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24th February 2015  
SGS Ref: 15200306  
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**RYA-TEC (PTY) LTD**

## **SAMPLING AND ANALYSIS REPORT**

In accordance with the instructions received from our principal, we attended at Mouton Farm; Saldanha Bay, South Africa, for the purpose of:-

- Identification of Cargo
- Sampling from Stockpile
- Analysis

**On a consignment described as: Iron Ore**

**On which we report as follows;**

PLACE OF INSPECTION	:	Mouton Farm; Saldanha Bay, South Africa
INSPECTION COMMENCED	:	18th February 2015
INSPECTION COMPLETED	:	18th February 2015
GROSS WEIGHT SAID TO BE	:	12,800 wmt stockpile

### **IDENTIFICATION OF CARGO**

The material is stored as a stockpile within an open area demarcated with a berm wall. The material is in two parts, iron ore fines smaller than 6mm, and lumpy iron ore 100 x 6mm, with some pieces larger than 100mm. The stockpile lies on an axis North East to South West.

The side of the stockpile facing SE is adjacent to the berm wall. The lumpy ore is said to be laid over a carpet made with some of the fine iron ore. The client is interested in the lumpy part of the stockpile.

### **SAMPLING**

Sampling was done according to ISO standard on three sides of the stockpile and the sub samples were generated. The Lumpy part of the stockpile was sampled in 3 zones: - North-East zone (sample A); Middle (sample B); South West (sample C). Using a TLB machine 12 holes were dug, 4 in each zone, and increments were taken randomly by using a built up shovel of 200mm x 300mm width. From each zone 500kg of sample was generated. This implies that a bulk sample of 1.5 tons of sample was generated. In addition a grab sample of 25kg fines resulting from the surface or floor of the stockpile was taken, and labeled as "fines". The three sub samples (A;B;C) were respectively crushed to -20mm and representative portions of 30kg were sent to SGS Booyens for further preparation and analysis. Also the fine sample from the surface was also sent to Booyens for preparation and analysis.

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Findings as per below

**ANALYSIS:** The quality pulp samples were submitted to SGS Laboratory for analysis

**Analysis was done by Borate fusion XRF**

Results are based on weighted average and reported on a Dry Basis

<b>Iron Ore Lumpy</b>		<b>Unit</b>	<b>Result</b>
Iron, as Fe	:	%	62.76
Iron, as Fe <sub>2</sub> O <sub>3</sub>	:	%	89.73
Silicon, as SiO <sub>2</sub>	:	%	7.47
Aluminium, as Al <sub>2</sub> O <sub>3</sub>	:	%	1.23
Calcium, as CaO	:	%	0.15
Magnesium, as MgO	:	%	0.07
Potassium, as K <sub>2</sub> O	:	%	0.06
Manganese, as MnO	:	%	0.46
Sodium, as Na <sub>2</sub> O	:	%	0.02
Phosphorus, as P <sub>2</sub> O <sub>5</sub>	:	%	0.11
Titanium, as TiO <sub>2</sub>	:	%	0.04
Chrome as Cr <sub>2</sub> O <sub>3</sub>	:	%	<0.01
Vanadium, as V <sub>2</sub> O <sub>5</sub>	:	%	0.01
Loss on Ignition	:	%	0.83
<b>Iron Ore Fines</b>			
Iron, as Fe	:	%	48.8

These are the obtained XRF values and are provided for information only.

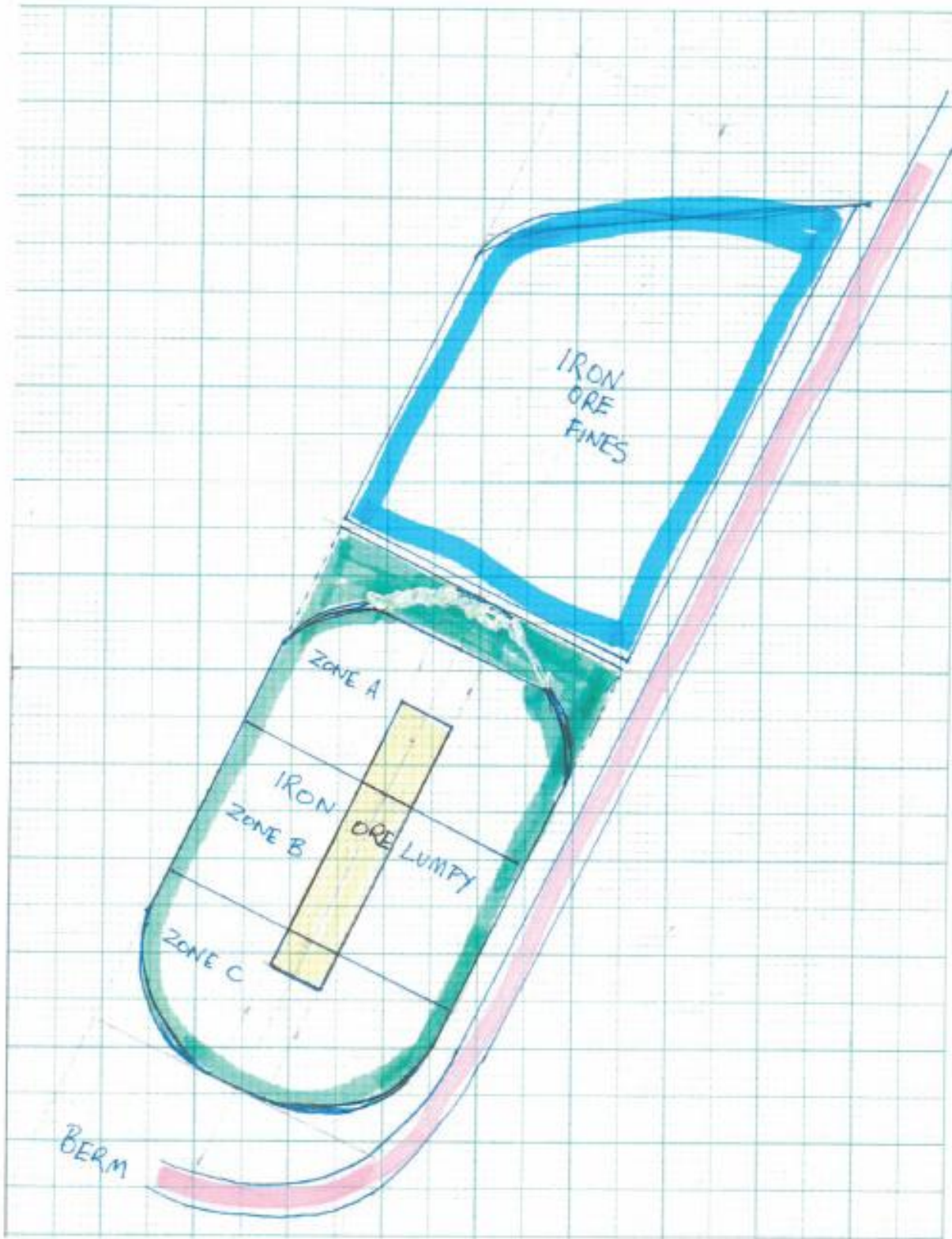
**Lumpy Stockpile:**

The Lumpy ore appears to be high quality. As it lies up against the berm wall on the SE side, the TLB was unable to access that side of the stockpile.

The NW side of the stockpile faces the sand screening operations. The SW side has some windblown sand on the face.

Vegetation grows on the terrace between the Lumpy and Fines parts of the stockpile.

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The photograph of the SW end of the Lumpy stockpile shows it has been molested by earlier samplers who have dug a deep section out of the stockpile. The excavated ore is placed around the SW end. If the excavated ore was returned to its former position, the stockpile would recover its original shape.

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### **Method:**

Measurements were taken such that parts (blocks) of the stockpile could be treated as prism, cube, or cone, or sectors thereof. Horizontal measurements were done with surveyor's tape. Vertical measurements were done with a telescopic five metre graduated staff, and a surveyor's theodolite on a tripod for sighting levels was used. Where height exceeds the length of the staff, the angle to the staff end is recorded so that the additional height can be found by the tangent of the angle and the distance apart. The volume of each block is calculated by the classic formulae, and all these volumes are added up to find the total.

### **Bulk Density:**

To convert volume into tonnes, the bulk density is found. A bucket of suitable size is brought: the large bucket for 10x150mm has a volume of 68.8 litres, The volume was found using a scale and filling the dry empty bucket with water, which has relative density 1.00. It would be usual to determine the bulk density in both the loose state and the compact state. Faced with making such a distinction for ore of 120mm in large quantity, the loose and compacted routine was abandoned. There was also a time constraint. Sample increments were carefully fitted into the receiving bucket to fill up the larger voids until the quantity inside was on average level with the rim.

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**Measurements:**

**Lumpy Stockpile**

Length	39	metres
Width	24.4	metres
Slope (side)	11.3	metres
Slope (base)	8.7	metres
Plateau	4.0	metres
Height of terrace	2.7	metres
Height of plateau above terrace	4.5	metres
Total height	7.2	metres

**Calculations**

Rectangular Core	$4 \times 21.6 \times 7.2$	= 622.0 cu.m
Prism Ends x 2	$2/2 \times 4 \times 8.7 \times 7.2$	= 250.6 cu.m
Prism Sides x 2	$2/2 \times 8.7 \times 21.6 \times 7.2$	= 1353 cu.m
Conical corners x 4	$4/12 \times 8.7^2 \times \pi \times 7.2$	= 570.7 cu.m

<b>Total Volume Lumpy stockpile</b>	<b>2796.3 m<sup>3</sup></b>
Bulk Density of ore	2.6 t/m <sup>3</sup>
Tonnage of Lumpy	7270 tonnes

**Fines Stockpile:**

Length	30	metres
Width	21.6	metres
Estimated Height	3	metres

<b>Estimated Volume of Fines</b>	<b>1944 m<sup>3</sup></b>
Approximate tonnes	5054 tonnes

Remarks:

- Please note that the assessment of quantities for minerals is restricted only to the material which is above the surface and does not take into account any embedded cargo.
- The assessed figures reflected in our report are indicative due to inherent limitations in the stack measurements.
- The measured bulk density does not necessarily represent the bulk density of compacted or piled up nature as and processed material.

## SAMPLING AND ANALYSIS REPORT

SGS responsibility is limited to performing the job of assessment of quantity by measuring the volume and determination of bulk densities with due care. The quantity findings thus reported are estimates and may not be comparable with physical weighing of the same cargo. Our findings strictly relate to the scope, date and place of attendance only.

The manual sampling method was agreed with the SGS Principal, as sampling by more reliable methods that provide probability samples was not possible. The holder of this document is cautioned that collected MANUAL samples of this type do not satisfy the minimum requirements for probability sampling, and as such cannot be used to draw statistical inferences such as precision, standard error, or bias.

*Due to not being able to access the entire volume of the cargo, the samples collected have indicative value only and will not necessarily be representative of the entire cargo, but only that part accessible and sampled. SGS has no responsibility and / or liability for the consequences of any action taken or not taken on the basis of this certificate / report.*

The consignment from which the samples were collected had a nominal top size of over 70 millimeter. While the sampling method was agreed upon by all parties to this report, due to the limited ability to extract representative increments from the cargo, the samples collected will not necessarily be representative of the entire cargo. SGS has no responsibility and / or liability for the consequences of any action taken or not taken on the basis of this certificate / report.



09 March 2015

For and on Behalf of  
SGS South Africa (PTY) Ltd

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