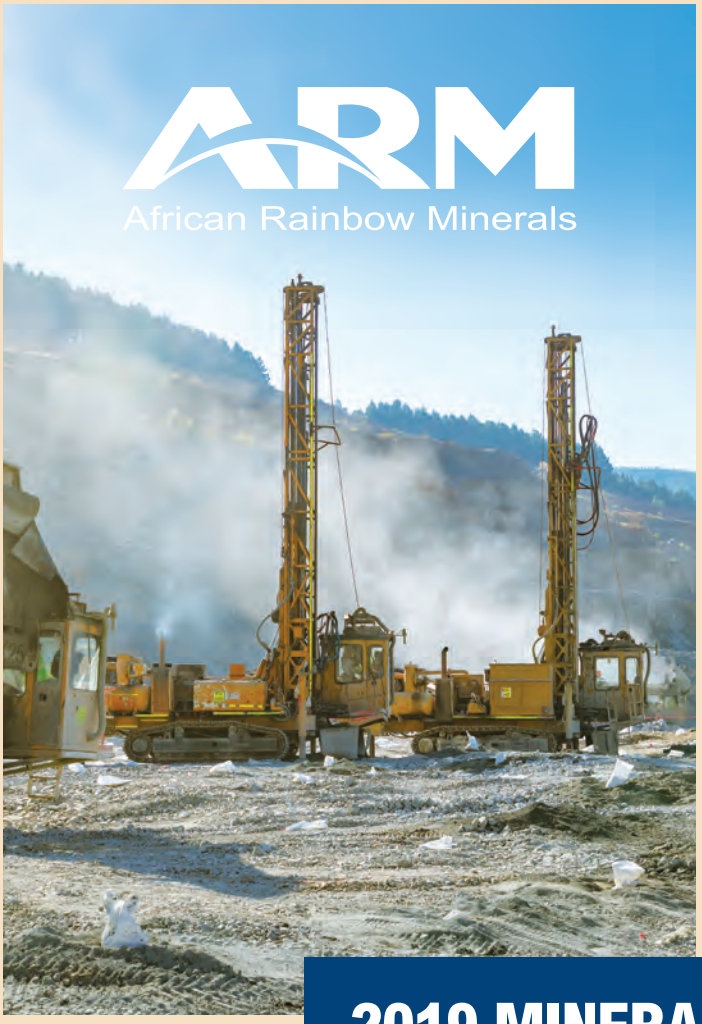
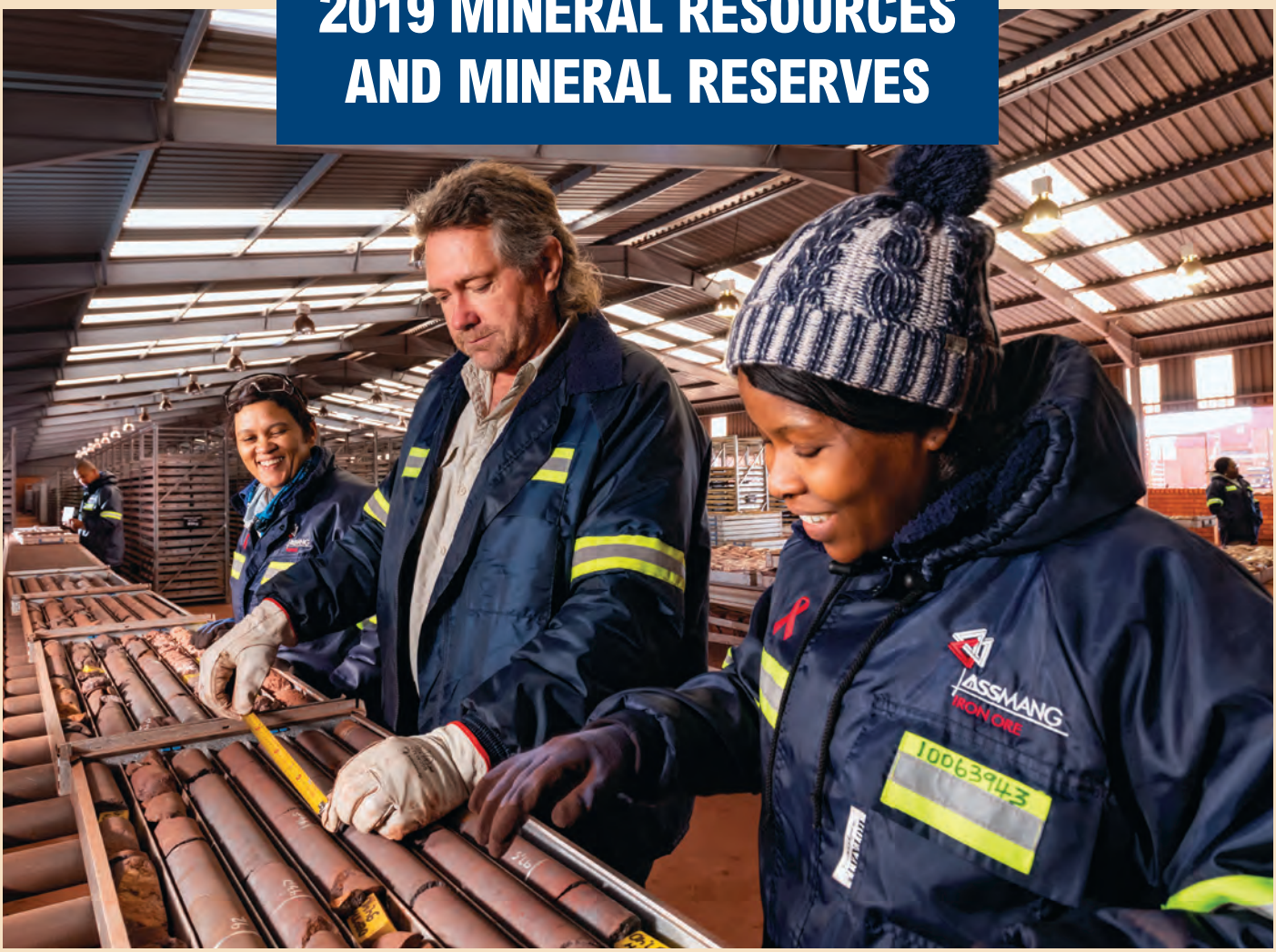
ARM

African Rainbow Minerals



2019 MINERAL RESOURCES AND MINERAL RESERVES



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OUR 2019 SUITE OF REPORTS

and additional material are available at **www.arm.co.za**

2019 INTEGRATED ANNUAL REPORT

2019 ANNUAL FINANCIAL STATEMENTS

2019 SUSTAINABILITY REPORT

2019 CORPORATE GOVERNANCE REPORT

2019 KING IV™ [1] APPLICATION REGISTER

2019 MINERAL RESOURCES AND RESERVES REPORT

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REFERENCES TO 2019 SUITE OF REPORTS

IAR 2019 Integrated annual report

AFS 2019 Annual financial statements

SR 2019 Sustainability report

RR 2019 Mineral Resources and Mineral Reserves report

CGR 2019 Corporate governance report

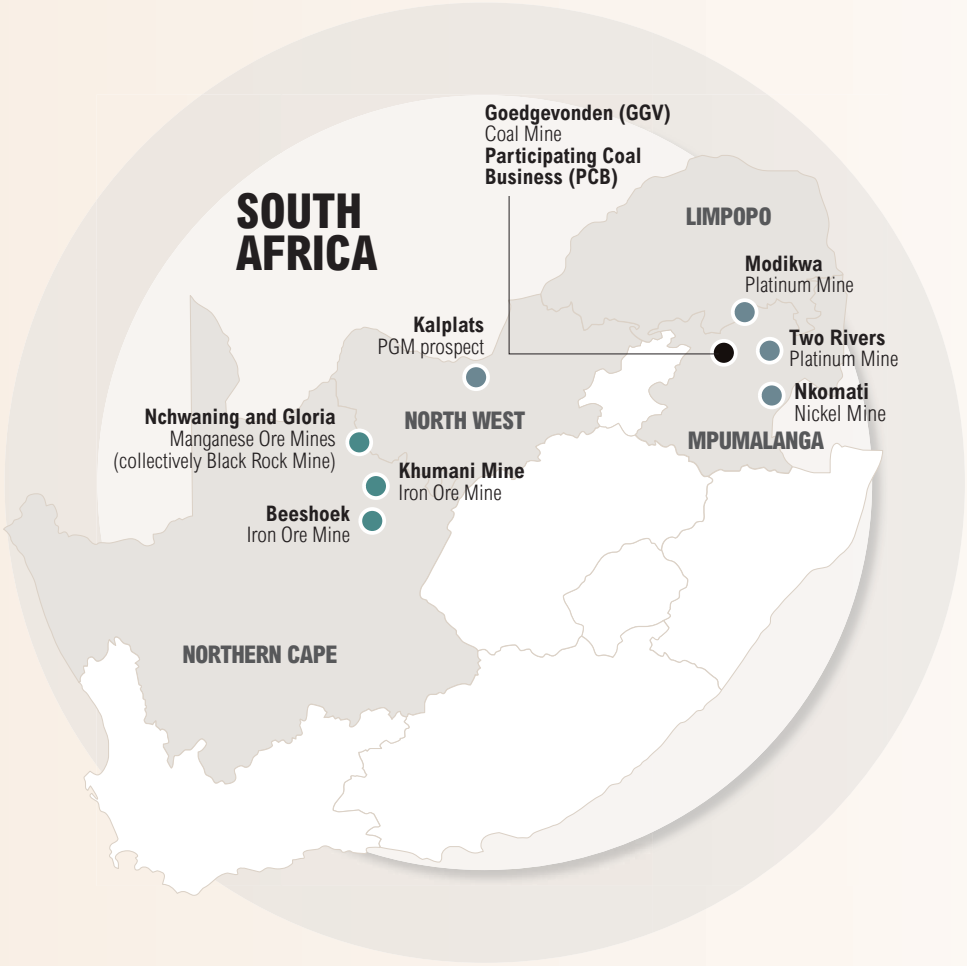
www.arm.co.za

All monetary values in this report are stated in South African rand unless otherwise stated. Rounding of figures may result in computational discrepancies on Mineral Resources and Mineral Reserves tabulations.

REPORT ON MINERAL RESOURCES AND MINERAL RESERVES AS AT 30 JUNE 2019

The report is issued annually to inform shareholders and potential investors of the mineral assets held by African Rainbow Minerals Limited (ARM). The report is a summary of competent persons' reports or technical reports on Mineral Resources and Mineral Reserves for ARM's mining operations and projects.

Locality map of ARM operations and projects



Adding value

Extracting optimal value from the Mineral Resources and Mineral Reserves in our portfolio is fully aligned to ARM's purpose of delivering competitive returns and sustainable value through its strategic pillars:

Strategic pillar	How we add value
Operate our portfolio of assets safely, responsibly and efficiently	Manage life-of-mine Mineral Resources and Mineral Reserves for each operation efficiently, revising mine plans as required.
Apply disciplined capital allocation	Undertake exploration activities on Mine and apply stringent criteria in allocating capital for the work.
Focus on value-enhancing and integrated growth	Maintaining the appropriate balance between Mineral Reserves depletion and growth to ensure a sustainable company.

Introduction

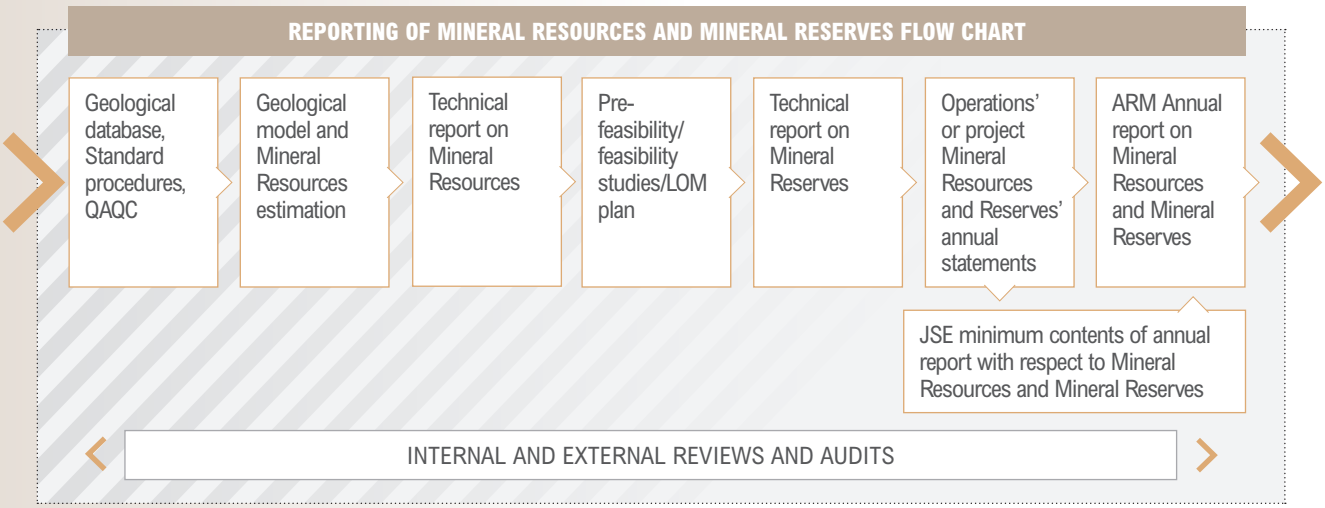
ARM's method of reporting Mineral Resources and Mineral Reserves complies with the South African Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves (SAMREC Code of 2016), the South African Code for reporting of Mineral Asset Valuation (SAMVAL Code, 2016) and Section 12.13 of the JSE Listings Requirements.

Historical ARM Mineral Resources and Mineral Reserves reports can be found at **www.arm.co.za** under Investors and Media, Annual Reports.

IAR An abridged version is included in the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

The SAMREC Code of 2016 sets out minimum standards, recommendations and guidelines for Public Reporting of Exploration Results, Mineral Resources and Mineral Reserves in South Africa. It was launched and adopted by the Johannesburg Stock Exchange (JSE) in May 2016. The 2019 ARM Mineral Resources and Mineral Reserves Report is based on the SAMREC Code of 2016.

The reporting of Mineral Resources and Mineral Reserves is done annually according to the following flow chart:



A set of guidelines have been formulated to assist Competent Persons in the estimation, classification and reporting of Mineral Resources and Mineral Reserves and are contained in a document entitled: "ARM Guidelines for Estimation, Classification and Reporting of Mineral Resources and Mineral Reserves".

As part of ARM's Management process of Mineral Resources and Mineral Reserves, quarterly divisional forum meetings are conducted with the following objectives:

- Skills and technical knowledge transfer in the Mineral Resources and Mineral Reserves fields
- Ensuring that best practices through SAMREC compliant standard procedures are shared and applied
- Facilitate internal peer reviews and audits
- Advance professional development and registration of technical personnel.

The convention adopted in this report is that the Measured and Indicated Mineral Resources estimates are reported **inclusive** of that portion converted to Mineral Reserves. **Inferred Mineral Resources** have not been included in feasibility studies or life-of-mine Plans.

Mineral Resources and Mineral Reserves estimates are quoted as at **30 June 2019**, unless stated otherwise.

Underground Mineral Resources are in situ tonnages at the postulated mining width, after deductions for geological losses. Underground Mineral Reserves reflect tonnages that will be mined and processed while surface Mineral Reserves consist of stockpiles already mined and ready for processing. Both are quoted at the grade fed to the plant. Open pit Mineral Resources are quoted as in situ tonnages and Mineral Reserves are tonnages falling within an economic pit-shell.

The classification into Measured, Indicated and Inferred Mineral Resources is done by consideration of geostatistical parameters, spacing of boreholes, geological structures and continuity of the mineralisation.

External consulting firms audit the Mineral Resources and Mineral Reserves of the ARM operations when substantial geological borehole data has been added to the previously established database.

The risk factors that could impact on the Mineral Resources and Mineral Reserves are reported in the following section:

IAR Pages 20 to 23 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

The Mineral Resources and Mineral Reserves are reported on a **100% basis** and the attributable interest is noted in the footnotes of the tabulations. Maps, plans and reports supporting Mineral Resources and Mineral Reserves are available for inspection at ARM's registered office and at the relevant mines.

ARM's Prospecting and Mining Rights details are provided in this report for each project and operation (refer to the relevant sections of the operations and projects). Rounding of figures may result in minor computational discrepancies on the Mineral Resources and Mineral Reserves tabulations.

Definitions

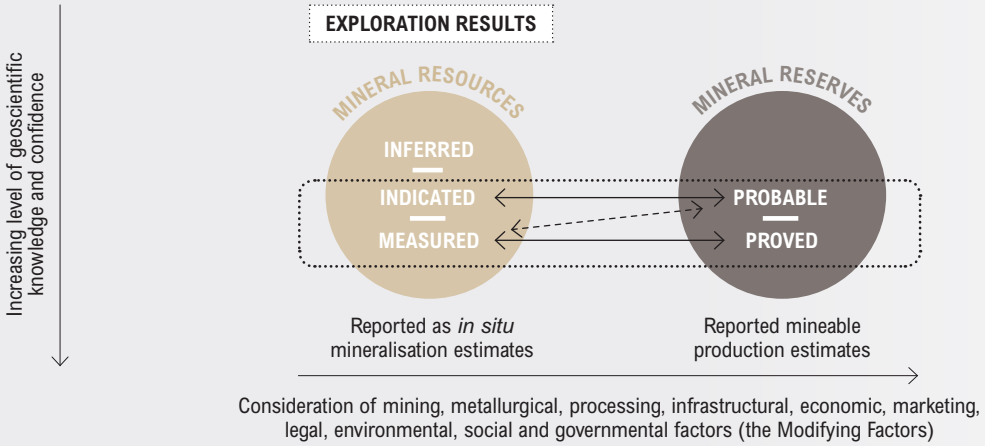
Mineral resources

A 'Mineral Resource'	is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.
A 'Measured Mineral Resource'	is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proved Mineral Reserve or to a Probable Mineral Reserve.
An 'Indicated Mineral Resource'	is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation.
An 'Inferred Mineral Resource'	is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

Mineral reserves

A 'Mineral Reserve'	is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified. The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported.
A 'Proved Mineral Reserve'	is the economically mineable part of a Measured Mineral Resource. A Proved Mineral Reserve implies a high degree of confidence in the Modifying Factors.
A 'Probable Mineral Reserve'	is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proved Mineral Reserve.

Relationship between exploration results, Mineral Resources and Mineral Reserves



Competence

The lead competent person with overall responsibility for the compilation of the 2019 Mineral Resources and Mineral Reserves Report is Shepherd Kadzviti, an ARM employee. He confirms that the information in this report complies with the SAMREC Code (2016) and that it may be published in the form and context in which it was intended.

Shepherd Kadzviti graduated with a BSc in geology and mathematics and a MSc in exploration geology from the University of Zimbabwe. He later completed a graduate diploma in mining engineering (GDE) at the University of the Witwatersrand. He worked at RioZim's Renco Gold Mine for 14 years in various capacities as geologist, technical services superintendent and mine manager. In 2005, he joined Anglo American Platinum at Union Mine as an evaluation geologist with responsibilities for geological database management and Mineral Resource estimation. After two years at the mine, he was transferred to the Anglo American Platinum corporate office where he was appointed resource geologist. He then joined ARM as Mineral Resources specialist in 2008, and was involved in the evaluation of various mineral deposits for the group. In 2012, he was appointed group mineral resources manager for ARM. He is registered with the South African Council for Natural Scientific Professions (SACNASP) as a professional natural scientist (Pr.Sci.Nat) in the field of practice of geological science, registration number 400164/05. SACNASP is based in the Management Enterprise Building, Mark Shuttleworth Street, Innovation Hub, Pretoria, 0087, South Africa. He has a total of 29 years' experience in various aspects of mining and exploration geology, database management and Mineral Resource estimation and as such is considered to be a competent person.

All competent persons at the ARM Corporate office and the operations have sufficient relevant experience in the type of deposit and in the activity for which they have taken responsibility.

Details of ARM's competent persons are available from the Company Secretary on written request.

The following ARM corporate office competent persons were involved in compiling some aspects of the Mineral Resources and Mineral Reserves report or general review of the report. They are employed by ARM.

ARM CORPORATE OFFICE				
Competent person	**Professional organisation**	**Membership number**	**Qualifications**	**Relevant experience**
S Kadzviti	SACNASP	400164/05	BSc, MSc Exploration Geology, GDE (Mining Engineering)	29 years
M Mabuza	SACNASP	400081/94	BSc, BSc Hons (Geology), MSc (Geology), GDE (Mining Engineering)	29 years
V Moyo	SACNASP	400305/11	BSc, BSc Hons (Geology), MSc (Project Management)	22 years
R Jooste	SACNASP	400163/05	BSc, BSc Hons (Geology), MEng (Mining Engineering)	18 years

The competent persons consent to the inclusion of the Exploration Results, Mineral Resources and Mineral Reserves information in this report, in the form and context in which it appears.

Shepherd Kadzviti Pr.Sci.Nat.
Group mineral resources manager

African Rainbow Minerals
24 Impala Road, Chislehurston, Sandton, South Africa.
11 October 2019

Salient features for F2019

ARM PLATINUM

Two Rivers Mine

The UG2 Reef Measured and Indicated Mineral Resources increased from 93.17 million tonnes at 5.61 g/t (6E) to 98.19 million tonnes at 5.69 g/t (6E) mainly due to the upgrade of some Inferred Mineral Resources in the Buffelshoek area where additional boreholes were drilled.

Mineral Reserves for the UG2 Reef decreased from 70.98 million tonnes at a grade of 3.50 g/t (6E) to 64.97 million tonnes at 3.50 g/t (6E) mainly due to mining depletion, an overall reduction in stoping height and allowance for pillars on major fault structures in the North Decline area.

The Indicated Mineral Resources for the Merensky Reef increased marginally by 1% to 75.73 million tonnes at 3.42 g/t (6E) after updating of the Merensky Mineral Resource model. The Inferred Mineral Resources reduced significantly from 104.69 million tonnes at 3.90 g/t (6E) to 61.39 million tonnes at 4.32 g/t (6E) mainly due to exclusion of narrow and low grade Merensky reef falling below the thickness and grade cut-offs in the Buffelshoek area.

Nkomati Mine

Mineral Reserves decreased significantly from 83.56 million tonnes at a grade of 0.31% Ni (72.34 million tonnes in the open-pit area and 11.22 million tonnes for the underground section) to 6.79 million tonnes at a grade of 0.30% Ni, open-pit Mineral Reserves due to the lower nickel price outlook, increased mining costs and increased waste stripping requirements that necessitated the change in the mining plan.

The Measured and Indicated Mineral Resources for Nkomati Mine, however, marginally increased by 2% from 172.20 to 175.74 million tonnes at 0.35% Ni mainly due to new geological information and updating of the Mineral Resource model.

Modikwa Mine

The UG2 Reef Mineral Reserves increased from 42.27 million tonnes at 4.62 g/t (4E) to 47.16 million tonnes at 4.34 g/t (4E) due to the mining design changes and the addition of Doornbosch Mineral Reserves after acquisition of a portion of this farm was formally concluded during the year.

ARM FERROUS

Black Rock Mine

Gloria Mine Seam 1 Mineral Reserves decreased from 123.93 million tonnes at 37.75% Mn to 115.04 million tonnes at 37.41% Mn mainly due to a revised mining plan on the eastern portion of Gloria Mine where the geological boundary of Seam 1 was updated. Nchwaning Seam 2 Mineral Reserves increased by 6% to 109.10 million tonnes at 42.73% Mn due to the increase in the depth to which Seam 2 could be mined based on geotechnical recommendations.

Khumani Mine

Mineral Reserves decreased from 447.13 million tonnes at 62.24% Fe to 433.44 million tonnes at 62.10% Fe primarily due to mining depletion of 20.11 million tonnes (ROM). The addition of 17.92 million tonnes at 61.95% Fe Probable Mineral Reserves at Mokaning South, which is being reported for the first time, partially off-set the production depletion.

Beeshoek Mine

Measured and Indicated Mineral Resources decreased marginally from 97.64 million tonnes at 64.14% Fe to 95.67 million tonnes at 64.07% Fe mainly due to mining depletion. There was however, an increase of 2.9 million tonnes in the Mineral Resources (Measured and Indicated) for Village pit, before mining depletion.

Mineral Resources and Mineral Reserves estimates were undertaken during the year for the low-grade jig and tailings stockpiles resulting in the declaration of a total of 15.05 million tonnes at 53.74% Fe of Measured and Indicated Mineral Resources, and a total of 14.26 million tonnes at 53.74% Fe of Mineral Reserves.

ARM COAL

Goedgevonden Coal Mine

Coal Reserves (ROM) decreased by 1% to 290 million tonnes. This was mainly due to mining depletion of 9.3 million tonnes offset by an addition of 4.7 million tonnes Coal Reserves from the South pit.

F2019 Mineral Resources and Mineral Reserves summary as at 30 june 2019

ARM Platinum operations

RR The tables below are summaries of the ARM Mineral Resources and Mineral Reserves. The detailed information on Mineral Resources and Mineral Reserves is provided per operation from page 9 in this report.

PLATINUM GROUP ELEMENTS

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources								Mineral Reserves						
	Measured		Indicated		(Measured and Indicated)		Inferred		Proved		Probable		Total Reserves		
	Mt	Grade g/t	Mt	Grade g/t	Mt	Grade g/t	Mt	Grade g/t	Mt	Grade g/t	Mt	Grade g/t	Mt	Grade g/t	Moz
Two Rivers Mine															
2019 UG2 (grade reported as 6E)	**13.99**	**5.58**	**84.20**	**5.71**	**98.19**	**5.69**	**79.03**	**5.40**	**5.39**	**3.57**	**59.58**	**3.49**	**64.97**	**3.50**	**7.31**
2018 UG2 (grade reported as 6E)	13.11	5.50	80.06	5.63	93.17	5.61	80.39	5.69	8.29	3.61	62.68	3.49	70.98	3.50	8.00
2019 Merensky (grade reported as 6E)			**75.73**	**3.42**	**75.73**	**3.42**	**61.39**	**4.32**							
2018 Merensky (grade reported as 6E)			74.96	3.34	74.96	3.34	104.69	3.90							
Modikwa Mine															
2019 UG2 (grade reported as 4E)	**86.30**	**5.94**	**102.50**	**5.92**	**188.80**	**5.93**	**77.30**	**6.24**	**15.68**	**4.49**	**31.48**	**4.27**	**47.16**	**4.34**	**6.58**
2018 UG2 (grade reported as 4E)	87.10	5.96	103.30	5.93	190.40	5.95	77.80	6.22	11.49	4.70	30.78	4.59	42.27	4.62	6.27
2019 Merensky (grade reported as 4E)	**18.54**	**2.93**	**55.73**	**2.72**	**74.27**	**2.78**	**138.59**	**2.65**							
2018 Merensky (grade reported as 4E)	18.54	2.93	55.73	2.72	74.27	2.78	138.59	2.65							
Kalplats PGM Prospect															
2019 (grade reported as 3E)	**14.04**	**1.59**	**55.88**	**1.46**	**69.91**	**1.48**	**67.44**	**1.57**							
2018 (grade reported as 3E)	14.04	1.59	55.88	1.46	69.91	1.48	67.44	1.57							

6E *= platinum + palladium + rhodium + iridium + ruthenium + gold.*
4E *= platinum + palladium + rhodium + gold.*
3E *= platinum + palladium + gold.*
The Mineral Resources are ***inclusive*** *of those modified to produce Mineral Reserves.*
* ***Two Rivers Platinum Mine attributable interests (ARM 54%; Impala Platinum 46%).***
* ***Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa communities 8.5%; Anglo American Platinum 50%).***
* ***Kalplats PGM Prospect attributable interests (ARM 46%; Stella Platinum 44%; Anglo American Prospecting Services 10%).***

NICKEL

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources								Mineral Reserves					
	Measured		Indicated		(Measured and Indicated)		Inferred		Proved		Probable		Total Reserves	
	Mt	Ni%	Mt	Ni%	Mt	Ni%	Mt	Ni%	Mt	Ni%	Mt	Ni%	Mt	Ni%
Nkomati Mine														
2019 MMZ+PCMZ	**81.10**	**0.32**	**94.64**	**0.37**	**175.74**	**0.35**	**46.35**	**0.40**	**6.48**	**0.30**	**0.31**	**0.28**	**6.79**	**0.30**
2018 MMZ+PCMZ	78.11	0.33	94.09	0.37	172.20	0.35	46.35	0.40	53.12	0.30	30.45	0.33	83.56	0.31
2019 MMZ stockpiles									**0.20**	**0.27**			**0.20**	**0.27**
2018 MMZ stockpiles									0.12	0.45			0.12	0.45
2019 PCMZ stockpiles									**0.60**	**0.19**			**0.60**	**0.19**
2018 PCMZ stockpiles									0.77	0.18			0.77	0.18

The Mineral Resources are ***inclusive*** *of those modified to produce Mineral Reserves.*
MMZ *– Main Mineralised Zone;* ***PCMZ*** *– Chromititic Peridotite Mineralised Zone.*
Nkomati Mine MMZ Mineral Resources and Mineral Reserves also contain Cu, Co, and PGEs – details available on pages 22 to 23 of this report.
Nkomati Mine PCMZ Mineral Resources and Mineral Reserves also contain Cu, Co, PGEs and Cr_2O_3 *– details available on pages 22 to 23 of this report.*
* ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

CHROME

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources						Mineral Reserves					
	Measured		Indicated		(Measured and Indicated)		Proved		Probable		Total Reserves	
	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%
Nkomati Mine												
2019 Oxidised massive chromitite	**0.13**	**27.16**	**0.05**	**23.28**	**0.18**	**26.08**						
2018 Oxidised massive chromitite	0.13	26.45			0.13	26.45	0.05	25.87	0.06	21.61	0.11	23.55
2019 Un-oxidised massive chromitite	**0.12**	**25.26**	**0.21**	**24.42**	**0.33**	**24.73**	**0.07**	**17.77**			**0.07**	**17.77**
2018 Un-oxidised massive chromitite	6.07	28.33			6.07	28.33	0.66	17.23	0.55	19.83	1.21	18.41
2019 Chromite stockpiles							**1.77**	**19.37**			**1.77**	**19.37**
2018 Chromite stockpiles							2.10	19.18			2.10	19.18

*The Mineral Resources are **inclusive** of those modified to produce Mineral Reserves.*

* ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

ARM Ferrous operations

MANGANESE

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources								Mineral Reserves					
	Measured		Indicated		(Measured and Indicated)		Inferred		Proved		Probable		Total Reserves	
	Mt	Mn%	Mt	Mn%	Mt	Mn%	Mt	Mn%	Mt	Mn%	Mt	Mn%	Mt	Mn%
Black Rock Mine (Nchwaning Mine)														
2019 Seam 1	**82.11**	**44.65**	**49.05**	**40.48**	**131.16**	**43.09**			**38.65**	**44.16**	**30.11**	**42.20**	**68.76**	**43.30**
2018 Seam 1	75.70	44.61	52.35	40.78	128.05	43.04			35.31	44.30	37.87	42.30	73.17	43.26
2019 Seam 2	**104.25**	**42.83**	**68.54**	**42.08**	**172.79**	**42.53**			**73.09**	**42.70**	**36.01**	**42.80**	**109.10**	**42.73**
2018 Seam 2	97.38	42.57	74.86	42.09	172.24	42.36			69.36	42.52	33.83	42.62	103.19	42.55
Black Rock Mine (Koppie area)														
2019 Seam 1	**9.03**	**40.30**	**34.57**	**40.70**	**43.60**	**40.60**								
2018 Seam 1	9.03	40.30	34.57	40.70	43.60	40.60								
2019 Seam 2	**8.23**	**37.40**	**18.58**	**39.20**	**26.81**	**38.60**								
2018 Seam 2	8.23	37.40	18.58	39.20	26.81	38.60								
Black Rock Mine (Gloria Mine)														
2019 Seam 1	**64.01**	**37.49**	**92.93**	**37.65**	**156.94**	**37.58**	**31.87**	**37.29**	**41.84**	**37.40**	**73.20**	**37.42**	**115.04**	**37.41**
2018 Seam 1	64.32	37.45	92.93	37.69	157.25	37.59	31.87	37.11	49.62	37.51	74.31	37.91	123.93	37.75
2019 Seam 2			**34.81**	**28.41**	**34.81**	**28.41**	**133.46**	**30.03**						
2018 Seam 2			34.81	28.41	34.81	28.41	133.46	30.03						

*The Mineral Resources are **inclusive** of those modified to produce Mineral Reserves.*

* ***Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

F2019 MINERAL RESOURCES AND MINERAL RESERVES SUMMARY continued

IRON ORE

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources								Mineral Reserves					
	Measured		Indicated		(Measured and Indicated)		Inferred		Proved		Probable		Total Reserves	
	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%
Beeshoek Mine														
2019 All pits	**90.56**	**64.11**	**5.11**	**63.44**	**95.67**	**64.07**	**5.35**	**62.58**	**29.71**	**64.70**	**0.13**	**63.35**	**29.84**	**64.69**
2018 All pits	95.10	64.16	2.54	63.22	97.64	64.14	3.55	60.80	35.13	64.85	0.01	63.18	35.14	64.85
2019 Stockpiles											**0.77**	**58.52**	**0.77**	**58.52**
2018 Stockpiles											2.83	55.58	2.83	55.58
2019 Low-grade stockpiles	**2.41**	**56.46**	**12.64**	**53.22**	**15.05**	**53.74**			**2.29**	**56.46**	**11.97**	**53.22**	**14.26**	**53.74**
Khumani Mine														
2019 Bruce and King/Mokaning	**418.99**	**63.01**	**137.30**	**63.22**	**556.29**	**63.06**	**36.10**	**61.13**	**340.19**	**61.97**	**93.25**	**62.58**	**433.44**	**62.10**
2018 Bruce and King/Mokaning	442.99	62.95	108.00	63.23	550.99	63.00	59.49	61.73	369.16	62.12	77.97	62.79	447.13	62.24
2019 Stockpiles											**6.04**	**55.08**	**6.04**	**55.08**
2018 Stockpiles											5.01	55.08	5.01	55.08

*The Mineral Resources are **inclusive** of those modified to produce Mineral Reserves.*
** **Iron ore operations attributable interests (ARM 50%; Assore 50%).***

ARM Coal operations

COAL

* Coal Resources and Coal Reserves are reported on a 100% basis.	Coal Resources								Coal Reserves (ROM)						Coal Reserves (Saleable)					
	Measured		Indicated		(Measured and Indicated)		Inferred		Proved		Probable		Total Reserves		Proved		Probable		Total Reserves	
	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)	Mt	CV (MJ/kg)
Goedgevonden Coal Mine																				
2019 (Coal Resources reported as MTIS)**	**510**	**19.82**	**7**	**18.28**	**517**	**19.80**	**1**	**16.72**	**280**	**19.64**	**10**	**19.64**	**290**	**19.64**	**173**	**^**	**5**	**^**	**178**	**^**
2018 (Coal Resources reported as MTIS**)	515	19.85	7	21.45	522	19.87	1	14.45	283	19.57	10	19.57	293	19.57	175	^^	5	^^	180	^^

*The Coal Resources are **inclusive** of those modified to produce Coal Reserves.*
*** Mineable Tonnes in situ (MTIS) Coal Resources are now reported as per SAMREC Code of 2016 requirements.*
^ 2019 [HG Export (79 Mt; CV 6 000 Kcal/kg)] and [LG Export (99 Mt; CV 21.50 MJ/kg)].
^^2018 [HG Export (84 Mt; CV 6 000 Kcal/kg)] and [LG Export (101 Mt; CV 21.50 MJ/kg)].
** **Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%).***

TWO RIVERS PLATINUM MINE

ARM's attributable beneficial interest in Two Rivers Platinum Mine (TRP) operation is 54%. The other 46% is held by Impala Platinum.

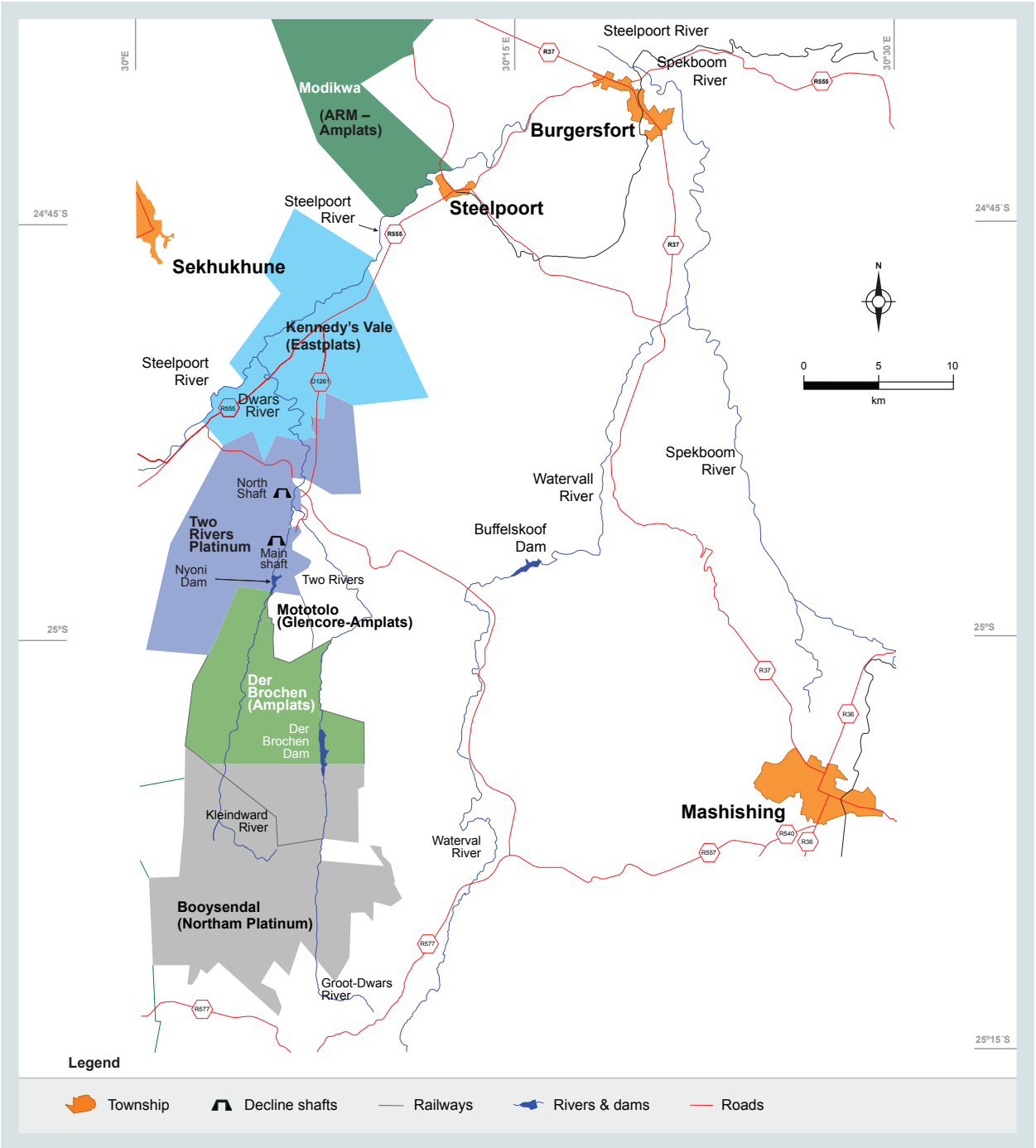
Locality

Two Rivers Platinum Mine is located on the southern sector of the Eastern Limb of the Bushveld Complex. The mine is located on the farm Dwarsrivier 372KT and extends to portions of the farms Kalkfontein 367KT and Tweefontein 360KT and the farm Buffelshoek 368KT. At longitude 30°07'E and latitude 24°59'S, the mine is approximately 30 kilometres from Steelpoort and 60 kilometres from Lydenburg, Mpumalanga Province, South Africa. Two Rivers Platinum Mine is neighboured by Mototolo Platinum Mine and Dwarsrivier, Tweefontein and Thorncliff chromite mines.

ARM PLATINUM

ARM PLATINUM continued

LOCALITY MAP OF TWO RIVERS PLATINUM MINE



History

Exploration, development and production history in the area dates from the early 1920s. During 1929, Lydenburg Platinum Areas Limited started mining activity, but no records are available.

Following the acquisition by Gold Fields Mining and Development Limited, exploration started again in 1987 and was mainly directed at the Merensky Reef. Assmang Limited acquired the Dwarsrivier farm in September 1998, primarily to exploit the LG6 chromitite.

During 2001, Anglovaal acquired the PGE rights on the farm from Assmang and targeted the UG2 Reef. In June 2005, after the ARM/Anglovaal merger, and following a full feasibility study and a period of trial underground mining, the ARM/Impala Joint Venture announced the approval of a 220 000 ounce-per-year PGM mine. As a result, an underground mine was established.

Competence

The following competent persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Two Rivers Platinum Mine. They are employed by ARM (S Kadzviti) and Two Rivers Mine (M Cowell, J Coetzee and JZ Khumalo).

Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
S Kadzviti (Mineral Resources)	SACNASP	400164/05	BSc (Geology and Mathematics), MSc (Exploration Geology), GDE (Mining Engineering)	29 years
J Coetzee (Mineral Resources)	SACNASP	114086	BSc (Geology), BSc Hons (Geology)	16 years
JZ Khumalo (Geology)	SACNASP	400256/05	BSc (Geology), BSc Hons (Geology), GDE (Mining Engineering)	20 years
M Cowell (Mineral Reserves)	SACNASP	400102/02	BSc (Geology), BSc Hons (Geology)	19 years

Mining authorisation

Legal entitlement	Minerals covered by mining right	Comment	Period of mining right (years)	Known impediments on legal entitlement
Mining Right LP 178 MR (as amended)	Platinum, palladium, rhodium, ruthenium, osmium, iridium, silver, gold and ores.	On 8 November 2017, the amended TRP Mining Right, incorporating the Remaining Extent of Kalkfontein (previously Tamboti) into the TRP Mining Right, was executed. The prospecting area previously covered by LP 2125 PR was also incorporated into the TRP Mining Right.	25 years: 20 March 2013 to 19 March 2038	None

Geology

The geological succession at Two Rivers Platinum Mine is broadly similar to other areas of the eastern limb of the Bushveld Complex. An exception is the presence of the Steelpoortpark granite in the south western part of the project, which is unique to this area. At Two Rivers, both the Merensky and UG2 Reefs are present, but only the UG2 is currently exploited. The middling between the Merensky Reef and the UG2 Reef is approximately 140 metres to 160 metres, but reduces significantly in the northern part of the Two Rivers Platinum Mine, to about 70 metres.

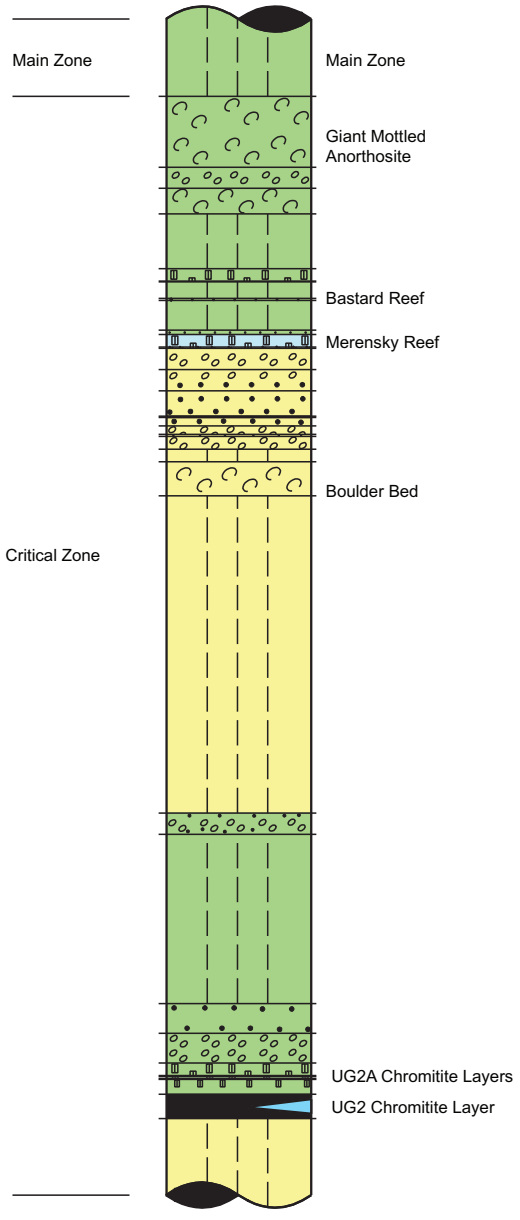
The UG2 Reef outcrops in the Klein Dwarsrivier valley on the Dwarsrivier farm, with a north-south strike length of 7.5 kilometres, dipping to the west at between 7º to 10º. The elevated topography results in the UG2 occurring at a depth of approximately 935 metres towards the western boundary.

The UG2 is usually bottom loaded with peak PGM values occurring in the basal 10 centimetre portion. The following reef facies have been defined for the UG2 at Two Rivers Platinum Mine:

- UG2 Normal Reef facies which is characterised by a 100 to 120 centimetre-thick chromitite overlain by up to three chromitite 'leaders' collectively termed the UG2A chromitites
- UG2 Split Reef facies in the southern, west-central and northeastern parts which is characterised by a chromitite seam that is separated by a layer of a fine- to medium-grained internal pyroxenite unit
- The UG2 Multiple Split Reef facies which is represented by multiple splitting of the UG2 chromitite by internal pyroxenite. It occurs mainly in the southern section of the mine on the Dwarsrivier farm as well as the east-central section of the Buffelshoek farm.

ARM PLATINUM continued

STRATIGRAPHIC COLUMN OF THE UPPER CRITICAL ZONE FROM THE MERENSKY HANGING WALL THROUGH TO THE UG2 FOOTWALL AT TWO RIVERS PLATINUM MINE



Thickness (metres)	Lithology
>250	Gabbronorite with anorthosite layers
35	Mottled and spotted anorthosite
5	Mottled anorthosite
6	Mottled anorthosite
13	Norite
3	Pyroxenite
4	Norite
0.1 – 0.5	Pyroxenite
7	Mottled anorthosite
1	Spotted anorthosite
2 – 3	Pyroxenite (Merensky Reef)
0 – 0.3	Pyroxenitic pegmatoid
0 – 5	Mottled anorthosite
5	Spotted and mottled anorthosite
6	Spotted anorthosite and norite
0.3	Mottled anorthosite
2	Spotted anorthosite
2	Mottled anorthosite
0.5	Spotted anorthosite
3	Mottled anorthosite
3	Norite
8	Mottled and spotted anorthosite, pyroxenite 'boulders'
65 – 75	Norite
5	Spotted and mottled anorthosite
30 – 40	Norite
7	Spotted anorthosite
7	Mottled anorthosite
3	Pyroxenite (medium grained)
0.2	Chromitite
0.3 – 0.5	Pyroxenite (medium grained)
0.1	Chromitite
0 – 2	Pyroxenite (fine grained)
0.4	Chromitite
0.6	Pyroxenite/norite
1 – 1.2	Chromitite (UG2 Reef)
0 – 2.5	Pegmatoid
>10	Norite/pyroxenite

The Merensky Reef consists mainly of orthopyroxene with lesser amounts of plagioclase and clinopyroxene. Thin chromitite layers, usually 1 to 4 millimetres thick, occur near the upper and lower contacts of the reef. The Merensky Reef has variable thickness but generally reduces in thickness from the Dwarsrivier farm towards Kalkfontein and Buffelshoek farms. The regional north-northeast to south-southwest trending Kalkfontein fault, with a vertical displacement of up to 1 000 metres down-thrown to the west, defines the limits of the eastern structural domain for both the UG2 and Merensky Reefs.

The ground beyond this fault remains an exploration target where both reefs are at depths in excess of 1 000 metres. Both reefs are affected by the granite intrusion in the southern portion of the Buffelshoek farm where both reefs are absent.

Exploration activities

A total of 14 surface boreholes with a total of 3 460 metres were drilled in the Tweefontein, Dwarsrivier and Kalkfontein Portions 4 to 6 areas. The total cost of the drilling inclusive of road construction and geological services amounted to R4.88 million. All boreholes intersected the UG2 Reef with those in Dwarsrivier and Kalkfontein areas also intersecting the Merensky Reef. Underground drilling of 111 boreholes with a total of 7 628 metres was completed. The costs for underground drilling was R5.07 million. Surface drilling for 2020 will cover the southern part on the mine in the multiple split reef area. Underground drilling will also continue.

Mining methods and infrastructure

The Two Rivers mining operation consists of two UG2 Decline shaft systems, the Main Decline and the North Decline, located approximately 2.5 kilometres apart on strike. Both shafts were designed for mechanised bord and pillar mining. The mine has a concentrator plant on site where initial processing is done. Concentrate is transported by road to Impala Platinum's plants for further processing.

Mineral Resources

The Two Rivers Mine UG2 geological and grade model was updated in 2019 using the borehole data from all the farms: Dwarsrivier, Kalkfontein and Tweefontein.

TRP has a large borehole database from drilling undertaken by the mine (Dwarsrivier farm and portions 4 to 6 of Kalkfontein and Tweefontein farms), Implats (Kalkfontein portions 1 to 3 and Buffelshoek) and Kameni (Pty) Ltd (Kalkfontein Remaining Extent).

The boreholes were drilled to intersect Merensky and UG2 Reefs. The boreholes have an average grid spacing of 500 metres over the whole property and 250 metre grid spacing in some areas. The borehole spacing is 100 metres on strike and 50 metres on dip in the north eastern portion of Dwarsrivier farm.

The borehole core drilled by TRP is cut by diamond saw and the half-core sampled at 20 centimetre intervals. Samples for both Merensky and UG2 Reefs are crushed and split and submitted for assaying. All samples from recent drilling at TRP were assayed at Genalysis Laboratory Services (Pty) Ltd (Genalysis) using Ni-sulphide collection fire-assay with an ICP-MS finish to determine Pt, Pd, Rh, Ru, Ir and Au values. Base metals (Ni, Cu and Co) were assayed by aqua regia digestion/OES finish. Duplicate samples and check analyses are carried out. Densities are determined at the laboratory by pycnometer. The earlier Gold Fields and Assmang samples were assayed by Pb-collector fire-assay with gravimetric finish. In order to combine the data, some of the original core samples were re-assayed by means of Ni-sulphide collection fire-assay and a regression equation was derived, to re-cast the original Pb-collection data as Ni-sulphide assay 'equivalents'. Samples from other drilling campaigns by Implats and Kameni used the Genalysis Laboratory as well.

In 2019, the UG2 Reef geological modelling was undertaken in Datamine Strat 3D. The software is suitable for stratified deposits and allows for the modelling of faults. The model produced shows consistency in the fault displacements. Ordinary Kriging interpolation within Datamine Studio RM was used to estimate the grade of each 50 x 50 x 1 metre block generated within the UG2 Reef geological models. Variables estimated were Pt, Pd, Rh, Au, Ru, and Ir, Cu and Ni. The internal pyroxenite and the leader chromitites were also modelled and estimated. Sub-cell splitting of blocks was allowed to follow the geological boundaries accurately. Density was estimated by Kriging in the resource model. Additional models of the UG2 leaders and the footwall of the UG2 chromitite were created for use in the Mineral Reserve model as mining dilution.

The Merensky Reef model was also updated in 2019. Strat 3D was also utilised in creating the geological model. Ordinary Kriging interpolation within Datamine Studio RM was used to estimate the grade of each 50 x 50 x 1 metre block generated within the Merensky Reef geological models. Variables estimated were Pt, Pd, Rh, Au, Ru, and Ir, Cu and Ni. Three models for the Top Mineralised zone, Middle Mineralised zone and the Bottom Mineralised zone were produced. An additional model was produced for the footwall unit.

The UG2 and Merensky Mineral Resource classification is based on the consideration of both geological and geostatistical parameters. The geological continuity of the reef is assessed by considering minor and major faulting and other structural disturbances on the reefs and the consistency in thickness and grade. Geostatistical parameters such as Kriging variance, Kriging efficiency, regression slope, number of samples used in estimation and search volume are also considered in the Mineral Resource classification. Geological losses of 23% to 24% (UG2 Reef) and 30% (Merensky Reef) were applied to account for potholes, faults, dykes and iron-rich replacement pegmatoids.

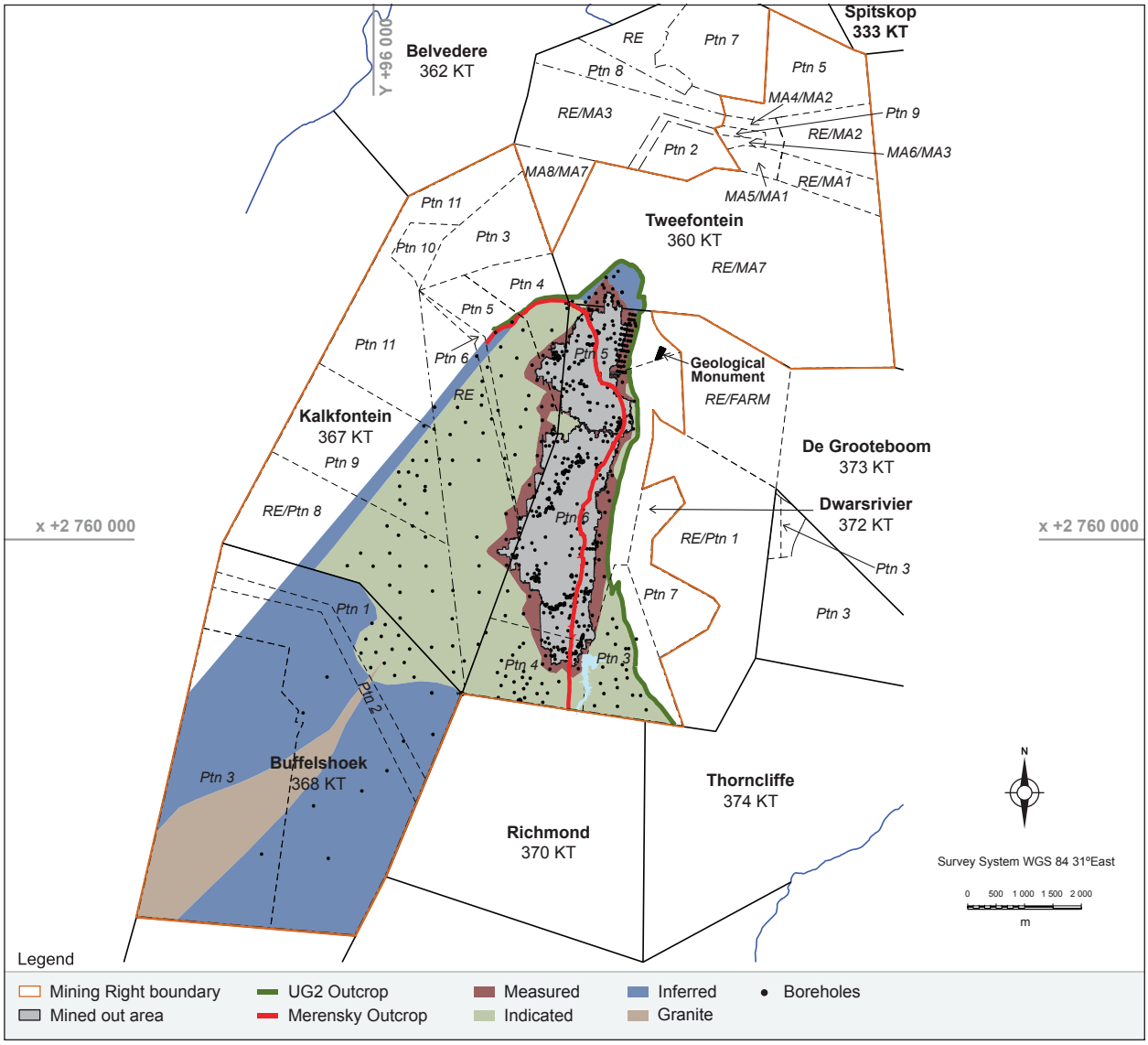
ARM PLATINUM continued

TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Mineral Resources								
	Mt	Pt g/t	Pd g/t	Rh g/t	Au g/t	4E g/t	6E g/t	Pt Moz	6E Moz
Measured	13.99	2.61	1.49	0.48	0.04	4.61	5.58	1.17	2.51
Indicated	84.20	2.58	1.66	0.48	0.04	4.76	5.71	6.97	15.47
Total Measured and Indicated 2019	**98.19**	**2.58**	**1.64**	**0.48**	**0.04**	**4.74**	**5.69**	**8.14**	**17.98**
Total Measured and Indicated 2018	93.17	2.54	1.61	0.47	0.04	4.67	5.61	7.61	16.80
Inferred 2019	**79.03**	**2.37**	**1.66**	**0.44**	**0.04**	**4.51**	**5.40**	**6.01**	**13.72**
Inferred 2018	80.39	2.51	1.75	0.47	0.04	4.77	5.69	6.48	14.71

4E *= platinum + palladium + rhodium + gold;* ***6E*** *= platinum + palladium + rhodium + iridium + ruthenium + gold.*
The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
Geological loss factor applied: 23% – 24%.
* ***Two Rivers Platinum Mine attributable interests (ARM 54%; Impala Platinum 46%).***

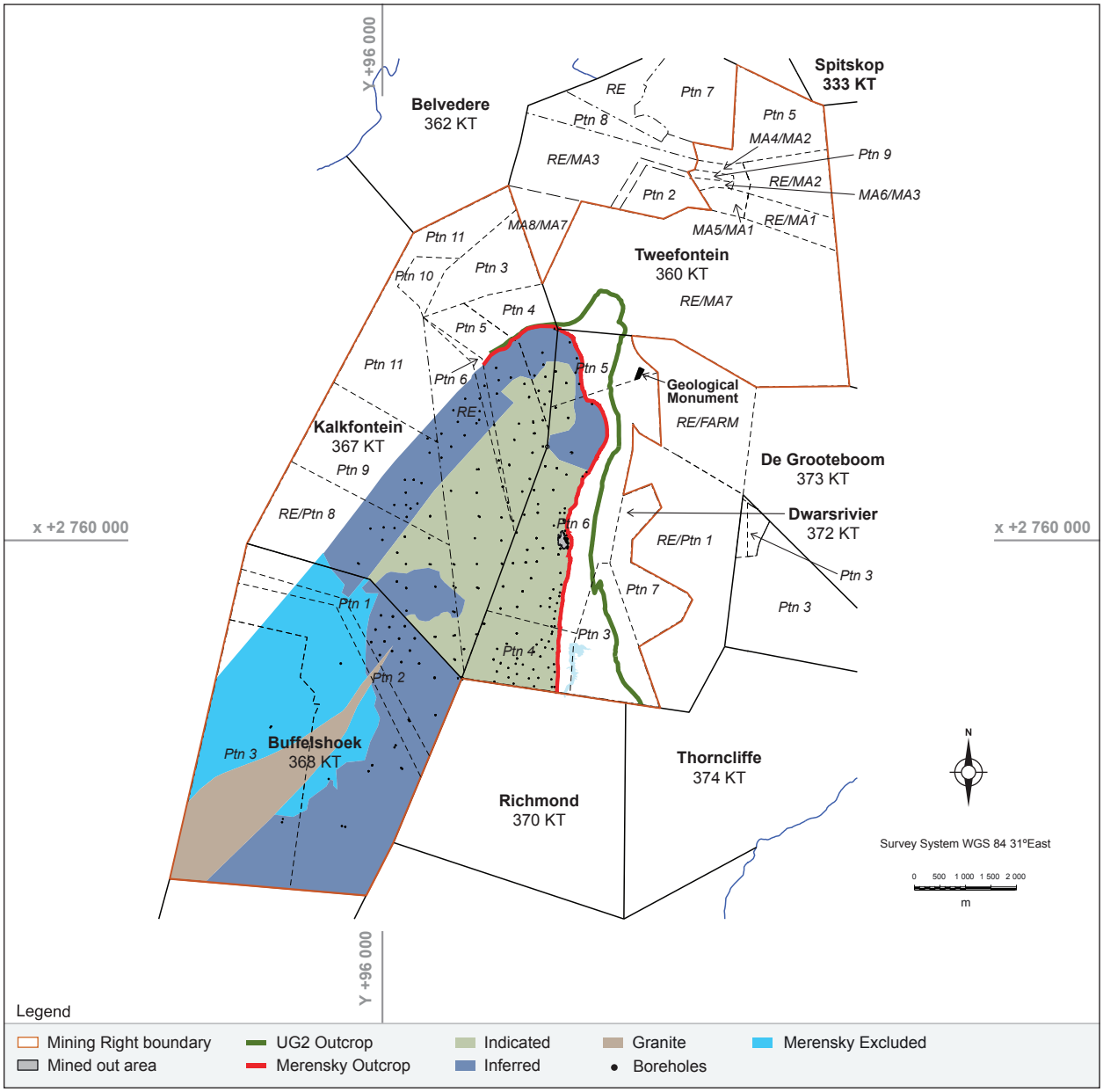
TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESOURCES CLASSIFICATION



Mineral Reserves

The Mineral Resources to Mineral Reserves conversion for the UG2 was done using the Studio 5D Mine Planning software package. Conversion of the UG2 Mineral Resources was done for the Measured and Indicated Mineral Resources in Dwarsivier farm, Kalkfontein farm portions 4 to 6 and Tweefontein. The modifying factors used for the conversion of Mineral Resources to Mineral Reserves took into account the mining method, mining extraction factor, mining losses, mining dilution, mine call factor and commodity prices among other parameters. Details of these parameters are provided as footnotes on the Mineral Reserves tabulations.

TWO RIVERS PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES CLASSIFICATION



ARM PLATINUM continued

TWO RIVERS PLATINUM MINE: UG2 REEF MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Mineral Reserves								
	Mt	Pt g/t	Pd g/t	Rh g/t	Au g/t	4E g/t	6E g/t	Pt Moz	6E Moz
Proved	5.39	1.67	0.97	0.31	0.03	2.97	3.57	0.29	0.62
Probable	59.58	1.60	0.96	0.30	0.03	2.89	3.49	3.06	6.69
Total Reserves 2019	**64.97**	**1.60**	**0.97**	**0.30**	**0.03**	**2.89**	**3.50**	**3.35**	**7.31**
Total Reserves 2018	70.98	1.62	1.01	0.31	0.03	2.97	3.50	3.70	8.00

4E *= platinum + palladium + rhodium + gold;* ***6E*** *= platinum + palladium + rhodium + iridium + ruthenium + gold.*
Totals are rounded off.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Mining loss factor: Main Decline 3%; North Decline 11%.
Plant recovery: 83% – 87% (6E) depending on plant feed grade.
Shaft call factor: Main Decline 95%; North Decline 97%.
Mining dilution: on average 16 to 19 cm on hangingwall and 35 cm on footwall.
Minimum mining height: 1.95 metres; maximum mining height 3.20 metres.
Prices (US$/oz): ***Pt:*** *1 181;* ***Pd:*** *1 229;* ***Rh:*** *2 401;* ***Ru:*** *196;* ***Ir:*** *1 037;* ***Au:*** *1 457.*
Prices (US$/tonne): ***Cu:*** *7 312;* ***Ni:*** *15 835;* ***Cr_2O_3:*** *180.*
Exchange Rate (R/US$): 14.68.
Life-of-mine: 19 years.
* ***Two Rivers Platinum Mine attributable interests (ARM 54%; Impala Platinum 46%).***

TWO RIVERS PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Mineral Resources								
	Mt	Pt g/t	Pd g/t	Rh g/t	Au g/t	4E g/t	6E g/t	Pt Moz	6E Moz
Indicated 2019	**75.73**	**1.87**	**0.95**	**0.11**	**0.20**	**3.13**	**3.42**	**4.55**	**8.32**
Indicated 2018	74.96	1.81	0.94	0.10	0.21	3.06	3.34	4.37	8.04
Inferred 2019	**61.39**	**2.28**	**1.31**	**0.14**	**0.25**	**3.98**	**4.32**	**4.50**	**8.53**
Inferred 2018	104.69	2.08	1.14	0.13	0.24	3.59	3.90	7.01	13.12

4E *= platinum + palladium + rhodium + gold;* ***6E*** *= platinum + palladium + rhodium + iridium + ruthenium + gold.*
The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
Geological loss factor applied: 30%.
* ***Two Rivers Platinum Mine attributable interests (ARM 54%, Impala Platinum 46%).***

Year-on-year change

The UG2 Reef Measured and Indicated Mineral Resources increased from 93.17 million tonnes at 5.61 g/t (6E) to 98.19 million tonnes at 5.69 g/t (6E) mainly due to the upgrade of some Inferred Mineral Resources in the Buffelshoek area where additional boreholes were drilled. An area previously classified as Inferred Mineral Resource in Buffelshoek area was upgraded to Indicated Mineral Resource category as a result of additional boreholes that increased the geological and estimation confidence in the area.

Mineral Reserves for the UG2 Reef decreased from 70.98 million tonnes at a grade of 3.50 g/t (6E) to 64.97 million tonnes at 3.50 g/t (6E) mainly due to mining depletion, an overall reduction in stoping height and allowance for pillars on major fault structures in the North Decline area. The maximum mining height was reduced from 3.6 metres to 3.2 metres based on mining recommendations.

The Indicated Mineral Resources for the Merensky Reef increased marginally by 1% to 75.73 million tonnes at 3.42 g/t (6E) after updating of the Merensky Mineral Resource model. The Inferred Mineral Resources reduced significantly from 104.69 million tonnes at 3.90 g/t (6E) to 61.39 million tonnes at 4.32 g/t (6E) mainly due to exclusion of narrow and low-grade Merensky Reef falling below the thickness and grade cut-offs in the Buffelshoek area. The thickness cut-off of 1 metre with a grade cut-off of 1.8 g/t (6E) was used to identify areas with no 'reasonable and realistic prospects of eventual economic extraction' (RPEEE).

HISTORICAL PRODUCTION AT TWO RIVERS PLATINUM MINE (UG2 REEF)

	ROM		Milled	
Financial year	Mt	Grade g/t (6E)	Mt	Grade g/t (6E)
2014/2015	3.44		3.36	
2015/2016	3.37		3.51	
2016/2017	3.38	3.80	3.50	3.90
2017/2018	3.45	3.57	3.46	3.63
2018/2019	3.32	3.58	3.40	3.52

IAR Additional information regarding production figures can be found on page 61 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

ARM PLATINUM continued

NKOMATI NICKEL-COPPER-COBALT-PGM-CHROMITE MINE

ARM's attributable beneficial interest at Nkomati Mine is 50%. The other 50% is held by Norilsk Nickel Africa (Pty) Ltd.

Locality

Nkomati Nickel Mine is located approximately 300 kilometres east of Johannesburg in the Mpumalanga Province of South Africa. Situated at latitude 25º40'S and longitude 30º30'E, the mine is accessed via the national N4 highway between Johannesburg and Machadodorp, the R341 provincial road and the R351 tarred road.

RR Refer to page 1 for the locality map showing the Nkomati Mine.

History

Nickel, copper, cobalt, PGM and chromite mineralisation is hosted by the Uitkomst Complex, a layered mafic-ultramafic, Bushveld satellite intrusion. The Uitkomst Complex outcrops on the farms Slaaihoek 540JT and Nkomati 770JT. In 1929, the Mineral Rights on Slaaihoek were purchased by ETC, an Anglovaal subsidiary, to mine gold at the old Mamre and Slaaihoek mines. In the early 1970s, an Anglo American/INCO Joint Venture began exploring Uitkomst for nickel. In 1990, AngloAmerican (AAC) completed a feasibility study on an open-pit operation exploiting the large disseminated sulphide resource on Uitkomst, with negative results.

Exploration on Slaaihoek by Anglovaal began in 1989, and in 1991, the massive sulphide body (MSB) was discovered by surface drilling. In 1995, the Nkomati JV between Anglovaal and AAC was formed and in January 1997, underground production started on the MSB. In 2004, Anglovaal acquired AAC's interest and in 2005, following the merger of Anglovaal and ARM, a 50:50 JV was formed between ARM and LionOre, then a global nickel producer and owner of the Activox technology. In February 2006, Nkomati approved the Phase 1 expansion project to exploit the Main Mineralised Zone (MMZ), one of the disseminated sulphide ore bodies, by underground and open-pit mining at a rate of 100 000 tonnes per month of ore to maintain annual nickel production at approximately 5 000 tonnes in concentrate after output from the MSB started declining. The project was completed in 2007 and in the same year, Norilsk Nickel acquired LionOre, together with its 50% share in Nkomati. The MSB orebody is now mined out.

The Phase 2a expansion project, increasing MMZ ore production to 375 000 tonnes per month with the construction of a new plant, was commissioned during 2010. The Phase 2b expansion, involving the upgrading of the 100 000 tonnes per month MMZ plant to a 250 000 tonnes per month Chromititic Peridotite Mineralised Zone (PCMZ) plant was completed during F2011. The PCMZ, which is being mined only in the open pit, is a disseminated chromite-rich sulphide body within the Chromititic Peridotite (PCR) Unit (overlying the MMZ), which has to be treated separately to liberate the chromite fines.

Nkomati has also been producing lumpy chromite, chips and fines from the Oxidised Massive Chromitite since 2006, a layer which overlies the PCMZ orebody. A chrome washing plant to treat the fines stockpile was commissioned in 2008. In addition, the Oxidised PCR, which is the highly weathered PCR Unit immediately below the Oxidised Massive Chromitite, is being stockpiled for future processing for its chromite content.

Competence

The following competent persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Nkomati Mine. They are employed by Nkomati Mine.

Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
N Strydom (Mineral Resources)	SACNASP	400148/04	NHD (Economic Geology), MBA	20 years
T Mogano (Mineral Reserves)	SAIMM	708776	Certificates in Advanced Mine Survey and Advanced Mine Valuation	8 years

Mining authorisation

Legal entitlement	Minerals covered by Mining Right	Comment	Period of Mining Right (years)	Known impediments on legal entitlement
Mining Rights MP 146 MR and MP 147 MR	Nickel, copper, cobalt, platinum, palladium, rhodium, iridium, ruthenium, osmium, gold, silver and other contained minerals and metals.	None	25 years: 6 June 2012 to 5 June 2037	None

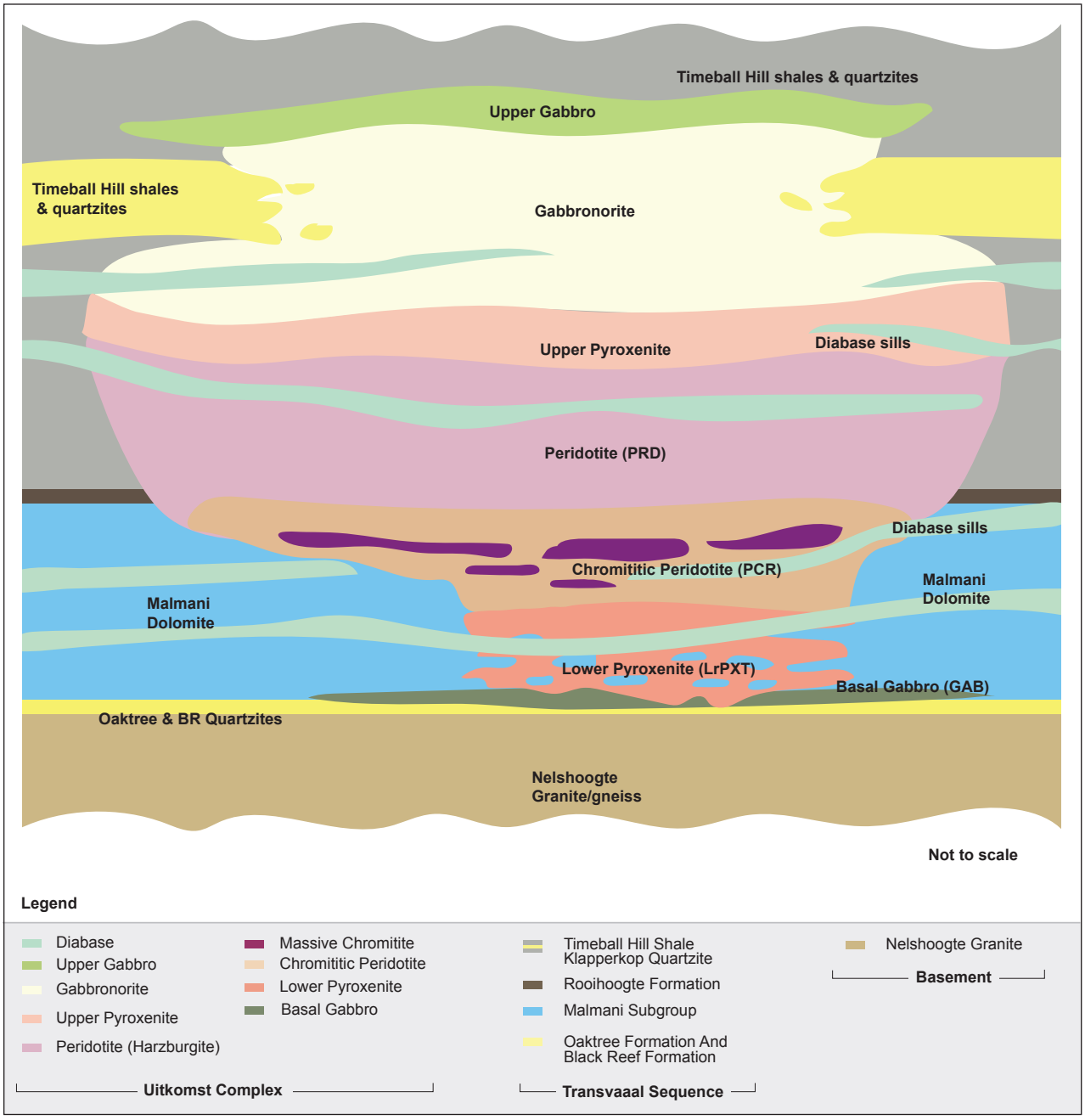
Geology

Sulphide and chromite mineralisation occurs within the Uitkomst Complex, a Bushveld-age, layered, mafic-ultramafic intrusion, which concordantly intrudes dolomite/chert of the Malmani Subgroup and shales/quartzites of the Timeball Hill Formation. The Uitkomst Complex, which lies unconformably on an Archaean basement, is a north west/south east tubular shaped body which outcrops in the Slaaihoek Valley for approximately 9 kilometres before dipping at 4º below an escarpment where it has been drilled down-dip for another 4 kilometres and is still open-ended to the north west.

From the base to top, the stratigraphy of the Uitkomst Complex comprises the Basal Gabbro Unit (up to 15 metres thick), the Lower Pyroxenite Unit (average 35 metres), the Chromititic Peridotite Unit (30 to 60 metres), the Massive Chromitite Unit (up to 10 metres), the Peridotite Unit (330 metres), the Upper Pyroxenite Unit (65 metres), the Gabbronorite Unit (250 metres), and the Upper Gabbro Unit (50 metres). The complex and surrounding sediments are intruded by numerous diabase sills up to 30 metres in thickness.

ARM PLATINUM continued

IDEALISED GEOLOGICAL SECTION OF UITKOMST COMPLEX



Apart from the now mined out Massive Sulphide Body (MSB), situated at and below the base of the Uitkomst Complex, there are three main economic sulphide mineralised zones:

- The Basal Mineralised Zone (BMZ) within the Basal Gabbro
- The Main Mineralised Zone (MMZ) occurring within the Lower Pyroxenite Unit
- The Chromititic Peridotite Mineralised Zone (PCMZ) which occurs with the Chromititic Peridotite (PCR).

In addition, the Peridotite Unit contains the Peridotite Mineralised Zone (PRDMZ) which is a low grade disseminated sulphide mineralisation zone not yet included in the mine's resource base. The current mined chromite is contained within the Massive Chromitite Unit (MCHR) in the open-pit area. The dominant sulphide minerals are pyrrhotite, pentlandite and chalcopyrite. Cobalt is mostly in solid solution in the pentlandite, and the platinum group metals (PGMs) occur as separate minerals, with merenskyite being dominant.

Exploration activities

There was no exploration drilling conducted in this financial year. A total of 704 surface Reverse Circulation (RC) boreholes were drilled between 1 July 2018 and 30 June 2019 for the purposes of infill drilling and grade control in the open-pit. Total metres drilled are 48 738 metres at a cost of R19.8 million. There are no plans to resume exploration drilling in 2020.

Mining methods and infrastructure

Mining operations comprise open-pit mining operation which feeds two concentrators (MMZ and PCMZ) producing concentrate containing PGMs, nickel, copper and cobalt. Previously, MMZ was also mined by underground mechanised mining methods but this operation is now on care and maintenance. Final products are transported to various third parties for toll smelting and refining. Chrome products from Oxidised Massive Chromitite and the PCMZ, produced from the chrome washing plant and the PCMZ plant, are sold to local and export markets.

Mineral Resources

There has been numerous diamond, percussion and RC drilling campaigns since 1972. Consequently, various sampling and assaying protocols as well as varying standards of QA/QC have been used. Core sizes are mainly NQ and TNW. Before 1990 (Anglo American boreholes), half core samples over widths ranging from 1 metre to 5 metres were taken. Samples were assayed at the Anglo American Research Laboratory (AARL) for total nickel, copper and cobalt using Atomic Absorption (AA) and for 'sulphide' nickel using a peroxide leach/AA finish. Composite samples were assayed for platinum and palladium by Pb-collection fire-assay/ICP, S by combustion, and a range of major elements by fusion and density using the Archimedes bath method. Between 1990 and 1997 (Anglovaal boreholes), assays were carried out at the Anglovaal Research Laboratory (AVRL), with internal standard checks. Nickel analyses were also carried out by the partial digestion methods. Comparisons between AARL and AVRL were undertaken to ensure that the data was compatible.

In 2003, a 50 metre-spaced drilling programme was carried out in the shallow open-pit area. Samples from this drilling were analysed at AVRL for nickel, copper and cobalt using an aqua regia partial extraction/AA finish. Platinum, palladium, rhodium and gold were analysed by Pb-collection fire-assay/AA finish. Analyses also included Cr_2O_3, MgO, FeO and S. Density was also determined by gas pycnometer. Duplicates and internal standards were used and a suite of referee samples were analysed at the Genalysis Laboratory in Perth. Comparisons indicated good correlations between laboratories. In 2005, it was decided to resample many of the Anglo American drillholes to improve the sample density for PGEs in the open-pit area. Drill core was resampled (quarter core) at 1 metre intervals. Assays were carried out by the SGS Laboratory in Johannesburg for Pt, Pd and Au by Pb-collection fire-assay/AA finish and for Ni, Cu and Co by aqua regia leach/AA finish. Blanks, duplicates and standards were included for quality control.

In 2007/2008, a 50 metre in-fill diamond drilling programme (116 holes – 18 000 metres) was completed in the shallower part of Pit 3. In the Pit 2 area, another 44 holes (3 450 metres) were added to the database. Half-core samples from the Pit 3 drilling were analysed at Genalysis Laboratory Services in Perth for Ni, Cu and Co by aqua regia partial digestion/ICP finish; for Pt, Pd and Au by Pb-collection fire-assay/ICP finish; high chrome samples for Cr_2O_3 by fusion/ICP and density by gas pycnometer. AMIS standards, duplicates and blank samples were used for internal QA/QC. Half-core samples from the Pit 2 drilling were analysed at Nkomati Mine's laboratory for Ni, Cu and Co by aqua regia partial digestion/AA finish.

The underground MMZ and PCMZ Mineral Resources are based on surface and underground diamond drilling as well as RC holes. Underground holes are spaced 10 to 20 metres apart and the drill core is sampled at 1 metre intervals. The Nkomati Mine laboratory analysed samples for Ni, Cu and Co using aqua regia leach/ICP finish, while the PGE assays are carried out by SGS and Mintek Laboratories in Johannesburg. Both laboratories use blanks, standards and check assays for quality control.

Geological wireframe models are generated from the entire borehole database (boreholes and RC holes) in Datamine Studio 3. All data is used for the variography. Grade estimation is by Ordinary Kriging. In addition to the estimation of Ni, 3PGMs + Au, Co and Cu, density is also estimated for each model cell. Block sizes for the resource model are at 50 x 50 x 2.5 metres for poorly informed areas, 25 x 25 x 2.5 metres for moderately informed areas and 12.5 x 12.5 x 2.5 metres for well-informed areas. Grade cut-offs used for the Mineral Resources are 0.16% Ni for MMZ and PCMZ (open-pit) and 0.30% Ni for MMZ and PCMZ (underground).

The open-pit and underground Mineral Resources were based on the 2019 and 2016 Mineral Resource models, respectively, which were created on-mine and internally reviewed. An external audit was undertaken by MSA in March 2019 to review the open-pit Mineral Resource estimate. No fatal flaws or critical issues were identified. There were, however, some issues necessary to implement as well as some continuous

ARM PLATINUM continued

improvement items. A remedial action plan is in place to address the issues highlighted during the audit.

A three-dimensional approach to the Mineral Resource classification is applied. It allows for the classification of each block model cell based on a combination of model cell geostatistical parameters and geological confidence. The geostatistical parameters considered are search volume, Kriging variance, Kriging efficiency and regression slope.

Mineral Reserves

Mineral Reserves for the Nkomati open-pit area were derived from application of modifying factors to the Measured and Indicated Resources. The factors included mining method and design, mining recovery factors, mining dilution, plant recovery factors and mine optimisation at specific metal prices. Details of some of these parameters are provided as footnotes below the Mineral Reserves tables. The open-pit optimisation also considered the following parameters: mining cost, processing cost, services and supplementary cost, geotechnical slope parameters and environmental aspects.

NKOMATI MINE: MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Measured Resources						Indicated Resources						Measured and Indicated Resources						Inferred Resources					
	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%
Underground																								
MMZ	10.04	0.57	0.20	0.03	1.19		37.37	0.48	0.21	0.02	1.19		47.41	0.50	0.21	0.02	1.19		6.30	0.41	0.20	0.02	1.26	
PCMZ	1.05	0.37	0.12	0.02	0.95	10.11	12.68	0.38	0.12	0.02	0.92	10.77	13.73	0.38	0.12	0.02	0.92	10.72	40.05	0.40	0.12	0.02	0.92	10.52
Open-pit																								
MMZ Pit 3	36.14	0.34	0.16	0.02	0.96		19.04	0.37	0.16	0.02	0.98		55.18	0.35	0.16	0.02	0.97							
PCMZ Pit 3	33.87	0.22	0.06	0.01	0.71	13.84	25.55	0.21	0.06	0.01	0.71	12.96	59.42	0.22	0.06	0.01	0.71	13.46						
Total 2019 Mineral Resources	**81.10**	**0.32**	**0.12**	**0.02**	**0.88**		**94.64**	**0.37**	**0.15**	**0.02**	**0.98**		**175.74**	**0.35**	**0.14**	**0.02**	**0.94**		**46.35**	**0.40**	**0.13**	**0.02**	**0.97**	
Total 2018 Mineral Resources	78.11	0.33	0.13	0.02	0.92		94.09	0.37	0.15	0.02	0.98		172.20	0.35	0.14	0.02	0.96		46.35	0.40	0.13	0.02	0.97	

4E *= platinum + palladium + rhodium + gold.*
The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
Grade cut-off: Underground: 0.30% Ni MMZ and 0.30% Ni PCMZ. Open-pit: 0.16% Ni MMZ and 0.16% Ni PCMZ.
**** Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

NKOMATI MINE: CHROMITE MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Measured Resources		Indicated Resources		Measured and Indicated Resources		Inferred Resources	
	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%
Oxidised Massive Chromitite Pit 3 2019	**0.13**	**27.16**	**0.05**	**23.28**	**0.18**	**26.08**		
Oxidised Massive Chromitite Pit 3 2018	0.13	26.45			0.13	26.45		
Un-oxidised (fresh) Massive Chromitite Pit 3 2019	**0.12**	**25.26**	**0.21**	**24.42**	**0.33**	**24.73**		
Un-oxidised (fresh) Massive Chromitite Pit 3 2018	6.07	28.33			6.07	28.33		

The measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
Grade cut-off: 20% Cr_2O_3.
**** Nkomati Mine attributable interests (ARM 50%, Norilsk Nickel Africa (Pty) Ltd 50%).***

NKOMATI MINE: MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves						Probable Reserves						Total Reserves					
	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%
Open-pit																		
MMZ Pit 3	4.54	0.34	0.14	0.02	0.99		0.19	0.31	0.14	0.02	0.97		4.73	0.34	0.14	0.02	0.99	
PCMZ Pit 3	1.94	0.21	0.07	0.01	0.73	10.22	0.12	0.22	0.07	0.01	0.76	10.93	2.06	0.21	0.07	0.01	0.73	10.26
Total Mineral Reserves 2019	**6.48**	**0.30**	**0.12**	**0.02**	**0.91**		**0.31**	**0.28**	**0.11**	**0.02**	**0.89**		**6.79**	**0.30**	**0.12**	**0.02**	**0.91**	
** Total Mineral Reserves 2018	53.12	0.30	0.11	0.02	0.88		30.45	0.33	0.13	0.02	0.90		83.56	0.31	0.12	0.02	0.89	

4E *= platinum + palladium + rhodium + gold.*
Totals are rounded off.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Average plant recovery: 68%.
Price ranges (US$): ***Ni****: 12 750 – 14 519/t ;* ***Cu:*** *6 350 – 6 973/t;* ***Co:*** *16.50 – 27.00/lb ;* ***Pt:*** *906 – 992/oz;* ***Pd:*** *1 094 – 1 300/oz;* ***Au:*** *1 338 – 1 342/oz.*
Exchange rate (R/US$): 13.61 – 14.08.
Grade cut-off: ***Open-pit:*** *0.16% Ni MMZ and 0.16% Ni PCMZ.*
Life-of-mine: 15 months.
*** ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***
**** ***2018 Mineral Reserves include both open-pit and underground Mineral Reserves.***

NKOMATI MINE: MMZ STOCKPILE MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves						Probable Reserves						Total Reserves					
	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%
MMZ stockpiles 2019	**0.20**	**0.27**	**0.19**	**0.03**	**1.04**								**0.20**	**0.27**	**0.19**	**0.03**	**1.04**	
MMZ stockpiles 2018	0.12	0.45	0.20	0.03	1.20								0.12	0.45	0.20	0.03	1.20	

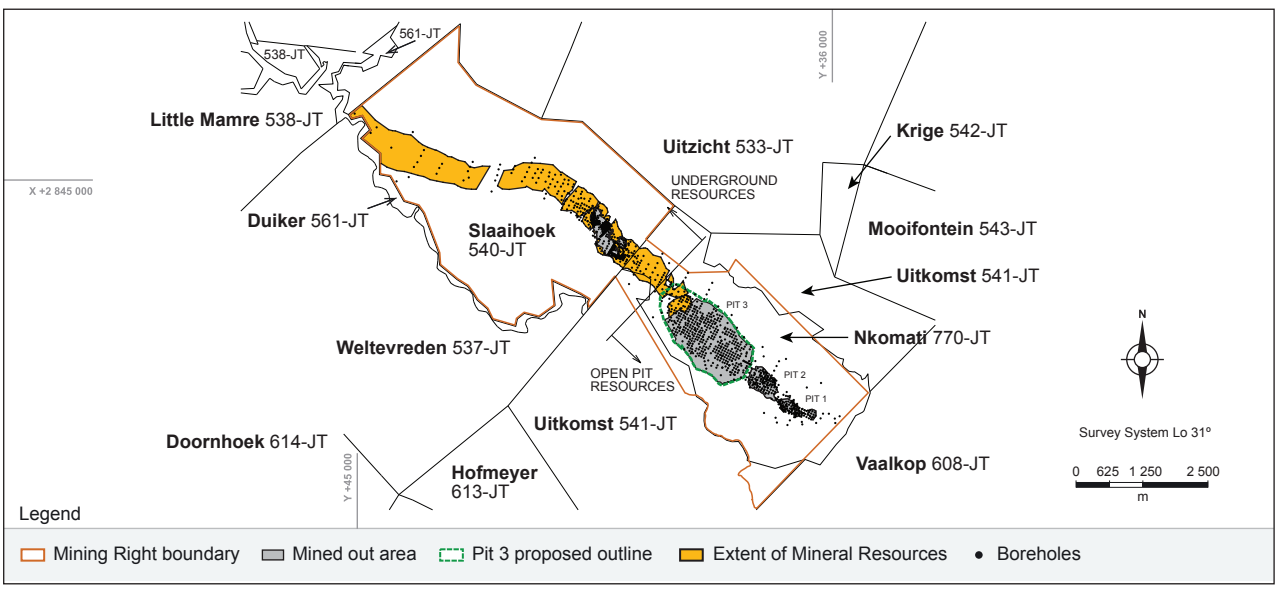
4E *= platinum + palladium + rhodium + gold.*
Totals are rounded off.
Grade cut-off: 0.16% Ni.
*** ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

NKOMATI MINE: PCMZ STOCKPILE MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves						Probable Reserves						Total Reserves					
	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%	Mt	Ni%	Cu%	Co%	4E g/t	Cr_2O_3%
PCMZ stockpiles 2019	**0.60**	**0.19**	**0.05**	**0.01**	**0.66**	**14.50**							**0.60**	**0.19**	**0.05**	**0.01**	**0.66**	**14.50**
PCMZ stockpiles 2018	0.77	0.18	0.05	0.01	0.67	13.52							0.77	0.18	0.05	0.01	0.67	13.52

4E *= platinum + palladium + rhodium + gold.*
Totals are rounded off.
Grade cut-off: 0.16% Ni.
*** ***Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

NKOMATI MINE MINERAL RESOURCES MAP



ARM PLATINUM continued

NKOMATI MINE: CHROMITE MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves		Probable Reserves		Total Reserves	
	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%
Oxidised massive chromitite pit 3 2019						
Oxidised massive chromitite pit 3 2018	0.05	25.87	0.06	21.61	0.11	23.55
Un-oxidised (fresh) massive chromitite pit 3 2019	**0.07**	**17.77**			**0.07**	**17.77**
Un-oxidised (fresh) massive chromitite pit 3 2018	0.66	17.23	0.55	19.83	1.21	18.41

Totals are rounded off.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Grade cut-off: 20% (Cr_2O_3).
Price ranges (US$/t): Cr Concentrate: 60.77 – 61.63.
Exchange rate (R/US$): 13.61 – 14.08.
** **Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

NKOMATI MINE: CHROMITE STOCKPILE MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves		Probable Reserves		Total Reserves	
	Mt	Cr_2O_3%	Mt	Cr_2O_3%	Mt	Cr_2O_3%
PCR stockpile	1.66	19.20			1.66	19.20
Fresh – massive chrome	0.11	22.00			0.11	22.00
Total stockpile Reserves 2019	**1.77**	**19.37**			**1.77**	**19.37**
Total stockpile Reserves 2018	2.10	19.18			2.10	19.18

Totals are rounded off.
Grade cut-off: 20% (Cr_2O_3).
** **Nkomati Mine attributable interests (ARM 50%; Norilsk Nickel Africa (Pty) Ltd 50%).***

Year-on-year change

There was a significant decrease in Mineral Reserves from 83.56 million tonnes at a grade of 0.31% Ni (72.34 million tonnes in the open-pit area and 11.22 million tonnes for the underground section) to 6.79 million tonnes at a grade of 0.30% Ni (open-pit Mineral Reserve) reported mainly due to:

- Lower nickel price outlook
- Increased mining costs
- Increased waste stripping requirements.

All the factors above necessitated the change in the Mining Plan. The underground Mineral Reserve was excluded as it is no longer economically viable under current nickel prices.

The Measured and Indicated Mineral Resources for Nkomati Mine, however, marginally increased by 2% from 172.20 to 175.74 million tonnes at 0.35 % Ni mainly due to new geological information and updating of the Mineral Resource model. The PCMZ Measured and Indicated Mineral Resources increased from last year as some of the fresh massive chromitite is now being reported under PCMZ as the material is processed in the PCMZ plant.

HISTORICAL PRODUCTION AT NKOMATI NICKEL MINE (MMZ AND PCMZ)

Financial year	ROM		Milled	
	Mt	Ni%	Mt	Ni%
2014/2015	7.35		8.03	
2015/2016	7.61		8.24	
2016/2017	5.20	0.38	7.49	0.30
2017/2018	5.90	0.26	8.04	0.24
2018/2019	7.09	0.28	8.15	0.26

IAR Additional information regarding production figures can be found on page 63 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

MODIKWA PLATINUM MINE

ARM's attributable beneficial interest in Modikwa's operations is 41.5%; 8.5% is held by the Modikwa Communities and 50% is held by Rustenburg Platinum Mines.

Locality

Modikwa Platinum Mine is situated approximately 15 kilometres north of Burgersfort and 15 kilometres north west of Steelpoort, along the border between the Mpumalanga and Limpopo Provinces in South Africa. Located at longitude 30°10'E and latitude 24°40'S, the site is accessed via the R37 road between Polokwane and Burgersfort. The topography of the area is defined by a low-lying broad valley which strikes due north-south and is underlain by rock units of the upper critical zone of the Bushveld Complex.

RR Refer to page 1 for the locality map showing the Modikwa Platinum Mine.

History

Exploration in the area started in the mid-1920s with the discovery of the Merensky Reef. During the late 1980s, drilling was undertaken on the UG2 and Merensky Reefs. In the late 1990s, a feasibility study was completed for the exploitation of the UG2 Reef. During 2001, a 50:50 JV agreement was signed between Rustenburg Platinum Mines and ARM Mining Consortium Limited. ARM's effective stake in Modikwa is 41.5%, through its 83% ownership of the ARM Mining Consortium. The other 8.5% is held by the Mampudima and Matimatjatji community companies through their 17% shareholding in the ARM Mining Consortium.

Competence

The following competent persons were involved in the estimation of Mineral Resources and Mineral Reserves for the Modikwa Platinum Mine. They are employed by Anglo American (I Colquhoun) and Modikwa Mine (J de Kock).

Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
I Colquhoun (Mineral Resources)	SACNASP	400097/00	BSc (Geology), BSc Hons (Mineral Economics)	36 years
J de Kock (Mineral Reserves)	SAIMM	705068	Government Survey Certificate of Competency	37 years

ARM PLATINUM continued

Mining authorisation

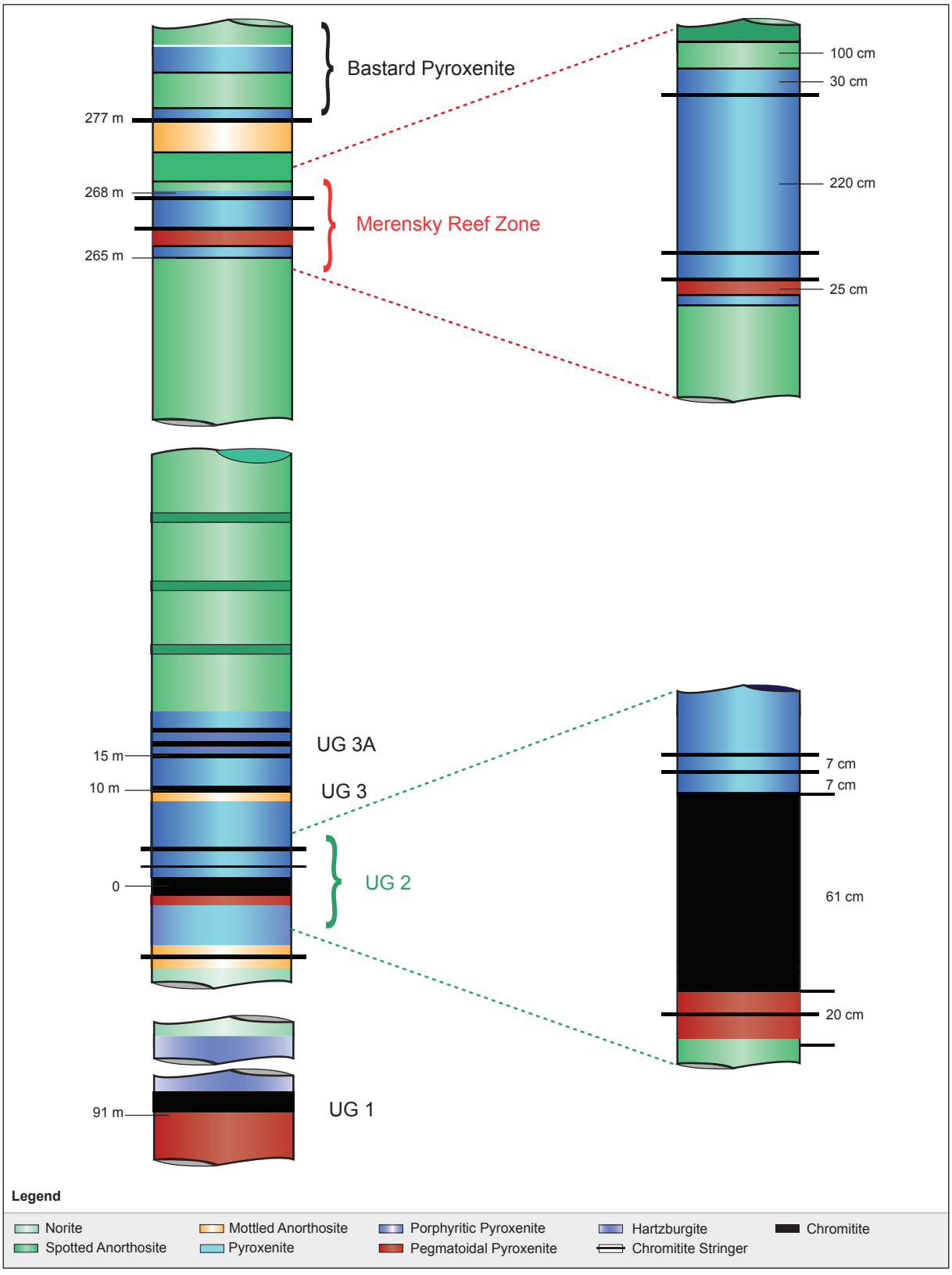
Legal entitlement	Minerals covered by Mining Right	Comment	Period of Mining Right (years)	Known impediments on legal entitlement
Mining Right LP 129 MR (as amended)	Platinum group metals together with metals and minerals found in association therewith.	The acquisition in respect of a portion of the farm Doornbosch 294 KT was completed, in 2019.	30 years: 13 November 2013 to 12 November 2043	None

Geology

The Bushveld layered sequence around Modikwa strikes north-northwest to south-southeast and dips to the southwest at 10º to 12º, with local variations in the dip resulting in gradients of nearly 20º. There are several instances where some gentle 'rolling' of the reef horizons have been recorded, and normally steeper dips are noted nearer the outcrop (as opposed to at depth). The outcrop positions of the Merensky Reef and the UG2 normally occur within the areas of low relief, and much of the outcrop is masked by extensive development of black turf, as well as, in places, transported sediments. On the farms Maandagshoek 254 KT, Onverwacht 292 KT and Winterveld 293 KT, however, the UG2 (and occasionally the Merensky Reef) outcrops in a series of elongated hills. Although frequently covered with scree material, much of this outcrop has been marked by a series of trenches and pits, many of which date from early pioneer prospecting.

Both the UG2 and Merensky Reefs are present at Modikwa. The UG2 occurs as a chromitite layer with an average thickness of approximately 60 centimetres. Three leader chromitites occur above the main seam. Gentle undulations of the UG2 with amplitudes of less than 2 metres are developed across the mine area. Potholes are randomly distributed within the North Shaft area but are less abundant in the South Shaft area. The Onverwacht Hill area in the southern portion of the mine is characterised by the presence of several large ultramafic pegmatoid intrusions that disrupt, and locally replace, the UG2.

GENERALISED GEOLOGICAL SUCCESSION AT MODIKWA PLATINUM MINE



ARM PLATINUM continued

Exploration activities

There was no surface drilling during 2019. A total of 5 042 metres were drilled underground at a cost of R3.1 million. The drilling results improved the geological structural interpretation.

Mining methods and infrastructure

Mining consists of mechanised development and conventional stoping. The UG2 is accessed via two primary declines from the surface, and South 2 shaft. Run-of-mine tonnage is processed at the Modikwa concentrator and the PGE-rich concentrate is transported to Anglo Platinum's Polokwane smelter and refining facilities.

Mineral Resources

The Mineral Resource modelling and estimation for Modikwa Platinum Mine is done by the Anglo American Platinum resource modelling team. The Mineral Resource classification is based on data constraints, information risk assessments, geological, geostatistical considerations and review by the competent person's team. The UG2 and Merensky Reef Mineral Resource is based on surface diamond drillholes (mother boreholes and deflections) and underground sample sections. The logs and assay values are kept in separate electronic databases and are combined for estimation purposes after rigorous data validation. Only the UG2 model was updated during the year.

Samples are submitted to Anglo Research Laboratories (AR) and Mintek Laboratories (primary laboratories) and to Genalysis (check laboratory) for analysis. The UG2 resource cut is divided into three units comprising the UG2 Reef and dilution cuts in the hanging wall and footwall to make up the mining cut. Estimation of the three sub-units in the mining cut is carried out separately and independently. Two-dimensional block models with block sizes of 125 x 125 metres, 250 x 250 metres and 500 x 500 metres, depending on the drillhole/sample section spacing, are created. The Pt, Pd, Rh, Au, Cu and Ni grades, reef width and density are interpolated using Ordinary Kriging. Mineral Resources are reported after deduction of geological losses. The geological losses account for losses due to pegmatoidal intrusions, faults, dykes and potholes.

Mineral Reserves

Part of the Measured and Indicated Mineral Resources are converted to Mineral Reserves by applying appropriate mining, metallurgical and economic factors, ie 'modifying factors', details of which are below the Mineral Reserves table.

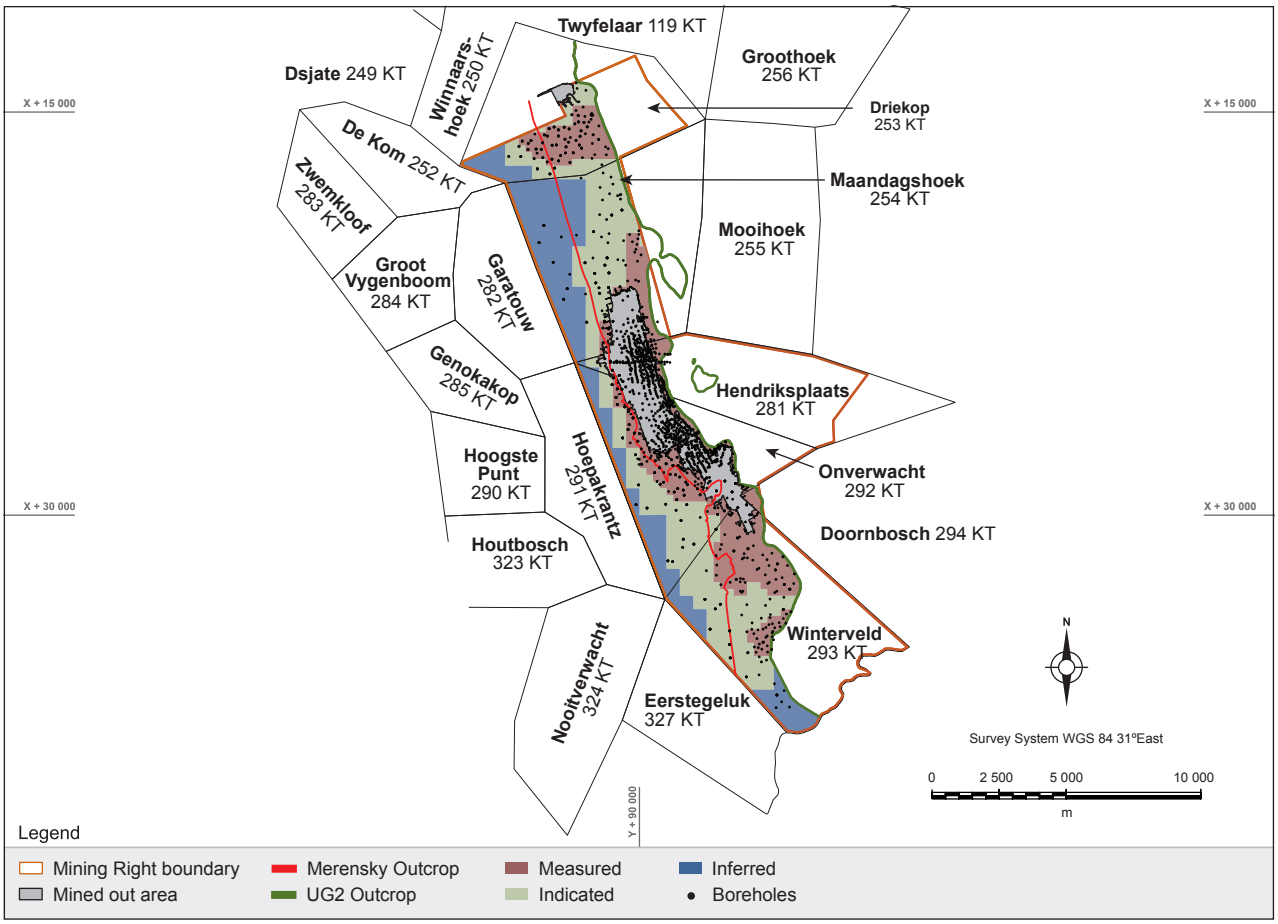
A minimum mining cut of 102 centimetres is used to determine the amount of footwall waste that is included in the mining cut. Where the hanging wall and the main seam thickness are greater than 102 centimetres, an additional 5 centimetres of footwall waste is included. The basal contact of the UG2 layer is typically high-grade and it is important that this contact is not left in the footwall during mining.

MODIKWA PLATINUM MINE: UG2 MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources				Mineral Reserves		
	Mt	4E g/t	4E Moz		Mt	4E g/t	4E Moz
Measured	86.30	5.94	16.48	Proved	15.68	4.49	2.26
Indicated	102.50	5.92	19.51	Probable	31.48	4.27	4.32
Total Measured and Indicated 2019	**188.80**	**5.93**	**35.99**	**Total Reserves 2019**	**47.16**	**4.34**	**6.58**
Total Measured and Indicated 2018	190.40	5.95	36.38	Total Reserves 2018	42.27	4.62	6.27
Inferred 2019	**77.30**	**6.24**	**15.51**				
Inferred 2018	77.80	6.22	15.56				

***4E** = platinum + palladium + rhodium + gold.*
** The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.*
Totals are rounded off.
Key assumptions for Mineral Resources:
Geological loss factor applied: 10.96% – 38.78% (average of 16.78% over lease area).
Grade and thickness cut-off: No grade cut-off applied but grades are >4.09 g/t (4E) and 1.02 metres.
Density: 3.92 g/cm^3 average for the total Mineral Resource.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
'Unknown' geological loss factor applied: 4% – 9%.
Mining loss factor: 1.2%.
Mining dilution: 33%.
Plant recovery: 88% (4E).
Mine call factor: 95%.
*Price ranges (US$/oz): **Pt:** 800 – 900; **Pd:** 950 – 1 050; **Rh:** 1 950 – 2 250; **Ru:** 100 – 200; **Ir:** 950 – 1 050; **Au:** 1 300 – 1 450.*
*Prices (US$/tonne): **Cu:** 6 500 – 7 000; **Ni:** 14 000 – 15 000.*
Exchange rate (R/US$): 13.75 – 14.50.
Reserve cut-off grade: 3.66 g/t (4E).
Life-of-mine: 24 years.
**** Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa communities 8.5%, Anglo American Platinum 50%).***

MODIKWA PLATINUM MINE UG2 MINERAL RESOURCES CLASSIFICATION



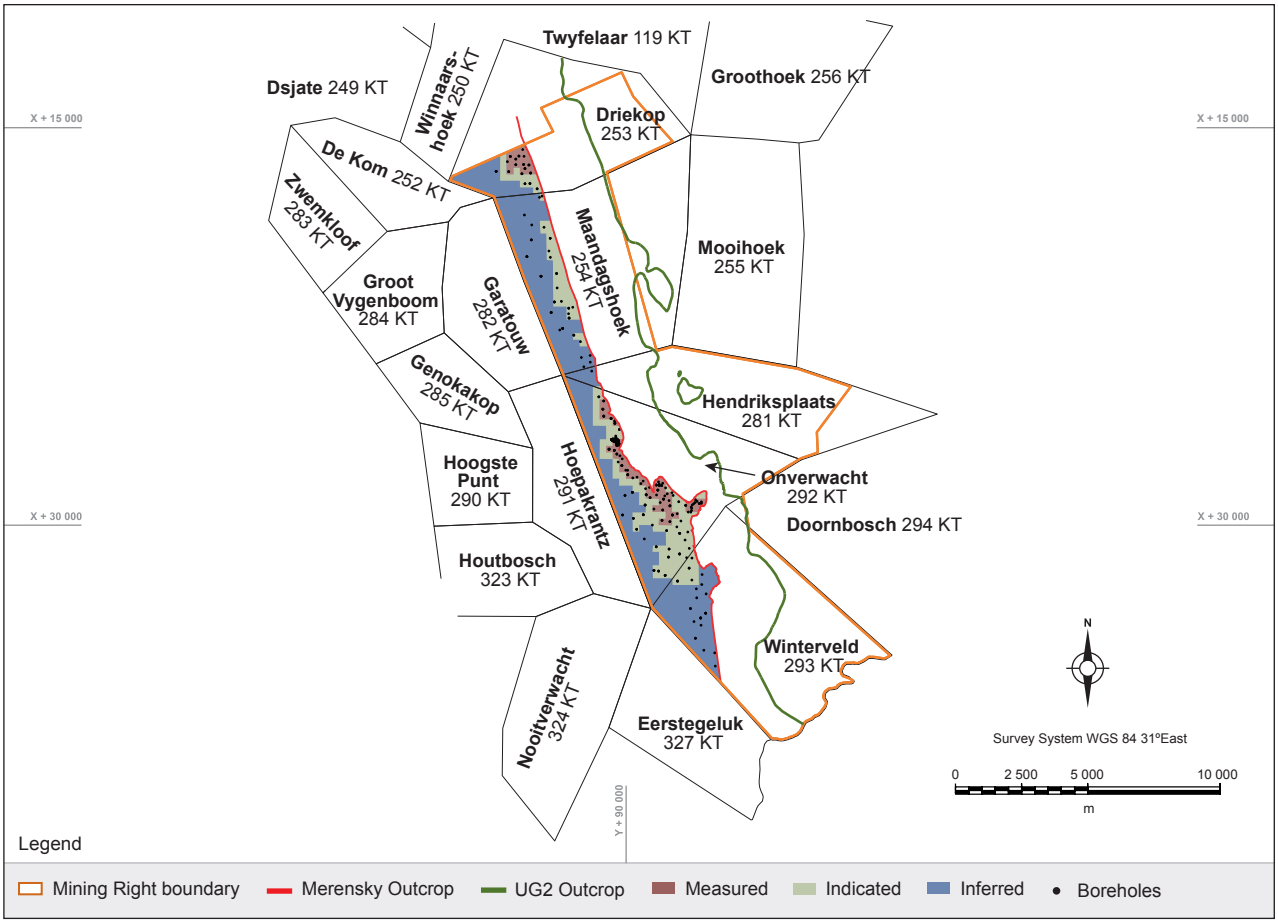
MODIKWA PLATINUM MINE: MERENSKY REEF MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

	Mineral Resources		
* Mineral Resources are reported on a 100% basis.	Mt	4E g/t	4E Moz
Measured	18.54	2.93	1.75
Indicated	55.73	2.72	4.88
Total Measured and Indicated 2019	**74.27**	**2.78**	**6.63**
Total Measured and Indicated 2018	74.27	2.78	6.63
Inferred 2019	**138.59**	**2.65**	**11.83**
Inferred 2018	138.59	2.65	11.83

4E = *platinum + palladium + rhodium + gold.*
Totals are rounded off.
Key assumptions for Mineral Resources:
Geological loss factor applied: 10.96% to 38.78% (average of 16.78% over lease area).
Grade and thickness cut-off: No cut-off grade applied but grades are >1.52 g/t (4E) and 1.02 metres.
* ***Modikwa Platinum Mine attributable interests (ARM 41.5%; Modikwa communities 8.5%; Anglo American Platinum 50%).***

ARM PLATINUM continued

MODIKWA PLATINUM MINE MERENSKY MINERAL RESOURCES CLASSIFICATION



Year-on-year change

The Measured and Indicated Mineral Resources for the UG2 marginally decreased from 190.40 miliion tonnes at 5.95 g/t (4E) to 188.80 million tonnes at 5.93 g/t (4E).

The UG2 Reef Mineral Reserves increased from 42.27 million tonnes at 4.62 g/t (4E) to 47.16 million tonnes at 4.34 g/t (4E) mainly due to the mining design changes and the addition of Doornbosch Mineral Reserves after acquisition of a portion of this farm was formally concluded during the year.

HISTORICAL PRODUCTION AT MODIKWA PLATINUM MINE (UG2 REEF)

	ROM		Milled	
Financial year	Mt	Grade g/t (4E)	Mt	Grade g/t (4E)
2014/2015	1.86		1.86	
2015/2016	2.08		2.05	
2016/2017	2.05	4.96	2.01	4.60
2017/2018	2.06	5.26	2.43	4.22
2018/2019	2.06	4.17	2.29	4.18

IAR Additional information regarding production figures can be found on page 62 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

KALPLATS PGM PROSPECT

ARM attributable beneficial interest in the Kalplats PGM Prospect is 46%. Stella Platinum holds 44% and Anglo American Prospecting Services 10%.

Locality

The Kalplats Platinum Prospect is situated 330 kilometres west of Johannesburg and approximately 90 kilometres south west of Mahikeng in the North West Province of South Africa. Situated at latitude 26º30'S and longitude 24º50'E, the project areas are accessed from Stella on the N14 national road linking Mahikeng and Vryburg.

RR Refer to page 1 for a locality map showing the Kalplats PGM Prospect.

History

Anglo American discovered the Kalplats platinum deposits in the early 1990s and Harmony Gold Mining Company Limited acquired the prospect from Anglo in 1999. Subsequently, ARM acquired the prospect as part of the merger of the Anglovaal, ARM and Harmony assets in 2004. Pre-2004, exploration comprised a combination of rotary air blast (RAB), reverse circulation (RC) and diamond drilling. Anglo drilled a total of 6 000 metres in 133 holes, while Harmony drilled a total of 35 640 metres in 399 holes. Harmony commissioned a feasibility study in 2003 and excavated a 500 tonne bulk sample for metallurgical test work. The study assessed the viability of both an open-pit and underground mining operation. The feasibility study was completed early in 2004. In 2005, ARM Platinum entered into two joint venture agreements with Platinum Australia (PLA), one of which was over the 'Kalplats PGM Prospect', which provided for PLA to earn up to 49% by completing a bankable level feasibility study and making the Panton metallurgical process available at no cost. PLA commenced drilling in 2006 with a combination of diamond and RC drilling focusing on extending the resources on the Vela, Scorpio, Sirius, Mira, Serpens North, Serpens South and Crux deposits. PLA completed 683 drill holes totalling 92 529 metres. Late in 2009, PLA completed a pre-feasibility study on a 1.5 million tonne of ore per year open-pit mining operation and in 2012, PLA completed a Definitive Feasibility Study. Stella Platinum acquired PLA's interest in Kalplats in 2015.

Competence

Geological modelling and resource estimation was done by Coffey Mining Consultants, who provided consent to publish the Mineral Resources in the ARM annual reports.

ARM PLATINUM continued

Prospecting Rights

Prospect	Legal entitlement	Minerals covered by Prospecting Right	Comment	Period of Prospecting Right (years)	Known impediments on legal entitlement
Kalplats PGM Prospect	Prospecting Right NW 492 PR	Platinum, gold ore, silver ore, precious stones, palladium, nickel ore, copper ore, cobalt and chrome ore.	ARM Platinum has applied for a Retention Permit over the Kalplats Prospect area.	Application for Retention Permit has been done, and no indication has been given on the outcome.	None

Geology

PGE mineralisation is hosted mainly by magnetite-rich gabbros within the Stella Layered Intrusion (SLI), a 3.0 billion-year-old layered complex intruded into the Kraaipan Greenstone Belt. Mineralisation is contained in eight separate, subvertically dipping zones known as Crater, Orion, Vela, Sirius, Mira, Serpens North, Serpens South and Crux, each with strike lengths of between approximately 500 and 1 000 metres and widths of between 15 and 45 metres. In addition, drilling has outlined at least three additional deposits known as Scorpio, Tucana and Pointer.

Three main sub-parallel reef packages within each zone have been recognised. They are the Main Reef (the highest grade reef), Mid Reef and LG Reef. The area is structurally complex, and thrusting has caused duplication of reefs in some cases.

Exploration activities

No exploration drilling programme was undertaken.

Mining methods and infrastructure

No mining is currently being undertaken at Kalplats.

Mineral Resources

Geological modelling and resource estimation was done on all eight major deposits in the Kalplats PGM Prospect. Mineral Resources have been estimated to a depth of 200 metres below surface at a cut-off grade of 0.5 g/t 3E. Tonnages and grades are reported only for the entire thickness of a package of seven reefs, namely the UM, UUM, LM, MR, LG, MMW and Main Reef Residual layers.

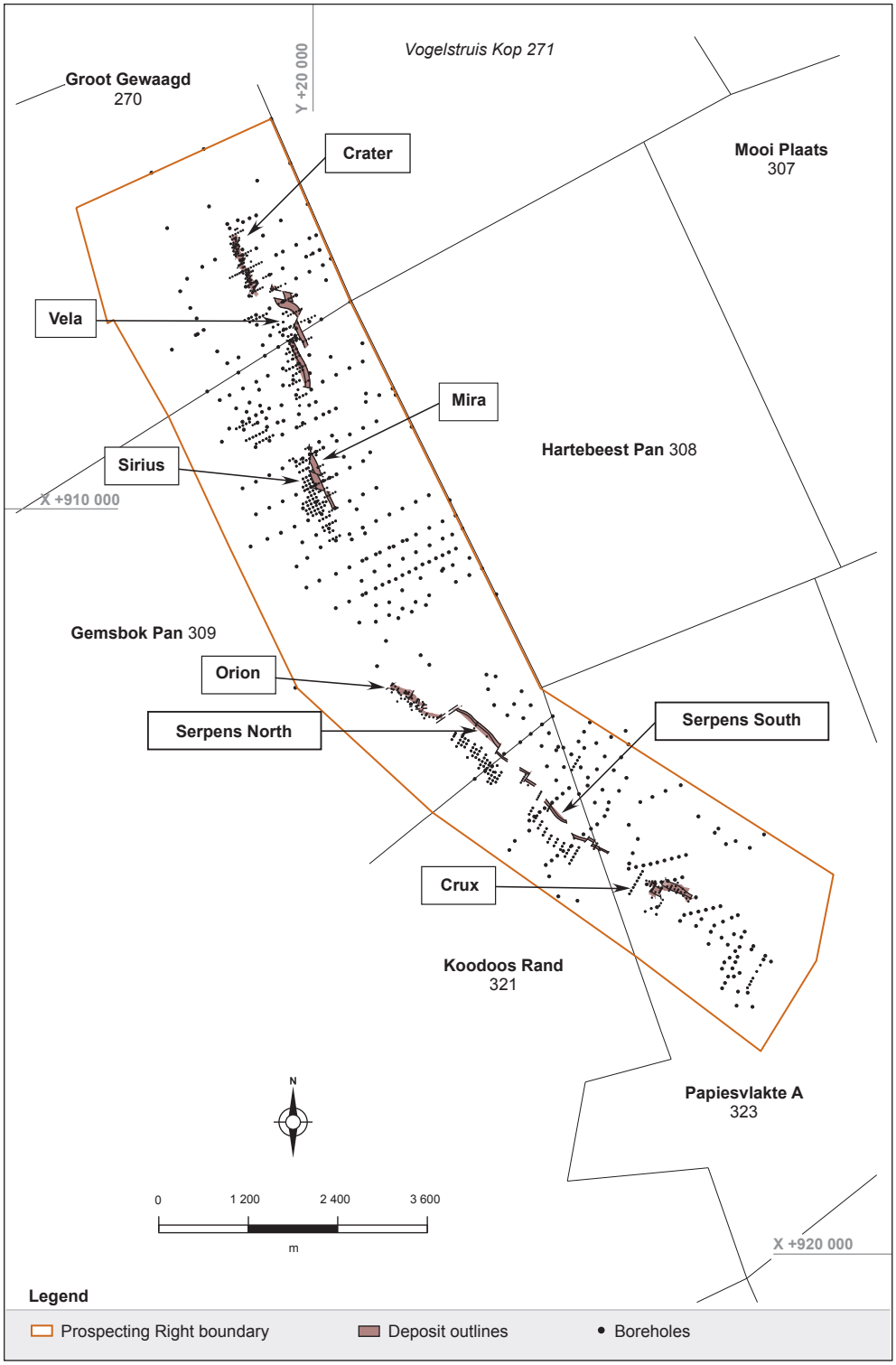
KALPLATS MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Measured Resources		Indicated Resources		Measured and Indicated Resources			Inferred Resources	
	Mt	3E g/t	Mt	3E g/t	Mt	3E g/t	3E Moz	Mt	3E g/t
Crater	1.34	1.89	6.22	1.85	7.55	1.86	0.45	18.66	2.11
Orion	4.20	1.57	4.01	1.56	8.21	1.57	0.41	3.64	1.61
Crux	7.70	1.55	10.88	1.40	18.58	1.46	0.87	9.46	1.35
Sirius	0.80	1.52	5.31	1.49	6.11	1.49	0.29	3.38	1.27
Mira			2.71	1.42	2.71	1.42	0.12	3.93	1.44
Vela			21.79	1.36	21.79	1.36	0.95	14.87	1.32
Serpens North			4.96	1.41	4.96	1.41	0.22	2.74	1.47
Serpens South								10.76	1.34
Total 2019	**14.04**	**1.59**	**55.88**	**1.46**	**69.91**	**1.48**	**3.33**	**67.44**	**1.57**
Total 2018	14.04	1.59	55.88	1.46	69.91	1.48	3.33	67.44	1.57

***3E** = platinum + palladium + gold.*
Totals are rounded off.
Mineral Resources include UM, UUM, LM, MR, LG, MMW and the Main Reef Residual layers, which is the total mineralised width for all seven layers.
Key assumptions for Mineral Resources:
Grade cut-off: 0.5 g/t.
*** Kalplats Platinum Prospect attributable interests (ARM 46%; Stella Platinum 44%; Anglo American Prospecting Services 10%).***

The Kalplats Mineral Resources estimates were done in September 2009 by Coffey Mining Consultants, and no model updates have been done since then.

KALPLATS PGM DEPOSITS LOCALITY MAP



Year-on-year change

There were no changes to the Measured, Indicated and Inferred Mineral Resources in comparison to 2018.

ASSMANG PROPRIETARY LIMITED (ASSMANG) OPERATIONS

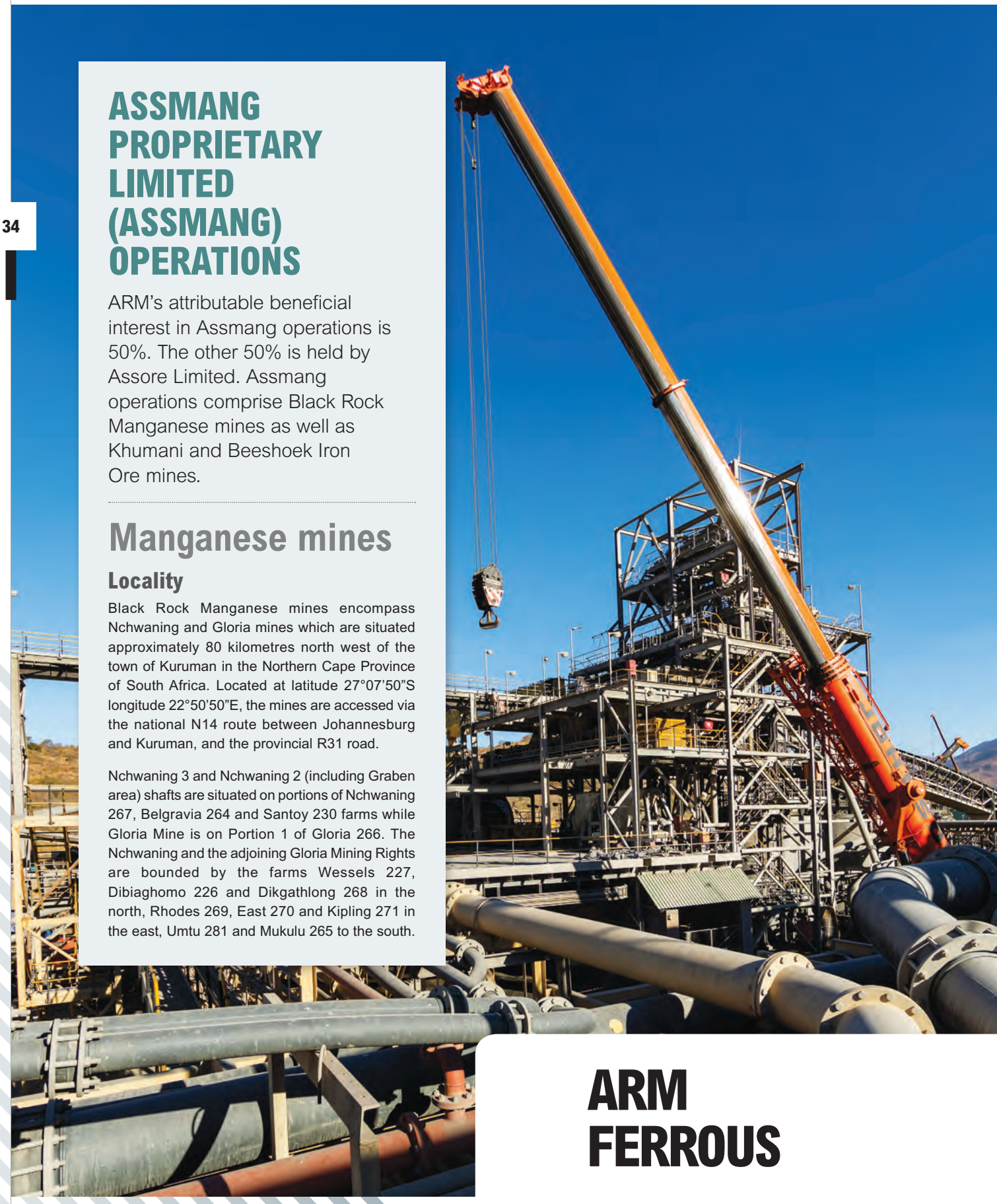
ARM's attributable beneficial interest in Assmang operations is 50%. The other 50% is held by Assore Limited. Assmang operations comprise Black Rock Manganese mines as well as Khumani and Beeshoek Iron Ore mines.

Manganese mines

Locality

Black Rock Manganese mines encompass Nchwaning and Gloria mines which are situated approximately 80 kilometres north west of the town of Kuruman in the Northern Cape Province of South Africa. Located at latitude 27°07'50"S longitude 22°50'50"E, the mines are accessed via the national N14 route between Johannesburg and Kuruman, and the provincial R31 road.

Nchwaning 3 and Nchwaning 2 (including Graben area) shafts are situated on portions of Nchwaning 267, Belgravia 264 and Santoy 230 farms while Gloria Mine is on Portion 1 of Gloria 266. The Nchwaning and the adjoining Gloria Mining Rights are bounded by the farms Wessels 227, Dibiaghomo 226 and Dikgathlong 268 in the north, Rhodes 269, East 270 and Kipling 271 in the east, Umtu 281 and Mukulu 265 to the south.



LOCALITY MAP OF BLACK ROCK MANGANESE OPERATIONS

History

In 1940, ARM Ferrous acquired a manganese ore outcrop on a small hillock known as Black Rock. Several large properties underlain by ore were subsequently found and acquired. Today, the Black Rock area is considered to be one of the largest and richest manganese deposits in the world. Manganese mining operations were extended and today include the Gloria and Nchwaning underground mines. Manganese ore is supplied locally to the Assmang-owned Cato Ridge Smelter, and is exported through Port Elizabeth, Durban and Richards Bay.

Competence

The following competent persons were involved in the estimation of Black Rock Mineral Resources and Mineral Reserves. They are employed by Assmang.

Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
B Ruzive (Mineral Resources)	SACNASP	400238/07	BSc, BSc Hons (Geology), MSc (Exploration Geology), MBA	19 years
J Smuts (Mineral Reserves)	ECSA	201270097	B Tech (Mining Engineering)	8 years

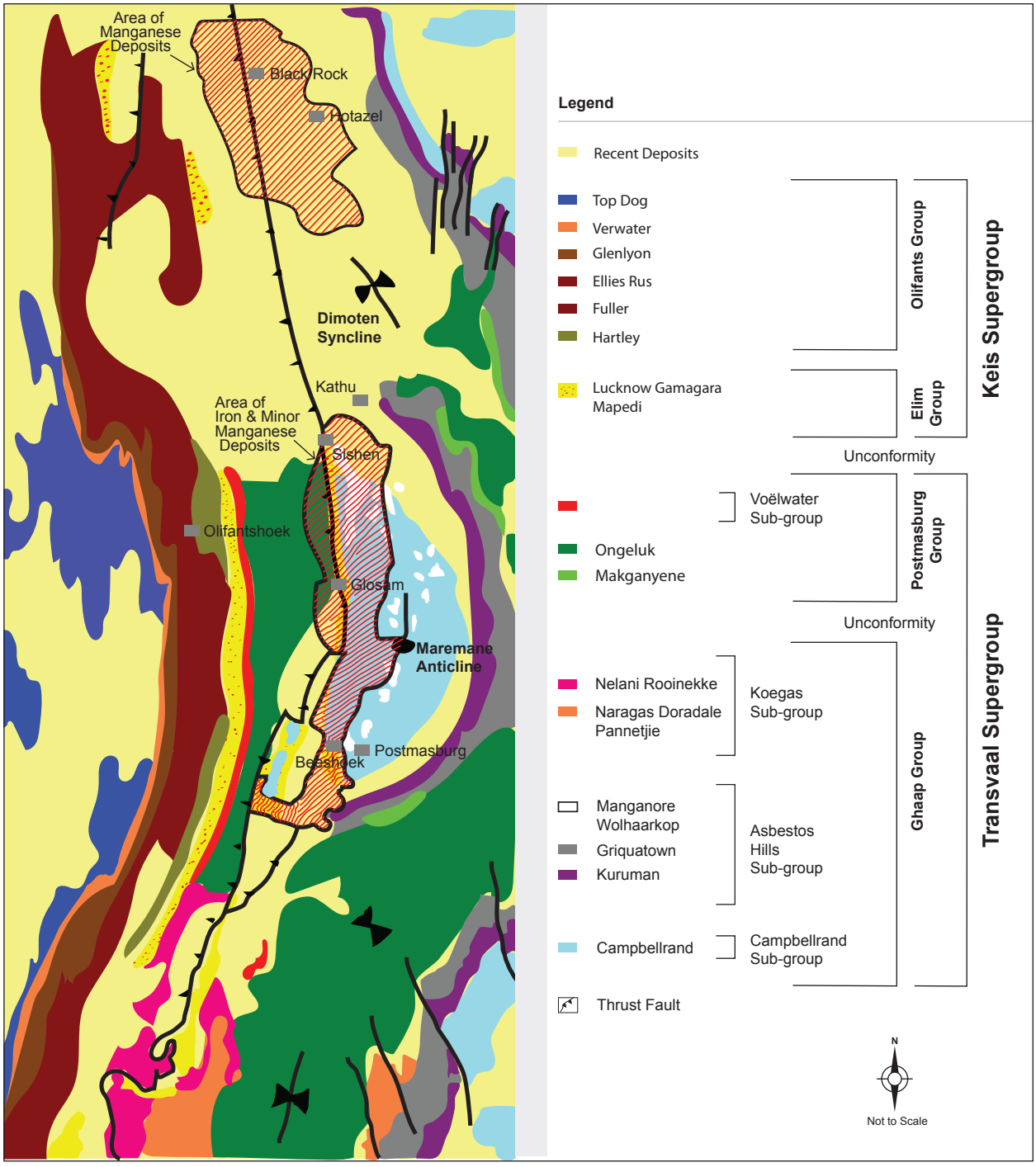
Mining authorisation

Legal entitlement	Minerals covered by Mining Right	Comment	Period of Mining Right (years)	Known impediments on legal entitlement
Mining Right NC 30/5/1/2/2/203 MRC	Manganese ore	None	30 years: 13 July 2011 to 12 July 2041	None

Geology

The manganese ores of the Kalahari Manganese Field are contained within sediments of the Hotazel Formation in the Postmasburg Group of the Griqualand West Sequence, a sub-division of the Proterozoic Transvaal Supergroup. The Griqualand West Sequence comprises a basal dolomite and banded ironstones dominating the Ghaap, Postmasburg and the Olifantshoek Groups. The Postmasburg Group consists of basal basaltic andesites of the Ongeluk lava and banded ironstone and manganese of the Hotazel Formation.

REGIONAL GEOLOGICAL MAP



On Belgravia, Santoy and Nchwaning farms the Hotazel Formation and overlying Mapedi shales and Lucknow quartzite sequences have been duplicated by thrusting. The thrusted orebodies were mined from surface at the Kalahari Manganese Field discovery outcrop, the Black Rock Koppie and at two other down dip interconnected Belgravia 1 and Belgravia 2 shafts. Mining reached depths of approximately 200 metres. The manganese resources hosted in the thrusted orebodies are reported, collectively, under Black Rock (Koppie area) orebodies. The average thickness of the Hotazel Formation is approximately 40 metres, with the banded iron formation (BIF) hosted manganese ore bodies occurring as three stratabound and stratiform units of variable thickness. The lowermost orebody (Seam 1) is higher grade in comparison to the topmost orebody (Seam 2). Seam 3, which occurs inbetween Seams 1 and 2, is thin and uneconomic.

GENERALISED STRATIGRAPHY OF MANGANESE UNITS IN THE HOTAZEL FORMATION

** Mn seams tend to be thicker in lower-grade Mamatwan/Gloria type ore compared to the higher-grade Wessels/Nchwaning type ore.*

The manganese orebodies exhibit a complex mineralogy and more than 200 ore and gangue mineral species have been identified. Hydrothermal upgrading has resulted in zoning of the orebody adjacent to fault positions. Distal areas exhibit more original and low-grade kutnohorite and braunite assemblages, while areas immediately adjacent to faults exhibit high-grade hausmannite rich ore. The intermediate areas exhibit mineralogy which includes bixbyite, braunite and jacobsite among a host of other manganese-bearing minerals. Similar zonation also exists in the vertical sense.

At the top and bottom contacts it is common to have high iron (Fe) and low manganese (Mn) contents while the reverse is true towards the centre of the seam. This vertical zoning has given rise to a mining practice where only the 4.0 to 5.0 metre-high centre portion of the seam is being mined.

Exploration activities

A total of 12 boreholes were planned for the 2018/2019 Nchwaning drilling project. The project started in March 2019. Drilling takes place in two stages, percussion drilling of the unconsolidated formation followed by diamond drilling. Percussion drilling was completed on all planned Nchwaning boreholes. Diamond drilling was completed on three boreholes (BEL8, BEL8A and BEL8B) by year end. The completed boreholes have all intersected the Hotazel Formation and the seam positions in the boreholes correlate well with the current geological model. Drilling is planned to commence on SA1J, SA1L and SA2H during the first quarter of 2020. An additional 11 boreholes will be drilled at Nchwaning and Gloria during F2020. The exploration expenditure for 2019 was R3.6 million.

Mining methods and infrastructure

Trackless mechanised equipment is used in the Bord and Pillar mining method. Two manganese seams are mined. The lowermost (Seam 1) at Nchwaning 3 is up to 6 metres thick, of which up to 5 metres is mined. There is, therefore, minimum dilution. Mining of Nchwaning Seam 2 has also been done on an optimum cut of 4.0 metres. Gloria Seam 1 is approximately 14 metres thick, but only an optimum cut of 4.0 metres is mined. No mining has been undertaken to date on Gloria Seam 2.

Nchwaning Mine Mineral Resources

Nchwaning Mine was diamond drilled from surface at 330 metre grid centres and the data is captured in a Geological Database Management System (GDMS) developed by Datamine. The core is logged and 0.5 metre-long, half-core, diamond-saw cut samples are submitted to Assmang's laboratory at Black Rock for X-ray fluorescence (XRF) analyses. Mn and Fe values are checked by Wet Chemical analyses. Several standards are used to calibrate the XRF equipment, and results are compared with other laboratories on a regular basis.

At Nchwaning, boreholes and underground sample sections were considered in the geological modelling and grade estimation for Nchwaning Seams 1 and 2. The geological modelling and the grade estimation was undertaken using Datamine Studio 3 and Datamine Strat 3D software. The resource models were built on 50 metre x 50 metre x optimal minable cut. The optimal mineable cuts were 4 to 5 metres for Nchwaning Seams. The blocks were sub-split in the X and Y directions to accurately follow the geological boundaries.

Statistical and geostatistical analysis was done on the following variables: Mn, Fe, Al_2O_3, BaO, CaO, K_2O, MgO, Na_2O, P, S and SiO_2. Ordinary Kriging interpolation within Datamine Studio 3 was used to estimate the grade of each block. Borehole and/or underground sample data composited to the optimal mineable cut was used in the estimation of grades. The relative density of the Nchwaning manganese Seams 1 and 2 was determined as 4.3 t/m^3. Mineral Resource classification at Nchwaning Mine is based on a number of parameters: Kriging variance, Kriging efficiency, regression slope, geological continuity of the manganese seams, geological structures and quality of assay data. Each of these parameters contributes to the overall classification. Measured and Indicated Resources have been declared for Nchwaning.

Nchwaning Mine Mineral Reserves

Conversion of the Mineral Resources to Mineral Reserves is done for the Measured and Indicated Mineral Resources. The main modifying factors for the conversion are: plant recovery factor, manganese prices and mining extraction factors. Details of these factors are listed below the Mineral Reserves tables.

Mining in the eastern extremity of Nchwaning occurs at a depth of 200 metres, while the deepest (current) excavations are 519 metres below surface. Ore from Nchwaning No 2 Mine is crushed underground before being hoisted to a surface stockpile via a

ARM FERROUS continued

vertical shaft. Similarly, ore from the Nchwaning No 3 Mine is crushed underground before being conveyed to a surface stockpile via a declined conveyor system. Ore is withdrawn from the surface stockpile and undergoes two stages of crushing, dry screening and wet screening to yield lumpy and fine products.

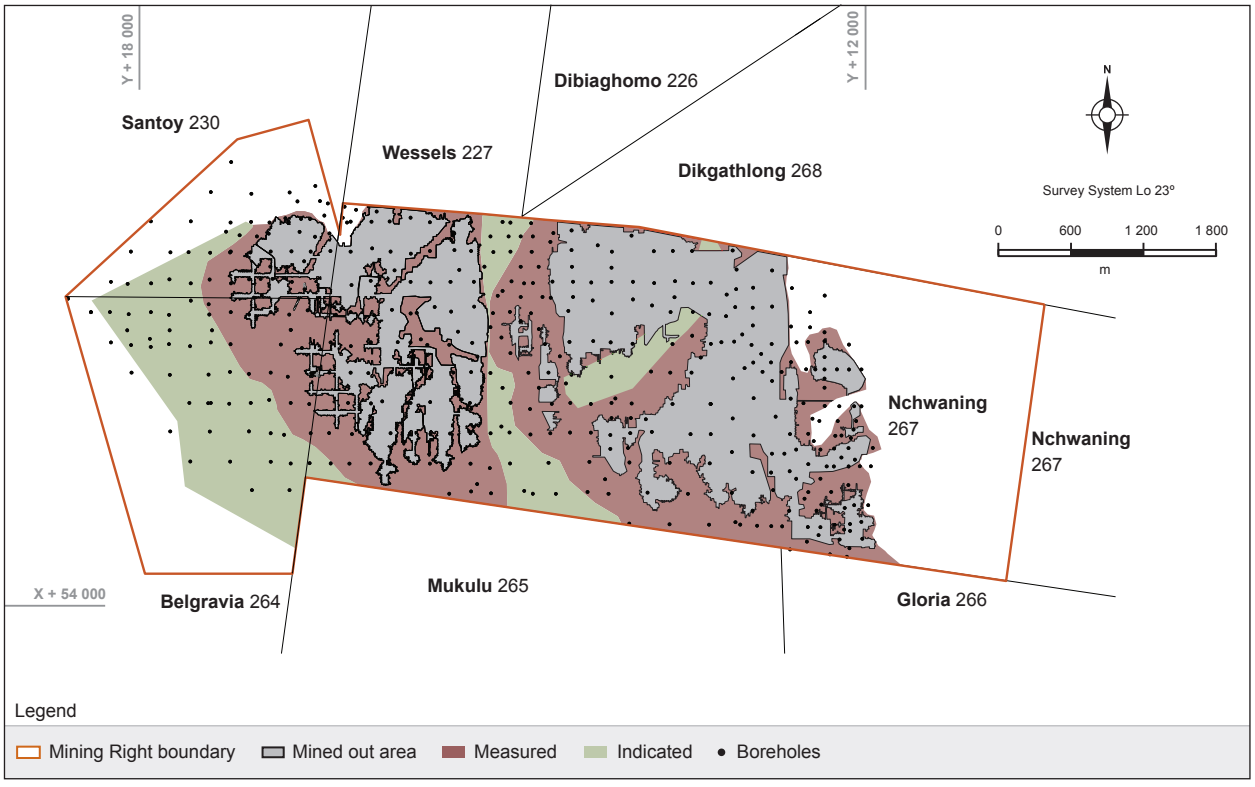
At the plant, the finer fractions are stockpiled while the coarser fractions are extracted from the respective product boxes into road haulers, sampled, weighed and stored on stacks ahead of despatch. Samples from each stack are analysed for chemical content and size distribution. This ensures good quality control and enables the ore control department to blend various stacks according to customer requirements.

NCHWANING MINE: SEAM 1 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources				Mineral Reserves		
	Mt	Mn%	Fe%		Mt	Mn%	Fe%
Measured	82.11	44.65	9.08	Proved	38.65	44.16	9.00
Indicated	49.05	40.48	7.83	Probable	30.11	42.20	8.23
Total Measured and Indicated (Seam 1) 2019	**131.16**	**43.09**	**8.61**	**Total Reserves (Seam 1) 2019**	**68.76**	**43.30**	**8.66**
Total Measured and Indicated (Seam 1) 2018	128.05	43.04	8.76	Total Reserves (Seam 1) 2018	73.17	43.26	8.85

The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
True thickness cut-off: 4.0 metres – 5.0 metres.
Density: 4.3 t/m³.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Cut-off grade: 35% Mn.
Tramming loss factor: 1%.
Plant recovery: 91%.
Mine extraction factor: 72% – 78%.
Price ranges: Based on market-related long-term view.
Exchange rate used: Market-related.
Life-of-mine: 30 years.
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

NCHWANING MANGANESE SEAM 1 MINERAL RESOURCES CLASSIFICATION

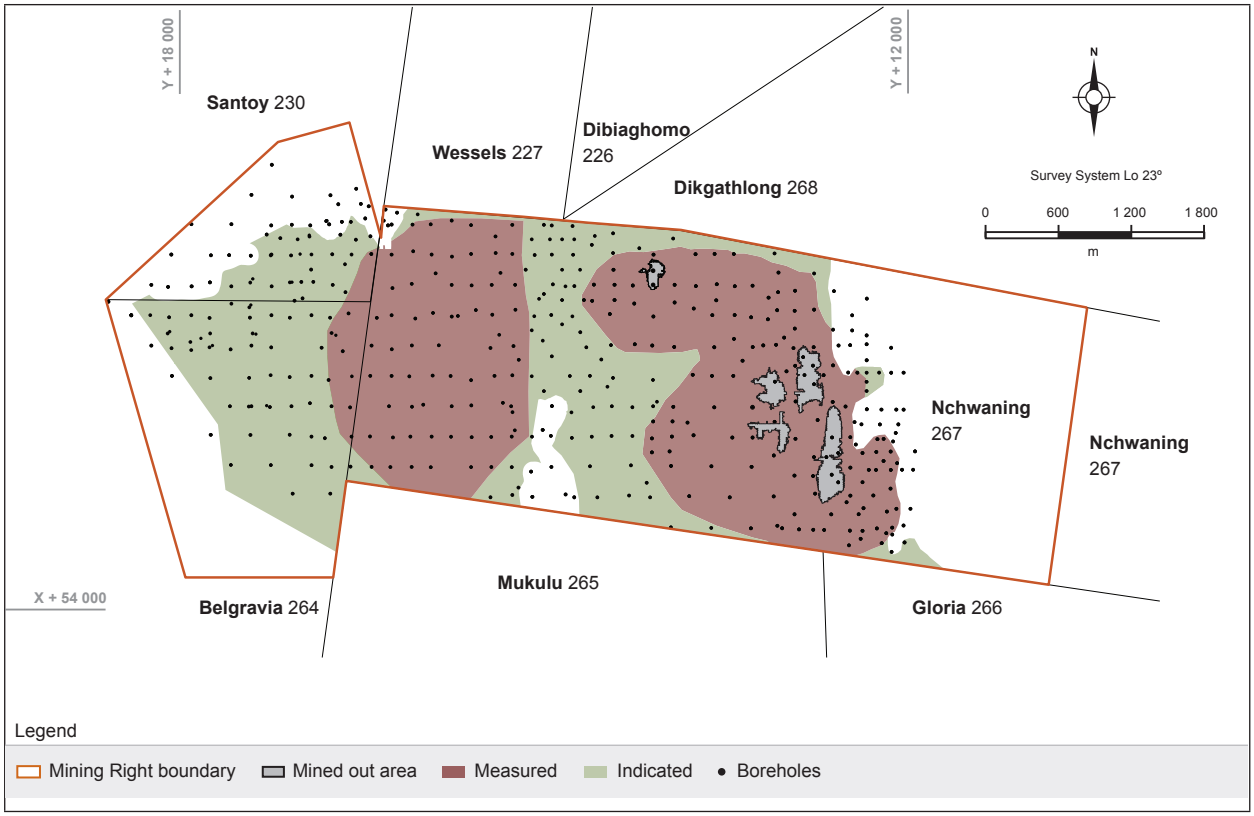


NCHWANING MINE: SEAM 2 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources				Mineral Reserves		
	Mt	Mn%	Fe%		Mt	Mn%	Fe%
Measured	104.25	42.83	15.86	Proved	73.09	42.70	15.91
Indicated	68.54	42.08	15.25	Probable	36.01	42.80	15.46
Total Measured and Indicated (Seam 2) 2019	**172.79**	**42.53**	**15.62**	**Total Reserves (Seam 2) 2019**	**109.10**	**42.73**	**15.76**
Total Measured and Indicated (Seam 2) 2018	172.24	42.36	15.65	Total Reserves (Seam 2) 2018	103.19	42.55	15.85

The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
True thickness cut-off: 4.0 metres.
Density: 4.3 t/m³.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Cut-off grade: 38% Mn.
Tramming loss factor: 1%.
Plant recovery: 91%.
Mine extraction factor: 72% – 78%.
Price ranges: Based on market-related long-term view.
Exchange rate used: Market-related.
Life-of-mine: 30 years.
**** Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

NCHWANING MANGANESE SEAM 2 MINERAL RESOURCES CLASSIFICATION



ARM FERROUS continued

Nchwaning year-on-year change

Measured and Indicated Mineral Resources for Nchwaning Seam 1 increased from 128.05 million tonnes to 131.16 million tonnes largely as a result of changes and re-interpretation of geological structures incorporated in the modelling process. Mining depletions were masked by the global increase in Mineral Resources.

Nchwaning Seam 2 Mineral Reserves increased by 6% to 109.10 million tonnes at 42.73% Mn due to the increase in the depth to which Seam 2 could be mined based on geotechnical recommendations.

HISTORICAL MANGANESE PRODUCTION AT NCHWANING MINE (SEAM 1 AND 2)

	ROM	Saleable
Financial year	Mt	Mt
2014/2015	3.05	2.48
2015/2016	2.91	2.39
2016/2017	3.00	2.35
2017/2018	3.59	3.00
2018/2019	3.34	2.99

IAR Additional information regarding production figures can be found on page 77 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

Black Rock 'Koppie' Mineral Resources

The Black Rock orebodies occur in the Black Rock Koppie, Belgravia 1 and Belgravia 2 areas. They are all part of a large thrust complex. Modelling of these orebodies was undertaken using 151 Nchwaning boreholes that intersected the thrust complex and 174 Black Rock in-fill boreholes. A 38% Mn cut-off was used in the modelling. Seams 1 and 2 were modelled at variable thicknesses. No mining is currently being done at Black Rock Koppie.

BLACK ROCK (KOPPIE AREA): SEAM 1 MANGANESE MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Mineral Resources		
	Mt	Mn%	Fe%
Measured	9.03	40.3	18.1
Indicated	34.57	40.7	18.1
Total Resources (Seam 1) 2019	**43.60**	**40.6**	**18.1**
Total Resources (Seam 1) 2018	43.60	40.6	18.1

Totals are rounded off.

Key Resources assumptions:

Density: 4.0 t/m³.

* ***Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

BLACK ROCK (KOPPIE AREA): SEAM 2 MANGANESE MINERAL RESOURCES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Mineral Resources		
	Mt	Mn%	Fe%
Measured	8.23	37.4	19.8
Indicated	18.58	39.2	19.8
Total Resources (Seam 2) 2019	**26.81**	**38.6**	**19.8**
Total Resources (Seam 2) 2018	26.81	38.6	19.8

Totals are rounded off.
Key Resources assumptions:
Density: 4.0 t/m³.
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

Gloria Mine Mineral Resources

Procedures for drilling and assaying at Gloria Mine are the same as at Nchwaning. Both boreholes and underground sample sections were considered in the evaluation of Gloria Seam 1. Gloria was modelled similarly to Nchwaning using Datamine Studio 3 and Datamine Strat 3D software for the geological modelling and for the grade estimation. The geological block model was created for an optimum cut of 4 metres for Seams 1 and 2. Block sizes in the X and Y directions were 50 x 50 metres allowing for sub-splitting. The relative density was determined as 3.8 t/m³. The full vertical extent of both Seams 1 and 2 were modelled respectively.

Statistical and geostatistical analysis for the following variables: Mn, Fe, Al_2O_3, BaO, CaO, K_2O, MgO, Na_2O, P, S and SiO_2 was undertaken. Ordinary Kriging interpolation within Studio 3 was used to estimate the grade in the 50 x 50 x 4 metre blocks using borehole and/or underground sample data. Mineral Resource classification methods were similar to those applied at Nchwaning Mine.

Gloria Mine Mineral Reserves

Conversion of the Mineral Resources to Mineral Reserves is done for Measured and Indicated Mineral Resources. The main modifying factors for the conversion are: plant recovery factor, manganese prices and mining extraction factors. Details of these factors are listed below the Mineral Reserves tables.

Manganese is extracted at depths that vary between 180 to 250 metres. Ore is crushed underground before being conveyed to a surface stockpile via a decline shaft. Ore is withdrawn from the surface stockpile and forwarded to two stages of crushing, dry screening, and wet screening to yield lumpy and fine products. At the plant, the ore is processed similarly to Nchwaning run-of-mine ore.

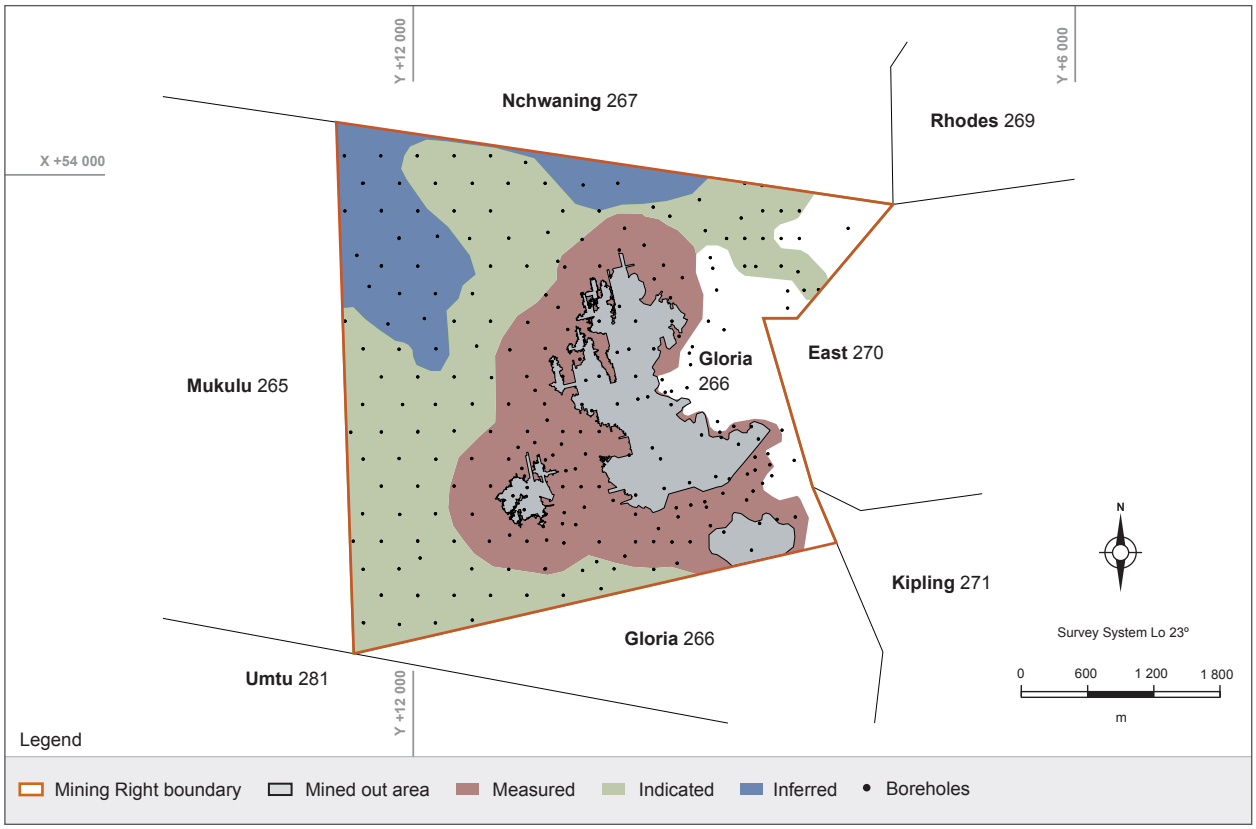
ARM FERROUS continued

GLORIA MINE: SEAM 1 MANGANESE MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Mineral Resources				Mineral Reserves		
	Mt	Mn%	Fe%		Mt	Mn%	Fe%
Measured	64.01	37.49	4.90	Proved	41.84	37.40	4.89
Indicated	92.93	37.65	4.88	Probable	73.20	37.42	4.79
Total Measured and Indicated (Seam 1) 2019	**156.94**	**37.58**	**4.89**	**Total Reserves (Seam 1) 2019**	**115.04**	**37.41**	**4.83**
Total Measured and Indicated (Seam 1) 2018	157.25	37.59	4.86	Total Reserves (Seam 1) 2018	123.93	37.75	4.86
Inferred 2019	**31.87**	**37.29**	**5.43**				
Inferred 2018	31.87	37.11	5.46				

*The Measured and Indicated Mineral Resources are **inclusive** of those modified to produce Mineral Reserves.*
Totals are rounded off.
Key assumptions for Mineral Resources:
True thickness cut-off: 4 metres.
Density: 3.8 t/m³.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Cut-off grade: 35% Mn.
Tramming loss factor: 1%.
Plant recovery: 91%.
Mine extraction factor: 82%.
Price ranges: Based on market related long term view.
Exchange rate used: Market-related.
Life-of-mine: 30 years.
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

GLORIA MANGANESE SEAM 1 MINERAL RESOURCES CLASSIFICATION

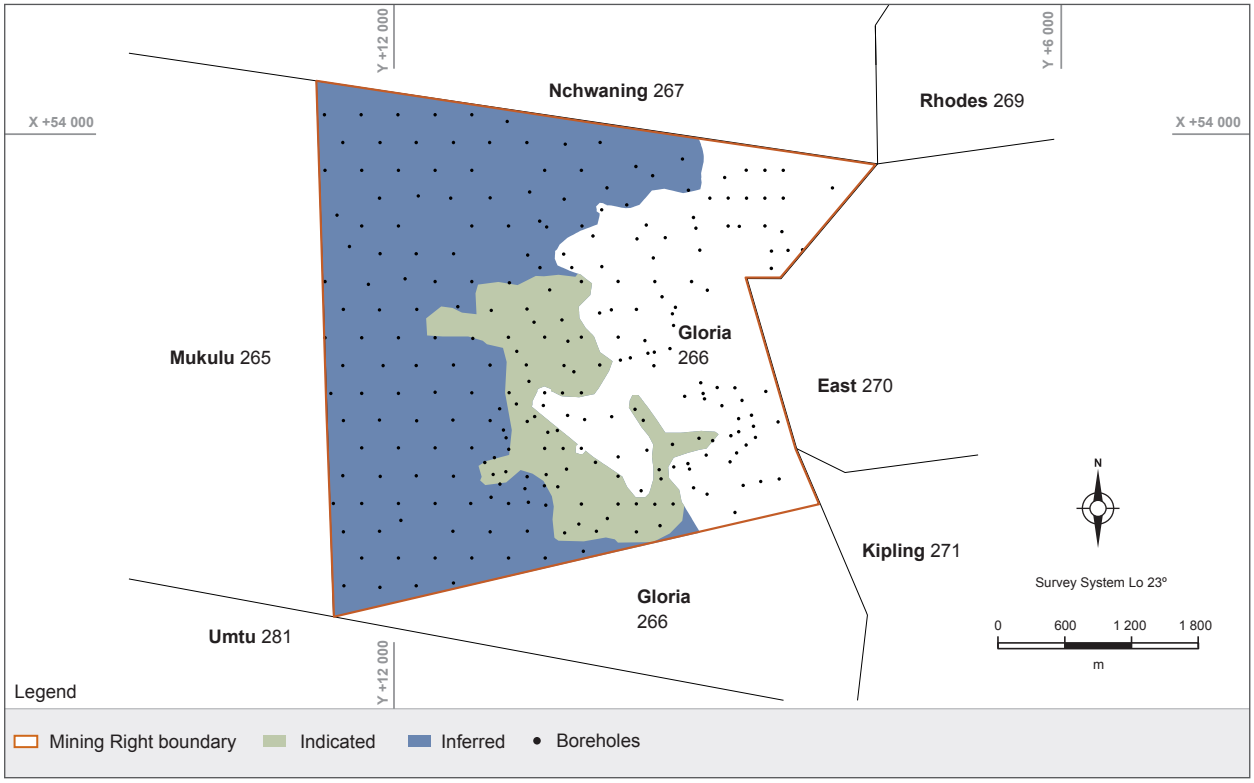


GLORIA MINE: SEAM 2 MANGANESE MINERAL RESOURCES ESIMATES AS AT 30 JUNE 2019

* Mineral Resources are reported on a 100% basis.	Mineral Resources		
	Mt	Mn%	Fe%
Measured Indicated	34.81	28.41	9.39
Total Measured and Indicated (Seam 2) 2019	**34.81**	**28.41**	**9.39**
Total Measured and Indicated (Seam 2) 2018	34.81	28.41	9.39
Inferred 2019	**133.46**	**30.03**	**9.67**
Inferred 2018	133.46	30.03	9.67

Totals are rounded off.
Key assumptions for Mineral Resources:
True thickness cut-off: 4.0 metres.
Density: 3.8 t/m³.
** **Black Rock Manganese Mine attributable interests (ARM 50%; Assore 50%).***

GLORIA MANGANESE SEAM 2 MINERAL RESOURCES CLASSIFICATION



Gloria year-on-year change

Gloria Mine Seam 1 Measured and Indicated Mineral Resources decreased marginally from 157.25 million tonnes to 156.94 million tonnes due to mining depletion.

The Mineral Reserves decreased from 123.93 million tonnes at 37.75% Mn to 115.04 million tonnes at 37.41% Mn mainly due to a revised Mining Plan on the eastern portion of Gloria Mine where the geological boundary of Seam 1 was updated.

HISTORICAL MANGANESE PRODUCTION AT GLORIA MINE (SEAM 1)

Financial year	ROM Mt	Saleable Mt
2014/2015	0.74	0.61
2015/2016	0.56	0.55
2016/2017	0.72	0.72
2017/2018	0.69	0.71
2018/2019	0.51	0.42

IAR Additional information regarding production figures can be found on page 77 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

ARM FERROUS continued

IRON ORE MINES

Locality

The iron ore division is made up of Beeshoek Mine located on the farms Beesthoek 448 and Olyn Fontein 475 and Khumani Mine situated on farms Bruce 544, King 561 and Mokaning 560. All properties are approximately 200 kilometres west of Kimberley in the Northern Cape. The Beeshoek open-pit operations are situated 7 kilometres west of Postmasburg and the Khumani open pits are adjacent to, and south east of Kumba Iron Ore's Sishen Mine. Beeshoek and Khumani Mines are located at latitude 28°30'00"S/longitude 23°01'00"E, and latitude 27°45'00"S/longitude 23°00'00"E respectively.

History

Mining of iron ore (mainly specularite) was undertaken as early as 40 000 BC on the farm Doornfontein which is due north of Beeshoek. The potential of iron ore in this region was discovered in 1909, but, due to lack of demand and limited infrastructure, this commodity was given little attention. In 1929, the railway line was extended from Koopmansfontein (near Kimberley) to service a manganese mine at Beeshoek. In 1935, the Associated Manganese Mines of South Africa Limited (Assmang) was formed, and in 1964, Beeshoek Iron Ore Mine was established, with a basic hand-sorting operation. In 1975, a full washing and screening plant was installed at Beeshoek Mine. The Khumani Iron Ore Mine was commissioned in 2007.

Competence

The following competent persons were involved in the estimation of Mineral Resources and Mineral Reserves for the iron ore operations. S Kadzviti and R Jooste are employed by ARM while the rest are employed by Assmang.

Mining operation	Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
Beeshoek Mine	**S Kadzviti (Mineral Resources)**	SACNASP	400164/05	BSc (Geology and Mathematics), MSc (Exploration Geology), GDE (Mining Engineering)	29 years
	R Jooste (Mineral Resources)	SACNASP	400163/05	BSc, BSc Hons (Geology), MEng (Mining Engineering)	18 years
	A Burger (Mineral Reserves)	SACNASP	400233/08	BSc (Geology), BSc Hons (Geology), GDE (Mining Engineering)	18 years
Khumani Mine	**M Burger (Mineral Resources and Mineral Reserves)**	SACNASP	400086/03	BSc (Geochemistry), BSc Hons (Geochemistry), GDE (Mining Engineering)	36 years
	I van Niekerk (Mineral Resources)	SACNASP	400006/94	BSc Hons (Geology)	29 years

Mining authorisation

Mining operation	Legal entitlement	Minerals covered by Mining Right	Comment	Period of Mining Right (years)	Known impediments on legal entitlement
Beeshoek Mine	Mining Right NC 30/5/1/2/2/223 MRC	Iron ore	None	30 years: 16 March 2012 to 15 March 2042	None
Khumani Mine	Mining Right NC 50/5/1/2/5/2/70 MR	Iron ore	None	30 years: 25 January 2007 to 24 January 2037	None

Geology

Beeshoek and Khumani mines are situated within a sequence of early Proterozoic sediments of the Transvaal Supergroup. Both mines are symmetrically located on the Maremane Anticline in the Griqualand West Sequence of the Transvaal Supergroup, as well as the Elim Group of the Keis Supergroup.

RR Refer to the regional geological map on page 36 (Beeshoek Mine) and detailed map on page 46 (Khumani Mine).

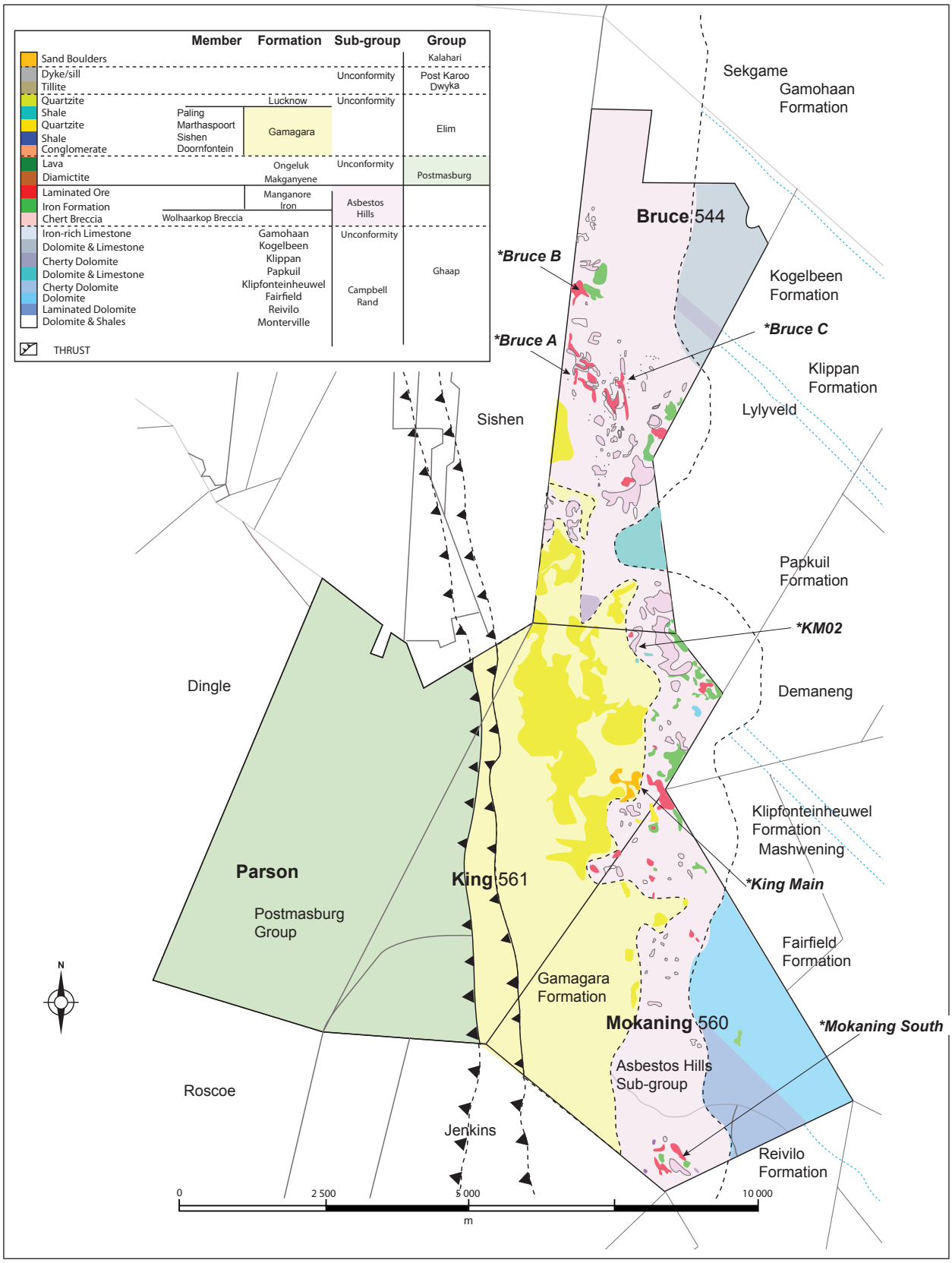
In general, two ore types are present: laminated haematite ore, forming part of the Manganore Iron Formation, and conglomerate ore, belonging to the Doornfontein Conglomerate Member at the base of the Gamagara Formation. The laminated ore types occur in the upper portion of the Manganore Iron Formation as enriched high-grade hematite bodies. The boundaries of high-grade hematite orebodies cross-cut primary sedimentary bedding, indicating that secondary hematitisation of the iron formation took place. In all of these, some of the stratigraphic and sedimentological features of the original iron formation are preserved. The conglomeratic ore found in the Doornfontein Conglomerate Member of the Gamagara Formation, is lenticular but not consistently developed along strike. It consists of stacked, upward fining conglomerate-gritstone-shale sedimentary cycles.

The lowest conglomerates and gritstones tend to be rich in subrounded to rounded hematite ore pebbles and granules and form the largest part of the resource. The amount of iron ore pebbles decreases upwards in the sequence so that upper conglomerates normally consist of poorly sorted, angular to rounded chert and banded iron formation pebbles. Hematite is the predominant ore mineral, but limonite and specularite also occur.

Erosion in the Khumani deposit is less than in the Beeshoek area. This results in Khumani being characterised by larger stratiform bodies and prominent hanging-wall outcrops. The down-dip portions are well preserved and developed, but in the outcrop the deposits are thin and isolated. Numerous deeper iron ore extensions occur into the basins due to karst development. A prominent north-south strike of the orebodies dipping to the west is notable. The southern Beeshoek orebodies were exposed to more erosion and hence are more localised and smaller. Outcrops are limited to the higher topography on the eastern side of the properties. Down-dip to the west, the ore is thin and deep. The strike of the orebodies is also in a north-south direction dipping to the west, but less continuous.

ARM FERROUS continued

KHUMANI SURFACE GEOLOGY MAP



** Khumani Mine consists of Bruce A, Bruce B, Bruce C, KM02, King Main and Mokaning areas.*

Exploration activities

The exploration work at Khumani Mine for the past year concentrated on the southern part as well as the south eastern part of Mokaning. The former realised additional Mineral Resources after drilling, while the latter target was mainly reconnaissance. The drilling cost for 2018/2019 was R16.99 million excluding sampling costs. A total of 16 003 metres were drilled comprising percussion and diamond drilling. Exploration work is planned to continue in the Mokaning area as well as the western part of King.

Exploration activities at Beeshoek Mine carried out over the past year included drilling of Village Pit on the south west and north west as well as to the south of BN pit. The total amount of boreholes added to the database were 142 with 16 507 assay samples. The total number of metres drilled for the period July 2018 to June 2019 is 10 974 meters. The cost of the drilling work for the year was R17.36 million. Plans for next year are to drill additional boreholes to the west of Village Pit and the Oppikoppie areas.

Drilling and estimation was undertaken for the low grade tailings stockpile at Beeshoek Mine resulting in the definition of Mineral Resources reported in the table on page 48. The tailings stockpile Mineral Resources occur within a larger tailings exploration target. The exploration target is estimated to have a tonnage range of between 6 million tonnes and 10 million tonnes with grade range of between 50% and 60% Fe and further work will be required to define additional Mineral Resources for this target area.

RR Refer to Khumani deposits and Beeshoek deposits maps on pages 51 and 49 respectively.

Mining methods and infrastructure

Mining operations are all open-pit, based on the conventional drill-and-blast, truck-and-shovel operations. Run-of-mine ore is crushed and stored as 'on-' or 'off-grade' on blending stockpiles. Ore from the stockpiles is either sent to the wash-and-screen plants or, if 'off-grade', to the beneficiation plants. The washing and screening plants consist primarily of tertiary crushing, washing, screening, conveying and stacking equipment. The beneficiation plants consist of tertiary crushers; scrubbers; coarse and fine jigs; lumpy and fines product stockpiles; and a rapid load-out facility. No chemicals are being used in any of the treatment plants.

Mineral Resources

The methodology followed to identify exploration targets is initiated with geological mapping, followed by geophysics (ground magnetics and gravity). Numerous exploration programmes have been completed in the past. Percussion drilling is used to pilot holes through overlying waste rock down to the iron orebodies. Diamond drilling is the next phase, which is usually on a 200 x 200 metre grid. Further in-fill drilling is carried out at spacing ranging from 100 x 100 metres to 25 x 25 metres, depending on the complexity of the geological structures. Core samples are logged and split by means of a diamond saw and the half-core is sampled at 0.5 metre intervals. The half-cores are crushed, split and pulverised and submitted to the owner-managed laboratory for assaying. All holes and blast holes in mineralisation are sampled and analysed for Fe, K_2O, Na_2O, SiO_2, Al_2O_3, P, S, CaO, MgO, Mn and BaO. The analytical technique for elemental analyses is XRF spectroscopy. Volumetric titration is used as verification method for the determination of total iron in the ore. International standards (eg SARM11) and in-house iron standards are used for the calibration of the XRF spectrometer. The Khumani laboratory undertakes stringent quality control and assurance methods, including 'round robin' analysis with 11 laboratories for verification of assay results. A Datamine 'Fusion' database with all the borehole data has been established.

At Khumani the geological model is built with Datamine's Strat 3D modelling functionality to create a 3D representation of the stratigraphy using all validated borehole information. The stratigraphy is modelled from the surface geology to the stratigraphic unit below the lowest mineralised zone. Within the host stratigraphic units, Doornfontein (conglomeritic mineralisation) and Manganore (laminated mineralisation) outlines for mineralisation above a cut-off of 55% Fe are interpreted and solid wireframes created. Any lower-grade samples inside the orebody are defined as internal waste and modelled separately. Ordinary Kriging interpolation is used to estimate the grade of each 25 x 25 x 10 metre block generated within the geological model for the following separate units: mineralised envelopes (Fe>=55%), internal shales and banded iron stone, Doornfontein and Manganore units outside the Fe>=55% envelope. Densities in the resource model are calculated using a fourth degree polynomial fit applied to the estimated Fe grade. Mineral Resource classification is based on both geostatistical parameters as well as the geological continuity of the mineralisation. The geostatistical parameters that are considered are: Kriging efficiency, Kriging variance, number of samples, search volume and regression slope. The final assessment of the classification is done by the lead competent person who may make adjustments as necessary. The geological modelling of the orebody at Beeshoek is similar to Khumani, although the cut-off grade used is 60% Fe.

Mineral Reserves

Only Measured and Indicated Mineral Resources are converted to Proved and Probable Mineral Reserves respectively. Modifying factors are applied to these Mineral Resources and are financially optimised. The financial parameters are used to define the optimal pit outline. The pit designs are based on geotechnical parameters, mining fleet and selective mining unit (SMU). The combined waste and mineralisation models are reblocked at 6.25 x 6.25 x 10 metre blocks. The Resources within this mining constraint (optimised pit-shell) with grades of greater than 54% Fe (Khumani) and greater than 60% Fe (Beeshoek), are defined as Reserves. These are categorised into different product types, destined for the different plant processes and then scheduled for mining. The average Fe, K_2O, Al_2O_3 and SiO_2 grades of the SMUs are used to define 'on-grade' (wash and screen) feed as well as 'off-grade' (jig) feed.

ARM FERROUS continued

BEESHOEK IRON ORE MINE: MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Measured Resources		Indicated Resources		Measured and Indicated Resources		Inferred Resources		Proved Reserves		Probable Reserves		Total Reserves	
Pit/Area	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%
BN Pit	6.93	63.02			6.93	63.02			2.39	63.06			2.39	63.06
HF/HB Pit	15.47	64.57			15.47	64.57			4.73	64.96			4.73	64.96
BF Pit	7.50	63.51	0.23	63.54	7.73	63.51	0.00	65.24	0.60	61.59			0.60	61.59
East Pit	2.86	64.99	0.02	64.52	2.88	64.98			0.59	65.05			0.59	65.05
Village Area	42.96	64.36	4.75	63.45	47.71	64.27	2.80	64.89	21.40	64.90	0.13	63.35	21.53	64.89
GF Pit	3.13	63.81	0.09	61.80	3.22	63.75								
HH Ext Pit	0.28	62.63			0.28	62.63								
HL Pit	1.98	64.82	0.02	65.21	2.00	64.82								
West Pit	9.45	63.19			9.45	63.19	0.05	61.88						
Detrital**							2.50	60.00						
Total 2019	**90.56**	**64.11**	**5.11**	**63.44**	**95.67**	**64.07**	**5.35**	**62.58**	**29.71**	**64.70**	**0.13**	**63.35**	**29.84**	**64.69**
Total 2018	95.10	64.16	2.54	63.22	97.64	64.14	3.55	60.80	35.13	64.85	0.01	63.18	35.14	64.85

The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
*** Detrital is loose fragmented material occurring in various areas at Beeshoek Mine.*
Key assumptions for Mineral Resources:
Grade cut-off: 60% Fe.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Grade cut-off: 60% Fe.
Plant yield: On-grade (84%); Off-grade (28% to 45% depending on material type).
Price used for iron ore (US$/t): Based on market-related long-term view and customer contracts.
Exchange rate used: Market-related.
Life-of-mine: 7 years.
*** Beeshoek Iron Ore Mine attributable interests (ARM 50%; Assore 50%).***

BEESHOEK STOCKPILES MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves		Probable Reserves		Total Reserves	
Area	Mt	Fe%	Mt	Fe%	Mt	Fe%
North Mine (ROM on-grade)			0.01	64.00	0.01	64.00
North Mine (B ROM off-grade**)			0.23	55.00	0.23	55.00
North Mine (C off-grade)						
South Mine Village Pit (off-grade)			0.08	55.00	0.08	55.00
South Mine Village Pit (on-grade)			0.16	64.00	0.16	64.00
South Mine East Pit (ROM on-grade)			0.13	64.00	0.13	64.00
South Mine East Pit (B ROM off-grade)			0.16	55.00	0.16	55.00
South Mine (C off-grade)						
Total 2019 Stockpiles			**0.77**	**58.52**	**0.77**	**58.52**
Total 2018 Stockpiles			2.83	55.58	2.83	55.58

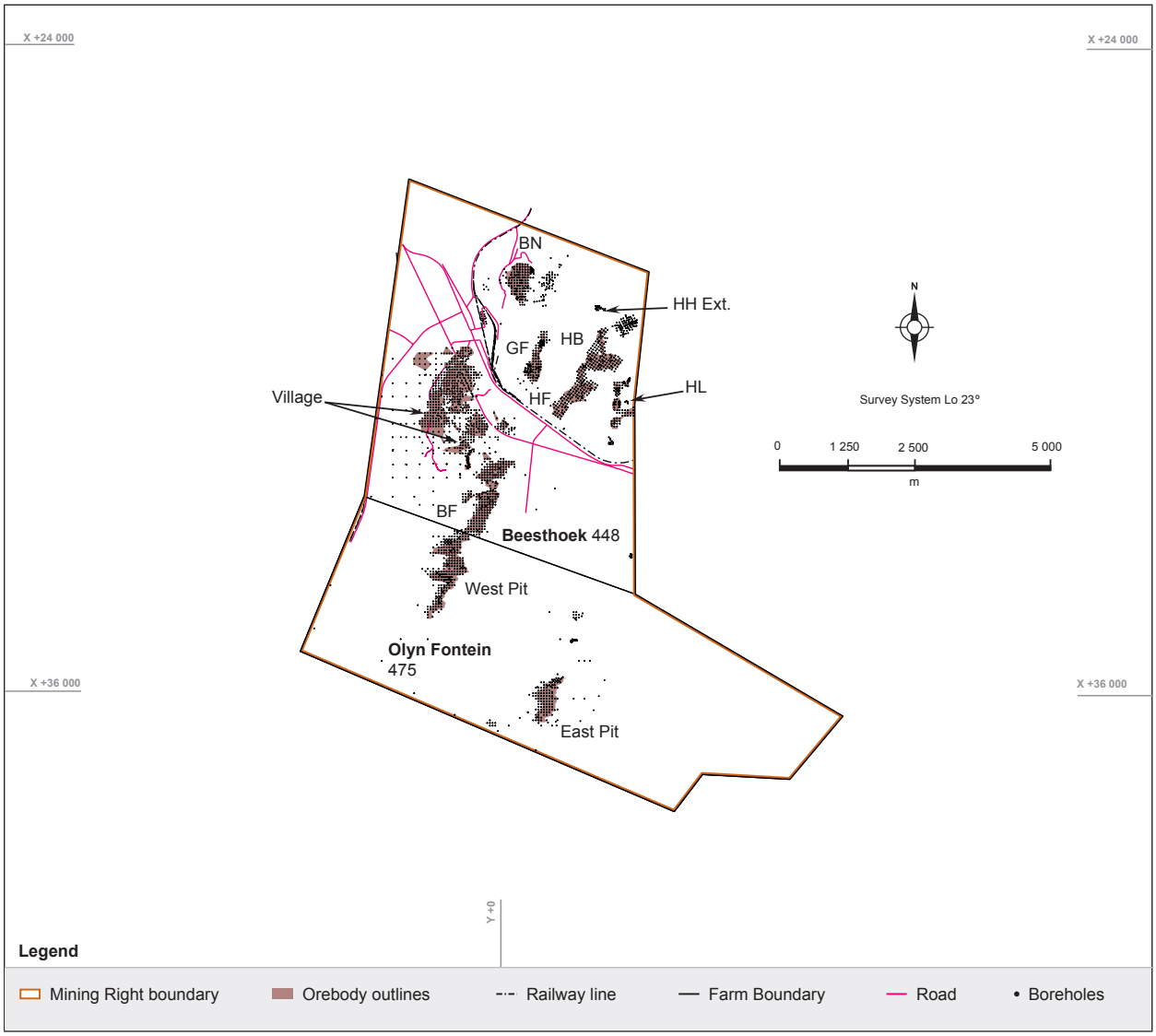
Totals are rounded off.
*** ROM off-grade ore is beneficiated to produce a saleable product.*
*** Beeshoek Iron Ore Mine attributable interests (ARM 50%; Assore 50%).***

BEESHOEK LOW GRADE STOCKPILE: MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Measured Resources		Indicated Resources		Total Measured and Indicated Resources		Inferred Resources		Proved Reserves		Probable Reserves		Total Reserves	
Pit/Area	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%
Tailings stockpile	2.41	56.46	0.04	54.52	2.45	56.43			2.29	56.46			2.29	56.46
Jig stockpile			12.60	53.22	12.60	53.22					11.97	53.22	11.97	53.22
Total 2019	**2.41**	**56.46**	**12.64**	**53.22**	**15.05**	**53.74**			**2.29**	**56.46**	**11.97**	**53.22**	**14.26**	**53.74**
Total 2018														

Mineral Resources are inclusive of Mineral Reserves
Totals are rounded off
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Mining loss: 5%.
Tailings stockpile Yield: 55% (saleable product 1.26 Mt at 63.5% Fe).
Jig stockpile Yield: 49% (saleable product 5.86 Mt at 63% Fe).
*** Beeshoek Iron Ore Mine attributable interests (ARM 50%; Assore 50%).***

BEESHOEK DEPOSITS MAP



Beeshoek year-on-year change

Measured and Indicated Mineral Resources were virtually unchanged, from 97.64 million tonnes in 2018 to 95.67 million tonnes in 2019. This is mainly due to mining depletions in 2018 being offset by an increase in the Mineral Resources for Village Pit.

Mineral Reserves decreased from 35.14 to 29.84 million tonnes mainly due to mining depletions.

Stockpile Mineral Reserves decreased from 2.83 million tonnes at 55.58% Fe to 0.77 million tonnes at 58.52% Fe mainly due to processing of the material.

Mineral Resource estimates were undertaken during the year for the low-grade jig and tailings stockpiles resulting in the declaration of a total of 15.05 million tonnes at 53.74% Fe of Measured and Indicated Mineral Resources. A total of 14.26 million tonnes at 53.74% Fe Mineral Reserve was reported.

HISTORICAL PRODUCTION AT BEESHOEK MINE

	ROM	Saleable
Financial year	Mt	Mt
2014/2015	3.35	3.43
2015/2016	3.05	3.11
2016/2017	3.39	3.15
2017/2018	4.17	3.88
2018/2019	4.44	3.64

IAR Additional information regarding production figures can be found on page 76 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

ARM FERROUS continued

KHUMANI IRON ORE MINE: MINERAL RESOURCES AND MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Resources and Mineral Reserves are reported on a 100% basis.	Measured Resources		Indicated Resources		Measured and Indicated Resources		Inferred Resources		Proved Reserves		Probable Reserves		Total Reserves	
Pit/Area	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%	Mt	Fe%
Bruce A	54.83	63.38	64.20	63.99	119.03	63.71			47.56	61.92	55.67	63.31	103.23	62.67
Bruce B	67.05	62.10	11.60	62.11	78.65	62.10	3.74	59.36	51.14	61.20	11.15	60.24	62.29	61.03
Bruce C	11.87	62.77			11.87	62.77			4.26	62.00			4.26	62.00
Total for Bruce pits	133.75	62.68	75.80	63.70	209.55	63.05	3.74	59.36	102.96	61.57	66.82	62.80	169.78	62.05
King Main	285.24	63.16	35.53	62.59	320.77	63.10	30.01	61.23	237.23	62.14	8.51	62.18	245.74	62.14
Mokaning South			25.97	62.69	25.97	62.69	2.35	62.62			17.92	61.95	17.92	61.95
Total King/Mokaning	285.24	63.16	61.50	62.63	346.74	63.07	32.36	61.33	237.23	62.14	26.43	62.02	263.66	62.13
Total 2019	**418.99**	**63.01**	**137.30**	**63.22**	**556.29**	**63.06**	**36.10**	**61.13**	**340.19**	**61.97**	**93.25**	**62.58**	**433.44**	**62.10**
Total 2018	442.99	62.95	108.00	63.23	550.99	63.00	59.49	61.73	369.16	62.12	77.97	62.79	447.13	62.24

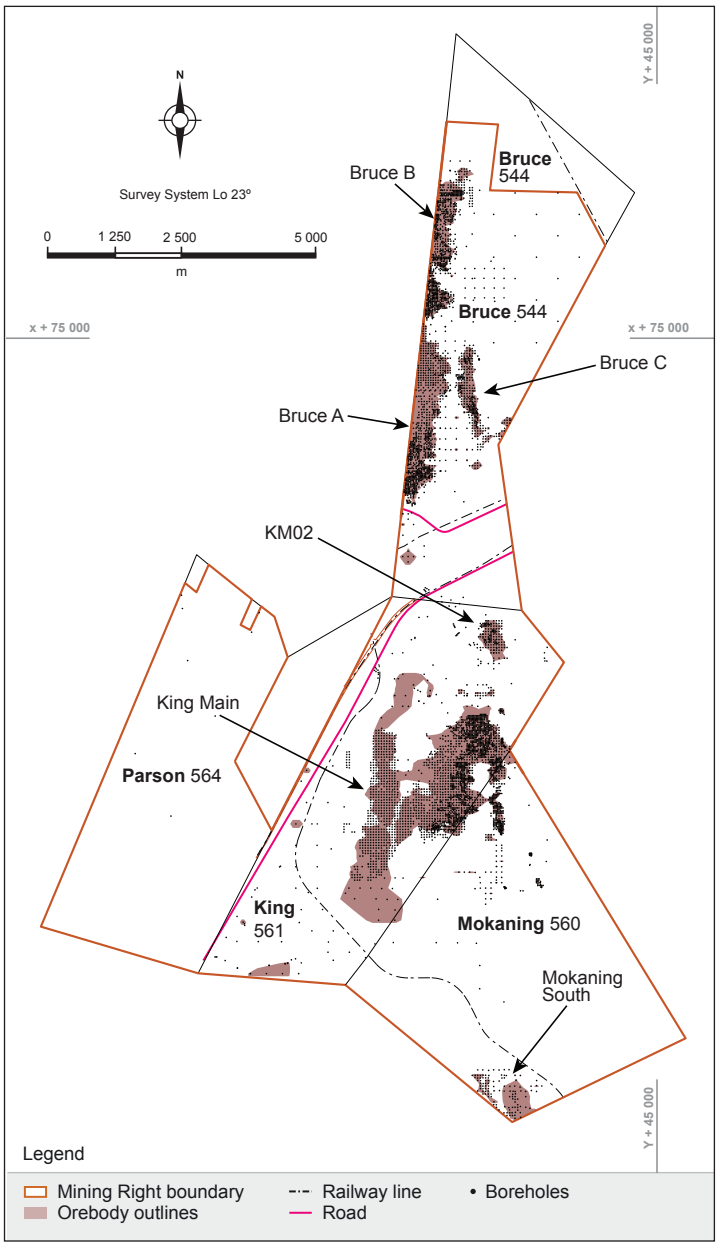
The Measured and Indicated Mineral Resources are inclusive of those modified to produce Mineral Reserves.
Totals are rounded off.
Key assumptions for Mineral Resources:
Grade cut-off: 55% Fe.
Modifying factors for the conversion of Mineral Resources to Mineral Reserves include:
Mining loss factor: 2%.
Mining dilution: 3%.
Strip ratio (LOM: 2.42).
Wash and screen recovery: 87% (on-grade).
Jig recovery: 72% (off-grade).
Grade cut-off: 54% Fe.
Price used for iron ore (US$/t): Based on market-related long-term view and customer contracts.
Exchange rate used: Market-related.
Life-of-mine: 23 years.
** **Khumani iron ore mine attributable interests (ARM 50%; Assore 50%).***

KHUMANI STOCKPILES MINERAL RESERVES ESTIMATES AS AT 30 JUNE 2019

* Mineral Reserves are reported on a 100% basis.	Proved Reserves		Probable Reserves		Total Reserves	
Area	Mt	Fe%	Mt	Fe%	Mt	Fe%
Bruce			3.56	55.00	3.56	55.00
King			2.48	55.20	2.48	55.20
Total 2019 Stockpiles**			**6.04**	**55.08**	**6.04**	**55.08**
Total 2018 Stockpiles			5.01	55.08	5.01	55.08

Totals are rounded off.
*** Stockpiles are beneficiated to produce a saleable product.*
** **Khumani iron ore mine attributable interests (ARM 50%; Assore 50%).***

KHUMANI DEPOSITS MAP



Khumani year-on-year change

The Measured and Indicated Mineral Resources increased from 550.99 million tonnes at 63.00% Fe to 556.29 million tonnes at 63.06% Fe after mining depletion mainly due to the upgrade of most of the Mokaning South Inferred Mineral Resources to Indicated Mineral Resources after completion of additional drilling and re-estimation of the Mineral Resources.

Mineral Reserves decreased from 447.13 million tonnes at 62.24% Fe to 433.44 million tonnes at 62.10% Fe primarily due to mining depletion of 20.11 million tonnes. The addition of 17.92 million tonnes at 61.95% Fe Probable Mineral Reserves at Mokaning South, which is being reported for the first time, partially off-set the production depletion.

Stockpile Mineral Reserves increased from 5.01 million tonnes at 55.08% Fe to 6.04 million tonnes at 55.08% Fe as a result of production from the pits.

HISTORICAL PRODUCTION AT KHUMANI MINE

	ROM	Saleable
Financial year	Mt	Mt
2014/2015	19.06	12.65
2015/2016	21.38	13.62
2016/2017	20.35	14.07
2017/2018	22.00	14.69
2018/2019	20.11	14.15

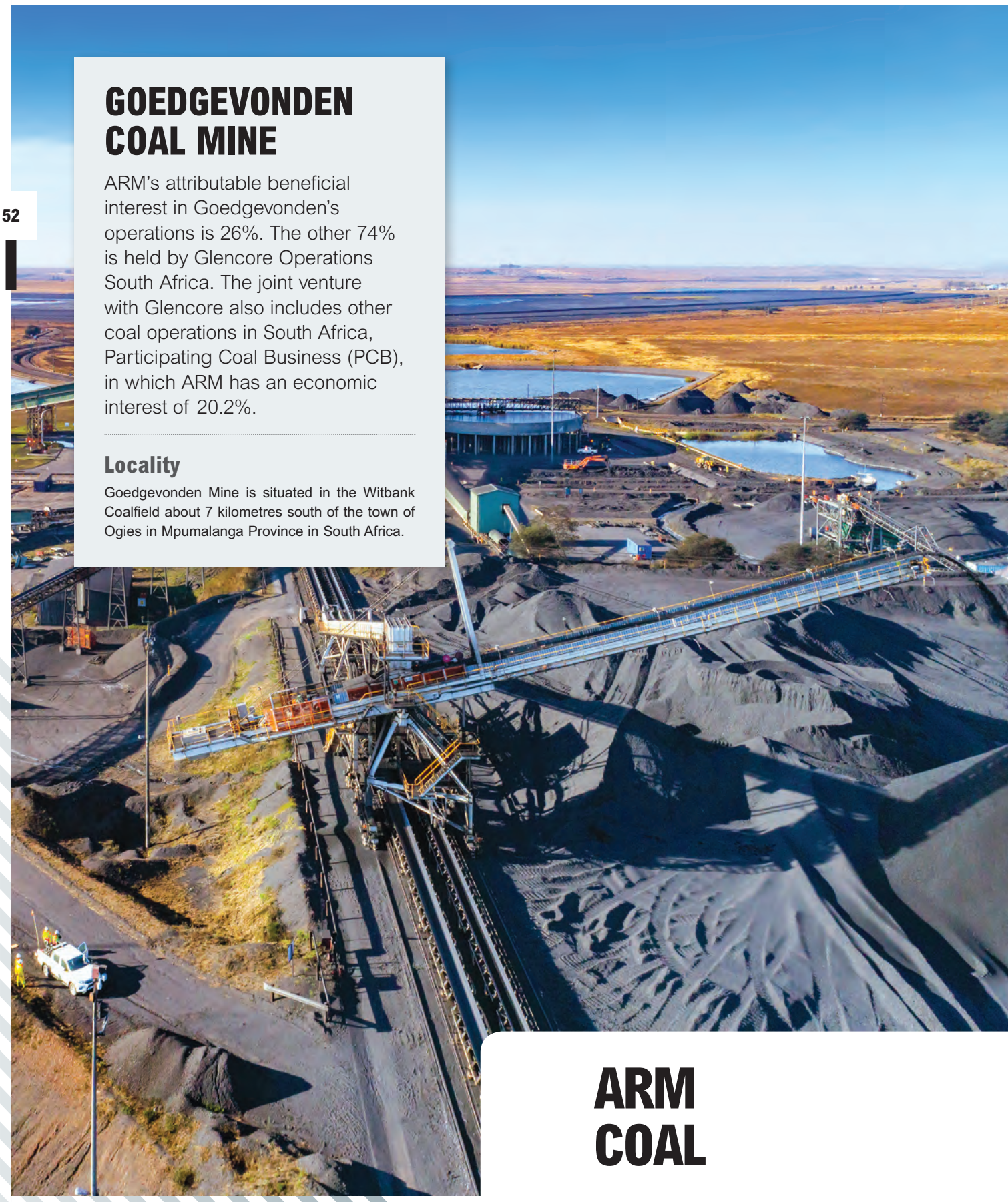
IAR Additional information regarding production figures can be found on page 76 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

GOEDGEVONDEN COAL MINE

ARM's attributable beneficial interest in Goedgevonden's operations is 26%. The other 74% is held by Glencore Operations South Africa. The joint venture with Glencore also includes other coal operations in South Africa, Participating Coal Business (PCB), in which ARM has an economic interest of 20.2%.

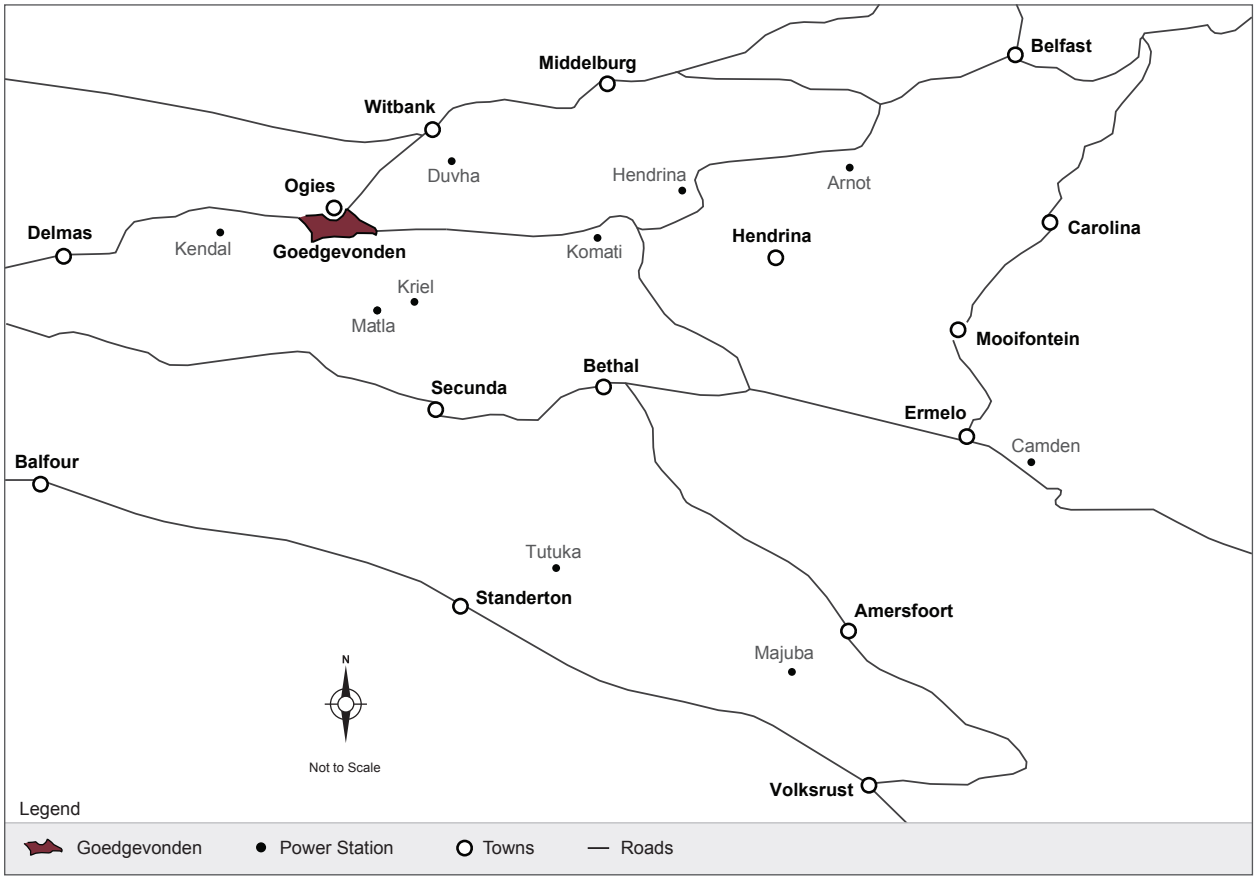
Locality

Goedgevonden Mine is situated in the Witbank Coalfield about 7 kilometres south of the town of Ogies in Mpumalanga Province in South Africa.



ARM COAL

LOCALITY MAP OF GOEDGEVONDEN COAL MINE



RR Refer to page 1 for another locality map showing the Goedgevonden Coal Operation.

History

A total of 548 surface diamond boreholes were drilled during 1964 to 2004 by Duiker Mining and Xstrata SA. Anglo Coal drilled an additional 102 boreholes for the Zaaiwater area. Most boreholes were drilled down to basement to define the seam locality and basement topography. Owing to the different campaigns, the database had to be validated to produce a consistent set of data.

Competence

The following competent person was involved in the reporting of Goedgevonden Coal Resources and Reserves. He is employed by Glencore.

Competent person	Professional organisation	Membership number	Qualifications	Relevant experience
M Smith (Mineral Resources and Mineral Reserves)	SACNASP	400075/03	BSc Hons (Geology), MBA	24 years

Mining authorisation

Legal entitlement	Minerals covered by Mining Right	Comment	Period of Mining Right (years)	Known impediments on legal entitlement
Mining Right	Coal	None	30 years: 13 November 2013 to 12 November 2043	None

ARM COAL continued

Geology

The stratigraphy of the Witbank Coalfield consists of five seams numbered from oldest to youngest: No 1 to No 5 Seam. The seams vary in thickness from less than 0.5 metres to over 6 metres and do not exceed 300 metres in depth from surface. The coal seams dip at less than 5°. However, coal seam morphology and qualities may be locally influenced by basement topography, surface weathering and intrusion of dolerite dykes and sills. The coal qualities vary both within and between individual coal seams.

Low-quality coals, suitable for the local steam coal market, have a calorific value of between 18 to 22 MJ/kg, whereas the high-quality export steam coal has a calorific value of greater than 27 MJ/kg.

All five coal seams are developed on Goedgevonden. The No 1 Seam is of low quality, thin and only developed in paleo-low areas. The No 2 Seam is extensively developed and is of good quality and is, on average, 6 metres thick. The No 3 Seam is of good quality but, with an average thickness of only 0.3 metres, is uneconomic. The No 4 Seam, being closer to surface and although of the same thickness as the No 2 Seam, is influenced by weathering and is not as extensively developed. The No 5 Seam is of good quality, but is preserved as erosional remnants on the high ground only and thus not extensively developed over the area. No major faults, structural disturbances or intrusives were observed in the boreholes drilled to date. Opencast dragline mining operations in the area are extracting the No 2, No 4 and No 5 Seams. The open-cut mine produces both export and domestic thermal coal.

Exploration activities

The exploration programme ran from January 2018 to December 2018 targeting the mining area ahead of the current faces to be exploited during an 18-month window. Fifteen cored boreholes were drilled. All boreholes were drilled by Genet, and were logged and sampled on site by the resident geologist. The samples were sent to the Sibonisiwe Laboratory in Middelburg. Boreholes were drilled to the Pre-Karoo and most holes intercepted all the seams developed at Goedgevonden (No 5, 4, 3, and 2 seams).

Full washability was conducted. CV and S analyses were done on all the floats and the sink fraction.

The boreholes were incorporated into the 2019 geological model.The total cost of all the drilling was R1.2 million.

Mining methods and infrastructure

Open-cut mining methods are utilised at Goedgevonden Mine.

Coal Resources

Borehole data for the Mine is captured into the Geobank database. Minex provides the geological and mine planning software solution for the mine.

Two-dimensional resource models are generated with block sizes of 50 x 50 metres. All estimations of the individual blocks are done using inverse distance cubed with an isotropic search. Other software packages used in the evaluation are 'Washproduct' and 'Xpac'.

Coal Reserves

Measured and Indicated Coal Resources are converted to Coal Reserves by applying the modifying factors such as mining losses, mining dilution, coal quality requirements, and seam thickness cut-offs. Details of these parameters are provided in the footnotes on the Reserves tables.

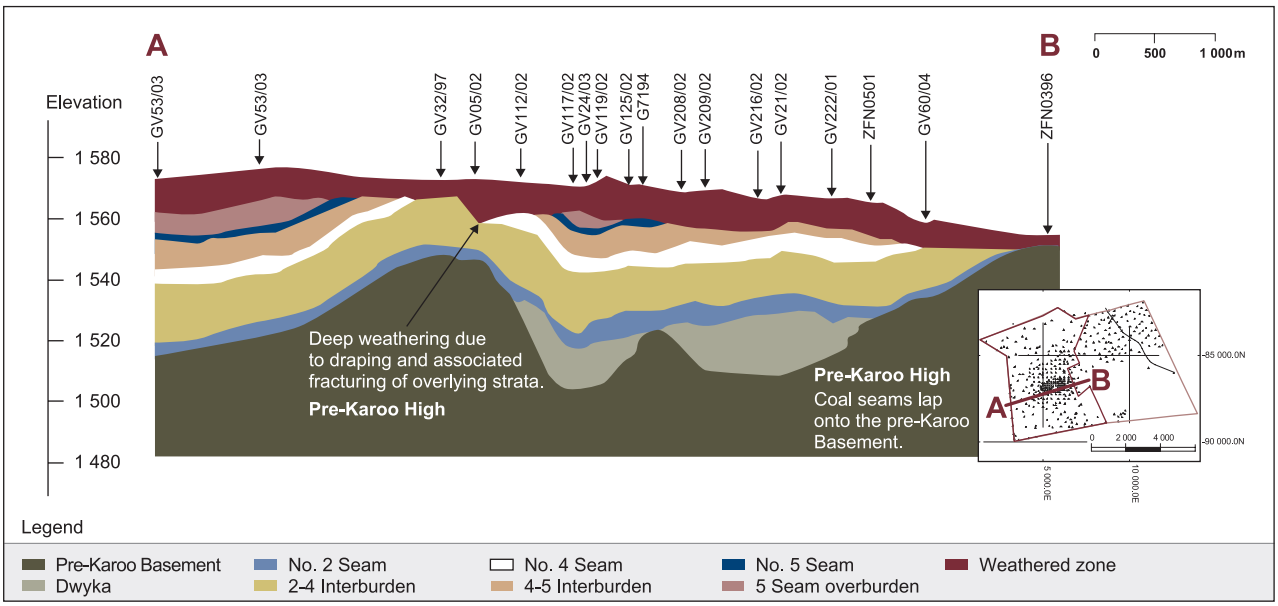
The following tables show the Goedgevonden Coal Resources and Reserves obtained from Glencore, reflecting the status as at 31 December 2018. Coal Resources and Reserves of the Glencore mines are the responsibility of the Glencore Coal Resources and Coal Reserves team.

GOEDGEVONDEN MINE: COAL RESOURCES ESTIMATES AS AT 31 DECEMBER 2018

* Coal Resources are reported on a 100% basis.	Coal type and qualities	Coal Resources			
		Measured MTIS****	Indicated MTIS	Measured and Indicated MTIS	Inferred MTIS
Total 2019	**Thermal coal (Mt)**	**510**	**7**	**517**	**1**
	CV (MJ/kg)	**19.82**	**18.28**	**19.80**	**16.72**
	Ash (%)	**32.31**	**34.67**	**32.34**	**40.91**
	VM (%)	**21.86**	**21.29**	**21.85**	**18.96**
	S (%)	**1.16**	**1.07**	**1.16**	**0.85**
Total 2018	Thermal coal (Mt)	515	7	522	1
	CV (MJ/kg)	19.85	21.45	19.87	14.45
	Ash (%)	32.33	27.88	32.27	48.02
	VM (%)	21.88	22.54	21.89	13.14
	S (%)	1.16	1.08	1.16	0.52

Coal Resources are inclusive of those modified to produce Coal Reserves.
***** MTIS – Mineable Tonnes In Situ Coal Resources are now reported as per SAMREC Code of 2016 requirements.*
Mining method is open-cut.
CV – calorific value; VM – volatile matter; S – sulphur.
Totals are rounded off.
Key assumptions for Coal Resources:
Coal Resources are reported on an MTIS basis.
Coal Resources qualities are reported on an air-dried moisture basis.
Geological loss: 6%.
Density ranges: 1.3 t/m³ – 1.8 t/m³.
Seam thickness cut-off: 1 metre (combined seams 2 and 4); 0.5 metres (seams 1 and 5).
Qualities cut-off: Ash: 50%; VM: 20%; S: 3%.
* ***Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%).***

SECTION SHOWING GOEDGEVONDEN COAL SEAMS



ARM COAL continued

GOEDGEVONDEN MINE: COAL RESERVES ESTIMATES AS AT 31 DECEMBER 2018

* Coal Reserves are reported on a 100% basis.	Coal Reserves (ROM)			Coal Reserves (Saleable)			
	Coal type and qualities	Proved	Probable	Total Reserves	Coal type and qualities	Proved	Probable	Total Reserves
Total 2019	**Thermal coal (Mt)**	**280**	**10**	**290**	**Thermal Coal (Mt)**	**173**	**5**	**178**
	CV (MJ/kg)			**19.64**				
	Ash (%)			**33.23**	**HG export (Mt)**			**79**
	VM (%)			**21.33**	**Export CV (Kcal/kg)**			**6 000**
	S (%)			**1.12**	**LG export (Mt)**			**99**
					LG export CV (MJ/kg)			**21.50**
Total 2018	Thermal coal (Mt)	283	10	293	Thermal Coal (Mt)	175	5	180
	CV (MJ/kg)			19.57				
	Ash (%)			33.73	Export (Mt)			79
	VM (%)			20.71	Export CV (Kcal/kg)			6 000
	S (%)			1.03	Domestic (Mt)			101
					Domestic CV (MJ/kg)			22.00

Saleable Coal Reserves are on a net as received moisture basis.
Coal Reserves qualities are reported on an air-dried moisture basis.
Totals are rounded off.
Mining method is open-cut.
CV – calorific value; VM – volatile matter; S – sulphur.
Modifying factors for the conversion of Coal Resources to Coal Reserves include:
Mining loss factor: 6%.
Plant yields: Export – 15%; Domestic – 45%.
Price used: Short-term – based on the API4; Long-term – based on market-related long-term view and customer contracts.
Exchange rate (R/US$): Market-related.
Seam thickness cut-off: 1 metre (combined Seams 2 and 4); 0.5 metres (Seam 5).
Qualities cut-off: Domestic: CV: 18%; Ash: 35%; VM: 20%; S: 1.5%. Export: All coal beneficiated.
Life-of-mine: 24 years.
**** Goedgevonden Coal Mine attributable interests (ARM 26%; Glencore Operations 74%).***

Year-on-year change

Coal Reserves (ROM) marginally decreased from 293 million tonnes to 290 million tonnes with the following contributing to the change:

- Depletion due to mining was 9.3 million tonnes (January to December 2019)
- The pan in the South Pit is now included to be mined, resulting in an increase of 4.7 million tonnes of Coal Reserves
- An additional 0.7 million tonnes was also gained due to the mining methodology changing from split seam mining to composite seam mining.

HISTORICAL PRODUCTION AT GOEDGEVONDEN MINE

	ROM	Saleable
Financial year	Mt	Mt
2014/2015	11.9	8.3
2015/2016	9.9	6.5
2016/2017	10.8	6.5
2017/2018	9.6	6.0
2018/2019	11.4	7.0

IAR Additional information regarding production figures can be found on page 82 of the ARM integrated annual report for 2019, which can be found at **www.arm.co.za**.

ARM owns 13.83% of Harmony's issued share capital. Harmony is separately run by its own management team. Mineral Resources and Mineral Reserves of the Harmony Mines are the responsibility of the Harmony team and are published in Harmony's Annual Report.

The report can be found on **www.harmony.co.za**.

GOLD: HARMONY

Glossary of terms

Mass units

tonnes:

metric system unit of mass equal to 1 000 kilograms

Mt:

million tonne; metric system unit of mass equal to 1 000 000 metric tonnes

Moz:

million troy ounces

MTIS:

Mineable Tonnes In Situ, adjusted for geological losses

Grade units

g/t:

grams per tonne

4E:

The sum of Platinum, Palladium, Rhodium and Gold grades in grams per tonne (g/t)

6E:

The sum of Platinum, Palladium, Rhodium, Ruthenium, Iridium and Gold in grams per tonne (g/t)

% Fe:

weight percent Iron

% Mn:

weight percent Manganese

% Ni:

weight percent Nickel

% Cu:

weight percent Copper

% Co:

weight percent Cobalt

CV:

Calorific Value

kcal/kg:

kilocalories per kilogram

MJ/kg

megajoules per kilogram

Professional organisations

ECSA:

Engineering Council of South Africa

GSSA:

Geological Society of South Africa

IMSSA:

The Institute of Mine Surveyors of South Africa

SACNASP:

South African Council for Natural Scientific Professions

SAIMM:

South African Institute of Mining and Metallurgy

Other abbreviations within the report

ARM:

African Rainbow Minerals Limited

ASSMANG:

Assmang Proprietary Limited

IAR:

Integrated annual report

JSE:

Johannesburg Stock Exchange

QAQC:

Quality Assurance/Quality Control

Contact details

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JSE share code: ARI
A2X share code: ARI
ISIN: ZAE000054045

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BDO South Africa

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FirstRand Bank Limited
The Standard Bank of South Africa Limited
Nedbank Limited

Sponsors

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MP Schmidt (chief executive officer)
F Abbott*
M Arnold**
Dr MMM Bakane-Tuoane*
TA Boardman*
AD Botha*
JA Chissano (Mozambican)*
WM Gule*
AK Maditsi*
HL Mkatshana
AM Mukhuba (finance director)
JP Möller*
DC Noko*
Dr RV Simelane*
JC Steenkamp**
ZB Swanepoel*
AJ Wilkens

* *Independent non-executive*
** *Non-executive*

Forward-looking statements

Certain statements in this report constitute forward-looking statements that are neither reported financial results nor other historical information. They include but are not limited to statements that are predictions of or indicate future earnings, savings, synergies, events, trends, plans or objectives. Such forward-looking statements may or may not take into account and may or may not be affected by known and unknown risks, uncertainties and other important factors that could cause the actual results, performance or achievements of the Company to be materially different from the future results, performance or achievements expressed or implied by such forward-looking statements. Such risks, uncertainties and other important factors include among others: economic, business and political conditions in South Africa; decreases in the market price of commodities; hazards associated with underground and surface mining; labour disruptions; changes in government regulations, particularly environmental regulations; changes in exchange rates; currency devaluations; inflation and other macro-economic factors; and the impact of the HIV & Aids epidemic in South Africa. These forward-looking statements speak only as of the date of publication of these pages. The Company undertakes no obligation to update publicly or release any revisions to these forward-looking statements to reflect events or circumstances after the date of publication of these pages or to reflect the occurrence of unanticipated events.

www.arm.co.za