SOUTH AFRICA

By a Special Contributor

South Africa's mining industry went through yet another year of rapid change in 2002. Government plans to speed the entry of black investors into the industry progressed and as the rand's progressive strengthening against the dollar crimped rand revenues from the sales of internationally-traded commodities.

The new Minerals Development Act (legislated in December 2002) and the subsequent Mining Charter and Scorecard set the rules for transfer of part ownership of the country's mining industry from white to black hands. Government itself said it would take ownership of many previously privately-owned mineral rights and set the rule as "use it and keep it". In other words, mineral rights owners would be obliged to exploit mineral rights within a specified time frame or risk seeing mining rights on those reserves transferred to other operators.

The Mining Charter set a compulsory target of 15% black participation in the industry within five years and a non-compulsory target of 26% within ten years. The 15% would be calculated in various ways, not simply ownership. Compliance would be measured in terms of the so-called Scorecard. The principal mining companies had resisted government's proposals for some years before accepting the inevitable in 2002. Fears were expressed that the new legislative framework would deter foreign investors from investing in South African mining ventures. As it was, when government's draft version of the Mining Charter was leaked to the media in the latter part of 2002 with indications that government was targeting 51% black ownership of the industry, between a quarter and a third was wiped of the stock market value of South African mining shares.

In March 2003, the South African Government announced draft proposals for additional royalties to be paid on gross mineral sales ranging from 3% on gold, 4% on platinum, 8% on diamonds and 2% on a range of base metals. The proposed increases aroused a degree of controversy and opposition from the mining industry.

In addition, the final report of South Africa's Truth and Reconciliation Commission (TRC) recommended that companies which had allegedly benefited from apartheid should be obliged to make reparations. At the time of writing (March 2003) no concrete proposals had been made. However, mining companies were outraged at the TRC proposals.

When the TRC's recommendations were followed by initiation of law suits in the US against Anglo American and De Beers, the industry was outraged. Lawyers in the US demanded US$6.1billion from Anglo American alone as reparations for the group's so-called apartheid profits. The legal suit was not welcomed by the South African Government which does not want to deter investors from investing in the country.

Aluminium

South Africa does not mine any bauxite and, yet, it is expanding its aluminium smelting industry based on imported alumina and cheap electrical power. During 2002, negotiations neared conclusion with French aluminium company Pechiney over the establishment of a smelter at Coega in the Eastern Cape Province.

South Africa is committed to providing new port and infrastructure at Coega which will become the country's first industrial processing zone. At year's end, Pechiney had still to take the final decision.

During 2002, BHP Billiton said expansion plans for its Hillside 3 aluminium plant in South Africa and Mozal 2 in Mozambique were on track, and should boost the company's aluminium output by more than 400,000 t/y by 2006. Production at Mozal on completion of Mozal 2, will rise from 262,000 t/y to 534,000 t, and at Hillside from current capacity of 532,000 t/y of aluminium to 664,000 t/y.

The company expects that on completion of the Hillside expansion, a break-even cost price based on London Metal Exchange (LME) prices would be US$600/t. At Mozal, break-even costs after the expansion would be US$575/t.

Antimony

Consolidated Murchison, South Africa's only antimony producer, supplies about 8% of world demand for the metal and its derivatives. At present the mine produces some 35,000 t/mth of ore with a head grade of 1.4% Sb from three shafts. In the year to June 2002, production of concentrates ran at 9,570 t averaging 59% Sb.

In fiscal 2002 the company benefited from higher dollar prices as Chinese producers suffered production set-backs. It also benefited from the comparative weakness of the rand against the dollar. These conditions reversed as 2002 drew to a close.

At mid-2002 Consolidated Murchison had proved and probable reserves totalling 1.7 Mt averaging 2% Sb. A further 8.5 Mt of mineral resources were estimated at an average grade of 2.5% Sb. Development has focussed on deepening the mine's Beta shaft to give access to the reserves at depth.

Asbestos

South Africa's asbestos production has, to all intents and purposes, halted, with present and previous owners of asbestos mines being sued in the UK courts by former employees suffering from lung diseases. In March 2003, the former owner of the Msauli and Gefco mines settled a sum of R460 million spread over a period to cover claims.

Chrome

South Africa's Bushveld Igneous Complex contains an estimated 80% of the world's chromite reserves which, over the past few decades, has allowed the country to become the world's largest producer of ferro-chrome.

Samancor, the largest individual producer believes that its 1,800 Mt of chromite reserves are sufficient to sustain operations for at least 200 years, even if production escalates from current extraction rates of 4 Mt.

As 2002 drew to a close, it was widely believed that government would push for large holders of chromite reserves to transfer mining rights to black mining firms. Whether this will transpire is a moot point. Chrome and ferro-chrome are capital-intensive operations which generate strong revenues but comparatively poor investment returns. This could deter prospective black investors who might need to borrow to fund investment purchases or greenfields developments.

In March 2003, SA Chrome announced a feasibility study to increase its then current 235,000 t annual ferro-chrome production rate by 500,000 t to serve Chinese stainless steel maker Jiuquan Iron & Steel. But while some producers have been expanding capacity, others have been moth-balling older ferro-chrome facilities. Samancor Chrome closed its Palmiet facility in 2002, but will maintain it as a swing producer.

In what was seen as a strange move, India's Tata Steel announced plans to establish a ferro-chrome production facility near the port of Richards Bay. The intention is to import chrome ore from India for processing into ferro-chrome. Initial reports indicated that the project's viability would depend on favourable funding from South Africa's state-owned Industrial Development Corporation.

Coal

Ready availability of coal on world markets affected South Africa's export collieries until comparatively late in 2002. But though dollar prices were stodgy, the rand's progressive weakness helped rand-denominated export revenues. Even so, all of the major coal owners reduced production in 2002, particularly as the rand started a recovery against the dollar as the year progressed.

BHP Billiton closed its 3 Mt/y Rietspruit colliery, Xstrata sliced an annual 800,000 t of production at its Duiker collieries and Anglo American Coal adjusted production to ensure that stockpiles did not increase. The cut-backs contributed to the softness of exports through the coal terminal at Richards Bay. Contributing to the problem were bottlenecks that continued to affect exports through the Richards Bay Coal Terminal (RBCT).

The net result was that the year's shipments of 65.8 Mt were below the targeted 68 Mt. During the first two months of 2003 shipments were higher but, on an annualised basis, they were still below the 68 Mt target and Richards Bay's 72 Mt theoretical annual capacity.

RBCT has an expansion programme which should see its annual handling capacity increased by 10 Mt by 2005-2006. Two thirds of this expanded capacity is to be earmarked for smaller producers who do not have allocations to export through the existing facility.

In 2002, BHP Billiton initiated a feasibility study into a proposed a R1,200 million coal mine at Klipspruit in Mpumalanga Province. This would be replacement capacity for the company's Reitspruit colliery (owned 50:50 with Xstrata) closed earlier in the year because of weakening coal prices. Rietspruit had produced about 4 Mt/y of coal, most of which was exported to Europe. If the Klipspruit mine goes ahead it could produce about 3 Mt/y of energy coal. Apart from the final closure of Rietspruit in May 2002, BHP Billiton's Ingwe subsidiary accelerated the closure of part of its Koornfontein colliery. It adjusted production at other collieries, in part by bringing forward scheduled major maintenance of draglines.

The strategies of Xstrata, the Swiss-domiciled mining group, typified much of the South African coal mining industry. In 2002 it closed the jointly-owned Rietspruit colliery where reserves had been depleted and closed the high-cost Strathrae colliery. To compensate, Xstrata re-opened the South Witbank colliery after re-equipping and refurbishing it. As a result, the underground mine recorded costs of around US$6/t free on rail, and Xstrata set about introducing new technologies and systems at its other South African mines. And this, in turn, contributed to a 13% cut in employee numbers and a 14% productivity improvement measured in terms of run-of-mine product per employee.

Extending the productivity drive, by early-2003 Xstrata was negotiating 'strategic reserve swaps' that would allow it to extend longwalls into neighbouring properties.

The owners of Kangra, the privately-controlled colliery operator, sold a 25% interest in their company to MCI Resources, a black empowerment company, early in 2003. MCI is controlled by Cyril Ramaphosa, the first and former general secretary of the all-black National Union of Mineworkers. The sale was in line with government targets for black ownership of the largely white-run mining sector.

Other sales by large companies to black empowerment companies were Billiton BHP's sale of its Delmas colliery and Anglo American's sale of its entire reserves in KwaZulu-Natal. Both sales were at peppercorn prices.

Small colliery operators were outraged early in 2003 when state-owned railway operator Spoornet announced rail tariff increases of around 60% for deliveries to the Maputo and Durban harbours. This was followed by the closure of some smaller export mines that could not tolerate the increase. Nevertheless, others such as mid-tier miner Metorex was not deflected from its ambition to quadruple its coal exports to about 500,000 t/y through Maputo.

Copper/Lead/Zinc

Palabora, South Africa's principal copper miner, realised that the rand's strength against the dollar and a delayed ramp-up of underground production had resulted in the need to re-finance the company with a US$90 million borrowing. By end-February 2003, Palabora had spent US$409 million on converting to underground operations from open pit. Underground development was 94% complete at that stage, but problems with large rocks blocking underground ore drawpoints meant that daily ore tonnage stood at only 10,000 t against an expected 30,000 t. Management is confident the problem will resolve itself as the underground block cave develops.

Diamonds

During the first half of 2002, sales of rough diamonds by De Beers' Diamond Trading Company were particularly strong and contributed to a 16% increase in sales for the entire year to US$5.15 billion. However, demand at the retail level flagged during the second half of the year, leading to warnings by De Beers that 2003 was likely to be a difficult year for sales.

In 2002, production was lower at all but one (Venetia) of De Beers' South African mines so that only 10.4 Mct were produced against 10.7 Mct in 2001. Whilst there were various technical factors which accounted for this decline, there has been no indication of any new mines being brought into production in South Africa. Most exploration expenditure is now outside South Africa, notably in Canada, India and Botswana

Nevertheless, De Beers is engaged in an expansion programme at its South African mines aimed at increasing annual production to 12 Mct from the present level of about 10 Mct. Most of that increase will come from the Venetia mine which, at present, provides almost half of the company's South African output.

Completion of a R820-million treatment plant to process old dumps and tailings will help increase the life of the company's Kimberly underground operations to the year 2009 and its surface operations beyond 2030. Additional production will come from optimisation of operations at existing mines in Namaqualand and at the Premier mine near Pretoria. Apart from its mining operations, De Beers' principal focus has been on managing the negative impressions among consumers of the question of so-called 'conflict diamonds'. By the start of 2003 the group had also still to resolve the concerns of EU competition authorities over the rough-diamond marketing agreement with Russia. Furthermore, the long-running dispute with the US anti-trust authorities shows no signs of coming nearer to resolution.

Among the smaller producers, Namakwa Diamond Co. spent much of 2002 evaluating alluvial diamondiferous gravels on South Africa's Namaqualand coast. By year's end, some preliminary results had encouraged the company to extend the testing programme. The company had set itself an annual production target of 100,000 ct to make any mining worthwhile.

In the Kimberley area, black empowerment company New Diamond Corp. acquired De Beers' dormant Kamferdam mine and various dumps with the intention of re-starting operations. And, in a larger deal, black empowerment firm Mvela Resources increased its interest in diamond miner Trans Hex to 19.4%.

Fluorspar

With the 2001 re-opening of the Buffalo Fluorspar mine, South Africa's production of fluorspar had been expected to increase by about half to a maximum of 350,000 t/y by 2006. The country's annual production, from three operating mines, had run between 200,000 t and 237,000 t between 1996 and 2000 and reached 286,000 t in 2001 with Buffalo's re-opening. However, an ownership dispute between Buffalo's present and previous owners led to the mine's closure in 2002 and a drop in national production to 227,000 t.
Buffalo's owners hope to re-open the mine in 2003.

Apart from the Buffalo disruptions, South Africa's fluorspar exporters continue to be plagued by rail transport problems. Shortages of rolling stock remain a problem, and long transport times cause difficulties at harbours.

Gold

The gold-mining industry's performance during 2002 was driven by the rand's early weakness against the dollar and the consequent increase in the rand price of gold received by the mines. This prompted a round of exploration and re-evaluation of ore lying as extensions to existing mines.

The rand gold price advance was leading companies to estimate that average recovery grades would be likely to fall in 2003, with previously-sub-marginal ore now capable of being mined profitably. However, the announcement that gold mines would be subject to a 3% royalty on gross revenues prompted several analysts to opine that mines would increase their cut-off grades or high-grade their operations. This, analysts warned, could lead to a shortening of several mines' lives.

During 2002 AngloGold, for one, initiated a significant reduction in its hedge book, saying that the rand gold price meant that the company no longer needed to manage its revenue flow as comprehensively through hedging. In the longer term the gold-mining industry faces a potential time bomb. According to AngloGold estimates, almost one third of its employees are HIV positive. Major groups such as AngloGold and Gold Fields are actively pursuing a policy of treating employees with Aids-related diseases. This is not simply based on humanitarian considerations but also because it is believed to be more cost-effective to treat rather than train new employees when those with Aids become incapable of working.

Another part of the trend in which the larger gold miners have sold assets to the smaller came early in 2003 when Avgold sold its veteran ETC mining interests in Mpumalanga Province for R300 million. The purchasers were mid-tier mining firm Metorex and MCI Resources, a black empowerment company controlled by former National Union of Mineworkers general secretary Cyril Ramaphosa.

ETC operates three mines and produces some 3 t/y of gold. Avgold, will use the proceeds from the sale to reduce debt. The Avgold sale mirrored to some extent AngloGold's earlier sale of its Free State mines which became effective at the very start of 2002. The Free State mines were sold to Freegold which is, itself, owned by Harmony Gold and ARMGold, a black-run mining company.

The rand:dollar exchange rate, which helped rand earnings in 2002 was expected to affect costs and revenues adversely in 2003. In its 2002 annual report, AngloGold estimated that its total cash costs would be US$209/oz at its South African mines. In 2002 costs across the AngloGold mine portfolio averaged US$161/oz and are expected to run at US$187/oz during 2003. The higher rand gold price, which stemmed from the rand's early weakness against the dollar, prompted AngloGold to examine new mining projects that could add an estimated 11 Moz of gold to the company's South African end-2002 reserves estimated at 47.5 Moz. The latter reserve figure represented an increase of one third on the previous year end's figure, again because the higher rand gold price had rendered previously un-pay ore payable.

In 2002, AngloGold's South African operations were affected by significant seismic events at the Great Noligwa mine. Overall gold production declined by 27% to 3,412,000 oz, largely as a result of the once-off decrease of 1,232,000 oz (26% on last year) attributable to the sale of the Free State assets. If the Free State operations are excluded from the 2001 production numbers, AngloGold's output decreased by 1% owing to the drop in production at Ergo.

Total cash costs decreased by 14% to US$158/oz, and even in Rand terms were well controlled to a 6% increase to R53,146/kg. This was despite an inflation rate of approximately 12% during the year. Productivity, in terms of the two main indices used – namely; grams per total employees costed (TEC) and m^2/TEC – improved by 8% to 223 and 4% to 4.58, respectively.

Harmony Gold, which has specialised in acquiring and operating low-grade mines previously-owned by larger mining groups, is to develop the Doornkop South Reef project which has an estimated gold resource of 6.6 Moz. The development is expected to cost R1.27 billion and to have an operating life of about 22 years. The South Reef project will also allow Harmony to extend its interaction with black economic empowerment (BEE) partners as envisaged by the Mining Charter. Payment for the BEE's participation will in part be satisfied by the granting of an option on its share of the project's gold production to Harmony.

Heavy minerals

The country's principal producers of heavy minerals remained highly secretive about their operations. Precious little information is disclosed because, most analysts believe, profit margins are particularly great.

Iron ore

South Africa's iron-ore sector was poised for significant rationalisation as 2002 drew to a close. London-registered mining group Anglo American plchad reported that it had acquired a 9.6% interest in Kumba, formerly the mining division of steelmaker Iscor, with the option to acquire a further 20.6% depending on approval by the competition authorities. Should Anglo American consolidate its holding, the door could be opened for a deal which rationalises inland and exports sales from the vast Northern Cape iron ore mines run by Kumba and Associated Manganese (Assmang). Rationalisation would make economic sense as ore from Kumba's mines to domestic steel plants crosses that from Assmang exported through the west coast port Saldanha Bay.

Kumba's chief executive, Con Fauconnier, reckoned that rationalisation would allow Kumba to add an annual 6 Mt to its current production in the Northern Cape. This would be in addition to the Sishen South project which is expected to deliver an annual 8.5 Mt but which awaits an agreement with an appropriate black empowerment partner.

Kumba itself ended 2002 forecasting firm ore prices based on Chinese demand. At present the company exports an annual 20 Mt of iron ore, of which about 9 Mt go to China. In 2002, China imported some 111 Mt of iron ore, with some forecasters estimating a rise to 130 Mt/y soon.

Manganese

South Africa's manganese companies are generally reluctant to disclose details of their operations for fear of giving international competitors a commercial advantage. However, some 80% of the world's known economically mineable high-grade manganese ore reserves occur near Hotazel in the Northern Cape Province.

Samancor Manganese operates two mines, Mamatwan and Wessels in this area. Mamatwan is an open-pit operation, mining a 20 m thick body of lower-grade manganese ore overlain by 50 m of Kalahari sand, gravels and calcrete. At Wessels, underground mining of a hydrothermally-enriched manganese ore of a higher grade occurs at a depth of 300 m. According to the company's marketing division, the variety of analyses enables Samancor to offer a range of products suitable for all applications, particularly as both ores are exceptionally low in phosphorus content.

Mamatwan's natural ore lends itself to technologically-advanced beneficiation processes. The dense-medium separation plant at Mamatwan beneficiates the ore prior to sintering. During the sintering process the ore is calcined, resulting in a physically strong and chemically stable product. The sintered product is reclaimed and transported to the rail-loading facility. Samancor's manganese mines at Hotazel have a combined annual capacity of 3.4 Mt of ore which includes 1.1 Mt used for sinter production.

Assore's new shaft at Nchwaneng manganese mine remained on schedule and within budget and should be completed by the end of 2003.

Platinum

South Africa’s platinum industry is in the throes of a major expansion that will see the country’s total output rise by well over half by the middle of this decade.

Anglo Platinum (Angloplat) expects to meet its expansion target to produce 3.5 Moz of platinum by 2006, but warned late in 2002 that this was likely to be achieved at an increased cost and with implications for the global platinum supply and demand balance. Delays were expected to retsrain production below originally expected levels in 2003 and 2004, according to Angloplat’s chairman Barry Davison.

The world's biggest platinum producer has changed the profile of its expansion plans as a result of a delay in getting mine authorisation on projects in the Eastern Bushveld earlier in the year. The delay Mr Davison was referring to came as the debate surrounding the country's new mining legislation was at its height and Angloplat called for authorisation to be speeded up. Angloplat estimated that expansion would cost R21.3 billion in 2003 monetary terms compared with an original estimate in 2000 of R17.1 billion.

Apart from conventional expansion projects, Angloplats is also planning a R1.6 billion tailings retreatment project at its Rustenburg platinum mines complex. The plant is expected to commence operations in 2004, reaching full production in 2006 at an average annual production rate of 120,000 oz of refined platinum and 38,000 oz of palladium.

Impala, the second largest producer, plans to double annual platinum production to 2 Moz within five years. Impala has three main mining operations Impala Platinum, Marula Platinum and Barplats. Of the three, the R1.7 billion Marula project is still in development and is scheduled to reach full capacity for phase one of the development of 103,000 oz/y of platinum in financial 2005. Impala, made several changes to the original mine design and planned production volumes are down substantially on the first design of 190,000 oz/y of platinum group metals. The new R1.7 billion mine has a life span of over 30 years and has comparatively shallow reserves estimated at 22.9 Mt of UG2 ore and at 45.5 Mt of Merensky reef. Notably, Implats is studying a possible 180,000 oz/y platinum operation at Two Rivers, in a joint venture with Avmin.

Barplats signalled that its Kennedy's Vale project feasibility study would be completed during the next current financial year which ends at end-June 2003. A decision on whether or not to go ahead with development of the mine is expected to be taken early in 2004.

New legislation aimed at expanding local beneficiation was reported to have prompted Northam to consider establishing a platinum refinery near Pretoria. The idea was that the new plant would be fed with concentrate from the new Messina and Cluff mines in addition to Northam’s own product which is currently refined in Germany.

Messina Platinum, which expects to be producing 120,000 oz/y of PGM from phase 1 of its Voerspoed project by April 2003, was examining proposals to treble production by 2006. Phase 1 Voorspoed section has a probable mineral reserve of 24.5 Mt averaging 4.98 g/t PGM. Later, phases 2 and 3 of the Messina development are expected to have a mine life of 30 years if mined to a depth of 1,000 m. The build-up phase would start with full production of between 340,000 oz and 360,000 oz/y of PGM and gold targeted to be reached by 2006-07.

Outside companies are gradually moving into South Africa's platinum sector, with second-tier companies such as London-listed Jubilee Platinum prospecting and evaluating rights on the eastern limb of the Bushveld Igneous Complex (BIC). Like others, Jubilee is seeking local black partners.

Others, which have black economic empowerment shareholders, are also evaluating and developing platinum-mining ventures as extensions of mines operated by the majors. Northam and empowerment grouping Bapo Ba Mogale negotiated participation in the Pandora project belonging to Angloplats and Lonmin Platinum. The joint venture will exploit the UG2 Reef near the town of Brits in North West Province. The parties will co-operate as participants in the joint venture which will be managed by Lonmin. The venture will use the existing infrastructure at Eastern Platinum mine to gain quick access to the adjacent mineral rights area.

A new 200,000 t/mth concentrator will be built on the Pandora mine area, adjacent to Eastern Platinum Mine, and three decline shaft systems will be installed, all of which will enable the joint venture to attain full ore output of 3.6 Mt/y about six years after commencement.

The Pandora mine will have mineable UG2 reserves and resources in excess of 130 Mt and is expected to produce 230,000 oz of refined platinum and 110,000 oz of refined palladium annually during its expected life of 30 years.

Aquarius Platinum has tied up a similar agreement with Impala.

An empowerment consortium comprising Maluti Mining, Khumo Bathong Holdings and Matodzi Resources is Angloplat's 50:50 partner in the development of the Der Brochen project on the eastern limb of the BIC.

The Der Brochen and Twickenham projects are the two key empowerment deals which Anglo Platinum agreed to, resulting in the Department of Minerals and Energy's approval of six Anglo Platinum mining applications in Limpopo Province in 2002.

Anglo Platinum agreed with the department that it would look for partners on these projects as the debate surrounding the country's new mining legislation intensified in August. The project, on one half of the Der Brochen farm, will cost about R3.2 billion to develop and will focus on the Bosendal part of the property, the southern part of Der Brochen.

It has been suggested, unofficially, that the state-owned Industrial Development Corp. may help fund the black partners' share of the cost of the development. It is estimated that the project could be producing about 160,000 oz/y of PGM by 2005, and has a potential mine life of 70 years.

Tin

South Africa's last operating tin mines, Rooiberg and Zaaiplaats, closed down a decade ago. However, small-scale production resumed in 2002 with the opening of a tin smelter in mid-2002 fed by concentrates recovered from mine dumps on the old Zaaiplaats and Rooiberg properties in Limpopo Province. The company hopes to supply about 80% of the 2,700 t of tin metal used each year by South African steelmaker Iscor.

Vanadium

The year 2002 was extremely volatile for South Africa's principal vanadium producer Highveld Steel & Vanadium. At the start of the year, prices were at barely economic levels. They rose as mid-year passed, collapsed to marginal levels in the third quarter before rising strongly again by year's end as Russian producers ran into difficulties.

In the event, Highveld's vanadium pentoxide slag production increased to 74,395 t from 2001's 73,666 t. Nevertheless, one kiln at subsidiary Vanchem remained closed, though the company says it can be re-started when market conditions are appropriate.

In December 2002, the US slapped punitive anti-dumping tariffs on South African and Chinese ferro-vanadium. However this is expected to have only a minor effect on Highveld as only a tenth of the company's sales are to the US. Highveld plans to bring on stream a vanadium steel production facility with Japanese partners Mitsui and Nippon Denko. It is scheduled to come on stream in June 2003 and its product will be exclusively for the Japanese market.

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Production Statistics 2002 (t unless otherwise stated)

Mineral	**2001**	**2002**
Gold (kg)	395.8	399.2
Coal (total)	224,182,000	224,921,473
Anthracite	N/a	1,420,453
Bituminous	N/a	223,501,020
Diamonds (ct)	N/a	10,876,130
Iron ore	43,757,000	36,484,015
Manganese ore	3,266,000	3,321,645
Chrome ore	5,502,000	6,435,746
Platinum Group Metals		
Total	**205.4**	**239.8**
Platinum (kg)	129.8	133.8
Palladium (kg)	62.1	64.2
Copper	141,865	129,589
Nickel	36,443	38,546
Zinc	61,221	64,173
Uranium oxide	1,065	998

