Underground tons milled increased to 2.53Mt from 1.89Mt in 2012 and cost per ton reduced to R1,750/t from R2,057/t. Operating profit doubled, despite a flat average gold price received, due to the increase in gold production. The majority of capital expenditure was spent on ORD, energy-saving projects, relocation of laboratory and social and safety projects. The weaker rand resulted in significantly lower unit costs in US dollars compared with the improved rand unit costs.

Safety

Driefontein showed an overall improvement in all safety lagging indicators, particularly the FIFR, which improved by 64% and was the lowest ever recorded by the mine to date.

With the introduction of AMCU as the new majority employee representative union, a new Health and Safety Agreement has been concluded and the mine is in the process of finalising full-time elections of Health and Safety representatives. Thereafter, a Joint Health and Safety Committee will be established in line with the agreement.

operational review continued

THE KLOOF OPERATION

Kloof is located in the Far West Rand mining district of Westonaria, some 60km south-west of Johannesburg in Gauteng province. Kloof operates under mining rights covering a total of approximately 20,100ha. It is principally an underground mine with nominal surface reserves represented by surface rock dumps and TSFs accumulated during the operating history of the mine.

Kloof has multiple operating shaft systems and three metallurgical plants one of which (KP2) processes underground ore from all the Kloof shafts. The remaining two process low-grade ore from surface rock dump (SRD) sources (KP1 and the Python plants).

Kloof is an intermediate to ultra-deep level mine, with operating depths of between 1,300m and 3,500m below surface. Kloof has access to the national electricity grid and to water, road and rail infrastructure and is located near regional urban centres where it can routinely obtain supplies. Kloof's present scope of operations is the result of the consolidation in 2000 of the Kloof, Libanon, Leeudoorn and Venterspost mines. Gold mining began in the area now covered by these operations in 1934.

Geology

Kloof is located on the West Wits Line that forms the Far West Rand of the Witwatersrand Basin. The majority of production at Kloof is from the VCR, which occurs at depths of between 1,300m and 3,350m below surface. The VCR is a tabular orebody that has a general northeast-south-west strike and that dips to the south-east at between 20 and 45 degrees. The MVR is classified as Kloof's secondary reef and further minor production volumes are delivered from the Kloof Reef and the Libanon Reef.

Kloof lies between the Bank Fault to the West, and the north trending West Rand Fault to the east. The latter truncates the VCR along the eastern boundary of the mine, with a 1km to 1.5km upthrow to the east. Normal faults are developed sub-parallel to the west-dipping West Rand Fault, with sympathetic north/north-east trending dykes that show little or no apparent offset of the stratigraphy. A conjugate set of faults and dykes occurs on a west/south-west trend, with throws of one to 50m. Structures that offset the VCR increase in frequency toward the southern portion of the mine as the Bank Fault is approached.

Infrastructure

Kloof comprises five producing shafts systems and three gold metallurgical plants with the following capacities:

Shaft system	Hoisting capacity
No 1	100,000tpm
No 3	36,000tpm
No 4	82,000tpm
No 7	58,000tpm
No 8	73,000tpm

KP1 was commissioned in 1968 and originally designed as a reef plant. It currently treats ore from surface rock dumps. The plant is comprised of three-stage crushing, open-circuit rod mills for primary grinding and closed circuit pebble mills for secondary milling. This is followed by cyanide leaching, filtration, zinc precipitation and smelting. In June 2001, a CIP pumpcell was installed to replace the less-efficient filtration and zinc precipitation and smelting was discontinued. Loaded carbon is transported by truck to KP2 for treatment at an independent elution facility. In 2013, all crushing was stopped, the secondary crushing circuit was bypassed and modifications were made to the conveyor feed ore-delivery system with the addition of an overland conveyor completed to allow screened material from the SRD's to feed the mill silos directly.

In November 1990, KP2 was commissioned and currently treats all of Kloof's underground ore. Reef is trucked and conveyed to a central stacker pad which feeds two SAG mills equipped with variable-speed ring motor drives. Milling is followed by cyanide leaching, CIP and treatment at an independent elution and smelting facility. The elution facility was upgraded in June 2001 and again in October 2003 to process loaded carbon from KP1 and the former KP3 (Libanon) plant.
The upgrade included the installation of continuous electrowinning sludge reactors.

A new pilot Python 500 plant was commissioned in February 2011 to treat SRD by concentrating the feed-grade material through screening, optical sorting and liberation of gold through comminution using a Vertical Shaft Impact (VSI) Crusher. Gold was to be recovered by a jig and flotation circuit followed by intensive cyanide leaching and carbon-in-columns. This was later replaced by an upgraded Python 2500 in July 2013 which is still being optimised.

Processing plant, capacity and recoveries

Plant	Capacity	Recovery factor
No 1 plant (KP1) commissioned in 1968	165,000tpm	90%
No 2 plant (KP2) commissioned in 1990	105,000tpm	98%
No 3 plant (KP3/Python) was originally commissioned in February 2011 and an upgraded unit recommissioned in July 2013	140,000tpm	85%

Operational review

Detailed below are the operating and production results for the past two financial years.

Production		2013			2012		
		u/g	Surface	Total	u/g	Surface	Total
Main development	m	**19,331**	**--**	**19,331**	16,438	–	16,438
Area mined	m^2	**300,985**	**--**	**300,985**	277,855	–	277,855
Tons milled	`000	**1,898**	**2,325**	**4,223**	1,801	2,281	4,082
Yield	g/t	**7.7**	**0.6**	**3.8**	7.7	0.7	3.8
Gold produced/sold	kg	**14,533**	**1,444**	**15,977**	13,866	1,484	15,350
	`000oz	**467.3**	**46.4**	**513.7**	445.7	47.8	493.5

Main development improved by 18% year-on-year with increases at all shafts. The long-life, high-grade No 2 and 4 shafts both increased their development profile by more than 10%. Square metres mined increased by 8% mainly due to recovery from the industry-wide strike which affected production during the latter half of 2012. Normalised production was relatively unchanged. Tonnages milled from surface sources as well as surface yields were marginally lower than in the previous year, but underground face grades mined improved by 2%. When coupled with the improvement in underground volumes, the total gold produced improved by 627kg year-on-year, or 4%.

Costs and margins		2013	2012
Operating cost	R/t	**971**	955
– underground	R/t	**1,982**	1,967
– surface	R/t	**146**	156
Operating profit	Rm	**2,854**	2,795
Operating margin	%	**41%**	42%
Capital expenditure	Rm	**1,304**	1,335
– sustaining	Rm	**460**	504
– ORD	Rm	**844**	831
All-in cost	R/kg	**353,884**	355,915
	US$/oz	**1,147**	1,352
All-in cost margin	%	**19%**	18%
Total cash cost	R/kg	**261,570**	258,241
	US$/oz	**847**	981

The underground unit cost per ton increased marginally year-on-year despite above-inflation wage increases, increases in electricity costs and general inflation, as this was mostly offset by the restructuring and cost-saving initatives implemented during 2013. Surface unit cost per ton decreased year-on-year by 7% due to an increase in tons milled and reduced ore-handling costs. Margins and other unit costs were similar year-on-year as the increased production was offset by the higher costs. Capital expenditure was similar year-on-year with the majority of expenditure on ore reserve development, the new Python processing plant, SLP housing projects and technical improvement projects. The reduction in the US dollar unit cost was mainly due to the weaker rand.

Safety

Kloof unfortunately had four fatalities in 2013. In spite of the regression measured against the one fatality, as recorded during 2012, the longer-term trend is positive for all key safety lagging indicators. Kloof received a number of safety awards for the year. The implementation of the overall organisational safety strategy will remain a key focus, in order to realise continual improvement.

Energy

Energy consumption for 2013 was 1,718MWh lower than 2012, in spite of significantly increased production year-on-year.

Water

Total water withdrawal in 2013 (76,636Ml) was higher than in 2012 (64,788Ml). Shafts and plants must explore the use of mine water for industrial applications and so reduce the use of potable water for industrial purposes.