DESIGN
CONSTRUCT
OPERATE

PRIMERO

PROCESS DESIGN CRITERIA - WHOLE OF ORE FLOTATION

MINA DO BARROSO TRADEOFF SCOPING STUDY

21004-DCR-PR-003

SAVANNAH RESOURCES PLC

SAVANNAH

DATE	REVISION	STATUS	PREPARED	REVIEWED	APPROVED
4-Mar-20	A	Issued for Study	S O'Leary	A Barry	A Barry

PREAMBLE

1.0 DISCLAIMER

Any grade, recovery or similar data presented herein are:

- Used for the purpose of process design and can represent maximum value and are not statements of predicted average plant performance.
- Based on preliminary testwork information.
- Subject to revision based on review of ongoing and further testwork and pilot work being undertaken.

2.0 DESIGN DEFINITIONS

These terms are used according to the definitions following:

Design Criteria Value:

The design criteria value provides the instantaneous process criterion value. This takes account of:

- variability in process parameters
- variability in operating conditions
- flow conditions that are not continuous

The design criteria value:

- is an individual rates used for sizing equipment.
- is intended as an attainable rate at the stated operating condition.
- does not include any additional design allowance(s), by engineer or vendor, to ensure attainment.

The combination of design values neither relate to the annual productions defined nor integrate to represent a metallurgical balance.

Where it is intended that the particular equipment will have an additional catch-up capacity or include additional allowances for sizing where these factors materially affect the equipment size, these are noted in the calculations.

SAVANNAH RESOURCES LTD
MINA DO BARROSO SCOPING STUDY
21004-DCR-PR-003

REVISION RECORD

Date	Revision	Description	Reason	Initials
3-Mar-20	A	High level design criteria and mass balance for 'whole of ore flotation' with mica removal via upflow classifier circuit	Scoping Study	SOL

Client	**Savannah Resources**	LEGEND
Project	**Mina do Barosso**	**Input data**
Doc.	**Process Design Criteria**	**Confirmation required**
Doc. No.	**21004-DCR-PR-003**	Calculated data
Rev.	**A**	**Linked Cell**

PDC REFERENCES

The process design criteria forms the basis for the design of the processing facilities and required site services. Together with the Process Flow Diagrams, this data is the basis for definition of the mass balance, process description and equipment specifications.

The design criteria is based on data from various sources and all data is referenced to the sources to ensure that the basis of the information is fully understood.

It is of particular importance to note areas in which assumptions have been made that require verification to ensure that the basis of the information is fully understood.

The referencing of data in this document is as follows:

Code	Source of Information, Data
1	Client advice/correspondence
2	Primero Group experience/database
3	Assumed or estimated data
4	Testwork data
5	Vendor data
6	Calculated data, derived from 1, 2, 3, 4 or 5
7	Site conditions and details
8	Industry standard specification
9	Previous studies (client supplied)
10	
TBC	To be confirmed

AREA	PARAMETER		UNIT	DESIGN VALUE	REV	CODE	SOURCE
1.0	**OPERATING SCHEDULE**						
1.1	**Crushing Plant Operating Schedule**						
	Throughput	Design	t/annum	**1,500,000**	A	1	Client advice/correspondence
	Operating Days Per Year		d	**365**	A	3	Assumed or estimated data
	Operating Days Per Week		d	**7**	A	3	Assumed or estimated data
	Operating Shifts Per Day		no.	**2**	A	3	Assumed or estimated data
	Operating Hours Per Shift		h	**12**	A	3	Assumed or estimated data
	Total Hours Per Year		h	8,760	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Crushing Circuit Overall Availability		%	**75.0**	A	2	Primero Group experience/database
	Crushing Circuit Available Hours		h	6,570	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed Rate (Dry)	Nominal	dry t/h	228	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Design	dry t/h	274	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed Rate (Wet)	Nominal	wet t/h	235	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Design	wet t/h	282	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
1.2	**Process Plant Operating Schedule**						
	Throughput	Design	t/annum	**1,500,000**	A	1	Client advice/correspondence
	Operating Days Per Year		d	**365**	A	3	Assumed or estimated data
	Operating Days Per Week		d	**7**	A	3	Assumed or estimated data
	Operating Shifts Per Day		no.	**2**	A	3	Assumed or estimated data
	Operating Hours Per Shift		h	**12**	A	3	Assumed or estimated data
	Total Hours Per Year		h	8,760	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Milling Circuit Overall Availability		%	**90.0**	A	2	Primero Group experience/database
	Milling Circuit Available Hours		h	7,884	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed Rate (Dry)	Nominal	dry t/h	190	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Design	dry t/h	228	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed Rate (Wet)	Nominal	wet t/h	196	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Design	wet t/h	235	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
2.0	**ORE CHARACTERISTICS**						
2.1	**Ore**						
	Source			**Mina Do Barroso**	A	1	Client advice/correspondence
	Ore Type			**Pegmatite**	A	1	Client advice/correspondence
	Mining Method			**Open pit**	A	1	Client advice/correspondence
	Average Li_2O Grade		%	**1.01**	A	1	Client advice/correspondence
	Moisture Content		%	**3.00**	A	3	Assumed or estimated data
	Ore, Specific Gravity			**2.80**	A	3	Assumed or estimated data
	Concentrate Bulk Density		t/m^3	**1.80**	A	3	Assumed or estimated data
	Water Consumption		m^3/t	**36.8**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Water, Specific Gravity			**1.00**	A	3	Assumed or estimated data
2.2	**Production - Lithia**						
	Concentrate Average Li_2O Grade		%	**6.00**	A	1	Client advice/correspondence, Testwork to confirm
	Recovery		%	**70.0**	A	3, 4	Subject to pilot testwork and Industry benchmarking for spodumene flotation
	Lithia Production Rate		t/a Li_2O	10,605	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Lithia Concentrate Production Rate @ 6% Li_2O		t/a	176,750	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
			t/h	22.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Lithia Concentrate, Specific Gravity			**2.80**	A	3	Assumed or estimated data
3.0	**ROM FEED**						
3.1	**Crushing Work Index**						
	Design (75th percentile)		kWh/t	**14.0**	A	3	Assumed or estimated data
3.2	**Abrasion Index**						
	Average		g	**0.55**	A	3	Assumed or estimated data
3.3	**UCS**						
	Design (75th percentile)		MPa	**150**	A	3	Assumed or estimated data
3.4	**Work Indices**						
	Bond Rod Mill Work Index @ 1180 µm closing screen		kWh/t	**11**	A	3	Assumed or estimated data
	Bond Ball Mill Work Index @ 125 µm closing screen		kWh/t	**16**	A	3	Assumed or estimated data
3.5	**Material Properties**						
	Ore SG Average		t/m^3	**2.80**	A	3	Assumed or estimated data
	Bulk Density Crushed Ore		t/m^3	**1.7**	A	3	Assumed or estimated data
	Ore Moisture Content - Average		%	**3.0**	A	3	Assumed or estimated data
	BENEFICIATION PLANT						
4.0	**CRUSHING**						
4.1	**ROM Sizing**						
	F_{100}		mm	**600**	A	3	Assumed or estimated data
	F_{80}		mm	**288**	A	3	Assumed or estimated data
	F_{50}		mm	**74**	A	3	Assumed or estimated data
	F_{20}		mm	**14**	A	3	Assumed or estimated data
4.2	**Apron Feeder**						
	Type			**Apron Feeder**	A	3	Assumed or estimated data
4.3	**Grizzly**						
	Aperture		mm	**75**	A	3	Assumed or estimated data
	Fraction of Crushing Circuit Feed to U/S			**60%**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.4	**ROM Bin**						

AREA	PARAMETER		UNIT	DESIGN VALUE	REV	CODE	SOURCE
	Bin Residence Time		min	**40**	A	3	Assumed or estimated data
	Live Volume		m^3	90	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Capacity (Live Tonnage)		t	152	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.5	**Primary Crusher**						
	Type			**Jaw**	A	2	Primero Group experience/database
	Product Size	P_{80}	mm	**135**	A	3	Assumed or estimated data
	Feed rate, nominal		t/h	228	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.6	**Crusher Screen**						
	Deck Aperture, 1		mm	**30**	A	3	Assumed or estimated data
	Deck Aperture, 2		mm	**10**	A	3	Assumed or estimated data
	Screen feed rate, nominal		t/h	**640**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
	Circulating Load			280%	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
	Screen O/S Top Deck	crusher screen feed mass split	%	**35%**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
	Screen O/S Bottom Deck	crusher screen feed mass split	%	**29%**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
4.7	**Secondary Crusher**						
	Type			**Cone**	A	2	Primero Group experience/database
	Product Size	P_{80}	mm	**35**	A	3	Assumed or estimated data
	Feed rate, nominal		dry t/h	**227.0**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.8	**Tertiary Crusher**						
	Type			**Cone**	A	2	Primero Group experience/database
	Product Size	P_{80}	mm	**12**	A	3	Assumed or estimated data
	Feed rate, nominal		dry t/h	**185.1**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.9	**Crusher Screen Undersize - Size Distribution**						
	% Mass Passing - Particle Size	P_{100}	mm	**10.0**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
		P_{80}	mm	**6.4**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
		P_{50}	mm	**3.1**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
		P_{20}	mm	**0.7**	A	6	Bruno Model/Calculated data - Based on ROM Feed PSD
4.10	**Crushed Ore Stockpile**						
	Feed rate, nominal		t/h	228	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Stockpile capacity (live)		h	**24**	A	3	Assumed or estimated data
	Stockpile total mass (live)		t	5479	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Stockpile volume		m^3	**3,223**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
4.11	**Stockpile Reclaim Feeders**						
	Feed rate to Process Plant		t/h	190	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
5.0	**MICA REMOVAL**						
	Feed preparation screen						
	Screen cut size		mm	**4.0**	A	3	Assumed or estimated data
	Mass split		t/h	77.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed prep screen spray water		m^3/h	**210**	A	3	Assumed, Vendor to confirm
	Screen oversize, moisture content		%	**12**	A	3	Assumed or estimated data
	Screen undersize	solids	t/h	112	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Fine screen						
	Screen cut size		mm	**1.0**	A	3	Assumed or estimated data
	Fine screen spray water		m^3/h	**36**	A	3	Assumed, Vendor to confirm
	Mass split (-4 + 1 mm)		%	34	A	4	Testwork data
	Mass split		t/h	65	A	4	Testwork data
	Screen oversize, moisture content		%	**12**	A	3	Assumed or estimated data
	Densification cyclone						
	Target cut-size		µm	**212**	A	3	Assumed or estimated data
	Mass split (-1000 + 212 µm)		%	13	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Cyclone Underflow mass split		t/h	25	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Cyclone Underflow density	% solids	%	**60**	A	3	Assumed or estimated data
	Coarse Upflow Classifier						
	Upflow Fluidisation Water		m^3/h	**429**	A	3	Assumed, Testwork to confirm
	Mass split		t/h	11.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Upflow Classifier - feed density	% solids	%	**25**	A	2	Primero Group experience/database
	Upflow Classifier - underflow discharge density	% solids	%	**65**	A	2	Primero Group experience/database
	Dewatering Screen	Moisture	%	**12**	A	3	Assumed or estimated data
		Oversize solids	t/h	66.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Fines Upflow Classifier						
	Upflow Fluidisation Water		m^3/h	**229**	A	3	Assumed, Testwork to confirm
	Mass split		t/h	9.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Upflow Classifier - feed density	% solids	%	**25**	A	2	Primero Group experience/database
	Upflow Classifier - underflow discharge density	% solids	%	**65**	A	2	Primero Group experience/database
	Dewatering Screen	Moisture	%	**12**	A	3	Assumed or estimated data
		Oversize solids	t/h	55.5	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Ultrafines Upflow Classifier						
	Upflow Fluidisation Water		m^3/h	**38**	A	3	Assumed, Testwork to confirm
	Mass split		t/h	3.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Upflow Classifier - feed density	% solids	%	**25**	A	2	Primero Group experience/database
	Upflow Classifier - underflow discharge density	% solids	%	**65**	A	2	Primero Group experience/database
	Dewatering Screen	Moisture	%	**12**	A	3	Assumed or estimated data
		Oversize solids	t/h	21.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Screw Feeder						
	Feed solids	solids	t/h	25.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	% Feed Solids reporting to Underflow (dewatered product)		%	**80**	A	3	Assumed or estimated data
	Dewatered product to tails (mica)	solids	t/h	20.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Dewatered product	Moisture	%	**12**	A	3	Assumed or estimated data
	Ball Mill Feed Thickener						
	Thickener Feed	Solids	t/h	27.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		% solids	%	1.9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Slurry	m^3/h	1404.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Thickener Underflow	% solids	%	**60**	A	3	Assumed or estimated data
		Solids	t/h	27.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Slurry	m^3/h	27.6	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Thickener Overflow	% solids	%	0.0	A	3	Assumed or estimated data
		Solids	t/h	0.0	A	3	Assumed or estimated data
		Slurry	m^3/h	1376.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
6.0	**GRINDING**						
6.1	**Mill**						
	Type			**Ball Mill**	A	3	Assumed or estimated data
	Discharge type			**Overflow**	A	3	Assumed or estimated data
	Feed rate			**190**	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed size	F_{80}	mm	**10**	A	3	Assumed or estimated data
	Product size	P_{80}	µm	**106**	A	3	Testwork data
	New feed		dry t/h	190.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Total feed		dry t/h	476	A	6	Calculated data, derived from 1, 2, 3, 4 or 5

AREA	PARAMETER		UNIT	DESIGN VALUE	REV	CODE	SOURCE
	Mill discharge solids concentration		% w/w	65	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Grinding media addition	g/t mill feed	g/t	1,000	A	3	Assumed or estimated data
			t/h	0.19	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
6.2	**Ball Mill Cyclones**						
	Type			Hydrocyclone	A	3	Assumed or estimated data
	Model	diameter	mm	400	A	3	Assumed or estimated data
	Feed rate		m³/h	699	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Pulp Density	Feed	% w/w	55	A	2	Primero Group experience/database
		Overflow	% w/w	35.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Underflow	% w/w	70	A	3	Assumed or estimated data
7.0	**FLOTATION FEED PREPARATION (GANGUE REMOVAL)**						
7.1	**Fe Removal LIMS Mag Separator**						
	Type			LIMS drum magnet	A	2	Primero Group experience/database
	Split to mags		%	0.109	A	3	Assumed or estimated data
			t/h	0.19	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	% solids			90	A	3	Assumed or estimated data
	Density of magnetics		kg/m³	7,600	A	3	Assumed or estimated data
	LIMS non-mags	flowrate	t/h	170.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
			m³/h	365.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
7.2	**Fe Removal WHIMS Mag Separator**						
	Type			WHIMS pulsating high gradient magnetic separator	A	2	Primero Group experience/database
	Model			SLon 2500	A	3	Assumed or estimated data
	Quantity			2	A	3	Assumed or estimated data
	WHIMS feed, % solids			25.0	A	3	Assumed or estimated data
	Split to mags		%	9.0	A	3	Assumed, Testwork to confirm
			t/h	90.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	% solids			90	A	3	Assumed or estimated data
	Density of magnetics		kg/m³	2,800	A	3	Assumed or estimated data
	WHIMS Mags - wash water	flowrate	m³/h	350	A	3	Assumed or estimated data
	WHIMS Mags to tails thickener		m³/h	357.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	% solids			4.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
7.3	**Deslime Cyclones, Stage 1**						
	Type			Hydrocyclone	A	3	Assumed or estimated data
	Model	diameter	mm	250	A	3	Assumed or estimated data
	Feed rate	nominal	m³/h	563.5	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		design	m³/h	676.2	A	3	Assumed or estimated data
	Pulp Density	Feed	% solids	23.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		Underflow	% solids	65	A	3	Assumed or estimated data
	Fraction of Deslime Cyclone Feed to O/F		%	9.1	A	3	Assumed, Testwork to confirm
	Cut Size D_{50}		µm	25	A	3	Assumed or estimated data
7.4	**Spodumene Attritioning**						
	Residence time		min	30	A	3	Assumed or estimated data
	Feed rate		m^3/h	126.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Attritioner size (required)		m^3	63.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Pulp Density	Feed	% solids	65.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Agitation energy flux		kW/m^3	3.0	A	3	Assumed or estimated data
7.5	**Deslime Cyclones, Stage 2**						
	Type			Hydrocyclone	A	3	Assumed or estimated data
		diameter	mm	250	A	3	Assumed or estimated data
	Feed rate		m³/h	191.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Pulp Density	Feed	% solids	50	A	3	Assumed or estimated data
		Underflow	% solids	65	A	3	Assumed or estimated data
	Fraction of Deslime Cyclone Feed to O/F		%	5.0	A	3	Assumed, Testwork to confirm
8.0	**SPODUMENE FLOTATION**						
8.1	**Spodumene Rougher Conditioning Stage**						
	Type			Agitated tank	A	3	Assumed or estimated data
	Lab/bench-scale residence time		min	30	A	4	Testwork data
	Scale-up factor			2	A	3	Assumed or estimated data
	Calculated residence time		min	60	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Selected residence time		min	60	A	3	Assumed or estimated data
	Slurry pH			8.5	A	4	Testwork data
	Feed rate		m^3/h	359.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Pulp Density	Feed	% solids	30.0	A	3	Assumed or estimated data
8.2	**Spodumene Rougher Flotation**						
	Flotation Cell type			Conventional	A	2	Primero Group experience/database
	Aspiration			Forced	A	2	Primero Group experience/database
	Lab/bench-scale residence time		min	12	A	4	Testwork data
	Scale-up factor			1.5	A	3	Assumed or estimated data
	Calculated residence time		min	18.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Plant retention time		min	18.0	A	3	Assumed or estimated data
	Air hold-up		%	15	A	3	Assumed or estimated data
	Feed solids concentration		% w/w	30	A	3	Assumed or estimated data
	Feed slurry flow		m^3/h	359.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Flotation volume required		m^3	127.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Nominal cell volume		m^3	20.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Number of cells required			6.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Number of cells installed			6.0	A	2	Primero Group experience/database
	Rougher Con - mass pull	(% of new rougher flotation feed)		29.7%	A	4	Testwork data
	Rougher Con		% solids	30	A	3	Assumed or estimated data
	Concentrate production		t/h	39.7		6	Calculated data, derived from 1, 2, 3, 4 or 5
	Concentrate density		% w/w	29	A	3	Assumed or estimated data
8.3	**First Cleaner Conditioning Tank**						
	Lab/bench-scale residence time		min	4	A	4	Testwork data
	Scale-up factor			1.5	A	3	Assumed or estimated data
	Calculated residence time		min	6.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Selected residence time		min	6.0	A	3	Assumed or estimated data
	Feed rate		m^3/h	173.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Pulp Density	Feed	% solids	20	A	4	Testwork data
	Live volume required		m^3	17.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Volume selected		m^3	15	A	2	Primero Group experience/database
8.4	**Cleaner 1 Flotation**						
	Flotation Cell type			Conventional	A	2	Primero Group experience/database
	Aspiration			Forced	A	2	Primero Group experience/database
	Lab/bench-scale residence time		min	4	A	3	Assumed or estimated data
	Scale-up factor			3	A	2	Primero Group experience/database
	Calculated residence time		min	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Selected residence time		min	12	A	2	Primero Group experience/database
	Air hold-up		%	15	A	3	Assumed or estimated data
	Feed solids concentration		% w/w	15	A	3	Assumed or estimated data
	Feed solids SG			0	A	3	Assumed or estimated data
	Feed slurry flow		m^3/h	173.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Flotation volume required		m^3	40.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5

AREA	PARAMETER		UNIT	DESIGN VALUE	REV	CODE	SOURCE
	Nominal cell volume		m^3	10	A	2	Primero Group experience/database
	Number of cells required			4.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Number of cells installed			5.0	A	2	Primero Group experience/database
	Mass pull to concentrate	(% of new rougher concentrate)	%	65.3%	A	3	Assumed, Testwork to confirm
	Concentrate production		t/h	25.9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Concentrate density		% w/w	20	A	3	Assumed or estimated data
	Concentrate SG		kg/m^3	0	A	3	Assumed or estimated data
8.5	**Cleaner 2 Flotation**						
	Lab/bench-scale residence time		min	4	A	3	Assumed or estimated data
	Scale-up factor			3	A	2	Primero Group experience/database
	Calculated residence time		min	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Selected residence time		min	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Air hold-up		%	15	A	3	Assumed or estimated data
	Feed slurry flow		m^3/h	123.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Flotation volume required		m^3	28.9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Nominal cell volume		m^3	10	A	2	Primero Group experience/database
	Number of cells required			2.9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Number of cells installed			3.0	A	2	Primero Group experience/database
	Mass pull to concentrate	(% Stage Rec)		93.0%	A	4	Testwork data
	Concentrate production		t/h	24.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Concentrate slurry density		% w/w	17.8	A	3	Assumed or estimated data
	Concentrate SG		kg/m^3	0	A	3	Assumed or estimated data
8.6	**Cleaner 3 Flotation**						
	Lab/bench-scale residence time		min	4	A	3	Assumed or estimated data
	Scale-up factor			3	A	3	Assumed or estimated data
	Calculated residence time		min	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Selected residence time		min	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Air hold-up		%	15	A	3	Assumed or estimated data
	Feed slurry flow		m^3/h	124.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Flotation volume required		m^3	29.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Nominal cell volume		m^3	10	A	2	Primero Group experience/database
	Number of cells required			2.9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Number of cells installed			3.0	A	2	Primero Group experience/database
	Mass pull to concentrate	(% Stage Rec)		93.0%	A	4	Testwork data
	Concentrate production		t/h	22.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Concentrate slurry density		% w/w	16.9	A	3	Assumed or estimated data
	Concentrate SG		kg/m^3	0	A	3	Assumed or estimated data
9.0	**SPODUMENE CONCENTRATE DEWATERING AND STORAGE**						
9.1	**Concentrate Thickener**						
	Type			High-rate thickener	A	3	Assumed or estimated data
	Diameter		m	12	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed rate	solids	t/h	22.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		slurry volume	m^3/h	134.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Underflow solids concentration		% w/w	60	A	3	Assumed or estimated data
	Underflow solids SG		kg/m^3	2800.1	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Design flux rate (solids settling)		$t/h/m^2$	0.25	A	3	Assumed or estimated data
	Rise rate	max	m/h	4.0	A	2	Primero Group experience/database
9.2	**Concentrate Filter Feed Tank**						
	Type			Agitated tank	A	3	Assumed or estimated data
	Number of tanks			1	A	3	Assumed or estimated data
	Residence time		h	12	A	3	Assumed or estimated data
	Slurry flow		m^3/h	23.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume per tank required		m^3	275.5	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume selected		m^3	300	A	2	Primero Group experience/database
9.3	**Concentrate Filter**						
	Filter type			Vacuum Belt Filter	A	3	Assumed or estimated data
	Feed rate, solids		t/h	22.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
			m^3/h	23.0			
	Feed solids concentration		% w/w	60	A	3	Assumed or estimated data
	Target moisture content		% w/w	15	A	3	Assumed or estimated data
	Filtration rate flux		$t/m^2/h$	1.0	A	3	Assumed or estimated data
9.4	**Concentrate Storage Shed**						
	Feed rate, solids		t/h	22.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Specific Gravity - Design			2.80	A	3	Assumed or estimated data
	Bulk Density - Design		t/m^3	1.80	A	3	Assumed or estimated data
	Angle of Repose		degrees	37	A	3	Assumed or estimated data
	Storage volume		m^3	900	A	3	Assumed or estimated data
	Residence time		hours	72	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
10.0	**TAILINGS TREATMENT AND DEWATERING**						
10.1	**Tailings Thickener**						
	Type			High-rate thickener	A	3	Assumed or estimated data
	Diameter		m	31	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed rate	solids	t/h	135.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		slurry volume	m^3/h	1210.3			
	Underflow solids concentration		% w/w	60	A	3	Assumed or estimated data
	Underflow solids SG			2800	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Design flux rate		$t/h/m^2$	0.25	A	3	Assumed or estimated data
	Rise rate	max	m/h	4.0	A	2	Primero Group experience/database
10.2	**Tailings Filter Feed Tank**						
	Number of tanks			1	A	3	Assumed or estimated data
	Residence time		h	12	A	3	Assumed or estimated data
	Slurry flow		m^3/h	138.2	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume per tank required		m^3	1659	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume selected		m^3	2000	A	2	Primero Group experience/database
10.3	**Tailings Filter**						
	Filter type			Vacuum Belt Filter	A	3	Assumed or estimated data
	Feed rate, solids		t/h	135.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
			m^3/h	138.2			
	Feed solids concentration		% w/w	60.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Target moisture content		% w/w	20	A	3	Assumed or estimated data
	Filtration rate flux		$t/m^2/h$	1.0	A	3	Assumed or estimated data
11.0	**BULK BY-PRODUCTS DEWATERING**						
11.1	**By-product separation**						
	Feed to by-product circuit		solids t/y	100,000	A	1	Client advice/correspondence
			t/h	12.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
11.2	**Bulk by-product thickening**						
	Type			High-rate thickener	A	3	Assumed or estimated data
	Diameter		m	9	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Feed rate	solids	t/h	12.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		slurry volume	m^3/h	40.3			
	Underflow solids concentration		% w/w	60	A	3	Assumed or estimated data
	Design flux rate		$t/h/m^2$	0.25	A	3	Assumed or estimated data
	Rise rate	max	m/h	4.0	A	2	Primero Group experience/database
11.3	**By-Product Filter Feed Tank**						
	Type			Agitated tank	A	2	Primero Group experience/database
	Number of tanks			1	A	3	Assumed or estimated data

AREA	PARAMETER	UNIT	DESIGN VALUE	REV	CODE	SOURCE
	Residence time	h	12	A	3	Assumed or estimated data
	Slurry flow	m^3/h	13.0	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume per tank required	m^3	156	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Live volume selected	m^3	160	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
11.4	**By-product Filter**					
	Filter type		Vacuum Belt Filter	A	3	Assumed or estimated data
	Feed rate, solids	t/h	12.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
		m^3/h	13.0			
	Feed solids concentration	% w/w	60	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Target moisture content	% w/w	15	A	3	Assumed or estimated data
	Filtration rate flux	$t/m^2/h$	1.0	A	3	Assumed or estimated data
11.5	**By-product Storage Shed**					
	Feed rate, solids	t/h	12.7	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Specific Gravity - Design		2.80	A	3	Assumed or estimated data
	Bulk Density - Design	t/m^3	1.80	A	3	Assumed or estimated data
	Angle of Repose	degrees	37	A	3	Assumed or estimated data
	Storage volume	m^3	510	A	3	Assumed or estimated data
	Residence time	hours	72	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
12.0	**REAGENTS**					
12.3	**Spodumene Collector**					
	Type		Oleic Acid	A	3	Assumed or estimated data
	Packaging		Bulk isotank	A	3	Assumed or estimated data
	Product concentration	%	100	A	3	Assumed or estimated data
	Dose concentration	%	10	A	3	Assumed or estimated data
	Dose rate	g/t	2400	A	4	Testwork data
	Usage	t/a	3600	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
12.4	**Spodumene pH Modifier**					
	Type		Sodium Carbonate	A	3	Assumed or estimated data
	Packaging		25 kg bag	A	3	Assumed or estimated data
	Product concentration	%	100	A	3	Assumed or estimated data
	Dose concentration	%	10	A	3	Assumed or estimated data
	Dose rate Na_2CO_3 (solid pellet/powder)	g/t	600	A	3	Assumed or estimated data
	Usage Na_2CO_3 (solid pellet/powder)	t/a	900	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
12.5	**Spodumene Dispersant**					
	Type		Sodium Silicate	A	3	Assumed or estimated data
	Packaging		IBC	A	3	Assumed or estimated data
	Product concentration	%	100	A	3	Assumed or estimated data
	Dose concentration	%	100	A	3	Assumed or estimated data
	Dose rate	g/t	65	A	4	Testwork data
	Usage	t/a	98	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
12.6	**Frother**					
	Type		non-DG frother	A	3	Assumed or estimated data
	Dose rate	g/t	TBC	A	3	Assumed or estimated data
	Usage	t/a	TBC	A	3	Assumed or estimated data
12.7	**Flocculant**					
	Type		Magnafloc 336	A	3	Assumed or estimated data
	Mix concentration	% w/w	0.25%	A	2	Primero Group experience/database
	Dose concentration	% w/w	0.025%	A	2	Primero Group experience/database
	Flocculant addition	g/t	40	A	3	Assumed or estimated data
	Usage	t/a	67	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
13.0	**UTILITIES**					
13.1	**Process Water 1**					
	Total process water demand	m^3/h	2630	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Total process water demand	m^3/t ore	13.4	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
13.2	**Raw Water**					
	Raw water source		TBC	A	TBC	To be confirmed
	Raw water make-up (Process Plant)	m^3/h	36.8	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Ancillary raw water demand (via potable water treatment plant feedstock requirements)	m^3/h	15	A	3	Assumed or estimated data
	Total raw water demand (average)	m^3/h	52	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Total raw water demand (average)	m^3/yr	407,813	A	6	Calculated data, derived from 1, 2, 3, 4 or 5
	Total raw water demand (average)	m^3/t ore	0.3	A	6	Calculated data, derived from 1, 2, 3, 4 or 5