



**bhpbilliton**  
resourcing the future

# Product Enquiries

At BHP Billiton, we take time to understand how our customers do business. By getting to know our customers' markets and products, we are in a position to better serve their needs. We welcome your enquiry regarding our products or specific technical requirements.

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- 



## Aluminium

BHP Billiton is one of the world's largest non-integrated producers of primary aluminium and a major supplier to the third party alumina market. We can offer both continuity and alternative sources of supply due to both the geographical spread of our assets and alumina and aluminium trade books. This, together with our international offices and global logistics capability, ensures that we can meet our customer needs in all major markets.

BHP Billiton services all the key market segments, like the automotive sector, construction industry and the packaging sector. Our network of operations services a global customer base, with sites in South America, Southern Africa and Australia.



# Aluminium

- ▶ **Aluminium**
  - ▶ **Primary Aluminium**
    - Hillside Ingots
    - Mozal Ingots
    - Alumar Ingots/Sow
    - Bayside Rolling Ingots
  - ▶ **Alumina**
    - Worsley Alumina
    - Alumar Alumina

## Hillside Ingots Hillside, South Africa

### Product Definition

Hillside produces primary aluminium, with a purity grade of, or greater than, 99.7 per cent aluminium. This product is traded as a commodity on the world market. Hillside product is graded in accordance with the Aluminium Association grading system.

The actual grade produced by Hillside will depend upon the present metal quality and market factors. They are likely to include P0406A, P0610A and P1020A. Hillside may offer other grades from time to time.

### Specifications Table

Material Master No.	Alloy Code	Si (%)	Fe (%)	Cu (%)	Mn (%)	Mg (%)	Zn (%)	Ga (%)	Ti (%)	Cr (%)	V (%)	B (%)	Al (%)	Others	
														Each	Total
P1020A23	P1020A	min											99.70		
		max	0.10	0.20				0.03	0.04		0.03				0.03
P0610A23	P0610A	min											99.80		
		max	0.06	0.10				0.03	0.04		0.02				0.02
P0406A23	P0406A	min											Rem.		
		max	0.04	0.06				0.03	0.03		0.02				0.02

### Ingots

The ingot is the basic component part of the product sold by Hillside, and its size and form conform to the special contract LME rules and specifications regarding quality shape and weight. The ingot has a nominal weight of about 23.7 kg, and oversize and undersize ingots are rejected through the process prior to packing into bundles.

### Bundles

The bundle comprises 44 ingots packed in an interlocked manner and secured with three polyester straps. The bottom of the ingot has slight projections on two opposite sides to allow easy handling of the product by forklift.

The bundles are packed by robot and shall show tight packing and interlocking of all ingots. Oversize and undersize ingots are rejected prior to packing to ensure a quality bundle build.

### Strapping

Three polyester straps (Tenax 19 mm or equivalent) secure the bundle. The straps are applied parallel to each other, with the centre one going through the middle of the bundle and the bottom ingot layer longitudinal face.

The polyester strapping is preferred over the more traditional steel for its improved shock resistance, corrosion resistance, elasticity and ease of handling. It is, however, more vulnerable to direct impact and abrasion. Reasonable care must be taken when handling this product.

Note: The polyester strapping is never to be used for lifting or dragging of the product. It will fail if used in this manner.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Aluminium

- ▶ **Aluminium**
  - ▶ **Primary Aluminium**
    - Hillside Ingots
    - Mozal Ingots
    - Alumar Ingots/Sow
    - Bayside Rolling Ingots
  - ▶ **Alumina**
    - Worsley Alumina
    - Alumar Alumina

## Mozal Ingots

### Mozal, Mozambique

#### Product Definition

Mozal produces primary aluminium, with a purity grade of, or greater than, 99.7 per cent aluminium. This product is traded as a commodity on the world market. Mozal product is graded in accordance with the Aluminium Association grading system.

The actual grade produced by Mozal will depend upon the present metal quality and market factors. They are likely to include P0406A, P0610A and P1020A. Mozal may offer other grades from time to time.

#### Specifications Table

Material Master No.	Alloy Code	Si (%)	Fe (%)	Cu (%)	Mn (%)	Mg (%)	Zn (%)	Ga (%)	Ti (%)	Cr (%)	V (%)	B (%)	Al (%)	Others	
														Each	Total
P1020A23	P1020A	min											99.70		
		max	0.10	0.20				0.03	0.04		0.03				0.03
P0610A23	P0610A	min											99.80		
		max	0.06	0.10				0.03	0.04		0.02				0.02
P0406A23	P0406A	min											Rem.		
		max	0.04	0.06				0.03	0.03		0.02				0.02

#### Ingots

The ingot is the basic component part of the product sold by Mozal, and its size and form conform to the special contract LME rules and specifications regarding quality shape and weight. The ingot has a nominal weight of about 23.7 kg, and oversize and undersize ingots are rejected through the process prior to packing into bundles.

#### Bundles

The bundle comprises 44 ingots packed in an interlocked manner and secured with three polyester straps. The bottom of the ingot has slight projections on two opposite sides to allow easy handling of the product by forklift.

The bundles are packed by robot and shall show tight packing and interlocking of all ingots. Oversize and undersize ingots are rejected prior to packing to ensure a quality bundle build.

#### Strapping

Three polyester straps (Tenax 19 mm or equivalent) secure the bundle. The straps are applied parallel to each other, with the centre one going through the middle of the bundle and the bottom ingot layer longitudinal face.

The polyester strapping is preferred over the more traditional steel for its improved shock resistance, corrosion resistance, elasticity and ease of handling. It is, however, more vulnerable to direct impact and abrasion. Reasonable care must be taken when handling this product.

Note: The polyester strapping is never to be used for lifting or dragging of the product. It will fail if used in this manner.

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# Aluminium

- ▶ **Aluminium**
  - ▶ **Primary Aluminium**
    - Hillside Ingots
    - Mozal Ingots
    - Alumar Ingots/Sow
    - Bayside Rolling Ingots
  - ▶ **Alumina**
    - Worsley Alumina
    - Alumar Alumina

## Alumar Ingots/Sow Alumar, Brazil

### Product Definition

Alumar produces primary aluminium, mainly with a purity grade of, or greater than, 99.7 per cent aluminium. This product is traded as a commodity on the world market. Alumar product is graded in accordance with the Aluminium Association grading system.

The actual grade produced by Alumar will depend upon the present metal quality and market factors. They are likely to include P0406A, P0610A and P1020A. Alumar may offer other grades from time to time.

### Specifications Table

Material Master No.	Alloy Code	Si (%)	Fe (%)	Cu (%)	Mn (%)	Mg (%)	Zn (%)	Ga (%)	Ti (%)	Cr (%)	V (%)	B (%)	Al (%)	Others	
														Each	Total
P1020A23	P1020A	min											99.70		
		max 0.10 0.20											0.03	0.10	
P0610A23	P0610A	min											99.80		
		max 0.06 0.10											0.03	0.04	0.02
P0406A23	P0406A	min											Rem.		
		max 0.04 0.06											0.03	0.03	0.02

### Ingots/Sows

The basic products produced by Alumar are in the shape of ingots or sows.

The ingot has a nominal weight of about 23.3 kg, and oversize and undersize ingots are rejected through the process prior to packing into bundles.

The sow has a nominal weight of about 318 kg, and oversize and undersize ingots are rejected through the process prior to packing into bundles.

### Bundles ingots

The bundle comprises 44 ingots packed in an interlocked manner and secured with four steel bands, as per ASTM rule, two longitudinal and two transversal.

The bundles are packed by robot and shall show tight packing and interlocking of all ingots.

Oversize and undersize ingots are rejected prior to packing to ensure a quality bundle build.

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# Aluminium

- ▶ **Aluminium**
  - ▶ **Primary Aluminium**
    - Hillside Ingots
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    - Bayside Rolling Ingots
  - ▶ **Alumina**
    - Worsley Alumina
    - Alumar Alumina

## Bayside Rolling Ingots

### Bayside, South Africa

#### Product Definition

Bayside produces primary alloyed aluminium in the shape of rolling ingots (slabs) with a variety of grades. Rolling ingots are produced in a range of alloys consisting of 1xx, 3xx, 5xx, 8xx and 9xx. Specifications depend on present metal quality and customer demand.

#### Rolling Ingots (Slab)

Bayside produces rolling ingots in either 490 mm thickness or 630 mm thickness in various widths from 1,180–1,645 mm and 1,000–1,800 mm respectively. Metal is cast from tilting furnaces through an Alcan Compact Degasser (ACD) and a ceramic foam filtration (CFF) as part of in-line metal treatment.

The metal is solidified using Wagstaff Hot Top® tables and mould technology. Normal water holed moulds are used for 490 mm thick slabs, while IHC Vari-mould® technology is used for the 630 mm thick material.

#### Bayside

Bayside Aluminium is 100 per cent owned by BHP Billiton and operates out of the port city of Richards Bay. The plant has been in operation since 1971 and has undergone a number of significant improvement projects over its lifespan to improve safety, production quantity and quality, but at the same time reduce the impact its operations have on the environment. Today, Bayside produces only rolling ingots, with a total production of approximately 90 kt per annum.

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# Aluminium

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  - ▶ **Primary Aluminium**
    - Hillside Ingots
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    - Alumar Ingots/Sow
    - Bayside Rolling Ingots
  - ▶ **Alumina**
    - Worsley Alumina
    - Alumar Alumina

## Worsley Alumina

### Worsley, Australia

At the Worsley refinery, alumina is extracted from bauxite using the Bayer process. The crushed bauxite arrives by conveyor from the mine site and passes through four main process stages – digestion, clarification, precipitation and, finally, calcination to produce smelter grade calcined alumina.

#### Worsley Specification and Typical Quality\*

Property		Specification (maximum)	Typical At Present	Typical After 4.6 Mtpa Production
Na <sub>2</sub> O	%	0.50	0.41	0.40
SiO <sub>2</sub>	%	0.025	0.008	0.008
Fe <sub>2</sub> O <sub>3</sub>	%	0.025	0.006	0.006
CaO	%	0.050	0.039	0.038
TiO <sub>2</sub>	%	0.005	0.004	0.004
V <sub>2</sub> O <sub>5</sub>	%	0.003	<0.001	<0.001
P <sub>2</sub> O <sub>5</sub>	%	0.003	<0.001	<0.001
ZnO	%	0.015	<0.001	<0.001
Loss On Ignition	%	1.0	0.75	0.75
-20 Micron Content	%	NA	<2.2	<2.2
-45 Micron Content	%	10	5.3	5
+150 Micron Content	%	10	6.3	6
BET	m <sup>2</sup> /g	60–80	77	76
Attrition Index		no specification	5.4	5
Loose Bulk Density	g/L	1,100	980	980

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# Aluminium

- ▶ Aluminium
  - ▶ Primary Aluminium
    - Hillside Ingots
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    - Alumar Ingots/Sow
    - Bayside Rolling Ingots
  - ▶ Alumina
    - Worsley Alumina
    - Alumar Alumina

## Alumar Alumina

### Alumar, Brazil

At the Alumar refinery, alumina is extracted from bauxite using the Bayer process. Bauxite passes through four main process stages – digestion, clarification, precipitation and, finally, calcination to produce smelter grade calcined alumina.

### Alumar Specification and Typical Quality\*

Alumar SGA Official Specification					
Alumar Alumina					
Parameter		Typical	Min	Max	Method
Na <sub>2</sub> O	%	0.37	0.35	0.45	
CaO	%	0.015		≤0.025	
Fe <sub>2</sub> O	%	0.010		≤0.015	
SiO <sub>2</sub>	%	0.010		≤0.020	
Ga <sub>2</sub> O <sub>3</sub>	%	0.010		≤0.015	
TiO <sub>2</sub>	ppm	25		<40	Australian Standard 2879.7
V <sub>2</sub> O <sub>5</sub>	ppm	10		<20	Alcoa 133
P <sub>2</sub> O <sub>5</sub>	ppm	<10		<10	
ZnO	ppm	<10		<10	
MnO	ppm	<5		<10	
K <sub>2</sub> O	ppm	<5		<100	
Li <sub>2</sub> O	ppm	<5		<50	
LOI (300–1,000°C)	%	0.83		≤0.9	Australian Standard 2879–1986
α-Alumina	%	3		≤5	Australian Standard 2879.3
Attrition Index	%	15		≤18	Alcoa 131D
Repose Angle	°	30		≤35	Alcoa 121.3
Surface Area (BET)	m <sup>2</sup> /g	70	65	80	Australian Standard 2879.4
Loose Bulk Density	g/cm <sup>3</sup>	1.01	0.95	1.05	
+100#	%	5		≤8	Alcoa 131C
+200#	%	63	55	80	Alcoa 131C
-325#	%	9.5		≤11	Alcoa 131C
-20 microns	%	1.0		≤1.5	Alcoa Laser Scattering

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- ▶ **Aluminium**
- ▶ **Base Metals**
  - ▶ **Copper**
    - Antamina Cu Concentrates
    - Cerro Colorado Cathodes
    - Escondida Cathodes
    - Escondida Cu Concentrates
    - Olympic Dam Cathodes
    - Pinto Valley Cathodes
    - Pinto Valley Cu Concentrates
    - Spence Cathodes
  - ▶ **Lead**
    - Cannington Concentrates
  - ▶ **Gold**
    - Olympic Dam Gold Bullion
  - ▶ **Molybdenum**
    - Pinto Valley Concentrates
  - ▶ **Silver**
    - Olympic Dam Silver Bullion
- ▶ **Diamonds and Specialty Products**
- ▶ **Energy Coal**
- ▶ **Iron Ore**
- ▶ **Manganese**
- ▶ **Metallurgical Coal**
- ▶ **Petroleum**
- ▶ **Stainless Steel Materials**



## Base Metals

BHP Billiton provides base metal concentrates to smelters and copper cathodes to rod and brass mills and casting plants.

Our in-house logistics function enables us to plan and track product efficiently from mine to market, while our technical support and customer satisfaction programs provide important follow-up and feedback. Our market-focused approach is based on a global network of offices managed from our marketing office in Singapore.



## Base Metals

► **Base Metals**

► **Copper**

Antamina Cu Concentrates  
Cerro Colorado Cathodes  
Escondida Cathodes  
Escondida Cu Concentrates  
Olympic Dam Cathodes  
Pinto Valley Cathodes  
Pinto Valley Cu Concentrates  
Spence Cathodes

## Antamina Cu Concentrates

### Antamina, Peru

#### Typical Analysis

Element	Range %
Cu	26–30
Bi	0.01–0.40
Fe	17–30
Mo	0.001–0.03
Pb	0.05–0.4
S	20–34
Si	0.5–2.2
Zn	1.0–7.0

#### Typical Analysis

Element	PPM
Ag	100–350
Al	200–9,000
As	100–4,000
Au	0.2–0.8
Ba	5–50
Be	<2
Ca	500–10,000
Cd	50–130
Cl	10–80
Co	20–120
Cr	5–20
F	100–200
Hg	<0.3
K	100–5,000
La	<50
Mg	300–2,000
Mn	100–400
Na	300–12,500
Ni	5–70
P	50–190
Sb	60–300
Se	<50
Sn	<20
Te	<20
Y	<5

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# Base Metals

► **Base Metals**

► **Copper**

- Antamina Cu Concentrates
- Cerro Colorado Cathodes
- Escondida Cathodes
- Escondida Cu Concentrates
- Olympic Dam Cathodes
- Pinto Valley Cathodes
- Pinto Valley Cu Concentrates
- Spence Cathodes

## Cerro Colorado Cathodes

### Cerro Colorado, Chile

#### Typical Analysis

	Typical ppm	LME Limit ppm	Maximum Levels ppm
Pb	<1	<5	3
S	<5	<15	8
Fe	<5	<10	10
Te	<0.2	<2	1
Se	<0.2	<2	1
As	<0.2	<5	3
Sb	<0.2	<4	4
Bi	<0.2	<2	1
Ag	<0.5	<5	3

#### Physical Characteristics

- LME registered cathodes
- 2.5 ton bundle
- 36–40 kg cathode
- Non-corrugated cathodes
- SXEW Mount Isa process

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## Base Metals

► **Base Metals**

► **Copper**

Antamina Cu Concentrates  
Cerro Colorado Cathodes  
Escondida Cathodes  
Escondida Cu Concentrates  
Olympic Dam Cathodes  
Pinto Valley Cathodes  
Pinto Valley Cu Concentrates  
Spence Cathodes

## Escondida Cathodes

### Escondida, Chile

#### Typical Analysis

	Typical ppm	LME Limit ppm	Maximum Levels ppm
Pb	<1	<5	3
S	<5	<15	8
Fe	<0.8	<10	10
Te	<0.2	<2	2
Se	<0.2	<2	2
As	<0.2	<5	5
Sb	<0.2	<4	4
Bi	<0.2	<2	2
Ag	<0.5	<25	5

#### Physical Characteristics

- LME registered cathodes
- 2.5 ton bundle
- 80–90 kg cathode
- Corrugated or non-corrugated cathodes
- SXEW Kidd Creek process

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## Base Metals

► Base Metals

► Copper

Antamina Cu Concentrates  
Cerro Colorado Cathodes  
Escondida Cathodes  
Escondida Cu Concentrates  
Olympic Dam Cathodes  
Pinto Valley Cathodes  
Pinto Valley Cu Concentrates  
Spence Cathodes

## Escondida Cu Concentrates Escondida, Chile

### Typical Analysis

Typical Range	
Cu	28–42
Au (ppm)	0.8–3.5
Ag (ppm)	45–120
Fe	15–26
S	27–35
SiO <sub>2</sub>	3–10
Sb	0.001–0.02
As	0.07–0.25
Hg (ppm)	0.2–0.6
Cl	0.010–0.05
F	0.010–0.35
Mo	0.07–0.35
Al <sub>2</sub> O <sub>3</sub>	1.5–3.5
Bi	0.001–0.03
Co	0.002–0.015
Pb	0.014–0.045
Ni	0.001–0.003
Se	0.003–0.008
Te	0.002–0.008
Zn	0.10–0.06
Cd (ppm)	20–400

(Per cent except as indicated)

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## Base Metals

► **Base Metals**

► **Copper**

Antamina Cu Concentrates  
Cerro Colorado Cathodes  
Escondida Cathodes  
Escondida Cu Concentrates  
Olympic Dam Cathodes  
Pinto Valley Cathodes  
Pinto Valley Cu Concentrates  
Spence Cathodes

## Olympic Dam – A Grade Electro Refined Cathodes Olympic Dam, Australia

### Chemical Specifications

Analyte	Symbol	Unit	LME Limit	Marketing Specification
				ER
Bismuth	Bi	ppm	<2	≤0.3
Selenium	Se	ppm	<2	≤0.3
Tellurium	Te	ppm	<2	≤0.3
GROUP		ppm	<3	≤0.9
Arsenic	As	ppm	<5	≤2
Antimony	Sb	ppm	<4	≤2
<b>Group</b> (includes Cadmium, Chromium, Manganese, Phosphorous)		ppm	<15	≤4
Lead	Pb	ppm	<5	≤0.5
Sulphur	S	ppm	<15	≤6.5
Iron	Fe	ppm	<10	≤3
<b>Group</b> (includes Cobalt, Nickel Tin, Silicon, Zinc)		ppm	<20	≤5
Silver	Ag	ppm	<25	≤10
Total		ppm	<65	≤15

### Physical Characteristics

- LME registered cathodes
- 2.6 ton bundle
- 70–80 kg cathode
- Non-corrugated cathodes
- ISA production technology (ER)

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# Base Metals

► **Base Metals**

► **Copper**

- Antamina Cu Concentrates
- Cerro Colorado Cathodes
- Escondida Cathodes
- Escondida Cu Concentrates
- Olympic Dam Cathodes
- Pinto Valley Cathodes
- Pinto Valley Cu Concentrates
- Spence Cathodes

## Pinto Valley Cathodes

### Pinto Valley, US

#### Typical Analysis

Pinto Valley	Typical ppm	LME Limit ppm
Ag	<1	<25
As	<1	<5
Bi	<1	<2
Cd	<1	
Co	<1	
Cr	<1	
Fe	2	<10
Mn	<1	
Ni	<1	<20
Pb	<1	<5
Sb	<1	<4
Se	<1	<2
Sn	<1	
Te	<1	<2
Zn	<1	<20
O <sub>2</sub>	18	
S	2	<15

Miami Unit	Typical ppm	LME Limit ppm
Ag	<1	<25
As	<1	<5
Bi	<.5	<2
Cd	<1	
Co	<1	
Cr	<1	
Fe	2	<10
Mn	<1	
Ni	<1	<20
Pb	<1	<5
Sb	<1	<4
Se	<1	<2
Sn	<1	
Te	<1	<2
Zn	<1	
O <sub>2</sub>	52	
S	2	<15

#### Physical Characteristics

- Comex registered cathodes
- 4,700 lb (2.13 ton) bundle
- 100–125 lb (45–56 kg) cathode
- Non-corrugated cathodes
- Pinto Valley SXEW plant

#### Physical Characteristics

- Non-registered cathodes
- 4,700 lb (2.13 ton) bundle
- 55–65 lb (25–29 kg) cathode
- Non-corrugated cathodes
- SXEW Mount Isa process

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# Base Metals

► **Base Metals**

► **Copper**

- Antamina Cu Concentrates
- Cerro Colorado Cathodes
- Escondida Cathodes
- Escondida Cu Concentrates
- Olympic Dam Cathodes
- Pinto Valley Cathodes
- Pinto Valley Cu Concentrates
- Spence Cathodes

## Pinto Valley Cu Concentrates

### Pinto Valley, US

#### Typical Analysis

Typical Range	
Cu	25–30%
Au	0.8–1.5 ppm
Ag	30–60 ppm
Fe	28–34%
S	30–36%
SiO <sub>2</sub>	2.0–6.0%
As	<0.2%, expected analysis 100 ppm
Sb	<0.2%, expected analysis 200 ppm
Bi	<300 ppm, expected analysis 100 ppm
Pb	<1.0%, expected analysis 1,000 ppm

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# Base Metals

► **Base Metals**

► **Copper**

- Antamina Cu Concentrates
- Cerro Colorado Cathodes
- Escondida Cathodes
- Escondida Cu Concentrates
- Olympic Dam Cathodes
- Pinto Valley Cathodes
- Pinto Valley Cu Concentrates
- Spence Cathodes

## Spence Cathodes Spence, Chile

### Typical Analysis

	Typical ppm	LME Limit ppm	Maximum Levels ppm
Pb	<1	<5	3
S	<5	<15	8
Fe	<5	<10	10
Te	<0.5	<2	2
Se	<0.5	<2	2
As	<2.3	<5	5
Sb	<0.8	<4	4
Bi	<0.1	<2	2
Ag	<0.5	<25	25

### Physical Characteristics

- LME registered cathodes
- 2.5 +/- 0.1 ton bundle
- 45–50 kg cathode
- Corrugated and non-corrugated cathodes
- SXEW Mount Isa process

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## Base Metals

► **Base Metals**

► **Lead**

Cannington Lead Concentrates

## Cannington Lead Concentrates Cannington, Australia

### Typical Analysis

Element	Unit	Typical Specs
Pb	%	68–72
Zn	%	3–6
Fe	%	3.0–4.0
Ag	ppm	2,600–3,300
S (total)	%	12.00–16.00
SiO <sub>2</sub>	%	2–4
Cu	%	0.20–0.40
As	ppm	100–1,000
Sb	ppm	1,800–2,200
Cd	ppm	100–300
Bi	ppm	20–200
Hg	ppm	8–12
F	ppm	500–700
Cl	ppm	50–150
Al <sub>2</sub> O <sub>3</sub>	ppm	0.20–0.30
CaO	%	0.25–0.4
MgO	%	0.6–0.9
Na <sub>2</sub> O	%	0.03
K <sub>2</sub> O	ppm	0.02
MnO		0.2
Organic Carbon	%	0.02
Tl	ppm	<10
Au		<0.5
Size, P80	micron	20

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



## Base Metals

► **Base Metals**

► **Gold**

Olympic Dam Gold Bullion

### **Olympic Dam Gold Bullion** Olympic Dam, Australia

#### **Olympic Dam Au Bullion**

Produced in refined form that at a minimum meets London Good Delivery standard. London Good Delivery standard is Au = 99.5 per cent. Olympic Dam Au bullion is Au  $\geq$  99.95 per cent.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Base Metals

- ▶ **Base Metals**
- ▶ **Molybdenum**  
Pinto Valley Moly Concentrates

## Pinto Valley Moly Concentrates

### Pinto Valley, US

#### Typical Analysis

Typical Range	
MoS <sub>2</sub>	80–85%
Mo	48–50%
Cu	1.25–1.5%
Fe	3.8–4.5%
Insol	4.5–5.0%
Oil	0.7–1.0%
Pb	0.1–0.2%
Re	0.08–0.12%

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



## Base Metals

► **Base Metals**

► **Silver**

Olympic Dam Silver Bullion

### **Olympic Dam Silver Bullion** Olympic Dam, Australia

#### **Olympic Dam Ag Bullion**

Produced in refined form that at a minimum meets London Good Delivery standard. London Good Delivery standard is Ag = 99.9 per cent. Olympic Dam Ag bullion is Ag  $\geq$  99.9 per cent.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*

- ▶ Aluminium
- ▶ Base Metals
- ▶ **Diamonds and Specialty Products**
  - Expression of Interest Form
- ▶ Energy Coal
- ▶ Iron Ore
- ▶ Manganese
- ▶ Metallurgical Coal
- ▶ Petroleum
- ▶ Stainless Steel Materials



## Diamonds and Specialty Products

BHP Billiton is a founding member of the Responsible Jewellery Council (RJC) and a member of the World Diamond Council (WDC), organisations established to promote responsible business practices throughout the industry from mine to retail. BHP Billiton Diamonds NV will only sell rough diamonds to members, in good standing, of the Responsible Jewellery Council.

We offer:

- ▶ Rough diamonds to the leading diamond dealers and manufacturers through our diamonds marketing office in Antwerp, Belgium.
- ▶ Titanium slag and rutile are converted by our customers in the US and Europe, to titanium dioxide pigment, for use in many lifestyle products such as paints, plastics, paper and cosmetics.
- ▶ Zircon for use in ceramics, refractories and electronic applications.



# Diamonds and Specialty Products

► **Diamonds and Specialty Products**  
Expression of Interest Form

## Expression of Interest Form Spot Market/Specials

Please note that BHP Billiton Diamonds will only sell rough diamonds to members in good standing of the Responsible Jewellery Council. If your company is not already a member, please apply to: [www.responsiblejewellery.com](http://www.responsiblejewellery.com)

### Type of goods interested in purchasing (please tick below):

Size	Sawable Low	Sawable Low	Makeable Fancy	Makeable Fancy	Clivage Low	Clivage Low	Rejections Boart	Run of Mine (OR)
+10.8 Carats								
Fancy Colours								
7-10 Carats								
2.5-6 Carats								
4-8 Grainers								
-3GR+9								
-9								

Colour								
White								
Brown								
Coated								

Company \_\_\_\_\_  
 Website \_\_\_\_\_  
 Contact \_\_\_\_\_  
 E-Mail \_\_\_\_\_  
 Telephone \_\_\_\_\_  
 Mobile \_\_\_\_\_  
 Fax \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### Affiliated Companies

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### Please submit completed form to:

**Attention:** Antony Dear  
**E-Mail:** Antony.R.Dear@BHPBilliton.com  
**Fax:** +32 3 213 0846

- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
  - Australian Operations
  - South African Operations
- ▶ Iron Ore
- ▶ Manganese
- ▶ Metallurgical Coal
- ▶ Petroleum
- ▶ Stainless Steel Materials



## Energy Coal

We are one of the world's largest producers and marketers of export thermal coal, supplying the seaborne markets of Europe, Asia and the Americas. We also supply domestic markets in South Africa, Australia and the United States.

Our thermal coal is used in the electric power generation industry, as well as for general industrial applications such as cement production.

BHP Billiton Energy Coal has equity export positions in South Africa, Australia and Colombia, as well as agency and third party sourcing positions in a number of geographies. This allows us to ensure security of physical supply and coal quality and provide downstream logistics and commercial solutions.



# Energy Coal

► **Energy Coal**

Australian Operations  
South African Operations

## Australian Operations

### Product

BHP Billiton Energy Coal owns and operates the Mt Arthur Coal Mine in New South Wales, as well as managing thermal coal product sales from our metallurgical coal operations in the Illawarra region of New South Wales and in Central Queensland. Consistently high-quality coals are produced from our mines, with typical specifications meeting the requirements of the market.

### Australian Coal Mines

Mt Arthur Coal is a large open-cut coal mine located near the town of Muswellbrook in the Upper Hunter region of New South Wales and produces up to 20 million tonnes of run-of-mine coal at full production.

Thermal coal from the Illawarra region in New South Wales is a high ash by-product of our metallurgical coal operations. The quantity produced is approximately one million tonnes per annum.

Queensland thermal coal is also a by-product of our large metallurgical coal mines in Central Queensland. Thermal coal is produced at a number of mines, including South Walker Creek, Gregory, Norwich Park, Blackwater and Poitrel. Approximately one million tonnes are produced per annum.

### Australian Product Typical Analysis

Component	Typical – Mt Arthur (as received)	Typical – Illawarra (as received)	Typical – Blackwater (as received)
Total Moisture	10.0%	5.5%	8.0%
Ash	11.0–20.0%	24.0%	14%
Volatile Matter	29.5–31.0%	18.5%	22.5%
Sulphur	0.60–0.90%	0.45%	0.60%
Net Calorific Value	6,150–5,500 kcal/kg	5,800 kcal/kg	6,300 kcal/kg
Initial Deformation Temperature	1,350°C	1,500°C	1,200°C
HGI	50	75	70

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Energy Coal

► Energy Coal

Australian Operations

South African Operations

## South African Operations

### Product

BHP Billiton Energy owns and operates four collieries in the Mpumalanga Province in South Africa. Consistently high-quality coals are produced from our collieries, with typical characteristics being low sulphur, medium ash and medium volatile matter.

### South African Coal Mines

Equity mines include Middelburg, Douglas, Klipspruit and Khutala.

**Location:** approximately 200 km east of Johannesburg in the Witbank–Middelburg area. The mines are close to domestic power plants and approximately 550 km by rail from Richards Bay Coal Terminal.

**Products:** Domestic coals supplying the domestic power generation market and export quality coal supplying power generators and industrial processes in Europe and Asia.

**Production capacity:** Approximately 40 million tonnes.

### South Africa Product Typical Analysis

Component	Typical (as received)
Total Moisture	7.5–8.0%
Ash	14.0–28.0%
Volatile Matter	19.0–25.0%
Sulphur	0.4–1.0%
Net Calorific Value	4,800–6,000 kcal/kg
Initial Deformation Temperature	1,300–1,400°C
HGI	50–60

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*

- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
- ▶ Iron Ore
  - MAC™ Fines – YEJ 2011
  - MAC™ Lump – YEJ 2011
  - Newman™ High Grade Fines – YEJ 2011
  - Newman™ High Grade Lump – YEJ 2011
  - Yandi™ Fines – YEJ 2011
- ▶ Manganese
- ▶ Metallurgical Coal
- ▶ Petroleum
- ▶ Stainless Steel Materials



## Iron Ore

BHP Billiton Iron Ore is one of the world's premier suppliers of iron ore, with operations in the Pilbara region of Western Australia. From these operations BHP Billiton Iron Ore produces five unique products – Yandi™ Fines, Newman™ Lump and Fines, MAC™ Lump and Fines. BHP Billiton Iron Ore exports its products to customers around the globe.

The Company's operations involve an integrated system of seven mines. Mining is all open-cut, after blasting, face shovels and excavators scoop up to 70 tonnes of iron ore and load it into haul trucks carrying as much as 240 tonnes. Ore is transported to primary crushers followed by secondary crushers; from there it is sent to the tertiary crushers and screening for the production of final product.

BHP Billiton Iron Ore's rail system is among the most technologically advanced and efficient in the world. The privately owned rail system has more than 1,000 kilometres of rail. Typical trains pulled by six locomotives carry more than 42,000 tonnes of ore to two separate port facilities located on opposite sides of the harbour at Port Hedland, one of the busiest bulk commodity ports in the world.

BHP Billiton Iron Ore has a long and sustainable future in Western Australia, with reserves for at least another 30 years and additional resources for future development.

A further key attribute of BHP Billiton Iron Ore is our ability to provide customers with technical support through our extensive technical knowledge of sintering, iron making processes and raw material requirements.



## Iron Ore

### ► Iron Ore

MAC™ Fines – YEJ 2011

MAC™ Lump – YEJ 2011

Newman™ High Grade Fines – YEJ 2011

Newman™ High Grade Lump – YEJ 2011

Yandi™ Fines – YEJ 2011

## MAC™ Fines – YEJ 2011

Mining Area C, Pilbara Region, Western Australia

### Typical Chemical Analysis

(Dry Wt % at Loading)

Component (%)	
Fe (Calcined)	64.9
Fe (Natural)	61.1
SiO <sub>2</sub>	3.9
Al <sub>2</sub> O <sub>3</sub>	2.2
P	0.065–0.085
LOI	5.9
H <sub>2</sub> O	8.0
TiO <sub>2</sub>	0.09
CaO	0.02
MgO	0.10
Mn	0.10
S	0.02
K	0.006
Na	0.012
Zn	0.005
Co	0.0005
Cu	0.001
Sn	<0.001
As	0.0009
Ni	0.0012
Cr	0.004
Cd	<0.000002
Be	<0.0001
Pb	0.0007
Hg	0.000002
V	0.002
Cl	0.013

### Typical Physical Properties

(At Loading)

Size (mm)	Cum.wt (% passing)
6.3	88
4.0	78
1.0	54
0.50	43
0.25	33
0.15	26

  

Bulk Density (t/m <sup>3</sup> )	
Loose	1.9
Compacted	2.3

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Iron Ore

► Iron Ore

- MAC™ Fines – YEJ 2011
- MAC™ Lump – YEJ 2011
- Newman™ High Grade Fines – YEJ 2011
- Newman™ High Grade Lump – YEJ 2011
- Yandi™ Fines – YEJ 2011

## MAC™ Lump – YEJ 2011

Mining Area C, Pilbara Region, Western Australia

### Typical Chemical Analysis

(Dry Wt % at Loading)

Component (%)	
Fe (Calcined)	66.4
Fe (Natural)	62.5
SiO <sub>2</sub>	3.1
Al <sub>2</sub> O <sub>3</sub>	1.3
P	0.055–0.075
LOI	5.9
H <sub>2</sub> O	4.2
TiO <sub>2</sub>	0.05
CaO	0.02
MgO	0.05
Mn	0.10
S	0.024
K	0.003
Na	0.01
Zn	0.005
Co	0.0003
Cu	0.0007
Sn	<0.001
As	0.0007
Ni	0.0015
Cr	0.003
Cd	<0.0002
Be	0.0001
Pb	0.0007
Hg	<0.00001
V	0.002
Cl	0.007

### Typical Physical Properties

(At Loading)

Size (mm)	Cum.wt (% passing)
31.5	88
25	75
20	60
15	40
10	19
8	9
6.3	5

  

Bulk Density (t/m <sup>3</sup> )	
Loose	1.8
Compacted	2.3

  

Shatter (%+10mm)	
(JIS 8711)	95

  

Tumble (%+6.3mm)	
(ISO 3271)	88

  

Abrasion (%–0.5mm)	
(ISO 3271)	8

  

Decrepitation (%–5mm)	
(ISO 8371)	5

  

RDI (%–2.8mm)	
(ISO 4692-2)	18

  

Reducibility (% Redn)	
(ISO 7215)	64

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Iron Ore

► **Iron Ore**

- MAC™ Fines – YEJ 2011
- MAC™ Lump – YEJ 2011
- Newman™ High Grade Fines – YEJ 2011
- Newman™ High Grade Lump – YEJ 2011
- Yandi™ Fines – YEJ 2011

## Newman™ High Grade Fines – YEJ 2011

Newman Joint Venture, Pilbara Region, Western Australia

### Typical Chemical Analysis

(Dry Wt % at Loading)

Component (%)	
Fe (Calcined)	64.9
Fe (Natural)	62.7
SiO <sub>2</sub>	4.3
Al <sub>2</sub> O <sub>3</sub>	2.2
P	0.08
LOI	3.4
H <sub>2</sub> O	6.4
TiO <sub>2</sub>	0.09
CaO	0.06
MgO	0.09
Mn	0.09
S	0.02
K	0.01
Na	0.01
Zn	0.006
Co	0.0006
Cu	0.001
Sn	<0.001
As	0.0015
Ni	0.002
Cr	0.003
Cd	<0.0002
Be	0.0002
Pb	0.0008
Hg	<0.00002
V	0.003
Cl	0.009

### Typical Physical Properties

(At Loading)

Size (mm)	Cum.wt (% passing)
6.3	88
4.0	75
1.0	49
0.50	38
0.25	28
0.15	23

  

Bulk Density (t/m <sup>3</sup> )	
Loose	2.5
Compacted	2.7

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Iron Ore

► Iron Ore

- MAC™ Fines – YEJ 2011
- MAC™ Lump – YEJ 2011
- Newman™ High Grade Fines – YEJ 2011
- Newman™ High Grade Lump – YEJ 2011
- Yandi™ Fines – YEJ 2011

## Newman™ High Grade Lump – YEJ 2011

Newman Joint Venture, Pilbara Region, Western Australia

### Typical Chemical Analysis

(Dry Wt % at Loading)

Component (%)	
Fe (Calcined)	66.0
Fe (Natural)	64.0
SiO <sub>2</sub>	3.6
Al <sub>2</sub> O <sub>3</sub>	1.4
P	0.070
LOI	3.0
H <sub>2</sub> O	3.3
TiO <sub>2</sub>	0.05
CaO	0.05
MgO	0.08
Mn	0.09
S	0.02
K	0.006
Na	0.007
Zn	0.005
Co	0.0006
Cu	<0.001
Sn	<0.001
As	<0.0015
Ni	0.001
Cr	0.003
Cd	<0.0002
Be	0.0001
Pb	0.0006
Hg	<0.00002
V	0.002
Cl	0.008

### Typical Physical Properties

(At Loading)

Size (mm)	Cum.wt (% passing)
31.5	88
25	75
20	61
15	40
10	20
8	11
6.3	5

  

Bulk Density (t/m <sup>3</sup> )	
Loose	2.3
Compacted	2.5

  

Shatter (%+10mm)	
(JIS 8711)	96

  

Tumble (%+6.3mm)	
(ISO 3271)	87

  

Abrasion (%-0.5mm)	
(ISO 3271)	8

  

Decrepitation (%-5mm)	
(ISO 8371)	5

  

RDI (%-2.8mm)	
(ISO 4692-2)	22

  

Reducibility (% Redn)	
(ISO 7215)	59

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Iron Ore

► **Iron Ore**

- MAC™ Fines – YEJ 2011
- MAC™ Lump – YEJ 2011
- Newman™ High Grade Fines – YEJ 2011
- Newman™ High Grade Lump – YEJ 2011
- Yandi™ Fines – YEJ 2011

## Yandi™ Fines – YEJ 2011

Yandi, Pilbara Region, Western Australia

### Typical Chemical Analysis

(Dry Wt % at Loading)

Component (%)	
Fe (Calcined)	64.3
Fe (Natural)	57.9
SiO <sub>2</sub>	5.4
Al <sub>2</sub> O <sub>3</sub>	1.45
P	0.04
LOI	10.0
H <sub>2</sub> O	8.3
TiO <sub>2</sub>	0.07
CaO	0.05
MgO	0.07
Mn	0.03
S	0.01
K	0.003
Na	0.01
Zn	0.002
Co	0.0006
Cu	0.0005
Sn	<0.001
As	0.002
Ni	<0.001
Cr	0.002
Cd	<0.00002
Be	0.0001
Pb	0.0005
Hg	<0.00002
V	0.004
Cl	0.006

### Typical Physical Properties

(At Loading)

Size (mm)	Cum.wt (% passing)
9.5	88
6.3	78
2.0	49
1.0	33
0.50	18
0.25	11
0.15	8

  

Bulk Density (t/m <sup>3</sup> )	
Loose	2.0
Compacted	2.2

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*

- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
- ▶ Iron Ore
- ▶ Manganese
  - ▶ Manganese Alloy
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn
  - ▶ **Manganese Ore**
  - ▶ **GEMCO**
    - SL75-01
    - MF-01
    - ML75-02
    - SC-01
  - ▶ **Wessels**
    - W1L Wessels Lump
    - W1F Wessels Fines
    - W4F Wessels Fines
    - W4L40 Wessels Lump
  - ▶ **Mamatwan**
    - M1F Mamatwan Fines
    - W1L Mamatwan Lump
    - MHS Mamatwan Sinter
    - MMS Mamatwan Sinter
- ▶ Metallurgical Coal
- ▶ Petroleum
- ▶ Stainless Steel Materials



## Manganese

BHP Billiton Manganese is the world's largest integrated producer of manganese units. We hold our assets through a 60 per cent holding in Samancor Manganese Pty Ltd. The remaining 40 per cent is held by Anglo American.

We have high-quality mining and smelting assets in Australia and South Africa.

- ▶ South African assets include:
  - Mamatwan – 3.5 Mtpa capacity open-cut mine with an average grade of 37 per cent Mn and a 1 Mtpa capacity sinter plant.
  - Wessels – 1 Mtpa capacity underground mine with high in situ ore grades of 42–49 per cent Mn.
  - Metalloys – One of the largest alloy plants in the world, with a total capacity of 660 ktpa of high-carbon ferromanganese, medium-carbon ferromanganese and silicomanganese alloy.
- ▶ Australian assets include:
  - GEMCO – 4.2 Mtpa capacity open-cut mine with an average grade of 43–48 per cent Mn.
  - TEMCO – 270 ktpa total capacity alloy plant producing high-carbon ferromanganese and silicomanganese alloy and 330 ktpa of sinter.

Supply risks are minimised and operations efficiency is maximised when using BHP Billiton products.



# Manganese

► **Manganese**

► **Manganese Alloy**

► **TEMCO**

SiMn

HcFeMn

Met Sinter (MS-75)

Met Sinter (MS-100)

► **Metalloys**

SiMn

HcFeMn

McFeMn

## SiMn

### TEMCO, Australia

#### Product Specifications

Size Fraction	Mn (min) (%)	Si (min) (%)	S (max) (%)	P (max) (%)	C (max) (%)
10 x 80	65	15	0.03	0.2	2.0
10 x 50	65	15	0.03	0.2	2.0

#### Sizing

Undersize Tolerance (%)	Size Fraction	Oversize Tolerance (%)
10	10 x 80	5
10	10 x 50	10

#### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	Si (%)	C (%)	P (%)	S (%)	Al (%)
<b>Max*</b>	67.7	14.8	18.1	2.0	0.20	0.03	0.027
<b>Mean*</b>	66.7	13.6	16.3	1.9	0.12	0.02	0.018
<b>Min*</b>	65.0	12.9	15.5	1.6	0.10	0.01	0.005

Trace Elements	As ppm	Ba ppm	B <sup>(total)</sup> <sup>(1)</sup> ppm	Be ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	K ppm	Li ppm
<b>Indicative<sup>†</sup></b>	67	17	85	< 5	235	6	220	325	135	< 50	< 1

Trace Elements	Mg ppm	Mo ppm	Na ppm	Ni ppm	Pb ppm	Se ppm	Sr ppm	Ti ppm	V ppm	W ppm	Zn ppm
<b>Indicative<sup>†</sup></b>	58	80	76	170	80	297	5	215	600	28	80

#### Indicative Bulk Density

3.1–3.5 t/m<sup>3</sup>

\*Values calculated on a 12 monthly average (excluding –10mm material).

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Total boron – chemically bound boron plus free boron.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
    - ▶ **TEMCO**
      - SiMn
      - HcFeMn
      - Met Sinter (MS-75)
      - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn

## HcFeMn TEMCO, Australia

### Product Specifications

Size Fraction	Mn (min) (%)	Si (min) (%)	S (max) (%)	P (max) (%)	C (max) (%)
10 x 80	76	0.5	0.02	0.2	7.5
10 x 50	76	0.5	0.02	0.2	7.5
5 x 15	74.5	1.2	0.02	0.2	7.5
0 x 5	70	3.0	0.02	0.2	7.5

### Sizing

Undersize Tolerance (%)	Size Fraction	Oversize Tolerance (%)
10	10 x 80	5
10	10 x 50	10
10	5 x 15	10
	0 x 5	10

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	Si (%)	C (%)	P (%)	S (%)	Al (%)
<b>Max*</b>	77.8	15.5	0.5	7.5	0.20	0.02	0.012
<b>Mean*</b>	77.0	15.1	0.3	6.8	0.18	0.04	0.012
<b>Min*</b>	76.0	14.4	0.1	6.4	0.17	0.002	0.012

Trace Elements	As ppm	Ba ppm	Be ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	K ppm	Li ppm
<b>Indicative<sup>†</sup></b>	64	6	< 1	200	8	142	67	142	< 50	402

Trace Elements	Mg ppm	Mo ppm	Na ppm	Ni ppm	Pb ppm	Se ppm	Sr ppm	Ti ppm	V ppm	W ppm	Zn ppm
<b>Indicative<sup>†</sup></b>	49	64	116	176	101	340	2	300	641	32	73

### Indicative Bulk Density

3.5–4.0 t/m<sup>3</sup>

\* Values calculated on a 12 monthly average (excluding –10mm material).

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn

## Met Sinter (MS-75) TEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 75	55.0	8.2	8.5	5.2	0.12

### Sizing

Undersize Tolerance (%)	Size Fraction	Oversize Tolerance (%)
5	6 x 75	5

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	BaO (%)	TiO <sub>2</sub> (%)
<b>Max*</b>	56.7	8.2	8.5	5.2	0.12	0.70	0.20	1.80	0.65	0.80	0.24
<b>Mean*</b>	56.0	6.5	7.1	3.7	0.11	0.26	0.12	1.50	0.43	0.45	0.20
<b>Min*</b>	55.0	4.6	5.1	3.5	0.09	0.18	0.10	0.65	0.15	0.20	0.15

Trace Elements	As ppm	Be ppm	B (total) <sup>(1)</sup> ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Li ppm	Mo ppm
<b>Indicative<sup>†</sup></b>	51	4	25	3	88	21	65	< 10	58

Trace Elements	Ni ppm	Pb ppm	Sb ppm	Se ppm	Sr ppm	V ppm	W ppm	Zn ppm
<b>Indicative<sup>†</sup></b>	109	100	< 5	271	444	520	18	142

\*Values calculated on a 12 monthly average.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Total boron – chemically bound boron plus free boron.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn

## Met Sinter (MS-100) TEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
3 x 100	55.0	8.2	8.5	5.2	0.12

### Sizing

Undersize Tolerance (%)	Size Fraction	Override Tolerance (%)
5	3 x 100	5

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	BaO (%)	TiO <sub>2</sub> (%)
<b>Max*</b>	56.7	8.2	8.5	5.2	0.12	0.70	0.20	1.80	0.65	0.80	0.24
<b>Mean*</b>	56.0	6.5	7.1	3.7	0.11	0.26	0.12	1.50	0.43	0.45	0.20
<b>Min*</b>	55.0	4.6	5.1	3.5	0.09	0.18	0.10	0.65	0.15	0.20	0.15

Trace Elements	As ppm	Be ppm	B (total) <sup>(1)</sup> ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Li ppm	Mo ppm
<b>Indicative<sup>†</sup></b>	51	4	25	3	88	21	65	< 10	58

Trace Elements	Ni ppm	Pb ppm	Sb ppm	Se ppm	Sr ppm	V ppm	W ppm	Zn ppm
<b>Indicative<sup>†</sup></b>	109	100	< 5	271	444	520	18	142

\*Values calculated on a 12 monthly average.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Total boron – chemically bound boron plus free boron.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn

## SiMn Metalloys, South Africa

### Product Specifications

Size Fraction	Mn (min) (%)	Si (min) (%)	S (max) (%)	P (max) (%)	C (max) (%)
40 x 80	65	16	0.02	0.10	2.0
25 x 50	65	16	0.02	0.10	2.0
10 x 25	65	16	0.02	0.10	2.0
5 x 10	64	15	0.02	0.10	2.5
3 x 5	62	14	0.05	0.10	2.5
0 x 3	60	12	0.05	0.15	2.5

### Sizing

Size Fraction	Tolerance Within Size Range (min) (%)
40 x 80	90
25 x 50	90
10 x 25	90
5 x 10	85
3 x 5	85
0 x 3	85

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	Si (%)	C (%)	P (%)	S (%)	Al (%)
<b>Max*</b>	67.2	15.2	17.4	2.0	0.10	0.02	0.033
<b>Mean*</b>	66.3	14.7	16.3	1.7	0.07	0.01	0.010
<b>Min*</b>	65.0	14.0	16.0	1.5	0.06	0.01	0.007

Trace Elements	As ppm	B (free) <sup>(1)</sup> ppm	B (total) <sup>(2)</sup> ppm	Ba ppm	Be ppm	Bi ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	K ppm	Mo ppm
<b>Indicative<sup>†</sup></b>	< 5	230	462	34	< 5	97	200	17	124	131	74	30	19

Trace Elements	N <sub>2</sub> ppm	Na ppm	Ni ppm	Pb ppm	Sb ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm	Ti ppm	V ppm	Zr ppm
<b>Indicative<sup>†</sup></b>	211	158	64	884	< 5	< 5	502	12	< 5	< 5	693	88	91

### Bulk Density

3.1–3.5 t/m<sup>3</sup>

The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.

\* Values calculated on a 12 monthly average (excluding –10mm material).

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Free boron – elemental form.

<sup>(2)</sup> Total boron – chemically bound boron plus free boron.



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - McFeMn

## HcFeMn Metalloys, South Africa

### Product Specifications

Size Fraction	Mn (min) (%)	Si (min) (%)	S (max) (%)	P (max) (%)	C (max) (%)
40 x 80	76	0.5	0.02	0.10	7.5
25 x 50	76	0.5	0.02	0.10	7.5
10 x 25	76	0.5	0.02	0.10	7.5
5 x 10	75	1.0	0.02	0.10	7.5
3 x 5	72	2.5	0.02	0.10	7.5
0 x 3	72	2.5	0.02	0.10	7.5

### Sizing

Size Fraction	Tolerance Within Size Range (min) (%)
40 x 80	90
25 x 50	90
10 x 25	90
5 x 10	85
3 x 5	85
0 x 3	85

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	Si (%)	C (%)	P (%)	S (%)	Al (%)
<b>Max*</b>	77.7	16.4	0.50	7.5	0.10	0.020	0.037
<b>Mean*</b>	76.9	15.5	0.14	7.0	0.07	0.004	0.010
<b>Min*</b>	76.0	15.0	0.03	6.8	0.06	0.003	0.005

Trace Elements	As ppm	B (free) <sup>(1)</sup> ppm	B (total) <sup>(2)</sup> ppm	Ba ppm	Be ppm	Bi ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	K ppm	Mo ppm
<b>Indicative<sup>†</sup></b>	< 5	166	274	< 5	< 5	128	500	17	143	416	63	48	24

Trace Elements	N <sub>2</sub> ppm	Na ppm	Ni ppm	Pb ppm	Sb ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm	Ti ppm	V ppm	Zr ppm
<b>Indicative<sup>†</sup></b>	384	207	143	979	< 5	< 5	675	< 5	135	< 5	148	96	73

### Bulk Density

3.1–3.5 t/m<sup>3</sup>

The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.

\*Values calculated on a 12 monthly average (excluding –10mm material).

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Free boron – elemental form.

<sup>(2)</sup> Total boron – chemically bound boron plus free boron.



# Manganese

- ▶ **Manganese**
  - ▶ **Manganese Alloy**
  - ▶ **TEMCO**
    - SiMn
    - HcFeMn
    - Met Sinter (MS-75)
    - Met Sinter (MS-100)
  - ▶ **Metalloys**
    - SiMn
    - HcFeMn
    - MCFeMn

## MCFeMn Metalloys, South Africa

### Product Specifications

Size Fraction	Mn (min) (%)	Si (min) (%)	S (max) (%)	P (max) (%)	C (max) (%)
50 x 80	78	0.5	0.03	0.15	1.45
35 x 50	78	0.5	0.03	0.15	1.45
10 x 35	78	0.5	0.03	0.15	1.45
5 x 10	76	1.0	0.03	0.15	1.45

### Sizing

Size Fraction	Tolerance Within Size Range (min) (%)
50 x 80	90
35 x 50	90
10 x 35	90
5 x 10	90

### Typical Properties

Major and Minor Elements	Mn (%)	Fe (%)	Si (%)	C (%)	P (%)	S (%)
<b>Max*</b>	80.6	19.3	0.5	1.45	0.15	0.03
<b>Mean*</b>	79.3	18.4	0.4	1.33	0.10	0.01
<b>Min*</b>	78.0	17.0	0.3	1.08	0.09	<0.01

Trace Elements	As ppm	B (free) <sup>(1)</sup> ppm	B (total) <sup>(2)</sup> ppm	Ba ppm	Be ppm	Bi ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	K ppm	Mo ppm
<b>Indicative<sup>†</sup></b>	< 5	185	463	< 5	< 5	115	130	19	168	384	81	36	14

Trace Elements	N <sub>2</sub> ppm	Na ppm	Ni ppm	Pb ppm	Sb ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm	Ti ppm	V ppm	Zr ppm
<b>Indicative<sup>†</sup></b>	451	123	160	995	< 5	< 5	< 5	701	162	< 5	20	97	39

### Bulk Density

3.8 t/m<sup>3</sup>

\* Values calculated on a 12 monthly average (excluding –10mm material).

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> Free boron – elemental form.

<sup>(2)</sup> Total boron – chemically bound boron plus free boron.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## SL75-01 GEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6.7 x 75	43.5	6.0	15.0	7.0	0.11

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	6.7 x 75	5

### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 2.9
H <sub>2</sub> O (+110°C) <sup>(2)</sup> 3.5

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	SrO (%)	BaO (%)	TiO <sub>2</sub> (%)
Max*	45.5	6.0	15.0	7.0	0.11	0.41	0.23	2.1	0.12	0.08	0.48	0.20
Mean*	44.6	4.8	11.8	4.5	0.08	0.29	0.11	2.0	0.09	0.06	0.33	0.18
Min*	43.5	3.5	9.2	3.9	0.06	0.23	0.08	1.8	0.08	0.05	0.22	0.17

Trace Elements	As ppm	B (total) ppm	C %	Cl ppm	Co ppm	Cr ppm	Cu ppm	F %
Indicative <sup>†</sup>	38	20	< 0.02	< 100	160	40	65	< 0.02

Trace Elements	Hg ppm	Mo ppm	Nb ppm	Ni ppm	Pb ppm	S %	V ppm	Zn ppm
Indicative <sup>†</sup>	< 0.05	27	1.5	65	75	0.07	325	130

### Bulk Density

2.02 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## MF-01 GEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
0.5 x 15.0	48.0	7.0	7.5	5.5	0.11

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	0.5 x 15.0	

### Typical Properties

Moisture	(%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup>	5.6
H <sub>2</sub> O (+110°C) <sup>(2)</sup>	3.3

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	SrO (%)	BaO (%)	TiO <sub>2</sub> (%)
Max*	51.0	7.0	7.5	5.5	0.11	0.41	0.18	1.4	0.13	0.07	0.93	0.16
Mean*	49.5	5.6	5.5	2.9	0.09	0.20	0.14	1.2	0.09	0.06	0.66	0.15
Min*	48.0	4.6	4.3	2.5	0.08	0.14	0.10	1.0	0.07	0.04	0.43	0.13

Trace Elements	As ppm	B (total) ppm	C %	Cl ppm	Co ppm	Cr ppm	Cu ppm	F %
Indicative <sup>†</sup>	55	30	< 0.02	< 100	150	45	55	< 0.02

Trace Elements	Hg ppm	Mo ppm	Nb ppm	Ni ppm	Pb ppm	S %	V ppm	Zn ppm
Indicative <sup>†</sup>	< 0.05	55	1.0	95	100	0.04	405	150

### Bulk Density

2.09 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## ML75-02 GEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6.7 x 75	46.0	5.5	10.0	5.5	0.11

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	6.7 x 75	5

### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 3.2
H <sub>2</sub> O (+110°C) <sup>(2)</sup> 3.3

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	SrO (%)	BaO (%)	TiO <sub>2</sub> (%)
Max*	48.2	5.5	10.0	5.5	0.11	0.43	0.18	2.1	0.11	0.08	0.91	0.19
Mean*	47.1	4.7	8.5	4.0	0.09	0.28	0.12	1.9	0.10	0.07	0.48	0.17
Min*	46.0	3.8	7.0	3.6	0.07	0.22	0.06	1.8	0.09	0.06	0.30	0.16

Trace Elements	As ppm	B (total) ppm	C %	Cl ppm	Co ppm	Cr ppm	Cu ppm	F %
Indicative <sup>†</sup>	40 30	< 0.02	< 100	200	50	65	< 0.02	

Trace Elements	Hg ppm	Mo ppm	Nb ppm	Ni ppm	Pb ppm	S %	V ppm	Zn ppm
Indicative <sup>†</sup>	< 0.05	34.5	1.5	75	80	< 0.01	320	155

### Bulk Density

2.08 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## SC-01 GEMCO, Australia

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
0.5 x 15.0	43.0	7.5	13.0	6.0	0.11

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	0.5 x 15.0	

### Typical Properties

Moisture	(%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup>	4.6
H <sub>2</sub> O (+110°C) <sup>(2)</sup>	3.3

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	Na <sub>2</sub> O (%)	MgO (%)	K <sub>2</sub> O (%)	CaO (%)	SrO (%)	BaO (%)	TiO <sub>2</sub> (%)
Max*	46.7	7.5	13.0	6.0	0.11	0.37	0.17	1.7	0.10	0.07	0.59	0.20
Mean*	45.2	6.9	8.9	3.8	0.08	0.23	0.12	1.5	0.08	0.05	0.48	0.18
Min*	43.0	5.4	7.2	3.4	0.06	0.18	0.08	1.3	0.07	0.04	0.31	0.16

Trace Elements	As ppm	B (total) ppm	C %	Cl ppm	Co ppm	Cr ppm	Cu ppm	F %
Indicative <sup>†</sup>	50	20	0.04	< 100	145	35	65	0.02

Trace Elements	Hg ppm	Mo ppm	Nb ppm	Ni ppm	Pb ppm	S %	V ppm	Zn ppm
Indicative <sup>†</sup>	0.05	46	1.5	70	115	0.02	445	130

### Bulk Density

2.03 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## W1L Wessels Lump Wessels, South Africa

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 75	47.0	12.5	5.0	0.8	0.07

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	6 x 75	10

### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 1.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	48.7	12.5	5.0	0.8	0.07	0.9	8.0	0.12
Mean*	47.4	11.8	3.0	0.5	0.04	0.5	6.2	0.12
Min*	47.0	10.6	1.0	0.3	0.03	0.3	4.4	0.12

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	9	806	81	162	99	186

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.2	35	201	0.24	158	170

### Bulk Density

2.4-2.5 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## W1F Wessels Fines

### Wessels, South Africa

#### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
-15	46.0	13.5	6.0	0.8	0.05

#### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
	-15	10

#### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 2.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	46.5	13.5	6.0	0.8	0.05	1.0	8.7	0.11
Mean*	46.3	12.6	3.3	0.4	0.03	0.6	5.7	0.11
Min*	46.0	11.0	2.4	0.3	0.03	0.4	4.5	0.11

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	6	919	88	169	103	215

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.26	32	197	0.32	164	196

#### Bulk Density

2.4-2.5 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## W4F Wessels Fines

### Wessels, South Africa

#### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
-15	41.0	16.0	6.0	0.8	0.05

#### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
0	-15	10

#### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 2.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	43.0	16.0	6.0	0.8	0.05	1.2	9.0	0.09
Mean*	42.6	14.4	4.7	0.5	0.04	0.6	6.6	0.09
Min*	41.0	13.5	3.8	0.4	0.03	0.3	4.8	0.09

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	13	270	76	158	68	297

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.19	36	225	0.31	200	69

#### Bulk Density

2.4-2.5 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## W4L40 Wessels Lump

Wessels, South Africa

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 75	42.0	16.0	7.0	0.8	0.07

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	6 x 75	10

### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 1.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	45.1	16.0	7.0	0.8	0.07	0.9	8.1	0.09
Mean*	43.5	13.7	4.5	0.4	0.04	0.6	7.2	0.09
Min*	42.0	11.1	2.9	0.2	0.02	0.4	5.4	0.09

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	11	856	71	166	72	281

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.14	30	178	0.21	176	160

### Bulk Density

2.4-2.5 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SSL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## M1F Mamatwan Fines

### Mamatwan, South Africa

#### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
-15.0	36.0	6.0	5.6	0.4	0.03

#### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
-	-15.0	10

#### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 2.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup> -

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	38.8	6.0	5.6	0.4	0.03	2.9	14.9	0.03
Mean*	37.1	4.8	4.6	0.2	0.03	2.2	14.2	0.02
Min*	36.0	4.3	4.4	0.2	0.02	0.2	13.6	0.01

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	4	570	11	5	8	274

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.06	19	15	0.02	100	54

#### Bulk Density

2.1-2.2 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on test results.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## W1L Mamatwan Lump

Mamatwan, South Africa

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 75	37.0	5.0	5.5	0.3	0.03

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
10	6 x 75	10

### Typical Properties

Moisture (%)	(%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup>	1.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>	-

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	38.8	5.0	5.5	0.3	0.03	3.8	14.9	0.01
Mean*	37.6	4.7	4.5	0.2	0.02	2.4	13.9	0.01
Min*	37.0	3.8	4.3	0.2	0.02	1.6	12.9	0.01

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	< 5	287	49	128	80	427

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.04	22	44	0.04	112	69

### Bulk Density

2.2-2.3 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## MHS Mamatwan Sinter

Mamatwan, South Africa

### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 63	48.0	6.0	7.5	0.7	0.04

### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
25	6 x 63	10

### Typical Properties

Moisture	(%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup>	1.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup>	-

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	48.9	6.0	7.5	0.7	0.04	3.9	15.7	0.02
Mean*	48.3	5.5	6.2	0.6	0.02	3.4	14.5	0.02
Min*	48.0	5.0	5.2	0.4	0.02	2.8	13.0	0.02

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	< 5	316	6	162	< 5	266

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.03	25	47	0.03	263	80

### Bulk Density

1.4–1.6 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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# Manganese

► **Manganese**

► **Manganese Ore**

► **GEMCO**

SL75-01

MF-01

ML75-02

SC-01

► **Wessels**

W1L Wessels Lump

W1F Wessels Fines

W4F Wessels Fines

W4L40 Wessels Lump

► **Mamatwan**

M1F Mamatwan Fines

W1L Mamatwan Lump

MHS Mamatwan Sinter

MMS Mamatwan Sinter

## MMS Mamatwan Sinter

### Mamatwan, South Africa

#### Product Specifications

Size Fraction (mm)	Mn (min) (%)	Fe (max) (%)	SiO <sub>2</sub> (max) (%)	Al <sub>2</sub> O <sub>3</sub> (max) (%)	P (max) (%)
6 x 63	45.5	6.0	8.0	0.7	0.04

#### Sizing

Undersize Tolerance (%)	Size Fraction (mm)	Oversize Tolerance (%)
25	6 x 63	10

#### Typical Properties

Moisture (%)
H <sub>2</sub> O (-110°C) <sup>(1)</sup> 1.0
H <sub>2</sub> O (+110°C) <sup>(2)</sup> -

Major and Minor Elements	Mn (%)	Fe (%)	SiO <sub>2</sub> (%)	Al <sub>2</sub> O <sub>3</sub> (%)	P (%)	MgO (%)	CaO (%)	S (%)
Max*	46.4	6.0	8.0	0.7	0.04	6.1	18.8	0.03
Mean*	45.7	5.6	5.7	0.5	0.02	4.8	16.7	0.03
Min*	45.5	5.0	4.6	0.5	0.02	3.4	14.5	0.03

Trace Elements	As ppm	B (total) ppm	Co ppm	Cr ppm	Cu ppm	K <sub>2</sub> O ppm
Indicative <sup>†</sup>	< 5	270	6	155	100	457

Trace Elements	Na %	Ni ppm	Pb ppm	SrO %	TiO <sub>2</sub> ppm	Zn ppm
Indicative <sup>†</sup>	0.04	25	45	0.03	299*	80

#### Bulk Density

1.4-1.6 t/m<sup>3</sup>

\*Values ranges are based on past 12 months historical data.

<sup>†</sup> Trace elements values are based on the analysis of 12 monthly composite sample.

<sup>(1)</sup> H<sub>2</sub>O (-110°C) is based on 12 months average.

<sup>(2)</sup> H<sub>2</sub>O (+110°C) is indicative.

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- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
- ▶ Iron Ore
- ▶ Manganese
- ▶ Metallurgical Coal
  - Coking Coals
  - Ancillary Coals
- ▶ Petroleum
- ▶ Stainless Steel Materials



## Metallurgical Coal

BHP Billiton Metallurgical Coal is the largest global supplier of seaborne traded hard coking coal. We produce and market a comprehensive range of high-quality hard coking coals for the international steel industry.

Metallurgical coal production is from our low cost assets located in Australia. These include the predominantly open-cut mines in Queensland owned by BHP Billiton Mitsubishi Alliance (BMA) and BHP Billiton Mitsui Coal (BMC). In addition, BHP Billiton operates a number of underground operations in New South Wales. All products are marketed by BM Alliance Coal Marketing.

Our metallurgical coal assets are strategically located in areas with seaborne access to key steel producing regions, delivering logistical advantages to our customers. Our access to dedicated deepwater ports allows the use of large capacity vessels to further build on regional logistic advantages.

Another key strength of BHP Billiton Metallurgical Coal is our ability to provide superior levels of customer support through our extensive technical knowledge of ironmaking and steelmaking raw material requirements and utilisations.

Long life reserves with a strong portfolio of undeveloped resources and ownership of key infrastructure provide flexibility to enable us to expand our production capacity in line with customer needs.



# Metallurgical Coal

► Metallurgical Coal

- Coking Coals
- Ancillary Coals

## Coking Coals

Blackwater, Broadmeadow, Goonyella-Riverside, Gregory-Crinum, Peak Downs, Norwich Park, Poitrel, Saraji and South Walker Creek mines in Queensland, Australia. Appin, West Cliff and Dendrobium mines in New South Wales, Australia.

### Typical Properties

Chemical Analysis		Norwich Park	Saraji	Peak Downs	Illawarra*	Riverside	Goonyella	Poitrel <sup>†</sup>	Blackwater	Gregory
Moisture (ad)	%	1.0	1.0	1.0	1.0	1.1	1.0	1.5	2.0	2.0
Total Moisture (ar)	%	10.0	10.0	9.5	10.0	9.5	10.0	12.0	10.5	8.5
Volatile Matter (ad)	%	17.3	18.5	20.5	22.5	22.5	24.3	24.0	27.0	33.0
Ash (ad)	%	10.0	10.5	10.5	9.5	10.0	8.9	8.0	8.0	7.3
Sulphur (ad)	%	0.65	0.60	0.60	0.45	0.55	0.52	0.43	0.50	0.65
CSN (FSI)		9	8.5	8.5	7.5	7.5	8	7	6.5	9
Phosphorus (in coal)	%	0.060	0.030	0.030	0.055	0.010	0.025	0.060	0.060	0.030
Alkali (in ash)	%	1.5	1.8	1.4	1.0	1.2	1.3	1.1	1.7	1.6
Maximum Fluidity	ddpm	75	160	400	1,200	500	1,100	300	600	7,500
Mean Maximum Reflectance of Vitrinite	%	1.65	1.53	1.42	1.25	1.24	1.17	1.15	1.03	0.94
Maceral Composition Vitrinite	%	72	66	71	53	59	62	54	55	76
Liptinite	%	0	0	0	0	1	1	1	2	3
Semi-fusinite	%	17	22	16	39	26	25	34	30	9
Other Inertite	%	7	8	8	5	9	8	9	9	9
Mineral Matter	%	4	4	5	3	5	4	2	4	3
NSC – Coke Strength After Reaction		65	72	74	73	72	68	45	35	57

Revision date: 25 May 2011.

BM Alliance Coal Marketing is responsible for the sales and marketing of these coking coals on behalf of the BHP Billiton Mitsubishi Alliance, <sup>†</sup>BHP Mitsui Coal and \*BHP Billiton.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Metallurgical Coal

► Metallurgical Coal

Coking Coals  
Ancillary Coals

## Ancillary Coals

Blackwater, Norwich Park, Poitrel and South Walker Creek mines in Queensland, Australia.

### Typical Properties

Chemical Analysis		Blackwater Weak	ULV	Poitrel PCI <sup>^</sup>	South Walker Weak <sup>^</sup>
Moisture (ad)	%	2.0	1.0	2.0	1.1
Total Moisture (ar)	%	10.0	10.0	11.0	9.0
Volatile Matter (ad)	%	25.0	16.5	22.0	13.0
Ash (ad)	%	9.5	11.3	9.3	9.0
Sulphur (ad)	%	0.50	0.65	0.40	0.37
CSN (FSI)		3.5	8.5	1	1
Phosphorus (in coal)	%	0.07	0.06	0.08	0.1
Alkali (in ash)	%	1.8	1.5	0.8	1.7
Hardgrove Grindability Index		68	90	82	84
Gross Specific Energy (ad)	kcal/kg	7,455	7,560	7,515	7,710
Maximum Fluidity	ddpm	50	20	1	1
Mean Maximum Reflectance of Vitrinite	%	1.04	1.68	1.16	1.90
Maceral Composition Vitrinite	%	42	71	30	42
Liptinite	%	1	0	1	0
Semi-fusinite	%	43	15	58	48
Other Inertite	%	9	8	8	7
Mineral Matter	%	5	6	3	3

Revision date: 25 May 2011.

BM Alliance Coal Marketing is responsible for the sales and marketing of these coking coals on behalf of the BHP Billiton Mitsubishi Alliance, <sup>^</sup>BHP Mitsui Coal and <sup>\*</sup>BHP Billiton.

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- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
- ▶ Iron Ore
- ▶ Manganese
- ▶ Metallurgical Coal
- ▶ Petroleum
  - ▶ Bass Strait
  - ▶ *Crude Oil and Condensates*
    - Gippsland Crude
  - ▶ **LPG**
    - Export
    - Domestic
  - ▶ **Minerva**
    - Minerva Condensate
  - ▶ **North West Shelf**
  - ▶ *Crude Oil and Condensates*
    - Cossack Crude
    - NWS Condensate
  - ▶ **LPG**
    - Export
      - Propane
      - Butane
    - Stybarrow
    - Pyrenees
    - Zamzama
    - Saharan Blend
    - Liverpool Bay/Keith
    - Gulf of Mexico
    - Calypso
    - Natural Gas
- ▶ **Stainless Steel Materials**



## Petroleum

### About BHP Billiton Petroleum

We provide a full range of customer solutions, including competitive pricing, marketing services, logistical support and contract structure. In the 2010 financial year, we produced 159 million barrels of oil equivalent, comprising 61 per cent liquids (crude oil, condensate and LPG) and 39 per cent Natural Gas. (including LNG).

- ▶ We sell a range of premium crude oils and condensates under term and spot contracts to refining and petrochemical customers in the Asia-Pacific and Atlantic regions.
- ▶ Natural gas is sold into local markets in Australia, the United Kingdom, Pakistan, Trinidad & Tobago and the United States.
- ▶ We market LNG from the North West Shelf, which we sell primarily under long-term contracts to customers in North Asia, as well as some spot sales to the international market.
- ▶ LPG produced from our assets is sold into both local and international markets.
- ▶ Ethane produced from the Bass Strait fields is sold under contract to customers in Victoria, Australia.



# Petroleum

- ▶ **Petroleum**
  - ▶ **Bass Strait**
  - ▶ **Crude Oil and Condensates**
    - Gippsland Crude
  - ▶ **LPG**
    - Export
    - Domestic

## Gippsland Crude Bass Strait, Australia

### Product

Product	Gippsland Crude
Location	Australia
Load Terminal	Western Port
Std. Parcel Sizes	600,000
API°	52.3
Sulphur Wt%	0.08
UOP K Factor	12.40
Pour Point – Upper °C	<-24
Acidity mg KOH/gm	0.09
Distillation Yields (%vol)	
C4 Minus	2.26
Naphtha – Up to 175°C	54.62
Jet/Kerosene – Up to 250°C	12.49
Gas Oil – Up to 360°C	15.75
Long Residue – 360°C+	14.88

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# Petroleum

- ▶ **Petroleum**
  - ▶ Bass Strait
  - ▶ Crude Oil and Condensates
    - Gippsland Crude
  - ▶ **LPG**
    - Export
    - Domestic

## LPG – Export Bass Strait, Australia

### Gippsland Export Propane Specification

	Specification	Test Method
<b>1. Composition Liquid Volume %</b>		
Ethane (Max)	2.2	ASTM D-2163
Propane (Min)	95.0	ASTM D-2163
Butane (Max)	3.0	ASTM D-2163
Pentanes + (Max)	0.2	ASTM D-2163
Unsaturation (Max)	0.1	ASTM D-2163
<b>2. Vapour Pressure At 40°C kPa (Max)</b>	1,480	ASTM D-2598
<b>3. Corrosive Compounds Copper Strip (Pass)</b>	1A or 1B	ASTM D-1838
<b>4. Total Sulphur ppm (Max)</b>	30	ASTM D-2784
<b>5. Residue ppm wt (Max)</b>		
At 75°C	60	JLPGA-S-05T
At 105°C	10	JLPGA-S-05T
<b>6. Free Water Content</b>	Dry	Visual

### Gippsland Export Butane Specification

	Specification	Test Method
<b>1. Composition Liquid Volume %</b>		
Propane (Max)	3.0	ASTM D-2163
Butane (Min)	97.0	ASTM D-2163
Pentanes + (Max)	2.0	ASTM D-2163
Unsaturation (Max)	0.1	ASTM D-2163
<b>2. Vapour Pressure At 40°C kPa (Max)</b>	520	ASTM D-2598
<b>3. Corrosive Compounds Copper Strip (Pass)</b>	1A or 1B	ASTM D-1838
<b>4. Total Sulphur ppm (Max)</b>	30	ASTM D-2784
<b>5. Residue ppm wt (Max)</b>		
At 75°C	60	JLPGA-S-05T
At 105°C	10	JLPGA-S-05T
<b>6. Free Water Content</b>	Dry	Visual

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

- ▶ **Petroleum**
  - ▶ **Bass Strait**
  - ▶ **Crude Oil and Condensates**
    - Gippsland Crude
  - ▶ **LPG**
    - Export
    - Domestic

## LPG – Domestic Bass Strait, Australia

### Gippsland Domestic LPG Specification

#### Propane

Constituent	Specified Limit	Test Method
Ethane	5.0 approximate mol %	ASTM D2163
Propane	95.0 minimum mol %	ASTM D2163
Butane Plus	2.0 maximum mol %	ASTM D2163
Pentanes Plus	0.2 maximum mol %	ASTM D2163
Vapour Pressure at 40°C	1,530 kPa maximum	ASTM D2598
Corrosive Compounds	Pass No. 1 copper strip test	ASTM D1838
Total Sulphur	80 ppm maximum by weight	ASTM D2784
Residue at 105°C	10 ppm maximum by weight	ALPGA JLPGA-S05T
Water	Dry/pass valve freeze test	ASTM D2713

#### Butane

Constituent	Specified Limit	Test Method
Propane	4.0 maximum mol %	ASTM D2163
Butane	95.0 minimum mol %	ASTM D2163
Pentanes Plus	2.0 maximum mol %	ASTM D2163
Vapour Pressure at 40°C	520 kPa maximum	ASTM D2598
Corrosive Compounds	Pass No. 1 copper strip test	ASTM D1838
Total Sulphur	30 ppm maximum by weight	ASTM D2784
Residue at 105°C	10 ppm maximum by weight	ALPGA JLPGA-S05T
Water	Dry/pass valve freeze test	Visual

Typically, the specific gravity (density in vacuo) for a mixture of 50 per cent propane and 50 per cent butane is approximately 0.5353 at 15°C.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

- ▶ **Petroleum**
- ▶ **Minerva**  
Minerva Condensate

## Minerva Condensate Minerva, Australia

### Product

Product	Minerva Condensate
Location	Australia
Load Terminal	Minerva Plant
Std. Parcel Sizes	Trucking
API°	57.24
Sulphur wt%	<0.1
UOP K Factor	11.9
Pour Point – Upper °C	<-36
Distillation Yields (%vol)	
C4 Minus	5.4
Naphtha – Up to 175°C	77.45
Jet/Kerosene – Up to 250°C	13.5
Long Residue >250°C	4.0
Acidity mg KOH/gm	0.04

For more detailed quality information, please click here:  
[Minerva Condensates Gas Assay Report.](#)

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

- ▶ **Petroleum**
  - ▶ **North West Shelf**
  - ▶ **Crude Oil and Condensates**
    - Cossack Crude
    - NWS Condensate
  - ▶ **LPG**
    - Export
    - Propane
    - Butane

## Cossack Crude

### North West Shelf, Australia

#### Product

Product	Cossack Crude
Location	Australia
Load Terminal	Okha FPSO
Std. Parcel Sizes	650,000
API°	48.1
Sulphur wt%	0.04
UOP K Factor	11.9
Pour Point – Upper °C	<-12.0
Acidity mg KOH/gm	0.05
Distillation Yields (%vol)	
C4 Minus	4.93
Naphtha – Up to 175°C	43.45
Jet/Kerosene – Up to 250°C	16.28
Gas Oil – Up to 360°C	18.54
Long Residue – 360°C+	16.75

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

- ▶ **Petroleum**
  - ▶ **North West Shelf**
  - ▶ **Crude Oil and Condensates**
    - Cossack Crude
    - NWS Condensate
  - ▶ **LPG**
    - Export
    - Propane
    - Butane

## NWS Condensate North West Shelf, Australia

### Product

Product	NWS Condensate
Location	Australia
Load Terminal	NWS Plant
Std. Parcel Sizes	650,000
API°	62.5
Sulphur wt%	0.0042
UOP K Factor	12.2
Pour Point – Upper °C	≤36 °C
Acidity mg KOH/gm	<0.05
Distillation Yields (%vol)	
C4 Minus	4.2
Naphtha – Up to 170°C	77.06
Jet/Kerosene – Up to 250°C	16.50
Long Residue – 250°C+	2.24

For more detailed quality information, please click here:  
[North West Shelf Condensate Report.](#)

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# Petroleum

- ▶ **Petroleum**
  - ▶ **North West Shelf**
    - ▶ **Crude Oil and Condensates**
      - Cossack Crude
      - NWS Condensate
    - ▶ **LPG**
      - Export
        - Propane
        - Butane

## LPG – Export North West Shelf, Australia

### North West Shelf Export Propane Specification

The specification of the LPG is as per the Gas Processors Association (GPA) standard 2140-92 for propane and butane, with the exception of the total sulphur product characteristic, which has been reduced from 185 ppmw for propane and 140 ppmw for butane to 30 ppmw for both propane and butane to reflect regional market requirements.

Product Characteristics	Propane	Test Methods
<b>Composition Liquid Volume %</b>		
Ethane (Max)	2.0	ASTM D-2163
Propane (Min)	96.0	ASTM D-2163
Butane (Max)	2.5	ASTM D-2163
Pentanes + (Max)	0.1	ASTM D-2163
Unsaturates (Max)	0.1 max	ASTM D-2163
Vapour Pressure at 37.8°C, kPa (Max)	1,379	ASTM D-2598
<b>Corrosive Compounds</b>		
Copper Strip (Pass)	1	ASTM D-1838
Total Sulphur, ppm (Max)	30	ASTM D-2784
Hydrogen Sulphide, ppm (Note A)	5 max	Lead acetate paper per Exxon Laboratory inspection Circular 200.14A
<b>Residual ppm wt (Max)</b>		
At 75°C	60	JLPGA S-03-2
At 105°C	10	JLPGA S-03-2
Water Content (Total), ppm	10 max	Aramco Method M-3 (Karl Fischer)
Free Water Content	Dry	Visual

**Note A:** Hydrogen sulphide test is required only when volatile sulphur test exceeds 5 ppm. A passing test of hydrogen sulphide shall be reported at 'Not more than 5 ppm'.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

- ▶ **Petroleum**
  - ▶ **North West Shelf**
    - ▶ **Crude Oil and Condensates**
      - Cossack Crude
      - NWS Condensate
    - ▶ **LPG**
      - Export
        - Propane
        - Butane

## LPG – Export North West Shelf, Australia

### North West Shelf Export Butane Specification

Product Characteristics	Butane	Test Methods
<b>Composition Liquid Volume %</b>		
Propane (Max)	2.0	ASTM D-2163
Butane (Min)	96.0	ASTM D-2163
Pentanes + (Max)	2.0	ASTM D-2163
Unsaturates (Max)	0.1 max	ASTM D-2163
Vapour Pressure at 37.8° C, kPa (Max)	483	ASTM D-2598
Corrosive Compounds		
Copper Strip (Pass)	1	ASTDM D-1838
Total Sulphur, ppm (Max)	30	ASTM D-2784
Hydrogen Sulphide, ppm (Note A)	5 max	Lead acetate paper per Exxon Laboratory inspection Circular 200.14A
<b>Residual ppm wt (Max)</b>		
At 75°C	60	JLPGA S-03-2
At 105°C	10	JLPGA S-03-2
Water Content (Total), ppm	10 max	Aramco Method M-3 (Karl Fischer)
Free Water Content	Dry	Visual

**Note A:** 1. Hydrogen Sulphide test is required only when volatile sulphur exceeds 5 ppm. A passing test of hydrogen sulphide shall be reported at 'Not more than 5 ppm'.

**Note:** 1. Odorant not required in refrigerated propane/butane.  
2. Refer to Clause 3.7 for additional quality information.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Stybarrow

### Product

Crude	Stybarrow Crude
Location	Australia
Load Terminal	Stybarrow FPSO
Std. Parcel Sizes	550,000
API°	22.8
Sulphur wt%	0.12
UOP K Factor	11.3
Pour Point – Upper °C	<-41.0
Acidity mg KOH/gm	0.67
Distillation Yields (%vol)	
C4 Minus	0.58
Naphtha – Up to 140°C	2.72
Jet/Kerosene – Up to 230°C	10.25
Gas Oil – Up to 360°C	38.92
Long Residue – 360°C+	47.52

For more detailed quality information, please click here:  
[Stybarrow Post Production Final Assay Report.](#)

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# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Pyrenees

### Product

Crude	Pyrenees Crude
Location	Australia
Load Terminal	Pyrenees FPSO
Std Parcels	550,000
API	19.0
Sulphur wt%	0.213
UOP (K-Factor)	11.6
Pour Point – Upper °C	-24
Acidity mg/KOH/g	1.42
Distillation Yields	
IBP –190°C	1.0 (vol%)
Jet/Kerosine – 190–230°C	1.8 (vol%)
Gas Oil – 230–370°C	39.1 (vol%)
Long residue – 370+°C	58.1 (vol%)

For more detailed quality information, please click here:

[Pyrenees Assay Report](#).

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# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Zamzama

### Zamzama, Pakistan

#### Product

Product	Zamzama Condensate
Naphtha	35.25%
Kerosene	25.92%
Gas Oil	26.13%
Residue Fuel Oil and Others	12.7%

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# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Saharan Blend Ohanet, Algeria

### Product

Product	Saharan Blend Crude
Location	Algeria
API°	43.5–47.5
Sulphur wt%	<0.1%
Distillation Yields (%vol)	
LPG	4%
Naphtha	34%
Jet/Kerosene	12%
Gas Oil	25%
Residue	25%

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# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Liverpool Bay/Keith Liverpool Bay, UK

### Product

Crude from Bruce and Keith assets is transported through the Forties pipeline, and as such its quality is consistent with that of the Forties blend.

Product	Liverpool Bay Crude
Location	UK
Load Terminal	Liverpool Bay OSI
Std. Parcel Sizes	650,000
°API	44.9
Specific Gravity (60/60°F)	0.8020
Density at 15°C (g/ml)	0.8016
Total Sulphur (% wt)	0.22
Mercaptan Sulphur (ppm wt)	684
Hydrogen Sulphide (ppm wt)	<1
Total Nitrogen (ppm wt)	149
Basic Nitrogen (ppm wt)	60
Water Content (% wt)	0.051

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# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zamzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Gulf of Mexico Gulf Of Mexico, US

BHP Billiton has a significant deepwater position in the Gulf of Mexico with, interests in nearly 450 lease blocks. Crude from these assets flows into several pipeline systems, including the Cameron Highway Pipeline System (CHOPS) and the Poseidon pipeline.

For more detailed quality information on SGC and Poseidon crudes, please visit the CHOPS (<http://www.cameronhighwayoil.com/>) and Poseidon (<http://www.poseidonoil.com/>) pipeline web sites. For quality information on Mars crude, please visit the Mars crude website (<http://www.marscrude.com/>).

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Petroleum

► **Petroleum**

- Stybarrow
- Pyrenees
- Zanzama
- Saharan Blend
- Liverpool Bay/Keith
- Gulf of Mexico
- Calypso
- Natural Gas

## Calypso

### Calypso, Trinidad and Tobago

#### Product

Product	Calypso Crude
Location	Trinidad and Tobago
Load Terminal	Angostura Terminal
Std. Parcel Sizes	550,000
API°	29
Mercaptan Sulphur ppm wt	148
Pour Point	-35°F
Distillation Yields (%vol)	
Paraffin	39.18
Isoparaffin	41.36
Naphthalene	14.66
Aromatic	4.62
Other	0.18

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# Petroleum

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► **Petroleum**

- Stybarrow
  - Pyrenees
  - Zanzama
  - Saharan Blend
  - Liverpool Bay/Keith
  - Gulf of Mexico
  - Calypso
  - Natural Gas
- 

## Natural Gas

Please contact us for product specifications at:  
[Petroleum.Marketing@bhpbilliton.com](mailto:Petroleum.Marketing@bhpbilliton.com).

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*

- ▶ Aluminium
- ▶ Base Metals
- ▶ Diamonds and Specialty Products
- ▶ Energy Coal
- ▶ Iron Ore
- ▶ Manganese
- ▶ Metallurgical Coal
- ▶ Petroleum
- ▶ **Stainless Steel Materials**
  - ▶ **Nickel**
    - Nickel Briquettes
    - Ferronickel Granules



## Stainless Steel Materials

Stainless Steel Materials is the world's fourth largest nickel producer and a global supplier of nickel to the stainless steel industry.

### About Stainless Steel Materials

Stainless Steel Materials primarily services the stainless steel industries through our wide range of high-quality nickel products. In addition, we supply nickel to other markets, including the specialty alloy, foundry, chemicals and refractory material industries and the intermediate nickel market.

### Our Products

Stainless Steel Materials produces:

- ▶ Nickel in the form of high-purity nickel briquettes and powders, and ferronickel granules.
- ▶ Nickel intermediates in the form of matte and concentrate.

### Our Operations

Nickel West, Western Australia (100 per cent ownership) – nickel.

Cerro Matoso, Colombia, South America (99.94 per cent ownership) – ferronickel.



# Stainless Steel Materials

► **Stainless Steel Materials**

► **Nickel**

Nickel Briquettes

Ferronickel Granules

## Nickel Briquettes Nickel West, Western Australia

Quality assured is the strength you can draw from the nickel briquettes produced by our Nickel West operation. The nickel briquettes conform to the ASTM B39-79 standard and are registered as BHP Billiton Nickel Briquettes on the London Metal Exchange. This makes them your best choice for a range of melting and non-melting applications.

### Profile

**Location:** Western Australia.

**Products:** BHP Billiton Nickel Briquettes (sintered pillow-shaped metal, approx. 40 mm x 30 mm x 20 mm), nickel matte and nickel concentrate.

**Operations:** Nickel sulphide ores mined in Western Australia are concentrated at Mount Keith, Leinster and Kambalda, then transported to Kalgoorlie to be smelted into nickel matte; the matte is brought to Kwinana for refining.

**Refining capacity:** 65,000 tonnes of nickel metal p.a.

### Typical analysis

Component	Typical	Max/Min
Nickel	99.8%	99.8% min
Cobalt	0.10%	0.15% max
Copper	0.005%	0.02% max
Carbon	0.005%	0.03% max
Iron	0.006%	0.02% max
Sulphur	0.006–0.010%	0.01% max

### Packaging

**Bags:** Non-returnable 2-tonne polypropylene bags.

**Bulk:** Loose in container.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*



# Stainless Steel Materials

## ► Stainless Steel Materials

### ► Nickel

Nickel Briquettes

Ferronickel Granules

## Ferronickel Granules Cerro Matoso, Colombia

With high global demand for stainless steel products, you can rely on a constant supply, unparalleled in quality, from our Cerro Matoso operation. In fact, our reserves are capable of sustaining the current level of production for at least the next 20 years. Cerro Matoso's other strengths include:

- A leading ferronickel producer by capacity.
- One of the world's lowest cost ferronickel producers.
- Amongst the world's highest grade lateritic nickel deposits.
- Integrated nickel mining and smelting operation.

### Profile

**Location:** Northern Colombia.

**Product:** High-purity, low-carbon ferronickel favoured by the stainless steel industry.

**Operations:** The ore is mined by open-pit methods; processed at Cerro Matoso's smelter, located next to the mine.

**Production capacity:** 50,000 tonnes of nickel in ferronickel.

### Typical Analysis

Component	Typical	Maximum
Nickel	36.0%	not applicable
Cobalt	0.80%	1.10%
Chromium	0.04%	0.20%
Phosphorus	0.025%	0.04%
Carbon	0.025%	0.06%
Sulphur	0.025%	0.06%
Silicon	0.40%	0.70%
Copper	0.05%	0.20%
Iron	balance	not applicable

### Packaging

**Bags:** Non-returnable 2-tonne polypropylene bags.

**Bulk:** Loose in container.

*The typical specifications set out above are indicative only. Seller does not warrant compliance with the typical specifications and reserves the right to amend them at any time.*