Copy to M. Ayr.

AMMTEC LTD

847001

TREATMENT

OF

A HIGH GRADE SILICA SAND

FOR

GWALIA CONSOLIDATED LTD

EL 25/88

DIP RANGE

REPORT NO. A4281

Mineral Holdings Aust Pty Ltd

AUGUST 1994

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SUMMARY

1. A single* sample of high grade silica sand was supplied to AMMTEC for upgrading and analysis.

Head Fe_2O_3	:	113 ppm
Head Al_2O_3	:	287 ppm
Head TiO_2	:	570 ppm

2. The sample was attritioned and deslimed.

Deslimed sand	:	97.9% by weight
Slime sand	:	2.1% by weight

3. The deslimed sand was TBE separated to remove any heavy mineral particles.

TBE Float	:	99.97% by weight
TBE Sink	:	0.03% by weight

4. Full details of the test results are found in the report.

* The 5 kg sand sample was taken by T Monks in August 1994 from the face of Thomas Mountain sand pit about 10 m below the surface.

1. INTRODUCTION

Mr David Bale, of Gwalia Consolidated Ltd, requested AMMTEC to carry out a treatment program on a sample of high grade silica.

The test program included the following :

1. Dry and weigh the received sand.
2. Assay a split of the sand.
3. Attrition and deslime the sand, deslime the product at 53μm and assay the products.
4. TBE separate a split of the deslimed sand.
5. Size and assay (in detail) the screen fractions.

Full details of the test program are found in the flowsheet of Figure 1.

2. SAMPLE

A single sample of damp, high grade silica was supplied to AMMTEC in a plastic bag.

MHA 1 : *8307 grams (damp)*

3. ANALYTICAL

Most of the test products were sent to Analabs, Welshpool, for detailed analysis. Analabs used specific preparation methods, i.e. Zirconia bowls.

The following elements (oxides) were assayed :

Fe_2O_3	Al_2O_3	TiO_2	CaO	MgO
Na_2O	K_2O	WO_3	ZrO_2	Cr_2O_3
NiO	CoO	Cl	V_2O_5	

Gwalia specified the analytical detection limit for each analyte. In some cases (e.g. Cr_2O_3) the analysis was at a higher detection limit (i.e. 10 vs 1).

A single sample was sent to SGS, Queens Park, to assay for Fe_2O_3, Al_2O_3, TiO_2 and Cr_2O_3 as a check and to determine if Cr_2O_3 in the product (float tail) was within specification. The method D3-AAS was used.

4. SAMPLE PREPARATION

The received sample was oven dried at 105°C overnight. The oven and all sample trays were washed and scrubbed clean to remove any source of cross contamination.

The sample (and intermediate products) were mixed and split using a clean stainless steel riffle.

Damp Head Weight	=	8307.5 grams
Dry Head Weight	=	7906.9 grams
Sample Moisture	=	4.82%

A split of the head was taken for detailed assay with the results presented in Table 1.

5. ATTRITIONING

The sample was lightly attritioned to remove any residual or surface contaminants. Following attritioning the sand was deslimed by screening at 53μm.

5.1 Test Procedure

The test procedure was as follows :

(1) Split out 2 x 1100 grams of dry head sample.

(2) Transfer 1100 grams of sample to a 1 litre *WEMCO* attritioning cell and add water to achieve 76% solids.

(3) Attrition for 5.0 minutes.

(4) Recover the attritioned sand and wet screen at 53μm using 10 litres of wash water.

(5) Repeat for the second charge.

(6) Recover, dry and weigh the +53μm and -53μm fractions.

(7) Assay splits of the +53μm and -53μm fractions in detail.

5.2 Test Results

The -53μm fraction after attritioning was only a small fraction (2.1%). The deslime fraction was high in contaminate grades.

The attrition weight results are shown below :

Attrition Test Results	
Feed Weight	2 x 1100 grams
Solids Density	76%
Attrition Time	5 minutes
+53μm Weight	2150.2 grams
-53μm Weight	47.0 grams
Total Weight	2197.2 grams

Details of the product assays are presented in Table 2.

6. TBE SEPARATION

A split of the deslimed (attritioned) sands was treated by TBE in an attempt to remove any heavy mineral particles, i.e. high in Fe and Ti.

6.1 Test Procedure

The test procedure was as follows :

(1) Split out 500 grams of +53μm attritioned sand.

(2) Transfer to a 2000 ml beaker and fill with new, clean TBE.

(3) Mix the sample and allow to separate.

(4) Recover the floats and sinks and wash thoroughly with acetone. Oven dry overnight.

(5) Weigh the sinks and floats. Send the sinks for detailed assay at Analabs and send a split of the TBE float (50 grams) to SGS for Fe_2O_3, Al_2O_3, TiO_2 and Cr_2O_3 analysis.

6.2 Test Results

The results showed that only 0.03% of the sample sank in the TBE. The sinks assay indicated high assays of all elements, particularly Fe_2O_3, Al_2O_3, MgO, TiO_2, ZrO_2 and Cr_2O_3.

TBE Separation		
Product	Weight (g)	Weight (%)
TBE Float	499.80	99.97
TBE Sink	0.17	0.03
Total	499.97	100.00

Details of the assay results for the sinks and floats are found in Tables 3 and 4.

7. SIZE ANALYSIS - TBE FLOATS

A split of the TBE floats was screen sized and the screen products assayed in detail.

7.1 Test Procedure

(1) Split out about 450 grams of TBE floats.

(2) Wet screen at 53μm and dry the oversize and undersize.

(3) Dry screen the dry oversize at 1180, 850, 600, 425, 300, 212, 150, 106, 75 and 53μm.

(4) Recover and weigh each screen fraction. Send each fraction to Analabs for detailed analysis.

(5) Calculate the distribution (by size) of each analyte.

7.2 Test Results

The sizing results indicated that most of the weight of material fell in the size range 150 to 600μm (i.e. 81.8% of the weight). There was a small quantity of -53μm material (0.7%) remaining in the sample even after desliming.

The results indicate a bias in most elements towards the fine and coarse fractions. Details of the results are found in Table 4. Note the head assay results for Fe_2O_3, Al_2O_3, TiO_2 and Cr_2O_3.

The Fe_2O_3, Al_2O_3 and TiO_2 grades and distribution over the size fractions were plotted and the results are presented in Figures 2 and 3.

FIGURES

FIGURE 1

FLOWSHEET - HIGH GRADE SILICA SANDS

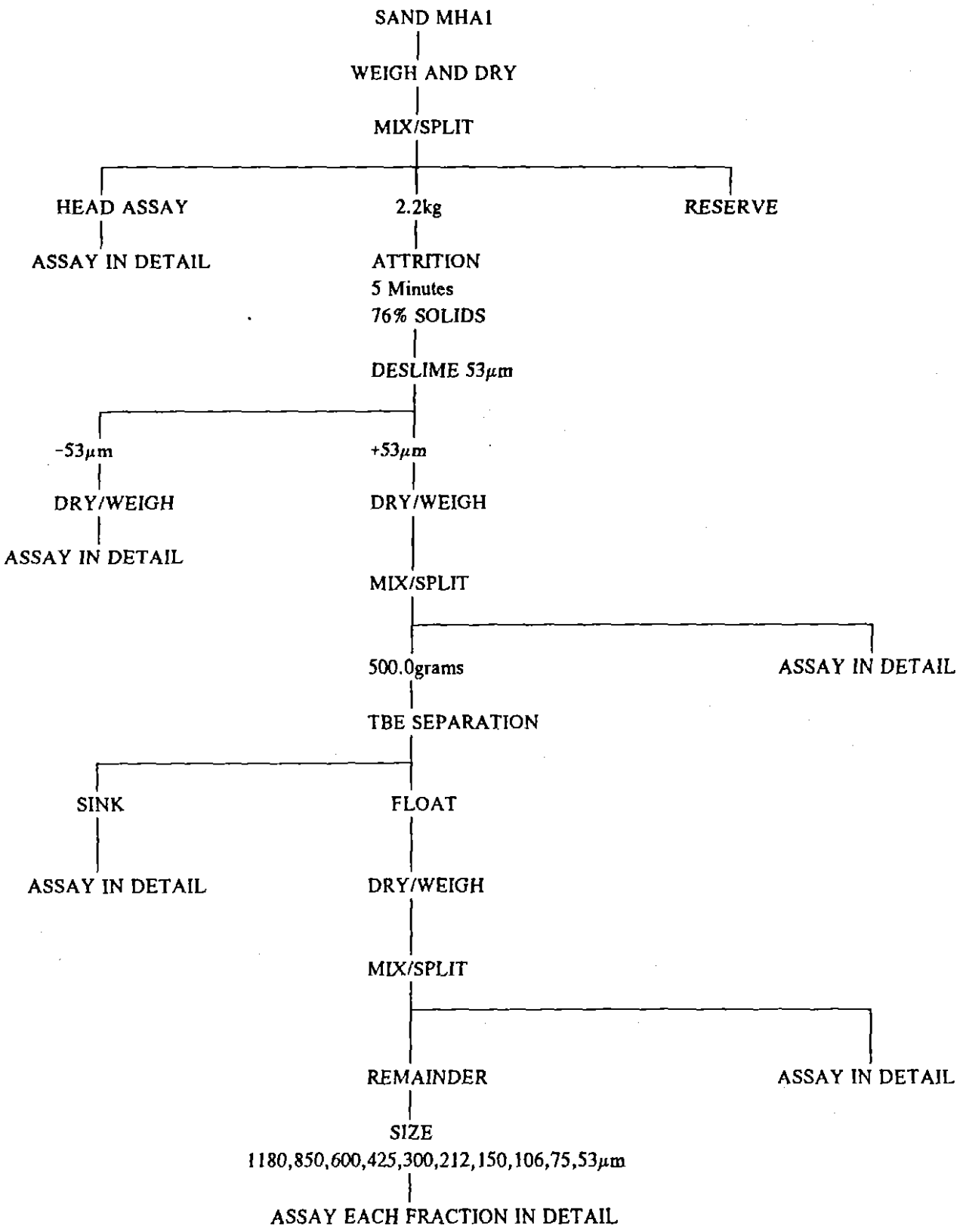


FIGURE 2

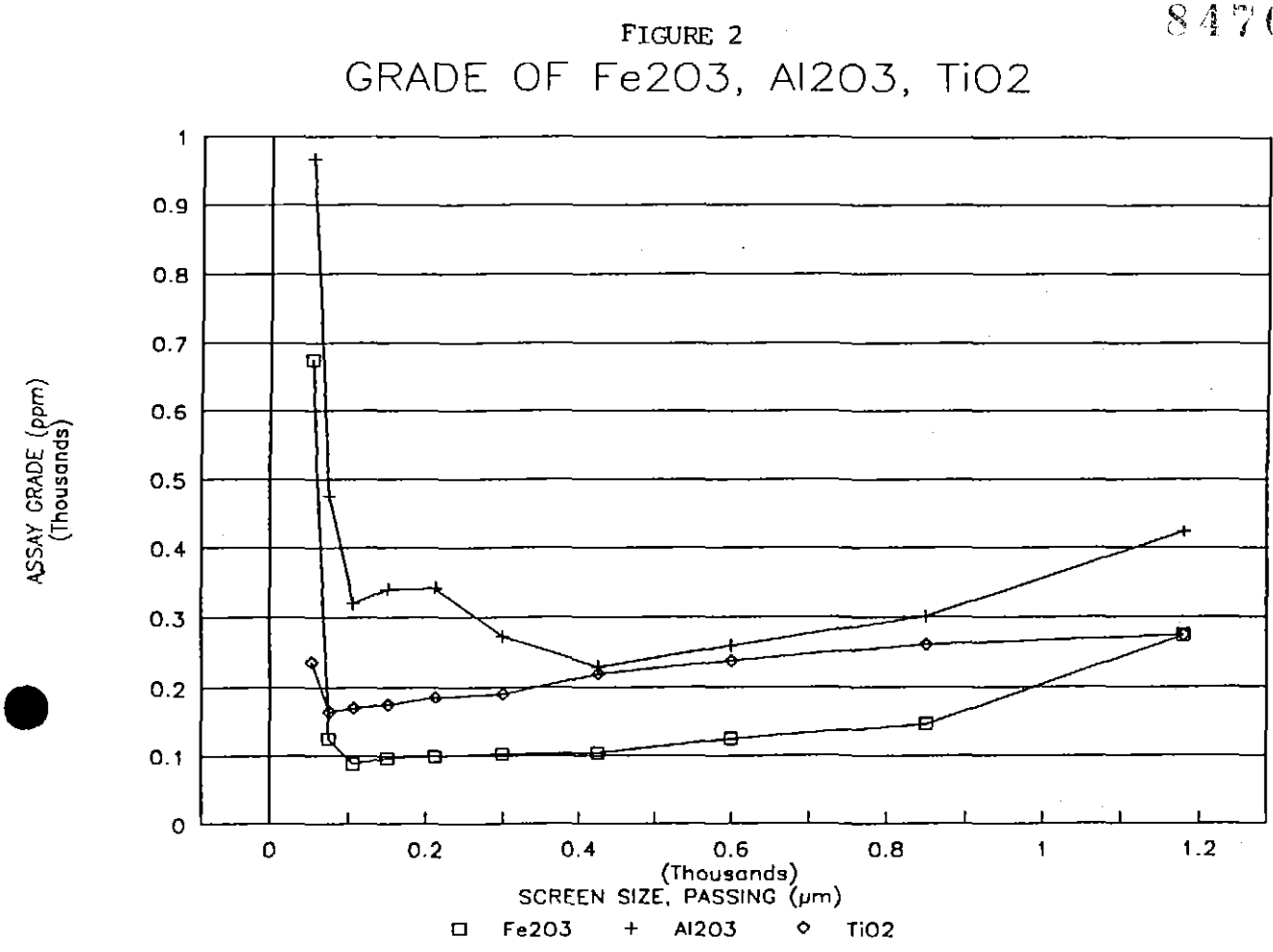
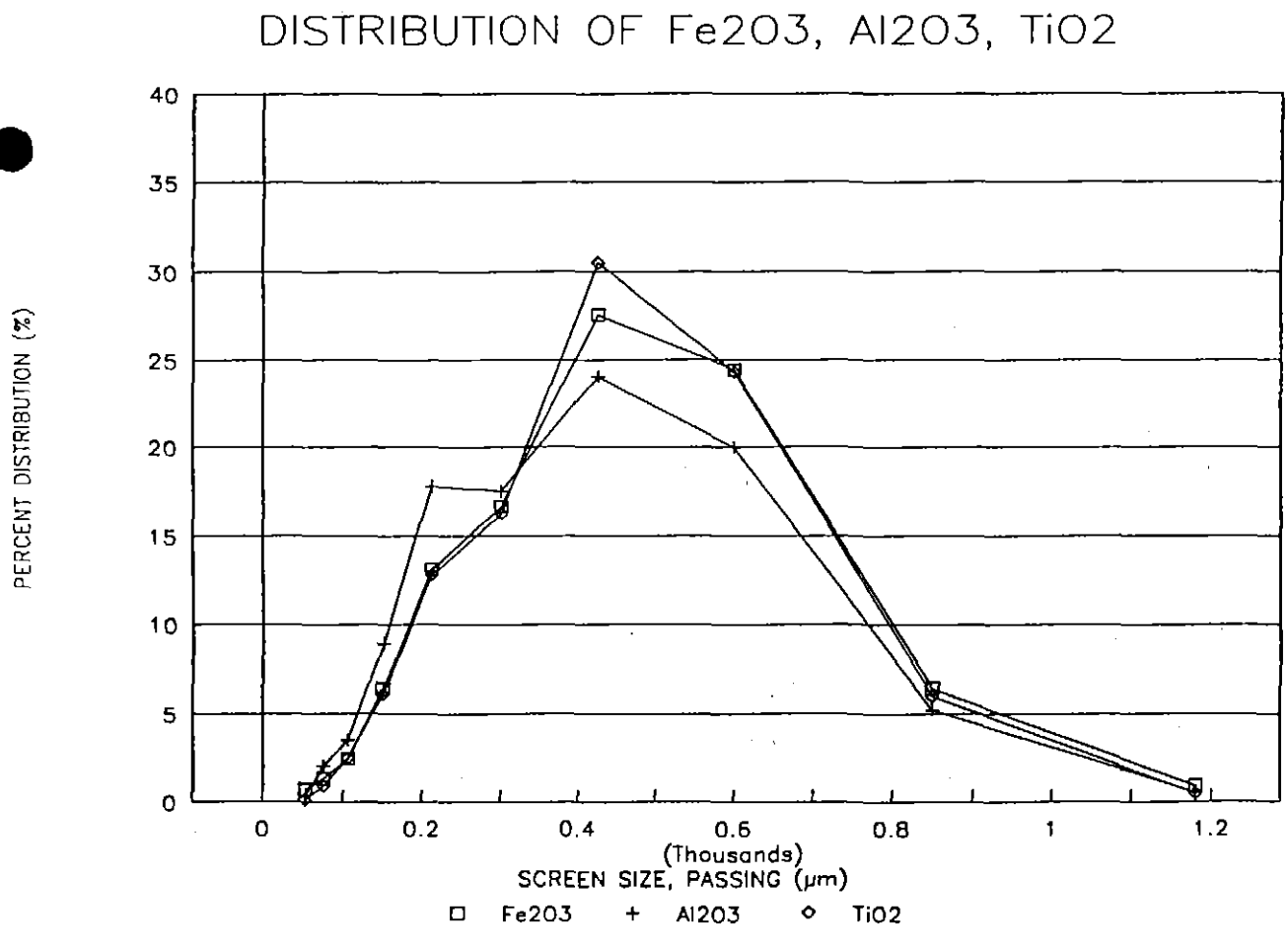


FIGURE 3



TABLES

TABLE 1

HEAD ASSAY														
SAMPLE	Fe2O3 (ppm)	Al2O3 (ppm)	Na2O (ppm)	MgO (ppm)	Cl (ppm)	K2O (ppm)	CaO (ppm)	TiO2 (ppm)	V2O5 (ppm)	Cr2O3 (ppm)	CoO (ppm)	NiO (ppm)	ZrO2 (ppm)	WO3 (ppm)
MHA1	113	287	19	23	120	59	31	570	<2	<10	<0.2	<2	52	0.1

TABLE 2

ATTRITIONED TEST RESULTS

SAMPLE	Product Weight (g)	Weight Percent (%)	Fe2O3		Al2O3		Na2O		MgO		Cl		K2O		CaO		TiO2		V2O5		Cr2O3		CoO		NiO		ZrO2		WO3	
			(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	
ATTRITED +53μm	2150.20	97.86	114	59.1	264	86.0	39	49.0	38	85.9	75		58	91.7	52	55.5	237	46.5	<2		<10		<0.2		<2		23	47.9	0.1	59.6
ATTRITED -53μm	47.00	2.14	3625	40.9	1965	14.0	1859	51.0	287	14.1			240	8.3	1896	44.5	12460	53.5	20		355		11		414		1128	52.1	3.9	40.4
TOTAL	2197.20	100.00	189	100.0	301	100.0	78	100.0	43	100.0			62	100.0	91	100.0	498	100.0			10		0		0		46	100.0	0.2	100.0
ASSAY HEAD			113		287		19		23		120		59		31		570		<2		<10		<0.2		<2		52		0.1	

TABLE 3

SINK ASSAY RESULTS

SAMPLE	Fe2O3 (ppm)	Al2O3 (ppm)	Na2O (ppm)	MgO (ppm)	Cl (ppm)	K2O (ppm)	CaO (ppm)	TiO2 (ppm)	V2O5 (ppm)	Cr2O3 (ppm)	CoO (ppm)	NiO (ppm)	ZrO2 (ppm)	WO3 (ppm)
SINKS	14443	38913	2130	6367		<600	651	48038	184	167	7	188	35531	6.1

TABLE 4

FLOAT SIZING RESULTS

Screen Fraction (μm)	Screen Weight (g)	Weight Percent (%)	Fe2O3		Al2O3		Na2O		MgO		Cl		K2O		CaO		TiO2		V2O5		Cr2O3		CoO		NiO		ZrO2		WO3	
			(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	Distn (%)	(ppm)	
+1180	0.12	0.03	(Combined with +850μm fraction for analysis)																											
-1180+850	1.58	0.35	273	0.9	423	0.6	65	0.6	36	0.3			96	0.6	52	0.4	274	0.5	<2		<10		0		4		23	0.6	0.3	
-850+600	21.95	4.85	147	6.4	300	5.2	50	5.9	81	7.3	50		65	5.6	60	5.3	260	6.0	<2		<10		<0.2		4		12	4.1	<0.1	
-600+425	97.26	21.48	126	24.4	239	20.0	46	24.2	55	21.7	50		57	21.6	63	24.8	237	24.3	<2		<10		<0.2		<2		14	21.1	<0.1	
-425+300	132.41	29.25	104	27.6	229	24.0	39	28.1	51	27.7	50		48	25.0	56	30.0	219	30.5	<2		<10		<0.2		4		16	34.7	<0.1	
-300+212	81.1	17.91	103	16.7	272	17.5	36	16.0	55	18.1	50		54	17.2	57	18.8	190	16.3	<2		<10		<0.2		<2		12	15.3	<0.1	
-212+150	65.61	14.49	100	13.1	342	17.8	32	11.5	55	14.6	50		59	15.2	45	11.9	185	12.8	<2		<10		<0.2		<2		12	12.5	<0.1	
-150+106	33.08	7.31	97	6.4	340	8.9	28	5.1	61	8.3	50		66	8.6	42	5.6	175	6.1	<2		<10		<0.2		<2		9	5.0	<0.1	
-106+75	13.78	3.04	89	2.4	319	3.5	28	2.1	17	0.9			71	3.8	36	2.0	170	2.5	<2		<10		<0.2		<2		22	4.9	0.1	
-75+53	5.33	1.18	126	1.3	476	2.0	40	1.2	25	0.5			96	2.0	43	0.9	165	0.9	<2		<10		<0.2		4		16	1.4	0.3	
-53	0.53	0.12	675	0.7	967	0.4	1859	5.3	287	0.6			200	0.4	90	0.2	235	0.1	<2		<10		<0.2		4		50	0.4	0.3	
TOTAL	452.75	100.00	111	100.0	278	100.0	41	100.0	54	100.0			56	100.0	55	100.00	210	100.0									14	100.0		
ASSAY			110		310												190				1									

APPENDIX I

ANALABS RESULTS

847017

Analabs

Analabs Pty. Ltd.
A.C.N. 004 591 664

Phone (09)4587999 | 52 Murray Road, Welshpool, W.A. 6106 | Fax (09) 4582922

ANALYTICAL REPORT No. 101160.10.13262

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

INVOICE TO:
I Smith
Ammtec Pty Ltd
6 MacAdam Place

Balcatta WA 6021

ORDER No.	PROJECT

DATE RECEIVED	RESULTS REQUIRED
04/08/94	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
4	16/08/94	1	22

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
94231 & others	Prep : GP013GP016 ZIRCONIA BOWL	Fe,Al,Ca,Mg,Na,K/GA144 Scan/GA201
94231 & others	Prep :	W,Ni,Co/GS201
94231 & others	Prep :	V,Ti,Cr/GI201
94231 & others	Prep : GP013,GP016	Zr/GS201
94231 & others	Prep :	Cl/GA25

RESULTS TO
I Smith
Ammtec Pty Ltd
6 MacAdam Place

Balcatta WA 6021

RESULTS TO

RESULTS TO

REMARKS

Note: Zr,Ti data >1% may bias low due to solubility problems.

AUTHORISED OFFICER

847018

Analabs

Analabs Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	101160.10.13262	16/08/94		1 OF 4

	SAMPLE No.				Na	Na	Na	Mg	Mg	Mg	Al
METHOD					OA144	GI201	GA201	OA144	GI201	GA201	OA144
1	A A4281 Head Assay				14	-	-	21	-	-	152
2	A A4281 Deslim +53um				29	-	-	23	-	-	140
3	A A4281 Float +600um				37	-	-	49	-	-	159
4	A A4281 Float +425um				34	-	-	33	-	-	137
5	A A4281 Float +300um				29	-	-	31	-	-	121
6	A A4281 Float +212um				27	-	-	33	-	-	144
7	A A4281 Float +150um				24	-	-	33	-	-	181
8	A A4281 Float +106um				21	-	-	37	-	-	180
9	A4281 TBE Sinks				-	1580	-	-	3840	-	-
10	A4281 Float -53um				-	-	68	-	-	55	-
11	A4281 Float +850um				-	-	48	-	-	22	-
12	A4281 Slime -53um				1379	-	-	173	-	-	1040
13	A4281 Float +75um				21	-	-	10	-	-	169
14	A4281 Float +53um				30	-	-	15	-	-	252
15											
16											
17											
18											
19											
20											
21											
22											
23											
24	DETECTION				2	50	5	2	20	5	10
25	UNITS				ppm	ppm	ppm	ppm	ppm	ppm	ppm

Results in ppm unless otherwise specified IS = Insufficient sample

AUTHORISED

847019

Analabs

Analabs Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	101160.10.13262	16/08/94		2 OF 4

	SAMPLE No.	Al	Al	Cl	K	K	K	Ca
METHOD		GI201	GA201	CA25	OA144	GI201	GA201	OA144
1	A A4281 Head Assay	-	-	-	49	-	-	22
2	A A4281 Deslim +53um	-	-	-	48	-	-	37
3	A A4281 Float +600um	-	-	-	54	-	-	43
4	A A4281 Float +425um	-	-	-	47	-	-	45
5	A A4281 Float +300um	-	-	-	40	-	-	40
6	A A4281 Float +212um	-	-	-	45	-	-	41
7	A A4281 Float +150um	-	-	-	49	-	-	32
8	A A4281 Float +106um	-	-	-	55	-	-	30
9	B A4281 Head Assay	-	-	120	-	-	-	-
10	B A4281 Deslim +53um	-	-	75	-	-	-	-
11	B A4281 Float +600um	-	-	50	-	-	-	-
12	B A4281 Float +425um	-	-	50	-	-	-	-
13	B A4281 Float +300um	-	-	50	-	-	-	-
14	B A4281 Float +212um	-	-	50	-	-	-	-
15	B A4281 Float +150um	-	-	50	-	-	-	-
16	B A4281 Float +106um	-	-	50	-	-	-	-
17	A4281 TBE Sinks	2.06	-	-	-	<500	-	-
18	A4281 Float -53um	-	512	-	-	-	166	-
19	A4281 Float +850um	-	224	-	-	-	80	-
20	A4281 Slime -53um	-	-	-	199	-	-	1355
21	A4281 Float +75um	-	-	-	59	-	-	26
22	A4281 Float +53um	-	-	-	80	-	-	31
23								
24	DETECTION	0.01	50	50	0	500	5	2
25	UNITS	%	ppm	ppm	ppm	ppm	ppm	ppm

ills in ppm unless otherwise specified IS Insufficient sample

AUTHORISED

847020

Analabs

Analabs Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	101160.10.13262	16/08/94		3 OF 4

	SAMPLE No.			Ca	Ca	Ti	V	Cr	Fe	Fe
METHOD				GI201	GA201	GI201	GI201	GI201	DA144	GI201
1	A A4281 Head Assay			-	-	342	<2	<10	79	-
2	A A4281 Deslim +53um			-	-	142	<2	<10	80	-
3	A A4281 Float +600um			-	-	156	<2	<10	103	-
4	A A4281 Float +425um			-	-	142	<2	<10	88	-
5	A A4281 Float +300um			-	-	131	<2	<10	73	-
6	A A4281 Float +212um			-	-	114	<2	<10	72	-
7	A A4281 Float +150um			-	-	111	<2	<10	70	-
8	A A4281 Float +106um			-	-	105	<2	<10	68	-
9	A4281 TBE Sinks			465	-	28800	103	114	-	1.01
10	A4281 Float -53um			-	64	141	<2	<10	-	-
11	A4281 Float +650um			-	37	164	<2	<10	-	-
12	A4281 Slime -53um			-	-	7470	11	243	2535	-
13	A4281 Float +75um			-	-	102	<2	<10	62	-
14	A4281 Float +53um			-	-	99	<2	<10	88	-
15										
16										
17										
18										
19										
20										
21										
22										
23										
24	DETECTION			50	5	10	2	10	0	0.01
25	UNITS			ppm	ppm	ppm	ppm	ppm	ppm	%

Units in ppm unless otherwise specified IS insufficient sample

AUTHORISED

847021

Analabs

Analabs Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	101160.10.13262	16/08/94		4 OF 4

	SAMPLE No.	Fe	Co	Ni	Zr	Zr	W	
THOD		GA201	GS201	GS201	GS201	GI201	GS201	
1	A A4281 Head Assay	-	<0.2	<2	-	-	0.1	
2	A A4281 Deslim +53um	-	<0.2	<2	-	-	0.1	
3	A A4281 Float +600um	-	<0.2	3	-	-	<0.1	
4	A A4281 Float +425um	-	<0.2	<2	-	-	<0.1	
5	A A4281 Float +300um	-	<0.2	3	-	-	<0.1	
6	A A4281 Float +212um	-	<0.2	<2	-	-	<0.1	
7	A A4281 Float +150um	-	<0.2	<2	-	-	<0.1	
8	A A4281 Float +106um	-	<0.2	<2	-	-	<0.1	
9	B A4281 Head Assay	-	-	-	38.4	-	-	
10	B A4281 Deslim +53um	-	-	-	16.8	-	-	
11	B A4281 Float +600um	-	-	-	8.7	-	-	
12	B A4281 Float +425um	-	-	-	10.1	-	-	
13	B A4281 Float +300um	-	-	-	12.2	-	-	
14	B A4281 Float +212um	-	-	-	8.8	-	-	
15	B A4281 Float +150um	-	-	-	8.9	-	-	
16	B A4281 Float +106um	-	-	-	7.0	-	-	
17	A4281 TBE Sinks	-	5.2	148	>1000.0	26300	4.8	
18	A4281 Float -53um	472	<0.2	3	36.8	-	0.2	
19	A4281 Float +850um	191	0.2	3	16.7	-	0.2	
20	A4281 Slime -53um	-	8.4	325	835.0	-	3.1	
21	A4281 Float +75um	-	<0.2	<2	16.5	-	0.1	
22	A4281 Float +53um	-	<0.2	3	12.2	-	0.2	
23								
24	DETECTION	10	0.2	2	0.5	5	0.1	
25	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	

1 in ppm unless otherwise specified IS [illegible] sample

847022

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