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NEW MT. COSTIGAN MINES LTD.
FEASIBILITY STUDY
of
BEACH SAND PROJECT,
KING ISLAND, TASMANIA

SP 2

*Manila Report*CONTENTS

1. INTRODUCTION
2. SUMMARY
3. PROJECT FEASIBILITY
4. GENERAL DESCRIPTION OF OPERATION
5. CAPITAL COST SCHEDULE
6. OPERATING COST SCHEDULE

- APPENDIX I ORE RESERVES
APPENDIX II UNIT OPERATIONS
APPENDIX III CAPITAL COST DETAILS
APPENDIX IV OPERATING COSTS DETAILS
APPENDIX V REVISED PROFITABILITY ESTIMATE -
Direct Loading to Overseas Ship

SITE PLAN
PLAN I

GRID LAYOUT ON LANHERNE BEACH

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October 25th, 1967.

Kenneth McMahon & Partners Pty.
Limited.

COMPANY	DATE 23.10.67
MEMORANDUM TO: DR. W.L. YOUNG	FILE
FROM B.J. COX, ESQ.	COPIES TO:
SUBJECT KING ISLAND - MINERAL SANDS	

A further point for discussion with the Premier of Tasmania is the future of the P.M.G. Cable Stations at Naracoopa. This could be a very useful site for our dry plant and/or power station, quite apart from any addition to ore reserves it may contain.

DefM	S&A	CG	CC&M	ACIM&E
RECEIVED	7 NOV 67		ESD	
HANDWERED	DEPT OF MINES			
REFNO.				

B. Cox

Mr Currows has applied for a lease of the Cable Station area and we have written to Lands Dept as to availability of area. Lands Dept are awaiting a reply from Commonwealth

26 7/1/67

COMPANY		DATE 20.10.67
MEMORANDUM TO: DR. W.L. YOUNG		FILE
FROM B.J. COX,	COPIES TO:	
SUBJECT KING ISLAND PROJECT-PROFIT & TAXES		

Estimates of Net Profit and Taxes have been re-assessed on the basis of direct loading of products to overseas ships at Naracoopa. It is assumed that this could come into operation in January, 1970, eighteen months after production commences in 1968.

Results are summarized below:-

	8-Year Operation		5-Year Operation	
	Revised Estimates	Original Estimates	Revised Estimates	Original Estimates
Total Net Profit \$	2,233,530	1,587,103	1,660,241	1,319,869
Total Taxes Payable \$	1,150,605	817,601	855,275	679,934

Reduced costs of production associated with direct loading at Naracoopa would increase reserves in the area by reducing the cut-off grade. The Cowper Point area, which becomes profitable under these conditions would alone increase the life of the operation by three years.

It is likely that the total life of the operation could significantly exceed ten years if the loading facility were available.

B.J. Cox
B.J. Cox

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1. INTRODUCTION

This report forms part of an overall study being made of the feasibility of exploiting heavy mineral sand deposits on King Island, for New Mount Costigan Mines Limited. The mining and treatment operations required to produce rutile and zircon are described, and estimates of capital and operating costs are included.

An initial 5-year mining programme is studied in detail, covering the proven reserves in the Naracoopa area. Additional reserves, both proven and indicated, extend the life of the operation to more than eight years, and comments are made on this aspect.

Critical evaluation of alternative methods or techniques was made at each stage of the proposed operation to ensure the selection of the method most appropriate to the conditions. This report represents the culmination of more than one year's investigation and reporting by the staff of Kenneth McMahon & Partners Pty. Ltd., many of whom have had considerable experience in the beach sand industry.

2. SUMMARY

At Naracoopa, on the east coast of King Island, areas covered by Special Prospecting Licences 2 and 7 contain reserves of heavy minerals sufficient to sustain production for five years at an annual rate of 10,000 tons* rutile and associated zircon, and further reserves are indicated within these and other areas covered by E.L. 10/65 and permits to enter. (See Appendix I - Ore Reserves).

Estimated capital cost of plant and equipment to produce at the rate of 10,000 tons rutile per year is \$600,000, with an additional \$110,000 required in the second year to increase wet concentrating plant capacity. Initial working capital of \$55,000 will be required.

During the initial 5-year period covered by this report, total net profit - after tax and provisions for depreciation - amounts to \$1,310,869, representing an average annual rate of return on capital employed of 37.2%.

Average working costs (including depreciation) are \$36.22 per ton (R. & Z.)

Estimates of capital and working costs are based on submissions by Warman Equipment (N.S.W.) Pty. Ltd., who also carried out test work on mineral concentration and separation.

Significant advantages would accrue from the establishment of facilities at Naracoopa for direct loading of products into overseas ships. Total net profit for the 5-year period would increase to \$1,660,241 and additional production life and profits would be assured (See Appendix V).

\$ 380,000 in 5 yrs.

* Long tons = 2240 lbs.

3. PROJECT FEASIBILITY

The estimated returns from the proposed operation are summarized in Table I. These refer only to the initial five-year period covered by this report. A revised feasibility, including production from the dune deposits at Cowper Point, and based on direct loading of products to overseas ships at Naracoopa, is given in Appendix V.

F.O.B. Prices

In this study, F.O.B. prices for Rutile (\$85 per ton) and Zircon (\$30) are considered realistic in the light of current conditions in the industry. Anticipated future price rises have not been used, as these could be roughly offset by increases in operating cost components.

Rutile & Zircon Recoveries & Grades

In this study, an overall recovery of 85% has been adopted for rutile and zircon, which is considered realistic in the light of current conditions in the industry. No difficulties are envisaged in producing a high quality rutile product, but zircon quality will probably not exceed 'standard grade' without some sacrifice of recovery or cost of production. Accordingly, zircon has been valued at \$30 per ton F.O.B. which corresponds with the price and quality of that produced in West Australia.

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TABLE I: PROJECT FEASIBILITY

Year	1	2	3	4	5
Production tons Rutile Zircon	10,000 11,927	10,000 8,031	10,000 7,706	10,000 7,706	10,000 7,706
Area Mined	Sea & Milford Beaches	Sea-Milford Lanherne Beaches	Lanherne Beach	Lanherne Beach	Lanherne Beach
Prices F.O.B. Rutile Zircon	85 30	85 30	85 30	85 30	85 30
<u>NET SALES</u> less cost of Production	1,168,670 616,997	1,057,634 555,413	1,048,371 498,276	1,048,371 498,276	1,048,371 498,276
Marginal Income less Prov. for Depreciation	551,673 119,500	502,221 146,219	550,095 146,219	550,095 146,219	550,095 146,219
GROSS PROFIT Less Tax at 42.5c (20% Exempt)	432,173 146,939	356,002 121,041	403,876 137,318	403,876 137,318	403,876 137,318
NET PROFIT	285,234	234,961	266,558	266,558	266,558
Total Net Profit					1,319,869
Capital Equipment Working Capital (Loan Funds) Net Profit as Percentage of Capital Employed	600,000 55,000 43.5	710,000 33.1	710,000 37.5	710,000 37.5	710,000 37.5

4. GENERAL DESCRIPTION OF OPERATIONS

During the initial phase of the operation, heavy mineral concentrates recovered by dragline from the Sea and Milford beaches, will be upgraded by normal gravity concentration techniques prior to wet magnetic separation for rejection of ilmenite.

Following air drying, the non-magnetic concentrates will be kiln-dried and subjected to standard high-tension and magnetic separation techniques for the recovery of rutile and zircon.

The dry mill will be located at Naracoopa near the mouth of the Fraser River, and the initial wet concentration will be located adjacent to it.

At the end of the first year, the grade of ore mined will be such that additional upgrading stages will be required. Throughput rate to the primary upgrader will also be doubled, to maintain the target level of production.

The second phase of the operation, which begins during the second year, involves the recovery of ore from the Lanherne beach by dredging. Rougher Mill throughput rate will again be increased to accommodate lower grade feed.

Final products will be stored in plastic bags of 3-tons capacity, especially designed for mechanical handling, and transported by sea to Stanley on the North-West coast of Tasmania. Despatch to oversea customers will be in bulk, and the empty bags returned to King Island for re-use.

Water for sand pulping and wet concentrating plant will be supplied from a small dam on the Fraser River. Plant tailings will be pumped to mined-out areas; no allowance has been made in the cost estimates for restoration.

5. CAPITAL COST SCHEDULE

Capital expenditure on plant and equipment is estimated to be - \$600,000 in Year 1
plus \$110,000 in Year 2.

This is summarized in Table II below:-

Category	Year 1	Year 2
Buildings & Foundations	\$107,629	-
Mining & Ore Transfer	18,551	\$81,674
Rougher Mill	28,326	28,326
Cleaner Mill	47,627	-
Wet Tabling	42,843	-
Dry Mill	154,502	-
Water Supply	7,886	-
Pipelines, Valves etc.	44,954	-
Power Supply	81,416	-
Roads, Vehicles, Houses Offices & Equipment etc.	55,639	-
Sub-Total	589,373	110,000
Commissioning	8,000	-

Notes

- (1) The above estimates include allowances for Insurance (1%), Engineering (8%) and Contingencies (5%).
- (2) No allowance has been made for capital cost of mining equipment in phase 1 (Sea and Milford beaches) where the dragline operation will be done under contract.
- (3) Details of Capital cost estimates are set out in Appendix III.

6. OPERATING COST SCHEDULE

Estimates of Operating Costs for the first five years are summarized in table 3.

In Appendix IV, detailed estimates of working costs are tabulated under a unit operations classification.

Average cost of sales (including depreciation) varies from \$33.58 to \$38.91 per ton of (R + Z).

Table 3 - OPERATING COST SCHEDULE
 (Sea, Milford & Lanherne Beaches Operation)

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			Year 1	Year 2	Year 3	Year 4	Year 5
Item	Production tons	Rutile Zircon	10,000 11,927	10,000 8,031	10,000 7,706	10,000 7,706	10,000 7,706
FIXED & SEMI-VARIABLE COSTS:							
Mining Contract		\$	65,895	66,528	-	-	-
Mining - Dredge Operating Labour			85,327	93,428	33,048	33,048	33,048
Maintenance Stores			10,000	20,000	98,232	98,232	98,232
Fuels & Oils			25,250	30,000	30,000	30,000	30,000
Insurance			9,000	30,000	37,100	37,100	37,100
Communications			7,500	10,000	10,000	10,000	10,000
Auditors			5,000	8,000	8,000	8,000	8,000
Company Registers			10,000	5,000	5,000	5,000	5,000
Miscellaneous			46,000	10,000	10,000	10,000	10,000
			43,800	43,800	43,800	43,800	43,800
	Sub Total	\$	263,972	296,670	275,180	275,180	275,180
VARIABLE COSTS							
Transfer to F.O.B. - Contract			339,869	247,924	212,472	212,472	212,472
- Stores			13,156	10,819	10,624	10,624	10,624
	Sub Total	\$	353,025	258,743	223,096	223,096	223,096
TOTAL COST OF PRODUCTION TO F.O.B.			616,997	555,413	498,276	498,276	498,276
PROVISION FOR DEPRECIATION			119,500	146,219	146,219	146,219	146,219
TOTAL COST OF SALES			\$ 736,497	\$ 701,632	\$ 644,495	\$ 644,495	\$ 644,495
Average Cost of Sales per Ton (R & Z)			\$ 33.58	\$ 38.91	\$ 36.40	\$ 36.40	\$ 36.40
Average Value of 1 ton (R & Z)			\$ 55.08	\$ 60.50	\$ 61.06	\$ 61.06	\$ 61.06

APPENDIX I - ORE RESERVES

Reserves of rutile-zircon sands on King Island have been described in separate reports by Kenneth McMahon & Partners Pty. Ltd. following extensive exploration and evaluation on behalf of New Mount Costigan Mines Ltd. Proven reserves which are of economic significance have been reported on the Sea, Milford and Lanherne beaches in the Naracoopa area, and in the high dunes at Cowper Point.

Relevant statistics which have been used in these reports are summarized in table 4.

Ore types vary from free sands in the Sea and Milford beaches and Cowper Point dunes to loosely-cemented and clay-bound in the Lanherne Beach area. Vegetation cover consists of bracken and marram grass, with small areas of light tea-tree scrub. No difficulties are envisaged in mining any of these areas by the proposed methods.

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Table 4 - ORE RESERVES

Area	Sand tons	Av. Grade % H.M.	Rutile			Zircon		
			Contained tons	Prop. in H.M.	Recover- able tons	Contained tons	Prop. in H.M.	Recover- able tons
Sea Beach - Naracoopa	101,318	28.4	2,807	9.74%	2,386	2,301	8.0%	1,956
Milford Beach - "	228,946	52.3	17,097	14.3%	14,533	18,386	15.4%	15,628
Lanherne Beach - "	4,012,635	8.93	42,542	11.87%	36,161	32,783	9.14%	27,865
Cowper Point Dunes	11,885,500	3.24	33,670	8.73%	28,620	29,460	7.64%	25,040

16,218,399

96,116

82,930

Naracoopa =

4,342,899

11.67

11.72

9.26

(1.37)

(1.08)

APPENDIX II - UNIT OPERATIONS1. Mining - Sea & Milford Beaches

Recoverable reserves of rutile (16,919 tons) and zircon (17,584 tons) in the Sea and Milford beaches will sustain operations for 85 weeks at the proposed rate of production.

Combined grade of these areas varies from 68% H.M. to 14.9% H.M.

The proposed method of ore extraction is by 1½ cu. yd. dragline, working two shifts per day, five days per week, operated by a contractor (No. 1 Flowsheet). The variation in ore grade requires an initial throughput rate of 40 tons per hour to be increased to 80 t.p.h. in week 45. (No. 2 Flowsheet).

Mined ore will be discharged into a receiving hopper from which it will be fed over a screen and pulped with water for pumping to the wet concentrating plant. The screen-hopper unit will be skid-mounted and towed behind the dragline. Rubber hose on the water supply and pulp delivery lines will permit flexibility of the mining unit; additional lengths of rigid pipe may be added during the night shift.

The presence of high grade mineral on the surface of the Sea and Milford beaches precludes the possibility of clearing grass and 'topsoil' ahead of the mining operation. Consequently, adequate screening capacity will be essential for the successful treatment of this area; a trommel screen is recommended because of its self-cleaning characteristic.

2. Mining - Lanherne Beach

Ore reserves of the Lanherne beach, between the Fraser River and line 35, average 8.9% Heavy Mineral, and contain 36,161 tons recoverable rutile and 27,865 tons recoverable zircon.

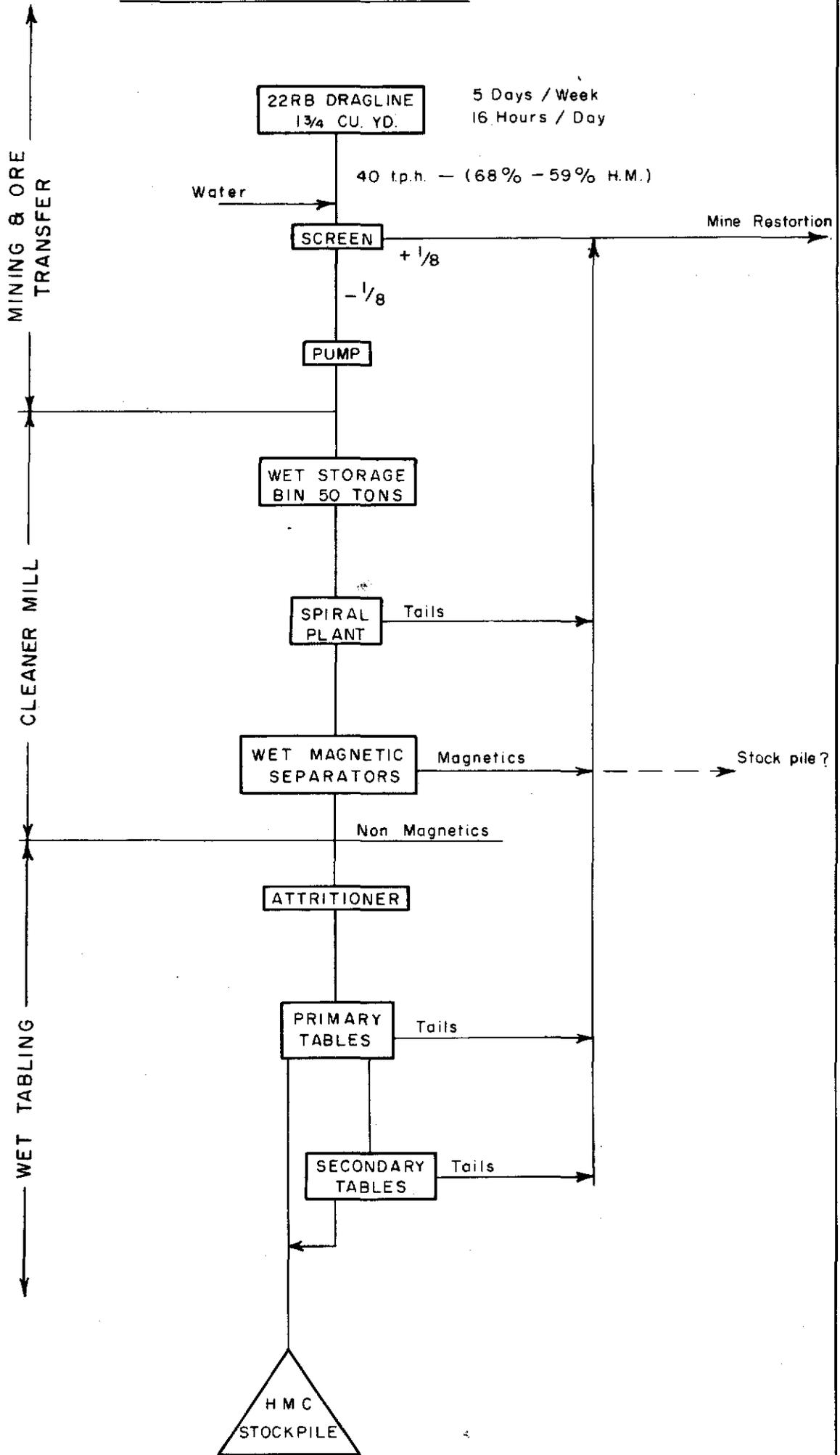
Mining will be by suction-cutter dredge at 170 tons per hour throughput, working 24 hours per day, 6 days per week (No. 3 Flowsheet).

The clay content and loosely-cemented nature of the Lanherne material presented no difficulty to Gemco drilling, and no unusual problems are expected with a cutter-assisted dredge. A relatively large pond may be necessary to allow settling of slimes, and some modification of water circuits could assist in control of slime content.

The dredge unit will deliver sand to the screening/pumping unit which may be either land-based or floating.

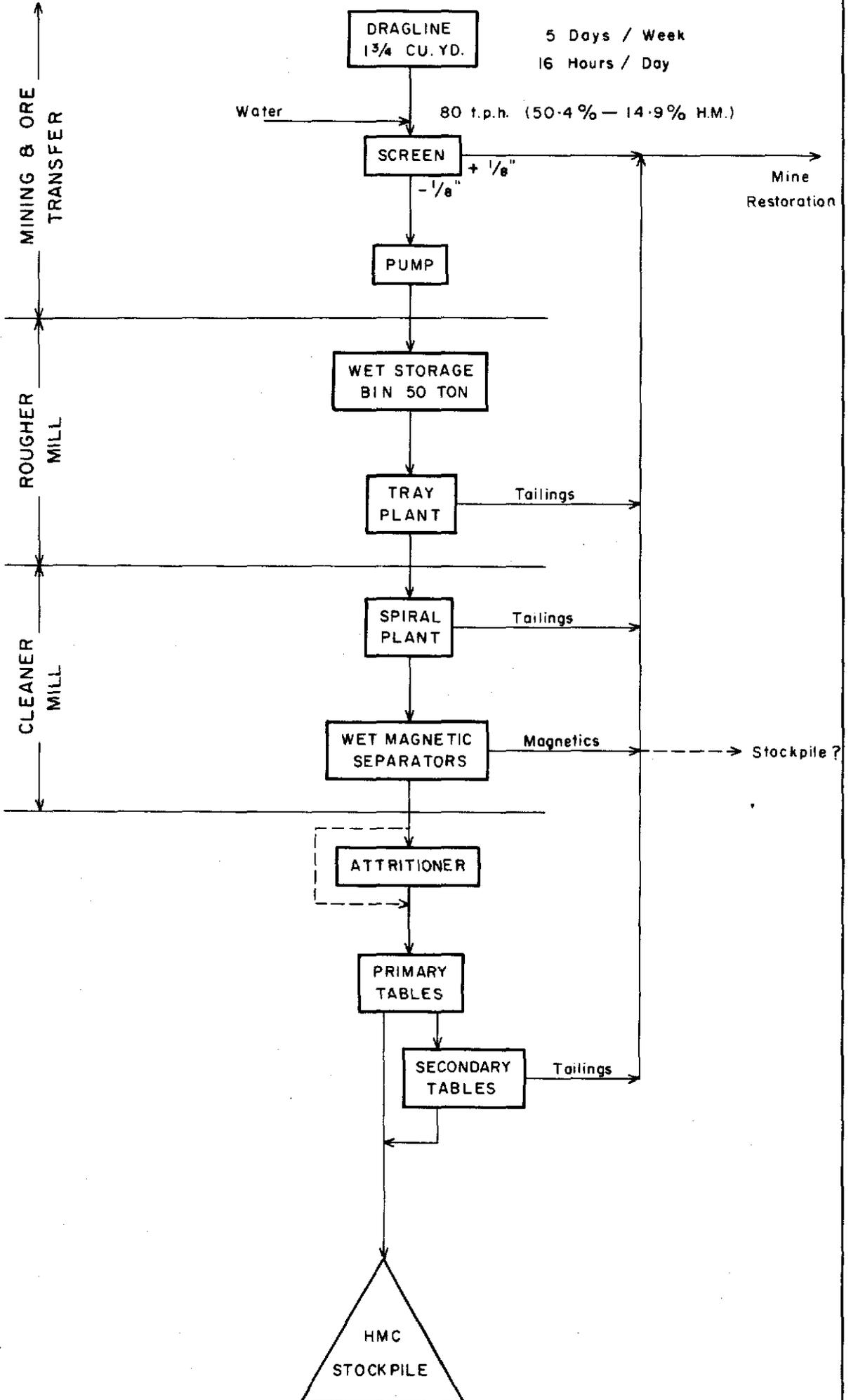
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No. I. FLOWSHEET - MINING & WET CONCENTRATION SEA & MILFORD BEACHES - STAGE I.



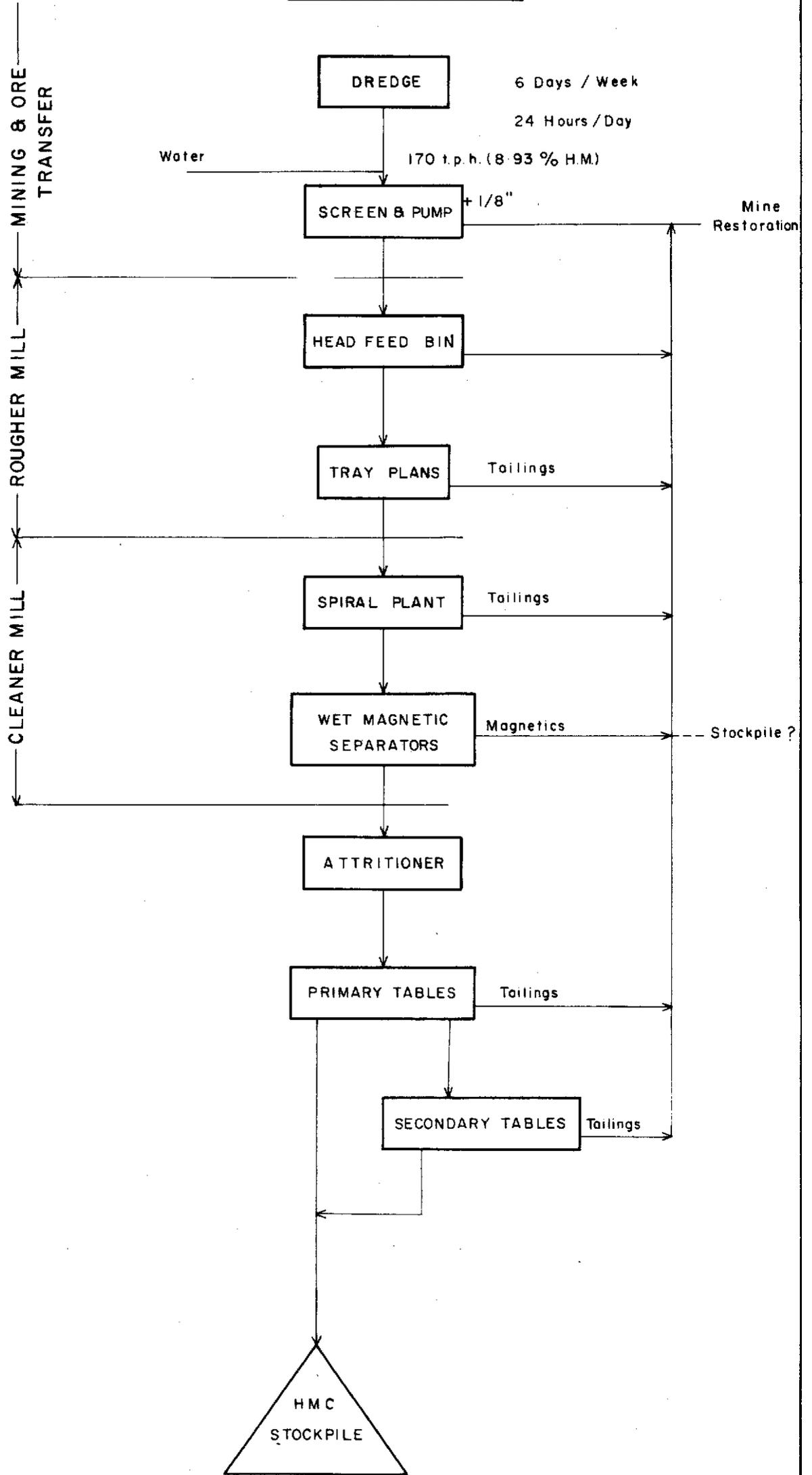
№ 2. FLOWSHEET – MINING & WET CONCENTRATION

SEA & MILFORD BEACHES – STAGE II



No. 3 FLOWSHEET - MINING & WET CONCENTRATION

LANHERNE BEACH



3. Rougher Mill

During the initial phase of mining the Sea & Milford beaches, no rougher mill stage is required, since the ore grade as mined exceeds 50% H.M. When ore grade falls below this level, a rougher mill consisting of multi-variable trays will be used, with a feed capacity of 80 tons per hour. This rougher stage may be by-passed for short periods if required, and for close metallurgical control should be located adjacent to the cleaner mill.

Rougher mill capacity will be doubled when dredging of the Lanherne beach commences. This larger plant should still be located near the cleaner mill for the following reasons:-

- (a) closer metallurgical control possible, and
 - (b) cheaper installation than a floating plant.
- (Refer Flowsheets 1, 2 and 3).

4. Cleaner Mill

The Cleaner Mill will consist of standard gravity concentration equipment for upgrading of heavy mineral concentrates from the rougher mill. Wet magnetic separators will also be employed for the rejection of ilmenite, thereby reducing capital costs of the tabling plant and cost of drying feed to the dry mill.

Operation of the cleaner mill will follow the mining cycle; i.e. ten-shifts per week in the initial stages increasing to eighteen shifts per week from the end of the second year.

A wet tabling section, consisting of primary and secondary Wilfley tables, will work in series with the cleaner mill. Moderate loadings on the tables should eliminate the possibility of losses of fine zircon in this section.

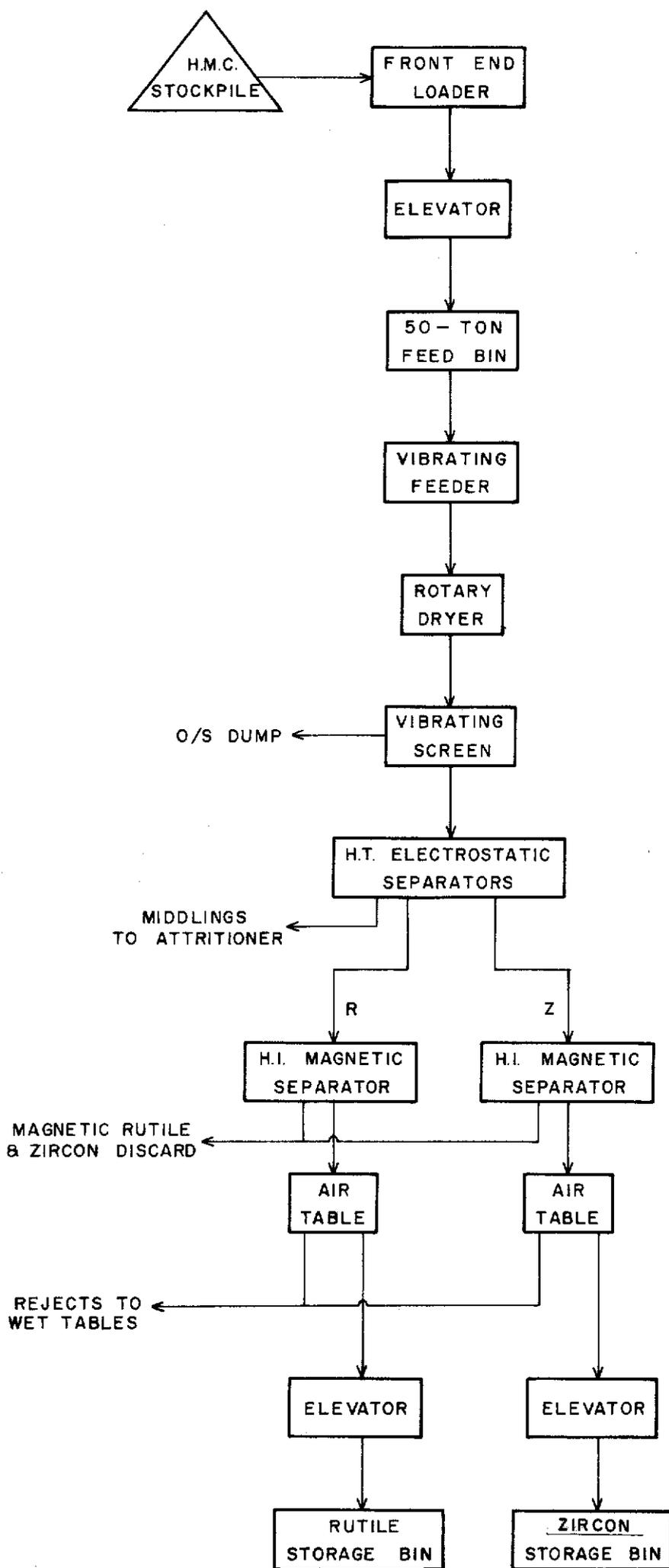
An attritioning unit which has been included prior to the wet tables, will be essential when treating Lanherne beach material, but may be by-passed in the earlier stages.

Silica-free concentrates from the wet tabling section will be ground-stockpiled for drainage and air drying. (See Flowsheets 1, 2 and 3).

5. Dry Separation Plant

Standard equipment and methods for the dry separation of rutile and zircon will be used. (See Flowsheet No. 4). High tension electrostatic separators and high intensity magnetic separators, followed by air tabling of the products, will produce rutile and zircon concentrates suitable for bulk storage, bagging and despatch. All equipment has been selected on the basis of moderate loadings thereby permitting significant plant adjustments to compensate for variations in ore type.

FLWSHEET - DRY SEPARATION



Test work done in the laboratory of Worman Equipment (N.S.W.) Pty. Ltd. indicates that no difficulty will be encountered in meeting specification of rutile, but close control will be required to produce an acceptable grade zircon. It is considered that sufficient equipment and capacity has been included to overcome problems which may arise in this section.

A plant site has been selected within the Lanherne area, on Line 10 corresponding to a low grade block. Centrally situated, it allows for easy disposal of tailings and proximity to water supply.

6. Shipping & Handling

The handling of products to F.O.B. overseas ship represents more than one third of the total cost of production. Detailed investigations were therefore carried out in order to arrive at the most efficient method of handling and shipping, at the King Island end and also at the port of delivery to overseas ship. Port and storage facilities were closely inspected at Naracoopa, Grassy and Currie (King Island); Stanley and Burnie (Tasmania); and Melbourne (Victoria).

Among the many alternatives considered, the following were adopted as the basis for costing. These appear at this stage to be the most logical and most economical methods, but it is possible that a third alternative could be feasible at some time during the life of the operation viz. the direct loading into overseas ships at Naracoopa.

Method 1

Products are handled in 2-3 ton plastic bags, by normal mechanical handling equipment to a port on King Island (Naracoopa or Currie) thence by chartered coastal ship to Stanley on the North-West coast of Tasmania. Bags are stored in wharfside sheds at Stanley, and exported in 2000-3000 ton bulk shipments every 6-8 weeks. Empty plastic bags are returned to King Island for further use.

Method 2

Toward the end of 1969, a new roll-on/roll-off service is expected to commence between Melbourne, King Island (east coast) and Stanley.

Freight rates offered by this service are extremely attractive, and present indications are that this service will be used in place of the chartered ship mentioned in Method 1. In all other respects, this method is identical to Method 1.

The possibility of direct loading into overseas ships at Naracoopa or Grassy is being examined further, but no firm proposal can be offered at this stage. However, the savings in costs of production which would follow, render the whole economics of the operation very much more attractive. In particular, the life of the operation would be significantly extended by rendering areas such as the Cowper Point Dunes profitable.

The effect of this factor on the feasibility of the operation is summarized in Appendix V

"Revised Profitability Estimate."

It is strongly recommended that the shipping and handling operations be negotiated with a contractor experienced in this field.

7. Water Supply

The banks of the Fraser River, near the proposed plant site, are fairly steep, and provide suitable sites for water storage. A proposed dam site is shown on the map attached to this report. Capital and operating cost estimates include allowances for storage tanks and pumps to supply fresh water to the plant. Water consumption can be minimized by the rationalization of water circuits, using a basic counter-current flow technique.

A large proportion of the operation is associated with ore extraction below natural water table, and especially when dredging operations commence, water supply is expected to be adequate under normal circumstances.

8. Ancillary Services

Reasonable allowances have been made in the estimates for roads and site preparation, vehicles and communications. Housing on King Island is reasonable and should be adequate for the small work force employed on this project. Better-class homes should be provided for key personnel, and this has been taken into consideration in the capital estimates.

Appendix III - CAPITAL COST DETAILS

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Item No.	Description	Units	Prime Cost \$	Additional Costs			Total Installed Cost
				Insurance	Contingencies	Engineering	
<u>BUILDINGS</u>							
1	Portal Frames, Bracing, Steelwork, etc.		28,130	86	1,400	2,250	31,866
2	Cladding, purlins, doors etc.		15,298	47	765	1,222	17,332
3	Concrete Foundations for Building and Equipment		18,750	57	937	1,500	21,244
4	Internal Steelwork, Stairways, etc.		32,822	100	1,641	2,624	37,187
<u>SCREENING and ORE TRANSFER</u>							
5	Mobile Tormmel Unit	1	16,373	50	818	1,310	18,551
<u>ROUGHER MILL</u>							
6	Mobile Rougher Unit	1	25,000	76	1,250	2,000	28,326
<u>CLEANER MILL</u>							
7	50-ton Wet Storage Bin, Discharge Valves	1	3,878	12	194	310	4,394
8	Bin Underflow Pump: 4/3 CAH and 15 HP Motor	1	1,411	4	70	113	1,598
9	Hopper and Pipes for Item 8	1	266	1	13	21	301
10	Spiral Concentrators (3 x 12) including frames	36	11,372	35	568	910	12,885
11	Launders for Item 10	1	2,129	6	106	170	2,441
12	Spiral Concentrates Pump: 3/2 CAH and 5 HP Motor	1	1,020	3	51	82	1,156
13	Spiral Tailings Pump: 3/2 CAH and 7½ HP Motor	1	1,020	3	51	82	1,156
14	Hoppers and Pipes for Items 12, 13	2	311	1	15	25	352
15	Wet Magnetic Separators, Reading and Gill lo-pole	3	16,611	51	830	1,329	18,821
Sub-Totals			174,391	532	8,709	13,948	197,580

Item No.	Description	Units	Prime Cost \$	Additional Costs			Total Installed Cost
				Insurance	Contingencies	Engineering	
	Balance C/f		174,391	532	8,709	13,948	197,580
16	Launders for Item 15	1	1,172	4	58	94	1,328
17	Non-Mags Pump: 1½/1 ABM and 7½ HP Motor	1	718	2	35	57	812
18	Mags. Pump: 1½/1 ABM and 5 HP Motor	1	673	2	33	54	762
19	Hoppers and Pipes for Items 17 and 18	2	500	1	25	40	566
20	Tailings Density Tank	1	957	3	48	77	1,085
	<u>WET TABLING PLANT</u>						
21	8" Warman Cyclone	1	589	2	29	47	667
22	Wemco Attrition Machine and 15 HP Motor	1	6,578	20	328	526	7,452
23	Underflow Pump: 1½/1 ABM and 5 HP Motor	1	1,063	3	53	85	1,204
24	Hopper and Pipes for Item 23	1	264	1	13	21	299
25	Distributor for Primary Tables	1	976	3	49	78	1,106
26	Primary Tables	4	13,880	42	694	1,110	15,726
27	Secondary Tables	2	6,556	20	327	525	7,428
28	Launders for Items 26, 27		2,869	9	143	230	3,251
29	Distributor for Secondary Tables	1	976	3	48	78	1,105
30	Table Conc. Pump: 1½/1 ABM and 7½ HP Motor	1	718	2	35	57	812
31	Table Mids. Pump: 1½/1 ABM and 5 HP Motor	1	673	2	33	54	762
32	Table Tails Pump: 1½/1 ABM and 3 HP Motor	1	658	2	32	53	745
33	6" Warman Cyclone	1	464	1	23	37	525
34	Hoppers and Pipes for Items 30, 31, 32	3	755	2	37	60	854
35	Cyclone Supporting Structure	1	801	2	40	64	907
	Sub-Totals		216,231	658	10,792	17,295	244,976

Item No.	Description	Units	Prime Cost \$	Additional Costs			Total Installed Cost
				Insurance	Contingencies	Engineering	
	Balance C/f		216,231	658	10,792	17,295	244,976
	<u>WATER SUPPLY</u>						
36	Water Storage Tank 25,000 gallons	1	3,784	12	189	303	4,286
37	Creek Water Pump: Ajax 4 LS and 5 HP Motor	1	475	1	24	38	538
38	Mains Supply Pump: Ajax 5 LS and 20 HP Motor	1	750	2	37	60	849
39	Head Tank 500 gallons	1	456	1	23	36	516
40	Concrete Dam	1	1,500	-	75	120	1,695
	<u>PIPELINES</u>						
41	Slurry Pipelines		20,187	62	1,009	1,615	22,873
42	Water Pipelines		17,558	54	877	1,406	19,895
43	Valves		725	2	36	58	821
	<u>DRY MILL</u>						
44	50-tons Feed Bin	1	4,000	12	200	320	4,532
45	Vibrating Feeder	1	479	1	24	38	542
46	Bucket Elevator 15' Ctrs. 1½ HP Motor	1	1,538	5	76	123	1,742
47	Rotary Dryer 4' Dia x 24' lg. with Drive	1	2,768	8	138	222	3,136
48	Vibrating Screen 60" x 120", 60 mesh	1	6,773	21	338	542	7,674
49	Feed and Discharge Chutes for Item 48	2	435	1	22	35	493
50	Bucket Elevators 30' Ctrs. 2 HP Motors	8	18,004	55	900	1,440	20,399
51	Reichert H.T. Separators 4-Roll	6	31,689	97	1,584	2,536	35,906
52	Rectifiers for Item 51	3	5,454	17	272	436	6,179
53	Underflow Pipes for Item 51		1,500	4	75	120	1,699
54	Reichert Magnetic Separators 4-Roll	3	28,962	89	1,448	2,315	32,814
	Sub-Totals		363,268	1,102	18,139	29,058	411,567

Item No.	Description	Units	Prime Cost \$	Additional Costs			Total Installed Cost
				Insurance	Contingencies	Engineering	
	Balance C/f		363,268	1,102	18,139	29,058	411,567
55	Underflow Pipes for Item 54		178	-	9	14	201
56	Conveyors under H.T. Separators	3	4,000	12	200	320	4,532
57	Oliver Air Table No. 160 and 7 $\frac{1}{2}$ H.P. Motor	2	9,618	29	480	769	10,896
58	Chutes for Item 57	3	1,042	3	52	83	1,180
59	Product Bins	2	10,930	33	546	875	12,384
60	Front-End Loader $\frac{3}{4}$ cu. yd.	1	7,000	21	-	-	7,021
61	Weightometers	2	2,800	8	140	224	3,172
62	Painting, Touchup etc.		1,300	-	65	-	1,365
	<u>ELECTRICAL</u>						
63	Cat. Diesel Set 180 KW	1	19,772	60	988	1,582	22,402
64	Cat. Diesel Set 80 KW	1	13,548	41	677	1,085	15,351
65	Diesel Fuel Storage Tank 5000 gallon	1	2,870	8	143	230	3,251
66	Foundations for Items 63, 65		550	-	28	44	622
67	Control Panels, Wiring etc.		37,500	115	1,875	300	39,790
	<u>ANCILLARY</u>						
68	Roads, Site Preparation		3,000	-	150	240	3,390
69	Houses, Senior Staff	3	34,000	-	1,700	-	35,700
70	Office and Equipment		10,000	31	500	-	10,531
71	Vehicles (St. Sedan, L. Rover)	2	6,000	18	-	-	6,018
Total - Initial Plant			527,376	1,481	25,692	34,824	589,373

Item No.	Description	Units	Prime Cost \$	Additional Costs			Total Installed Cost
				Insurance	Contingencies	Engineering	
	<u>ADDITIONAL PLANT - YEAR 2</u>						
72	170 tph Dredge and Pipe line	1	56,000	280	2,800	4,480	63,560
73	No. 2 Mobile Trommel Unit	1	16,373	50	818	1,310	18,551
74	No. 2 Mobile Rougher Unit	1	25,000	76	1,250	2,000	28,326
	Total Additional Plant		97,373	406	4,868	7,790	110,437

APPENDIX IV - OPERATING COST DETAILS - YEAR 1

Ore Treated: 161,280 tons
 Rutile Produced: 10,000 tons
 Zircon Produced: 11,927 tons

Section	Contract \$	Labour \$	Fuel-Power Gen & Dryer \$	Stores R & M \$	Deprecn. \$	Total \$	Cost per Ton of Ore cents	Cost per Ton (R + Z) \$	Proportion of Total Cost %
A. Mining & Ore Transfer	65,895	-	6,140	1,600	8,938	82,573	51.2	3.76	11.2
B. Rougher Milling	-	1,747	590	550	12,330	15,217	9.4*	0.69	2.1
C. Cleaner Milling	-	15,394	4,700	3,100	21,708	44,902	27.8	2.05	6.1
D. Water Supply	-	5,509	2,360	600	7,520	15,989	9.9	0.73	2.2
E. Road Transport	-	-	-	-	-	-	-	-	-
F. Dry Milling	-	19,237	10,110	4,200	56,276	89,823	55.7	4.10	12.2
G. Sea Transport & Others to F.O.B.	339,869	-	-	13,156	-	353,025	218.9	16.10	47.9
H. Administration	-	43,440	-	1,300	12,728	57,468	35.6	2.62	7.8
Sub-Total	405,764	85,327	23,900	24,506	119,500	658,997	408.6	30.05	
Cost per ton of Ore - cents	251.6	52.9	14.8	15.2	74.1	408.6			
Cost per ton (R + Z) - \$	18.50	3.89	1.09	1.12	5.45	30.05			
I. Other Overheads etc.						77,500	48.0	3.53	10.5
TOTAL COST						\$736,497	456.6	33.58	100.0

Notes:

(1) Average Value 1 Ton (R + Z) = \$55.08

* (2) Rougher Milling Costs apply for 6 weeks only

OPERATING COST DETAILS - YEAR 2

Ore Treated: 491,600 tons
 Rutile Produced: 10,000 tons
 Zircon Produced: 8,031 tons

Sections	Contract	Labour	Fuel-Power Gen. & Dry- er	Stores R + M	Deprecn.	Total	Cost per Ton of Ore cents	Cost per Ton (R + Z) \$	Proportion of Total Cost %
	\$	\$	\$	\$	\$	\$			
A. Mining & Ore Transfer	66,528	7,526	8,429	4,847	28,576	115,906	23.6	6.43	16.5
B. Rougher Milling	-	14,734	7,500	5,150	19,411	46,795	9.5	2.60	6.7
C. Cleaner Milling	-	11,302	4,510	4,100	21,706	41,620	8.5	2.31	6.0
D. Water Supply	-	3,408	2,270	1,100	7,520	14,298	2.9	0.79	2.0
E. Road Transport	-	-	-	-	-	-	-	-	-
F. Dry Milling	-	17,136	9,940	6,150	56,276	89,502	18.2	4.96	12.8
G. Sea Transport & Others to F.O.B.	247,924	-	-	10,819	-	258,743	52.6	14.35	36.9
H. Administration	-	43,440	-	1,800	12,728	57,968	11.8	3.21	8.2
Sub-Total	314,452	97,546	32,649	33,966	146,219	624,832	127.1	34.65	
Cost per Ton of Ore - cents	64.0	19.8	6.6	6.9	29.8	127.1			
Cost per Ton (R+Z) - \$	17.44	5.41	1.81	1.88	8.11	34.65			
I. Other Overheads						76,800	15.6	4.26	10.9
TOTAL COST						\$701,632	142.7	38.91	100.0

Note:

(1) Average Value 1 Ton (R+Z) = \$60.50

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OPERATING COST DETAILS - YEARS 3,4, 5

Ore Treated: 1,101,600 tons
 Rutile Produced: 10,000 tons
 Zircon Produced: 7,706 tons

Section	Contract \$	Labour \$	Fuel-Power Gen. & Dry- er \$	Stores R & M \$	Deprecn. \$	Total \$	Cost per Ton of Ore cents	Cost per Ton (R + Z) \$	Proportion of Total Cost %
A. Mining & Ore Transfer	-	17,178	15,733	11,549	28,576	73,036	6.6	4.12	11.3
B. Rougher Milling	-	17,136	12,048	8,150	19,411	56,745	5.1	3.20	8.8
C. Cleaner Milling	-	13,704	6,429	6,100	21,708	47,941	4.4	2.71	7.4
D. Water Supply	-	3,408	3,244	1,600	7,520	15,772	1.4	0.89	2.4
E. Road Transport	-	-	-	-	-	-	-	-	-
F. Dry Milling	-	17,136	11,375	7,150	56,276	91,937	8.3	5.19	14.3
G. Sea Transport & Others to F.O.B.	212,472	-	-	10,624	-	223,096	20.3	12.60	34.7
H. Administration	-	43,440	-	3,000	12,728	59,168	5.4	3.34	9.2
Sub-Total	212,472	112,002	48,829	48,173	146,219	567,695	51.5	32.06	
Cost per ton of Ore - cents	19.3	10.2	4.4	4.3	13.3	51.5			
Cost per ton (R+Z) - \$	12.00	6.32	2.76	2.72	8.26	32.06			
I. Other Overheads						76,800	7.0	4.34	11.9
TOTAL COST						\$644,495	58.5	36.40	100.0

Note:

(1) Average Value 1 Ton (R+Z) = \$61.06

APPENDIX V - REVISED PROFITABILITY ESTIMATE

Overseas Loading Facilities at Naracoopa, January, 1970

	Year 1 1.7.68- 30.6.69	Year 2 1.7.69- 30.6.70	Year 3 1.7.70- 30.6.71	Year 4 1.7.71- 30.6.73	Year 5 1.7.72- 30.6.73	Year 6 1.7.73- 30.6.74	Year 7 1.7.74- 30.6.75	Year 8 1.7.75- 30.6.76
Net Sales less cost of Production	\$ 1,168,670	1,057,634	1,048,371	1,048,371	1,048,371	1,068,947	1,078,125	1,078,125
	263,972	296,670	275,180	275,180	275,180	453,278	531,405	531,405
less costs to F.O.B.*	904,698	760,964	773,191	773,191	773,191	615,669	546,720	546,720
	353,025	183,910	76,136	76,136	76,136	79,240	80,625	80,625
MARGINAL INCOME less Prov. for Deprec.	\$ 551,673	577,054	697,055	697,055	697,055	536,429	466,095	466,095
	119,500	146,219	146,219	146,219	146,219	200,000	200,000	200,000
GROSS PROFIT Taxable Income less Tax @ 42.5c	\$ 432,173	430,835	550,836	550,836	550,836	336,429	266,095	266,095
	(345,738)	(344,668)	(440,669)	(440,669)	(440,669)	(269,143)	(212,876)	(212,876)
	146,939	146,484	187,284	187,284	187,284	114,386	90,472	90,472
NET PROFIT after Tax & Depreciation	285,234	284,351	363,552	363,552	363,552	222,043	175,623	175,623
Cum. Tax	146,939	293,423	480,707	667,991	855,275	969,661	1,060,133	1,150,605
Cum. Net Profit	285,234	569,585	933,137	1,296,689	1,660,241	1,882,284	2,057,907	2,233,530

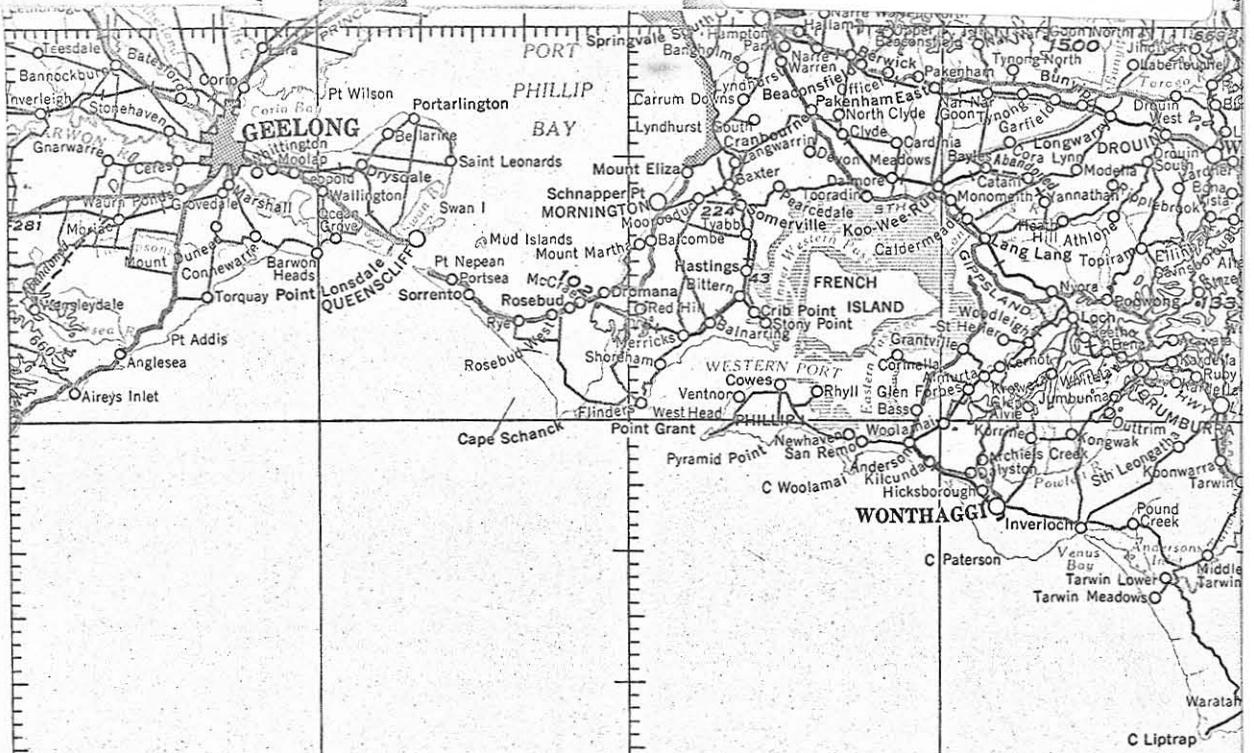
AMG REFERENCE POINTS ADDED

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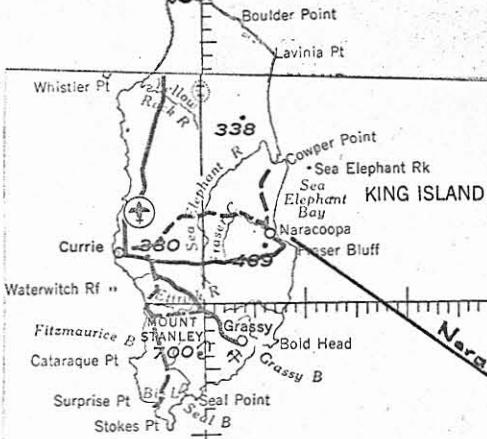


VICTORIA

TASMANIA

B A S S

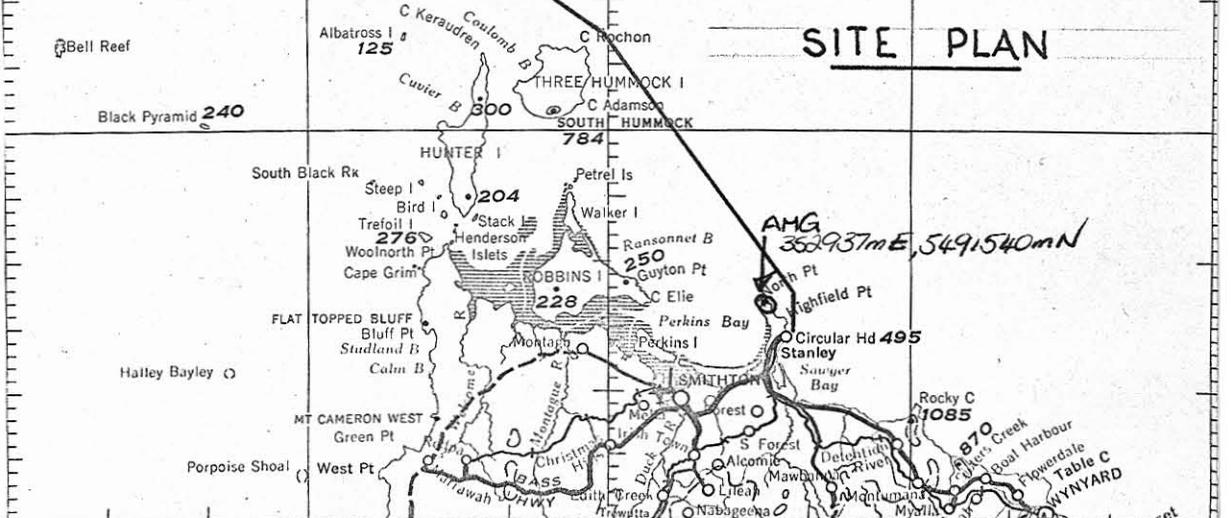
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337600mE
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B A S S

SCALE : 15.78 MILES TO 1 INCH

SITE PLAN



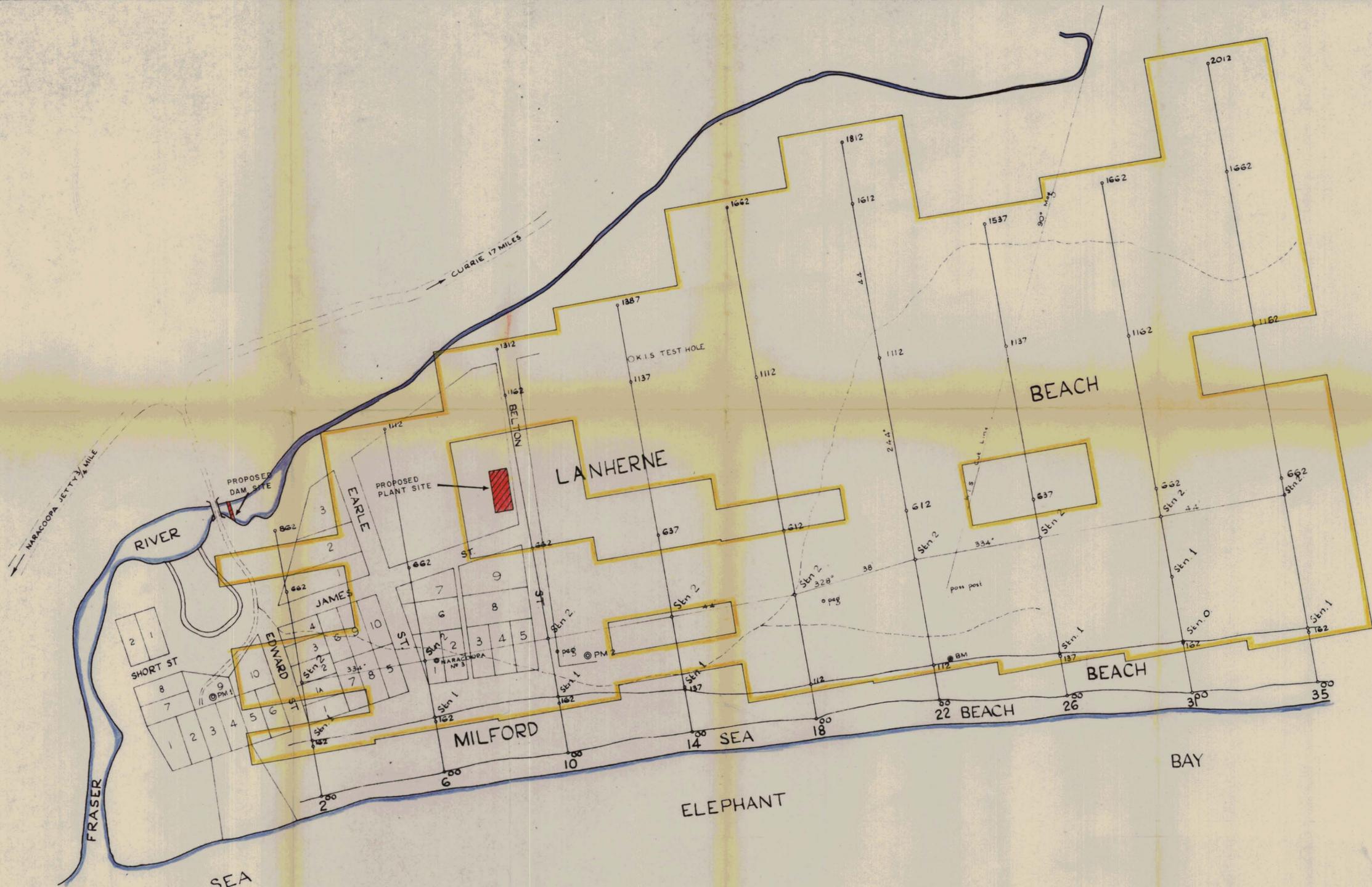
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5 cm

VICTORIA

TASMANIA

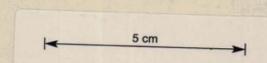
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BASS

STRAIT

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MT. COSTIGAN MINES LIMITED	
NARACOOPA	Scale: 1" = 200'
GRID LAYOUT	Date: May, 1967
ON	Plan No. 1.
LANHERNE BEACH	
KENNETH McMAHON & PARTNERS PTY. LTD.	