IMC DEVELOPMENT CORPORATION

Melbourne, Australia

Report No. 40

GEORGINA BASIN PHOSPHATE PROJECT

BENEFICIATION TESTS OF WONARAH DRILL HOLE SAMPLES

by

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September, 1970

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INTRODUCTION

The following report is a summary of the results obtained from beneficiation tests of non-cored prospect splits from nine holes. The holes covered in this report are W-48, W-103, W-54, W-108, W-109, W-112, W-60A, W-62 and W-65. All of these holes are in the Wonarah Area, Northern Territory.

Additional samples from the Wonarah and Alexandria areas have been received, and are being held at the Noralyn Metallurgical Laboratory.

The method by which the samples were processed is shown on Table II, which is also a material balance for the average of all the cores processed. It should be pointed out that the results shown are not believed to be the ultimate that can be obtained but are indicative.

It is anticipated that the flow diagram shown in Table II is similar to that visioned for commercial operation.

RESULTS OBTAINED

A tabulation of the data from the beneficiation tests showing Feed Grades, Concentrate Grades, and Yields of the 15 samples is shown on Table I.

The Arithmetical Average of the Concentrates Produced Were:

Mesh Size	BPL	Insol.	Fe_2O_3	Al_2O_3	Flot. BPL Rec.	% Wt. Matrix	% BPL Matrix
-28+65	71.24	16.4	0.72	1.49	84.7	12.44	24.1
-65+325	71.42	16.4	0.75	1.49	87.2	9.04	17.6
comb-28+325	71.37	16.4	0.72	1.49	84.7	21.48	41.7
-325+20 micron	67.16	20.5	0.72	1.28	79.5	3.61	6.5
comb-28 mesh +20 micron	70.49	17.3	0.72	1.44	84.1	25.09	48.2

It will be noted from Table I that the results obtained varied widely from hole to hole. The rejection of several of the very bad samples from the average would raise the concentrate grade several BPL.

It is interesting to note that the impurities in the concentrate, with the exception of insoluable are low. The average combined Fe_2O_3 was 0.72% and Al_2O_3 1.44%, or a combined average of 2.14% I&A.

The other minor impurities in the concentrate also appear to be low. The average CaO to P_2O_5 ratio was 1.30 , which is very good and is equivalent to the ratio obtained from Ocean and Christmas Islands.

DISCUSSION OF RESULTS

In comparing the results from the various splits, it is interesting to note the wide variation in the results obtained. When a particular split was difficult to process, the difficulties extended through all the three size fractions; this tends to confirm the visual observations that the Feed contained a coating that inhibited the separation.

At the present time mineralogical studies of these particular samples have not been completed, so the exact cause of the difficulties is not determined.

There also seems to be a trend that when several splits have been made in the same hole, that the upper split is more difficult to process.

Whether these splits tie into similiar horizons in the ore body is not known.

The average reagent usage per ton of final concentrate was as follows:

No. 5 Fuel Oil	12 lbs.
Glidden Fatty Acid (FA10)	8 lbs.
Sodium Silicate	3.0 lbs.
Sodium Hydroxide	.1.5 lbs.

In addition to the above reagents used in the flotation step, approximately two pounds of Sodium Hydroxide per ton of flotation feed was used in the scrubbing step prior to flotation. The use of Sodium Hydroxide in this manner appeared to improve the selectivity of the flotation operation.

It is anticipated that more detailed studies of the feed preparation steps and other reagent combinations would improve the results in some of the difficult areas, but this study was not possible with the limited samples available.

Listed below is a comparison of the feed and concentrate grades of the various mesh sizes. The ratio of P_2O_5 to the various impurities such as insoluable Fe_2O_3 and Al_2O_3 is shown.

This comparison together with the BPL recovery and rejection of the insoluable, Fe_2O_3 and Al_2O_3, is comparable with results obtained from other Australian samples. This type comparison can be a useful tool in predicting grade that can be obtained from a given feed source.

COMPARISON OF MESH X MESH FRACTIONS

Feed	% BPL	% Insol.	% Fe_2O_3	% Al_2O_3	Ratio P_2O_5 to Insol	Ratio P_2O_5 to Fe_2O_3	Ratio P_2O_5 to Al_2O_3
- 28+ 65 mesh	44.40	45.1	1.05	1.45	2.22	.051	.071
- 65+325 mesh	43.70	46.7	1.02	1.35	2.21	.051	.067
-325+ 20micron	28.89	62.7	1.02	1.08	4.56	.075	.079
Concentrates							
- 28+65 mesh	71.24	16.4	0.70	1.48	.50	.021	.045
- 65+325mesh	71.42	16.4	0.75	1.49	.50	.023	.045
-325+20micron	67.16	20.5	0.72	1.28	.66	.023	.042

Recovery BPL and Rejection of Impurities

	Recovery	Rejection Percent Insol.	Rejection Percent Fe_2O_3	Rejection Percent Al_2O_3
- 28+65 mesh	82.9	81.3	65.7	47.6
- 65+325 mesh	87.2	81.1	66.8	40.9
-325+20 micron	79.5	88.4	75.1	50.0

Tests of the concentrates for phosphoric acid manufacture or other agronomic studies were not conducted on the concentrates; however, the phosphatic material appears to be similiar to that obtained from other Australian reserves, and should be very satisfactory for these uses.

FUTURE PROGRAM

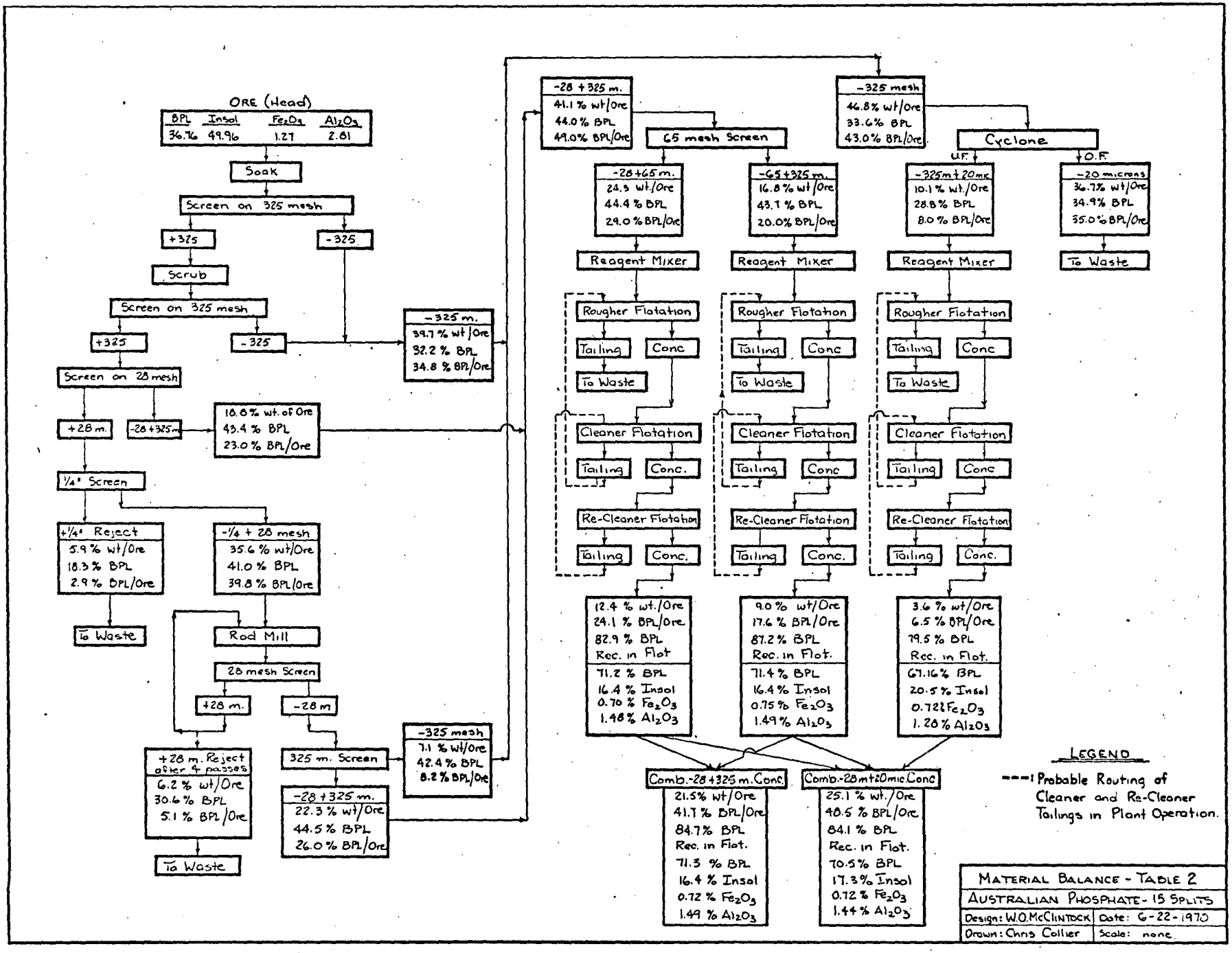
No additional laboratory studies are scheduled on the Wonarah or Alexandria samples at this time.

Any future work that is conducted would include the following:

1. Determine the feasibility and effect on product grade and BPL recovery, of recovery and beneficiation, of the -20 +10 micron fraction, of the ore.
2. More effective method of grinding feed to flotation size (to minimize grinding loss).
3. More effective methods to remove coating from difficult feed samples.
4. More efficient and selective reagent combinations.

SUMMARY - AUSTRALIAN SAMPLES - NORTHERN TERRITORY - WONORAH AREA - TABLE I

HOLE No.	DEPTH FEET	Ore as received						-28+65 mesh Feed						-65+325 mesh Feed						-325+20 microns Feed						Comb. Feed -28+325	Comb. Feed -28m+20mic	-28+65 mesh Conc.						-65+325 mesh Conc.						-325+20 microns Conc.						Comb.-28+325 m. Conc.						Comb.-28m+20mic. Conc.						These Analyses on-65+325 mesh Conc. only												
		BPL	Insol	Fe_2O_3	Al_2O_3	-325 %Wt	-325 BPL	BPL	Insol	Fe_2O_3	Al_2O_3	%Wt	BPL Dist.	BPL	Insol	Fe_2O_3	Al_2O_3	% Wt.	BPL Dist.	BPL	Insol	Fe_2O_3	Al_2O_3	%Wt	BPL Dist.	BPL	% Wt of Ore	BPL	% Wt of Ore	BPL	Insol	Fe_2O_3	Al_2O_3	BPL Rec.	%Wt of Ore	BPL	Insol	Fe_2O_3	Al_2O_3	BPL Rec.	%Wt of Ore	BPL	Insol	Fe_2O_3	Al_2O_3	BPL Rec.	%Wt of Ore	BPL	Insol	Fe_2O_3	Al_2O_3	BPL Rec.	%Wt of Ore	BPL	Insol	Fe_2O_3	Al_2O_3	BPL Rec.	%Wt of Ore	CaO	F	Cl	SiO_2	SO_4	Na_2O	K_2O	MgO	CO_2	LOI	Ratio CaO/ P_2O_5
W-48	92.5 - 97.5	53.30	31.1	0.65	4.81	49.7	33.6	59.5	23.9	0.55	2.55	24.1	26.7	62.8	25.5	0.54	2.44	17.2	20.1	49.5	49.5	0.77	1.77	7.6	7.0	60.9	41.3	59.1	48.9	84.4	4.3	0.26	1.54	72.1	12.2	84.4	4.0	0.25	1.50	85.2	10.8	81.6	6.5	0.30	1.20	88.9	3.45	84.5	4.2	0.26	1.52	77.7	23.1	84.2	4.5	0.27	1.48	79.1	26.5	50.7	3.50	.006	4.12	.01	.060	.030	0.03	0.73	1.65	1.31
W-48	97.5 - 110	23.20	61.7	0.70	3.60	43.7	29.7	21.6	68.7	0.99	1.46	22.5	21.8	25.0	65.1	0.97	1.72	14.9	16.7	15.1	76.4	0.80	1.15	10.1	6.8	22.9	37.4	21.3	47.5	75.6	12.0	0.32	1.70	77.1	5.0	73.7	3.3	0.34	1.86	80.2	4.1	60.6	28.8	0.31	1.18	69.6	1.75	74.8	12.6	0.33	1.77	78.6	9.0	72.5	15.2	0.32	1.67	77.2	10.8	44.6	3.18	.005	14.28	.02	.050	.080	0.05	0.92	2.37	1.32
W-103	77.5 - 87.5	26.68	58.1	1.88	3.12	24.2	16.8	35.7	51.8	1.40	1.07	27.7	31.3	36.1	53.1	1.34	1.21	16.5	22.4	23.3	66.5	1.57	1.30	7.7	6.1	35.9	44.2	34.0	51.9	56.6	30.6	0.80	1.35	89.1	14.5	62.4	24.4	0.66	1.40	59.7	5.7	61.2	23.0	0.72	1.78	46.0	1.38	58.4	28.8	0.76	1.51	73.7	20.2	58.6	28.5	0.75	1.40	70.9	21.5	39.5	2.71	.005	24.71	.02	.050	.080	0.07	0.89	2.11	1.36
W-103	87.5 - 115 (115)	38.00	49.2	0.98	2.35	19.5	31.8	43.4	43.5	0.90	1.19	28.3	32.9	45.6	40.8	0.78	1.17	12.5	15.2	33.5	56.9	0.98	0.99	7.7	6.9	44.0	40.8	42.3	48.5	59.1	27.2	0.56	1.37	91.6	19.0	69.4	16.6	0.49	1.29	70.3	5.8	72.1	13.4	0.44	1.30	70.1	2.50	61.5	24.7	0.54	1.35	84.8	24.7	62.5	23.7	0.53	1.35	82.9	27.2	43.3	2.85	.015	17.73	.23	.060	.060	0.31	1.35	2.39	1.36
W-103	125 - 135	24.88	63.2	1.09	1.32	54.2	15.3	43.5	44.9	1.39	0.76	13.9	24.9	42.8	48.0	1.18	0.81	12.6	22.3	16.5	75.5	0.76	0.51	9.4	6.3	43.2	26.5	36.2	35.9	66.9	21.8	0.63	0.72	87.2	7.9	71.0	17.7	0.54	0.80	88.5	6.7	75.9	11.5	0.53	0.80	71.8	1.47	68.8	19.9	0.59	0.76	87.4	14.6	69.5	19.1	0.58	0.77	85.6	16.1	43.7	2.98	.006	17.86	.15	.040	.070	0.15	0.78	1.50	1.25
W-54	142.5 - 152.5	28.59	32.6	1.20	5.63	46.8	30.6	54.1	35.5	0.63	2.99	21.7	22.3	55.1	35.3	0.57	2.10	20.9	21.9	49.4	42.5	0.56	1.58	11.1	10.4	54.6	42.6	53.5	53.7	76.7	11.6	0.39	2.63	56.5	8.6	78.1	10.9	0.37	2.37	95.5	14.1	77.5	12.0	0.28	1.99	95.3	6.75	77.6	11.2	0.38	2.47	74.3	22.7	77.5	11.4	0.36	2.36	78.3	29.5	45.7	3.10	.012	11.18	.21	.040	.030	0.03	0.58	1.92	1.28
W-106	107.5 - 117.5	46.19	38.5	1.10	4.91	25.1	43.3	54.6	33.4	0.61	4.14	27.7	32.1	56.4	32.7	0.67	3.03	17.3	20.7	45.7	44.7	0.92	2.41	10.2	9.9	55.2	45.0	53.5	55.2	76.2	11.8	0.32	2.90	79.9	15.8	76.7	12.1	0.27	2.69	94.3	12.0	78.4	10.3	0.12	1.88	85.6	5.09	76.4	11.9	0.30	2.81	85.5	27.8	76.7	11.7	0.27	2.67	85.5	32.9	45.3	3.00	.006	12.26	.21	.040	.029	0.03	0.48	2.10	1.29
W-109	115 - 120	24.89	58.7	2.32	1.41	29.7	16.4	50.0	40.8	1.66	0.49	30.5	44.2	41.7	50.1	2.01	0.82	15.8	19.1	21.8	68.1	2.15	0.64	10.6	6.7	47.2	46.3	42.6	56.9	75.9	12.1	1.84	0.60	94.7	19.0	74.3	13.6	2.20	1.01	93.8	8.3	59.3	26.6	2.32	1.10	84.9	3.31	75.5	12.6	1.95	0.72	94.4	27.3	73.7	14.1	1.99	0.76	93.5	30.7	44.9	2.98	.011	14.03	.26	.070	.028	0.06	0.78	1.69	1.32
W-112	105 - 125 (125)	40.65	46.9	0.75	2.13	37.9	31.6	51.5	38.9	0.81	1.20	19.9	25.4	48.7	41.9	0.79	0.89	20.3	24.5	27.9	64.6	0.75	0.75	11.5	8.0	50.1	40.2	45.2	51.7	77.7	11.2	0.39	1.10	84.1	10.3	78.3	9.9	0.34	0.77	95.7	12.1	71.1	13.6	0.39	0.79	82.0	3.70	78.0	10.5	0.36	0.92	89.8	22.4	77.0	11.0	0.37	0.90	88.7	26.1	47.7	3.00	.009	10.05	.31	.090	.060	0.05	0.89	1.73	1.33
W-112	137.5 - 145 (145)	23.81	65.9	0.79	1.54	25.7	30.3	28.5	63.3	0.56	0.78	21.0	23.9	28.8	64.6	0.84	0.95	12.8	14.8	19.6	74.3	0.91	0.82	7.9	6.2	28.6	33.8	26.9	41.7	60.1	25.4	0.28	1.23	69.0	6.9	53.6	36.3	0.42	1.25	85.7	5.9	40.0	51.1	0.45	1.06	70.3	2.72	57.1	30.5	0.34	1.24	75.4	12.8	54.1	34.1	0.36	1.21	74.7	15.5	33.0	3.02	.017	36.40	.22	.030	.062	0.05	0.53	1.65	1.35
W-60A	145 - 160	26.99	62.0	1.43	2.47	30.9	24.1	29.6	66.7	0.97	1.24	33.1	36.5	28.1	64.2	0.89	1.26	20.1	21.1	22.2	71.4	0.90	0.99	11.2	9.3	29.0	53.2	27.8	64.4	59.6	26.8	0.70	1.67	84.6	13.9	55.0	32.1	0.87	2.07	93.0	9.6	50.1	38.7	0.78	1.70	88.9	4.41	57.7	29.0	0.77	1.95	87.7	23.5	56.5	30.5	0.77	1.91	87.8	27.9	34.0	1.55	.041	32.88	.10	.043	.056	0.05	0.65	2.37	1.35
W-60A	167.5 - 175	46.62	40.7	1.46	1.71	41.3	35.4	59.1	31.2	1.39	0.44	25.6	32.8	55.0	36.1	1.24	0.34	20.4	24.3	35.8	57.6	1.01	0.41	12.5	9.7	57.3	46.0	52.9	58.5	84.3	4.7	0.94	0.40	96.3	17.3	79.5	8.6	1.09	0.40	98.6	13.9	80.5	7.4	0.92	0.35	91.6	5.10	82.1	6.5	1.01	0.40	97.3	31.2	81.9	6.6	1.00	0.39	96.4	36.3	49.2	3.55	.040	8.48	.06	.095	.026	0.03	0.62	1.15	1.35
W-62	137.5 - 150	29.76	58.4	1.40	2.37	33.7	28.8	30.0	61.0	1.05	2.17	28.4	28.9	31.0	56.6	0.99	2.26	17.2	18.1	24.0	68.0	1.07	1.97	10.5	8.6	30.4	45.6	29.2	56.1	57.1	29.7	1.24	3.45	80.5	12.0	59.2	26.7	1.25	3.49	88.2	7.4	49.4	38.4	1.10	2.90	74.8	3.82	57.9	28.6	1.24	3.47	81.2	19.4	56.5	30.2	1.22	3.38	80.2	23.2	34.8	2.95	.041	27.63	.14	.047	.077	0.06	0.67	3.00	1.28
W-62	155 - 160	34.20	53.2	1.77	2.14	50.5	23.5	51.8	37.4	1.81	0.73	21.9	32.8	42.8	48.5	1.59	0.57	14.8	18.3	23.9	70.7	1.08	0.38	11.0	7.6	48.2	36.7	42.6	47.7	79.9	7.9	1.29	0.69	91.7	13.0	78.1	9.0	1.58	0.73	95.0	7.7	74.1	14.3	1.49	0.56	82.7	2.94	79.3	8.3	1.40	0.71	92.9	20.7	78.6	9.0	1.41	0.69	91.6	23.7	39.6	2.70	.017	22.69	.07	.031	.078	0.06	0.60	1.58	1.11
W-65	142.5 - 162.5	49.69	35.5	1.58	2.65	45.5	44.2	53.5	35.9	1.05	0.55	18.6	20.3	52.6	38.0	0.96	0.61	19.1	20.5	40.1	51.8	1.07	0.47	12.1	9.9	53.0	37.7	49.9	49.8	78.5	9.3	0.48	0.67	89.6	11.2	77.6	10.3	0.55	0.46	89.8	11.6	75.4	12.5	0.61	0.63	88.4	5.69	78.1	9.7	0.58	0.64	89.2	22.9	77.5	10.2	0.54	0.64	89.1	28.5	38.0	2.80	.019	26.50	.08	.070	.131	0.07	0.74	1.78	1.07
	Average	36.76	50.0	1.27	2.81	37.2	30.4	44.4	45.1	1.05	1.45	24.4	29.0	43.5	46.7	1.02	1.35	16.8	20.0	29.9	62.7	1.02	1.08	10.1	8.0	44.0	41.1	41.1	51.2	71.2	16.4	0.70	1.48	82.9	12.4	71.4	16.4	0.75	1.49	87.2	9.0	67.2	20.5	0.72	1.28	79.5	3.61	71.3	16.4	0.72	1.49	84.7	21.5	70.5	17.3	0.72	1.44	84.1	25.1	42.3	2.93	.015	18.71	.14	.054	.060	0.07	0.75	1.90	1.30


ORE (Head)
BPL 36.7% Insol 49.9% Fe2O3 1.27 Al2O3 2.81
Soak
Screen on 325 mesh
+325
-325
Scrub
Screen on 325 mesh
+325
-325
-325 m.
39.7 % wt/Ore
32.2 % BPL
34.8 % BPL/Ore
Screen on 28 mesh
+28 m.
-28+325 m.
18.6 % wt. of Ore
43.4 % BPL
23.0 % BPL/Ore
1/4" Screen
+1/4" Reject
5.9 % wt/Ore
18.3 % BPL
2.9 % DPL/Ore
To Waste
-1/4 + 28 mesh
35.6 % wt/Ore
41.0 % BPL
39.8 % BPL/Ore
Rod Mill
28 mesh Screen
+28 m.
-28 m
+28 m. Reject after 4 passes
6.2 % wt/Ore
30.6 % BPL
5.1 % BPL/Ore
To Waste
325 m. Screen
-325 mesh
7.1 % wt/Ore
42.4 % BPL
8.2 % BPL/Ore
-28 +325 m.
22.3 % wt/Ore
44.5 % BPL
26.0 % BPL/Ore
-28 +325 m.
41.1 % wt/Ore
44.0 % BPL
49.0% BPL/Ore
65 mesh Screen
-325 mesh
46.8% wt/Ore
33.6% BPL
43.0% BPL/Ore
Cyclone
U.F.
O.F.
-28+65 m.
24.3 wt/Ore
44.4 % BPL
29.0 % BPL/Ore
-65+325 m.
16.8 % wt/Ore
43.1 % BPL
20.0% BPL/Ore
-325m+20mic
10.1 % wt./Ore
28.8 % BPL
8.0 % BPL/Ore
-20 microns
36.7% wt/Ore
34.9% BPL
35.0 % BPL/Ore
To Waste
Reagent Mixer
Reagent Mixer
Reagent Mixer
Rougher Flotation
Tailing
Conc
To Waste
Cleaner Flotation
Tailing
Conc.
Re-Cleaner Flotation
Tailing
Conc.
12.4 % wt./Ore
24.1 % BPL/Ore
82.9 % BPL
Rec. in Flot
71.2 % BPL
16.4 % Insol
0.70 % Fe2O3
1.48 % Al2O3
9.0 % wt/Ore
17.6 % BPL/Ore
87.2 % BPL
Rec. in Flot.
71.4 % BPL
16.4 % Insol
0.75 % Fe2O3
1.49 % Al2O3
3.6 % wt/Ore
6.5 % BPL/Ore
79.5 % BPL
Rec. in Flot.
67.16% BPL
20.5 % Insol
0.72% Fe2O3
1.28 % Al2O3
Comb.-28+325 m. Conc
21.5% wt/Ore
41.1 % BPL/Ore
84.7% BPL
Rec. in Flot.
71.3 % BPL
16.4 % Insol
0.72 % Fe2O3
1.49 % Al2O3
Comb.-28 m+20mic Conc
25.1 % wt./Ore
40.5 % BPL/Ore
84.1 % BPL
Rec. in Flot.
70.5% BPL
17.3% Insol
0.72 % Fe2O3
1.44 % Al2O3
LEGEND
---! Probable Routing of Cleaner and Re-Cleaner Tailings in Plant Operation.
MATERIAL BALANCE - TABLE 2
AUSTRALIAN PHOSPHATE - 15 SPLITS
Design: W.O.McCLINTOCK
Date: 6-22-1970
Drawn: Chris Collier
Scale: none

Summary of Feed Preparation Results - Table 3

Hole #	Depth/ft.	Coarse Reject				Grinder Feed			Grinder Product			Grinder Oversize			-20 microns Slimes					
		Mesh	% Wt.	BPL	BPL Dist.	% Wt	BPL	BPL Dist	% Wt	% BPL	BPL Dist	% Wt.	% BPL	BPL Dist.	% Wt.	BPL Dist.	% BPL	% Insol	% Fe_2O_3	% Al_2O_3
W-48	92.5-97.5	6 mesh	3.7	27.6	1.9	26.6	56.4	28.1	22.0	57.3	23.7	0.7	49.4	0.6	46.7	43.7	49.9	30.7	0.99	5.94
W-48	97.5-110	6 mesh	10.3	6.9	3.2	27.8	14.3	17.1	22.5	16.7	16.1	6.5	9.1	2.6	35.7	48.9	30.6	52.9	0.75	4.94
W-103	77.5-87.5	3/8"	2.1	13.9	1.1	51.2	30.9	59.2	31.8	35.2	41.9	10.4	17.9	7.0	35.6	25.4	26.5	58.1	2.25	2.50
W-103	87.5-115	1/4"	7.6	27.4	5.6	50.8	37.7	51.3	26.8	42.8	30.7	19.1	32.4	16.5	24.8	22.9	34.5	46.7	1.98	3.85
W-103	125-135	1/4"	6.2	12.1	3.1	28.4	36.9	43.2	13.6	41.3	23.1	1.7	31.9	2.2	56.2	41.2	17.7	66.0	1.13	2.80
W-54	142.5-152.5	—	—	—	—	26.9	55.4	28.3	15.2	56.8	16.4	2.4	30.2	1.4	43.9	44.0	52.7	28.0	2.32	4.51
W-108	107.5-117.5	1/4"	5.6	21.4	2.6	44.5	50.6	47.0	23.3	58.0	28.8	12.4	32.0	8.5	26.8	26.2	45.9	34.7	2.47	3.59
W-109	115-120	1/4"	5.9	10.8	1.9	43.5	51.4	64.8	27.3	53.5	42.2	8.1	50.4	11.8	29.1	16.3	19.0	63.4	4.09	3.90
W-112	105-125	3/8"	4.5	23.9	2.7	35.4	48.4	42.5	19.7	53.1	25.9	6.4	25.8	4.1	37.4	35.3	38.1	47.2	0.98	5.11
W-112	137.5-145	1/4"	15.2	12.4	7.5	36.4	23.1	33.7	20.1	25.3	20.4	13.8	10.5	5.8	29.3	41.8	36.9	49.7	1.03	4.73
W-60A	145-160	1/4"	3.9	12.7	1.9	42.6	27.8	44.2	31.2	28.7	33.4	3.7	9.4	1.3	28.0	29.9	28.7	57.2	1.76	2.98
W-60A	167.5-176	—	—	—	—	31.0	57.2	38.4	20.3	61.1	26.9	3.0	70.0	4.5	38.0	28.7	34.4	51.0	2.18	2.50
W-62	137.5-150	1/4"	3.5	11.9	1.4	38.3	27.3	35.4	25.6	28.8	24.9	3.5	11.9	1.4	36.0	40.9	33.6	51.9	1.82	3.32
W-62	155-160	—	—	—	—	30.1	47.6	41.4	19.6	54.5	30.9	0.9	51.6	1.3	51.4	40.0	26.9	61.1	2.80	2.02
W-65	142.5-162.5	1/4"	2.4	40.0	1.9	21.3	51.1	22.2	15.6	53.9	17.1	0.3	26.4	0.2	47.5	47.2	48.8	34.5	2.58	3.02
	Average	—	5.9	18.3	2.9	35.6	41.0	39.8	22.3	44.5	26.5	6.2	30.6	5.1	36.7	35.0	34.9	48.9	1.90	3.71

LABORATORY PROCEDURE

AUSTRALIAN SAMPLES

The following procedure is planned for the Australian ore samples. It is proposed as a general plan, and will be varied to fit the individual samples.

Step

1. Record gross weight of sample as received.
2. Split sample into equal quarters using laboratory riffle.
3. Put one quarter into plastic bag and place inside 1-gallon can, with proper identification, for reserve.
4. Split one quarter into equal parts, one part will be used for moisture sample, head sample and screen analysis.
   The other part will be combined with the remaining 2 quarters of the split in step 2, and used for beneficiation tests.
5. Weigh and record wet weight of both of the above samples.
6. Split out 1/8 of smaller sample for moisture determination, and head sample, analyze for BPL, Insol, Fe_2O_3, Al_2O_3, CaO, and CL.
7. Soak balance of sample overnight in water, hand stir and wet screen at 3/8, 1/4, 6, 10, 24, 65, 200 and 325 mesh. Obtain and record dry weight of all fractions, including -325 mesh.
   Analyze each fraction for BPL, Insol, Fe_2O_3 and Al_2O_3.
   Save unground portion of fractions coarser than 24 mesh, for possible heavy liquid tests, or other investigations.
   Save -325 mesh fraction, after drying, for further investigation of values in finer sizes.

Step

7. cont'd.

The results from step 7, will be used as a guide for beneficiation tests, on the larger samples.

Assuming BPL, distribution, on the general range of past samples the following steps will be taken.

8. Soak large sample (5/8 of original) overnight and wet screen at 325 mesh, obtain dry wegiht of -325 mesh fraction.
9. Scrub +325 mesh fraction for 3 minutes and re-screen on 325 mesh, obtain dry weight of -325 mesh fraction and analyze for BPL.
10. Screen +325 mesh fraction on 24 mesh.
11. Based on the BPL content and other analysis, of the small sample (from step 6), the plus 24 mesh will be re-screened at 1/4 inch, 6, or 10 mesh and the coarse fraction rejected, or the entire +24 mesh fraction will be stage ground at 2 minute intervals, in laboratory rod mill, until 95 percent of original feed is minus 24 mesh.

    The wet weight and moisture content of the coarse reject and grinder feed will be determined.
12. Screen ground product at 325 mesh, obtain dry weight of -325 mesh fraction and analyze for BPL.
13. Obtain dry weight of +325 mesh fraction of ground feed, by cutting out small sample, which will be returned to main sample after moisture determination.
14. Combine -24+325 mesh ground product with balance of -24+325 mesh fraction from step 10.
15. Screen the combined products on 65 mesh.

Step

16. Obtain wet weight of both -24+65 and -65+325 mesh fraction and determine moisture content, by cutting out small sample.

17. Split the above fraction into equal parts and subject each portion to flotation tests separately.

18. Place the flotation feed into small mixing jar, add fatty acid, #5 fuel oil, sodium silicate, in pre-determined amounts, based on the estimated dry weight of the sample. Add sodium hydroxide to obtain a Ph of approximately 9.0 in the flotation cell.
    Add water to obtain solid of 60 to 70 percent and mix for 2 minutes.
    Record amounts of reagents used.

19. Transfer mixed feed to laboratory flotation cell. Obtain sample of cell water for Ph measurement.
    Float off rougher concentrate. Remove residue from cell as rougher tailings.

20. Return rougher concentrate to cell for re-float using water from rougher flotation step.
    Float cleaner concentrate from cell.
    Remove residue from cell as cleaner tailings.

21. Split cleaner concentrate into equal parts, treat one part by scrubbing with sulfuric acid, at 50 to 60 percent solids for 3 minutes, rinse and decant off water.
    Return product to flotation cell.
    Adjust Ph to approximately 8.0 with NaO H and add amine, kerosene emulsion to remove insoluble as froth product.

Step

22. Dry and weigh all products from above test.

    Analyze for BPL, Insol, Fe_2O_3 and Al_2O_3.

23. Repeat step 18 on remaining portion of feed sample, adjusting reagent quantity, to obtain better product grade or better recovery depending on visual observation of product from previous test.

    Step 21 (amine flotation) will be omitted on the repeat test.

24. A small sample (15 to 20 grams) of the unground cleaner concentrate from each of the tests will be sent to Mr. Murowchick at Libertyville for Mineralogical study.

    In the event the Fe_2O_3 is in excess of 2% the amount of sample will be increased to approximately 100 grams to allow for magnetic separation tests.

25. Complete analysis will be obtained on one of the coarse and fine flotation concentrate deemed most representative.

26. Save all unground flotation concentrate not needed for analysis, or mineralogical study with proper identification, for chemical testing or other study.

27. All data and pertinent observations will be recorded, and made part of the report on each drill sample.

28. All reports and data will use the same identification hole number and footage split as shown on the samples received from Australia.

W O Mc Clintock
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WOM:bjb