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MOUNT COSTIGAN MINES LIMITED

King Island Mineral Sands

Surprise Bay and Yellow Rock  
E.L. 13/66 and E.L. 14/66

A PRELIMINARY REPORT

by

C. BYRNE

December, 1966.

**MICROFILMED**

AMG REFERENCE POINTS ADDED

CONTENTS

Introduction  
The Leases  
Outline of Solid Geology  
Beach and Dune Deposits  
Heavy Mineral Content and Economic Possibilities

ACCOMPANYING FIGURES

1. Map showing positions of leases
2. Sketch map of solid geology
3. Beach and Dune Deposits - Surprise Bay
4. Beach and Dune Deposits - Yellow Rock
5. Duck Bay
6. Stokes Point

Surprise Bay - Yellow RockKing Island Mineral Sands.INTRODUCTION

King Island is situated on the western entrance to Bass Strait, midway between Victoria and Tasmania. Its greatest length north-south is 40 miles and maximum width about 16 miles. It covers about 450 sq. miles and has a maximum height of about 550 feet.

The island lacks good harbour facilities; Currie harbour cannot take ships greater than 300 tons and the jetty at Naracoopa, capable of handling larger ships, is unsheltered from a frequently stormy sea. It is well serviced by aircraft to Currie from Melbourne and Tasmania.

Within the island, most areas are readily accessible by roads and tracks.

The three areas being considered are in the east, south and north-west and contain considerable beach and dune deposits which contain heavy mineral concentrations ranging from very high to very low.

This report is concerned primarily with the extent, heavy mineral concentration, and economic possibilities of sand deposits in the north-western and southern areas.

THE LEASES

The position with regard to the leases is indicated on Fig. 1. The areas include two leases recently taken up and held by Dr. Young of Mount Costigan Mines Limited and a further area on the east coast between Naracoopa and the mouth of the Sea Elephant River.

The two new leases are under Exploration Licences 13/66 and 14/66 and are referred to as the Surprise Bay and Yellow Rock areas respectively.

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In the south the Surprise Bay lease covers an area of roughly 35 sq. miles and occupies the whole of the Wayanna Parish. Yellow Rock in the north-west covers an area of about 17 sq. miles and is bounded on the south by the Pass River, on the east by the North Road, on the north by the South Yellow Rock Road, and on the west by the sea.

At Yellow Rock and Surprise Bay most of the dune areas are grass covered and extensive agriculture, with sheep and beef and dairy cattle grazing is practiced. Thick scrub persists over much of the inland areas with extensive swamp and marsh conditions in low lying regions making the land unsuitable for agriculture. Large scrub areas with better drainage are still being cleared.

#### OUTLINE OF SOLID GEOLOGY (Fig. 2)

Most of the island is covered by Pleistocene to recent superficial deposits and outcrops of solid rock away from the immediate coast are <sup>uncommon</sup> ~~common~~.

##### Yellow Rock

All outcrops examined along the shore were of granitic rocks. The rocks ranged in composition from granodiorite to "normal" granite. A tourmaline (?) rich variety outcrops inland at a gravel pit on block 102.1.20 near the junction of the North and South Yellow Rock Roads. Loose boulders of micaceous quartzite and slate in the gravel pit may be transported from elsewhere but seem more likely to indicate a possible contact or at least a large xenolithic body. Time did not permit more than a cursory examination.

##### Surprise Bay

Underlying most of the area and outcropping along the coast (except for the bays) from just north of Seal Rocks to the Red Hut Headland are a series of rocks belonging to a folded Precambrian (?) metamorphic complex and includes quartzites, slates, schists, knotted schists and phyllites. Similar rocks also outcrop for a few miles north of Fitzmaurice Bay. They are steeply dipping and strike nearly north-south. They are intruded by a series of acid plutonics on the

004

west at Cataraque Pt. and on the east, from the eastern side of the Red Hut Headland to the western end of Grassy Bay. Jennings (1959, p. 4) suggests they are "probably of the Tabberahberan Orogeny" but they may well be related to the Cambrian granites.

The Cataraque Pt. granite is the southern end of the granitic belt which extends through the Yellow Rock area. The eastern contact of the granite in Fitzmaurice Bay is gradational in parts and shows some replacement features (bedding etc.). Lenticular xenoliths and pegmatitic veins rich in quartz and feldspar are common. A tongue of metamorphics extends into the granite on the south side of the point.

Tertiary bryozoal limestone outcrops about three-quarters of a mile north of the eastern end of Big Swamp. It outcrops for about 50 feet along the banks of the major tributary of the Seal River. Specimens collected have been given to Mr. P. Quilty of the Geology Department, University of Tasmania.

#### BEACH AND DUNE DEPOSITS (Figs. 3 and 4)

Two dune systems are readily recognisable in the two areas and these have been called the Old and New Dunes (Jennings, 1959).

##### New Dunes

The New Dunes form a more or less continuous coastal rim around the areas concerned. They are generally fixed by vegetation and have not been degraded much from their form at fixation. They are usually parabolic dunes and are either simple or composite. Simple conical dunes also occur. The dunes have a maximum height of 300-400 feet but are usually smaller. The inland margin is distinctly lobate (due to the complex parabolic pattern) and is readily discernible both on the ground and on air-photographs. In places (e.g. at Yellow Rock) two belts of parabolic dunes are easily recognised.

Blowouts are more common in the near-shore dunes although they do occur inland, where they appear to be due, at least partly, to overgrazing and firing.

The composition of the dunes is dominantly shelly sand with a low heavy mineral fraction which shall be discussed later.

Calcareous and organic rich hard pans are developed and observable in blowouts and dune cliffs. In some places the two are observable in the one blowout. The organic hardpan is a misnomer in some respects as it is commonly soft but somewhat more consolidated than the overlying sand. This pan is generally 5 to 6 feet below the surface and ranges in thickness from several inches to a few feet.

The calcareous hardpan or "sandrock" generally occurs at a greater depth (5 to 20 feet) and may be 20 feet or greater in thickness. Steep angled cross-bedding is shown in some of the more massive outcrops as in a dune cliff 100 yards south of the mouth of the Pass River and in a blowout near Seal Rocks (the "Petrified Forest"). The sandrock is an off-white (fresh) to light grey (weathered) deposit of shelly sand cemented by the action of secondary solutions.

#### Old Dunes

The Old Dunes are more sporadic in distribution and subdued in nature. A lobate inland margin is only recognisable in places. These dunes generally lie inland of the New Dunes and are rather feature-less with respect to dune shape.

The Old Dunes are dominantly quartz aeolianite in the Surprise Bay area but, at Yellow Rock, have a higher shell content.

A dark brown organic-rich hardpan, locally known as "coffee rock" and which may be up to several feet thick, is overlain by several feet of bleached quartz sand.

The Old Dunes extend to, or close to, present sea level and are probably overlain to a large extent by the New Dune system. Jennings (1959, p.11) suggests the sandrock "seems more likely to be of Old Dune provenance perhaps covered by New Dune aeolianite".

Earlier Sand Deposits

A mantle of sandy material covers most of the remaining inland areas. It is quite likely that the Old Dunes have a wider distribution than indicated on the map. Just how much more extensive they are cannot be estimated at this stage. A few boreholes in areas not indicated as Old Dunes revealed a few feet of bleached sandy material which appeared indistinguishable from that in the Old Dunes.

Surprise Bay

New Dunes cover about 7 sq. miles within the lease area. They are for the most part continuous around the coast except for the 5 mile coastline between Cataraque Point and Surprise Point along which the New Dunes extend a total of only 1 1/2 miles. Cobble ramparts and marine terraces at various heights above present sea level are well developed along the rocky west coast and western sides of the major headlands. Where rock platforms etc. are exposed along the shore (e.g. Stokes Point) the boundary between dune and dominantly rock is somewhat arbitrary.

In Seal Bay, west of the mouth of the Seal River, up to 3 foredunes are developed in front of a fixed dune cliff. These primary dunes are probably related in age to the Milford beach at Naracoopa.

Three foredunes, or sand beach ridges, developed on the Red Hut Headland have been measured by Jennings at 22 and 49 feet above sea level and are probably related to the Old Dunes.

West of the Red Hut Headland, between the New and Old Dune belts, there is a depression partly occupied by Big Lake and Big Swamp. Strand lines around the northern and eastern margins of the lake suggest: by their orientation that they are probably related to different levels: of the lake and not to an old shoreline as at Naracoopa. Behind the depression the Old Dunes appear as a series of NE-SW ridges which might represent the end result in parabolic dune formation.

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About 1 mile west of the junction of the South Road and the track running east behind Big Lake, are numerous well rounded, subtabular quartz boulders. These occur on a north-south ridge top on the recently cleared property of Mr. P. Bowling and are thought to indicate an old beach.

A ridge running south from near Mt. Stanley to the Red Hut Headland represents the western margin of a high plateau. This plateau and the high west coastline between Cataraque Point and Surprise Point surround a subtriangular lowland area.

#### Yellow Rock

New Dunes form a continuous coastal rim in the lease area and cover about 7 sq. miles. Behind the beach on each side of the Yellow Rock foreland are a series of up to 3 foredunes (but generally only one or two). Towards their southern extent, the depression between or behind them is occupied by marsh. Similar dunes are also formed near the mouth of Eel Creek. Immediately behind the foredunes are the secondary dunes, two belts of which are readily discernible in certain areas. These dunes extend  $\frac{1}{2}$  to 2 miles inland and at least partly overly the Old Dunes. Much of the central area of the lease behind Bungaree Lagoon, is swampy and covered by thick scrub.

#### HEAVY MINERAL CONTENT AND ECONOMIC POSSIBILITIES

No sampling for laboratory analysis has yet been done in the two area concerned. Panning by Mr. W. D. Bartlett and attempts by myself have revealed low concentrations of heavy minerals varying in amount and mineral species in the following localities:

<u>Surprise Bay</u>	<u>Concentration</u>
New Dunes	
South Fitzmaurice Bay	Low.
Near the "Petrified Forest"	Not detected
Surprise Bay	Very low
Blowout west of Red Hut Headland	Low

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Surprise BayConcentration

## Old Dunes and Earlier Deposits

1 mile SE of Cataraque Pt.	Low
1 mile west of Seal Rocks	Low
Near track $1\frac{1}{2}$ miles SW of Pearshape	Low
Near strand lines north of Big Lake	Low

Yellow Rock

## New Dunes

Near mouth Yellow Rock River	Low
Whistler Pt.	Not detected
Mouth of Eel Creek	Very low

## Old Dunes etc.

Gravel Pit near junction N and S Yellow Rock Rds.	Low (Sn?)
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These "results" are not intended to indicate anything about the spatial distribution of heavy minerals but rather, that heavy minerals in low concentrations do occur in the Old and New Dune systems and in Earlier Deposits.

At some localities in the New Dunes (e.g. mouth of Yellow Rock River, South Fitzmaurice Bay, west of Red Hut Headland), thin bands of pale grey sand containing low to moderate (?) concentrations of heavy minerals are visible in the dunes. The heavy mineral grains commonly concentrate in minute gullies etc. in the dry sand.

If the high, moderate and low concentrations of heavy mineral in the Naracoopa area prove economic and if the project is proceeded with, then the establishment of a working plant etc. on the island would reduce the cut-off figure for other deposits and enhance the economic possibilities of these two areas.

Conclusions as to the origin of the heavy minerals (apart from coming from the basement rocks) would only be hazardous guesses at this stage.

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A few permanently (?) flowing creeks and rivers should provide sufficient water but the problems of this supply has not really been considered.

Future investigation should involve sampling from bores and pits along widely spaced traverses. Difficulties in hand-boring would be encountered with the hardpans and water table. Concentrations might be expected to vary above and below the sandrock.

References

- Jennings, J. N., 1959: The Coastal Geomorphology of King Island, Bass Strait, in Relation to Changes in the Relative Level of Land and Sea. Rec. Q. Vict. Mus., 11.
- Solomon, M., 1964 (?): King Island Mineral Sands - A Preliminary Appraisal. Unpub. report to Tas. Mines Dept.

10<sup>th</sup> January 1967

C. Byrne

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UNIVERSITY OF QUEENSLAND

St. Lucia, Brisbane.

Department of Mining and  
Metallurgical Engineering

29th June, 1967.

Mr. W. D. Bartlett,  
Mt. Costigan Mines Ltd.,  
CURRIE,  
King Island.

Dear Mr. Bartlett,

I have pleasure in forwarding herewith a test report on the sink-float tests on sand samples, prepared by Mr. R. O. Archbold, Senior Analyst of this Department.

I trust that this report will be of assistance to you.

Yours sincerely,

(Dr. L.M. Hogan)  
Acting-Head of Department of Mining &  
Metallurgical Engineering.

UNIVERSITY OF QUEENSLAND

DEPARTMENT OF MINING AND METALLURGICAL ENGINEERING

MINERAL INDUSTRIES RESEARCH AND TESTING SERVICES

Report on: Sink-float Tests on Sand Samples.

For: Kenneth McMahon & Partners Pty.Ltd., 291 George St., Sydney, N.S.W.  
W.D. Bartlett, Mt. Costigan Mines Ltd., Currie, King Island.

Your Ref: S B and Y R series

Date: 28th June, 1967.

	<u>No.</u>	<u>Depth</u>	<u>% Heavies</u>		<u>No.</u>	<u>Depth</u>	<u>% Heavies</u>
Hole 1	SB 1	1-5	0.64	4	26	10-15	0.26
	2	5-10	0.47		27	15-20	0.35
	3	10-15	0.56		28	20-25	0.70
	4	15-20	0.56		29	25-30	0.65
	5	20-25	0.52	30	30-33	0.73	
	6	25-30	0.46	5	31	1-5	0.46
	7	30-35	0.54		32	5-10	1.12
	8	35-40	1.16		33	10-15	1.11
	9	40-45	0.79		34	15-20	0.65
	10	45-48	0.40		35	20-25	0.42
11	1-5	0.40	36		25-30	0.61	
2	12	5-10	0.26	37	30-34	0.33	
	13	10-15	0.42	6	38	1-5	0.88
	14	15-20	0.70		39	5-10	1.03
	15	20-25	0.56		40	10-15	0.66
	16	25-30	0.55		41	15-19	0.60
17	1-5	0.07	42		1-5	0.48	
3	18	5-10	0.10	43	5-10	0.80	
	19	10-15	0.07	44	10-15	0.54	
	20	15-20	0.13	7	45	15-20	0.60
	21	20-25	0.14		46	20-25	0.36
	22	25-30	0.09		47	25-30	1.24
	23	30-35	0.12		48	30-34	0.80
	24	1-5	0.38		49	1-5	0.38
	25	5-10	0.33		50	5-10	0.39

	No.	Depth	% Heavies		No.	Depth	% Heavies
Hole 8	SB 51	10-15	0.41	15	81	5-10	0.29
	52	15-17	0.94		82	10-15	0.11
9	53	1-5	0.45	16	83	1-5	0.15
	54	5-10	0.66		84	5-8	0.35
	55	10-15	0.70	17	85	1-5	0.45
	56	15-20	0.85	18	86	1-5	0.40
	57	20-25	0.72	19	87	1-5	0.68
	58	25-30	0.66	20	88	1-5	0.50
	59	30-35	0.75		89	5-10	0.40
	60	35-40	0.87		90	10-15	0.83
61	40-44	0.58	91		15-17	0.47	
10	62	1-5	0.35	21	92	1-5	0.33
	63	5-10	0.72	22	93	1-5	0.18
	64	10-13	0.35		94	5-7	0.18
11	65	1-5	0.91	23	95	1-5	0.55
	66	5-8	0.72		96	5-7	0.31
12	67	1-5	0.78	24	97	1-5	0.39
	68	5-10	0.83		98	5-10	0.30
	69	10-15	0.70		99	10-15	0.28
	70	15-20	0.72		100	15-20	0.35
	71	20-25	0.37	101	20-25	0.33	
	72	25-30	0.56	102	25-30	0.36	
	73	30-35	0.58	103	30-35	0.25	
	74	35-40	0.68	104	35-36	0.28	
	75	40-44	0.58	25	105	1-5	0.20
13	76	1-5	0.60		106	5-10	0.28
	77	5-8	0.72		107	10-20	0.28
14	78	1-5	0.22		108	15-20	0.36
	79	5-7	0.46		109	20-25	0.25
	80	1-5	0.29				

No.	Depth	% Heavies	No.	Depth	% Heavies		
25	110	25-30	0.23	Hole SB 139	40-45	0.55	
	111	30-35	0.31	29	140	45-50	0.52
	112	35-40	0.35		141	50-55	0.35
26	113	1-5	0.15	30	142	1-5	1.02
	114	5-10	0.24		143	5-10	0.71
	115	10-15	0.35		144	10-15	0.49
	116	15-20	0.44		145	15-20	0.33
	117	20-22	0.66		146	20-25	0.45
	118	22' below	0.08		147	25-30	0.97
YR 1	Yellow rock river 65% 18 mesh	0.54	Yellow rock	148	30-35	0.86	
27	SB 119	1-5	0.45	31	149	35-40	0.75
	120	5-10	0.24		150	40-45	0.51
	121	10-15	0.21		151	45-47	0.28
	122	15-20	0.13		152	1-5	0.85
	123	20-25	0.18		153	5-10	1.07
	124	25-30	0.31		154	10-15	0.90
	125	30-35	0.24		155	15-20	0.97
	126	35-40	0.21		156	20-25	0.96
28	127	40-45	0.60	32	157	25-30	0.96
	128	45-46	2.70		158	30-35	0.69
	129	1-5	0.73		159	35-40	0.45
	130	5-10	0.58		160	40-44	0.75
	131	1-5	0.57		161	1-5	0.94
	132	5-10	0.65		162	5-10	1.15
29	133	10-15	0.58	163	10-15	1.09	
	134	15-20	0.53	164	15-20	0.94	
	135	20-25	0.66	165	20-25	0.92	
	136	25-30	0.60	166	25-30	0.81	
	137	30-35	0.40	167	30-35	0.70	
	138	35-40	0.95	168	35-37	0.83	
				169	37-38	0.45	

	<u>No.</u>	<u>Depth</u>	<u>%Heavies</u>		<u>No.</u>	<u>Depth</u>	<u>% Heavies</u>
Hole	SB 171	5-10	1.80	YR22	YR 213	1-5	0.28
33	172	10-15	0.68	YR23	214	1-5	0.45
	173	15-20	0.75		215	5-7	0.17
	174	20-25	0.35	YR27	230	1-5	0.26
	175	25-30	0.85		217	5-10	0.71
					218	10-15	0.77
Hole No. YR 5	YR 176	1-5	0.13	YR24			
	179	15-17	0.37		220	1-5	0.77
YR 7	184	5-10	0.25	YR25	224	20-25	0.37
	187	20-25	0.32		226	5-10	0.53
YR 8	188	1-5	0.37	YR26	228	15-20	0.35
	191	15-20	0.45		234	20-25	0.53
YR 4	197	20-23	0.54	YR27	236	5-10	0.50
YR 3	200	10-15	0.26	YR28	240	10-15	0.17
	205	10-15	0.29				
YR 2	206	15-20	0.24	Hole 34	SB 243	1-5	0.35
	270	5-10	1.01		244	5-10	0.38
YR 9	273	20-25	0.60		245	10-14	0.53
	275	1-5	0.45	35	246	1-5	0.42
YR10	276	5-9	0.17		247	5-10	0.30
	277	1-5	0.75		248	10-15	0.35
YR11	278	5-8	0.16	36	249	1-5	0.90
	279	1-7	0.65		250	5-7	1.66
YR12				37	251	1-5	0.17
YR14	281	1-5	0.19		252	5-7	0.70
	283	1-4	0.12	38	253	1-5	0.37
YR16					254	5-10	0.23
YR19	210	1-5	not suitable		255	10-15	0.35
YR20	211	1-5	for separation				

015

	<u>No.</u>	<u>Depth</u>	<u>% Heavies</u>
Hole	SB 256	1-5	0.32
39	257	5-7	0.38
	258	1-5	0.32
40	259	5-6	0.16
	260	1-5	0.40
41	261	5-7	0.34
	262	1-5	0.42
42	263	5-9	0.34
	264	1-5	0.64
43	265	5-10	0.28
	266	10-13	0.44
	284	1-5	0.57
44	285	5-10	0.40
	286	1-5	0.50
45	287	5-7	0.34
	288	1-5	0.50
46	289	5-10	0.41
	290	10-13	0.26
	291	1-5	0.45
47	292	5-10	0.27
	293	1-5	0.28
48	294	5-10	0.28
	295	1-5	0.36
49	296	5-8	0.42
	297	1-5	0.17
50	298	5-7	0.23
	299	1-5	0.35
51	300	5-9	0.28
	301	1-5	0.37
52	302	5-8	0.23

Holes 34-55 Just N of  
Big Lake

016

	<u>No.</u>	<u>Depth</u>	<u>% Heavies</u>
Hole	SB 303	1-5	0.30
53	304	5-8	0.29
	305	1-5	0.33
54	306	5-7	0.22
	307	1-5	0.58
55	308	5-9	0.52

(R. O. Archbold)  
Senior Analyst.

THE LEASES

205018

5 cm

ANG  
237785mE, 5614353mN

Whistler Pt.

Yellow Rock R.

3

1

NARACOOPA

Currie

- ① NARACOOPA
- ② SURPRISE BAY
- ③ YELLOW ROCK



Grassy

Surprise Bay

Seal Bay

-  Lease Area
-  Roads (only some shown)
-  Rivers, Creeks

5 4 3 2 1 0 5 Miles

ANG 237968mE, 5549663mN

FIG.1

AMG REFERENCE POINTS ADDED

OUTLINE OF SOLID GEOLOGY

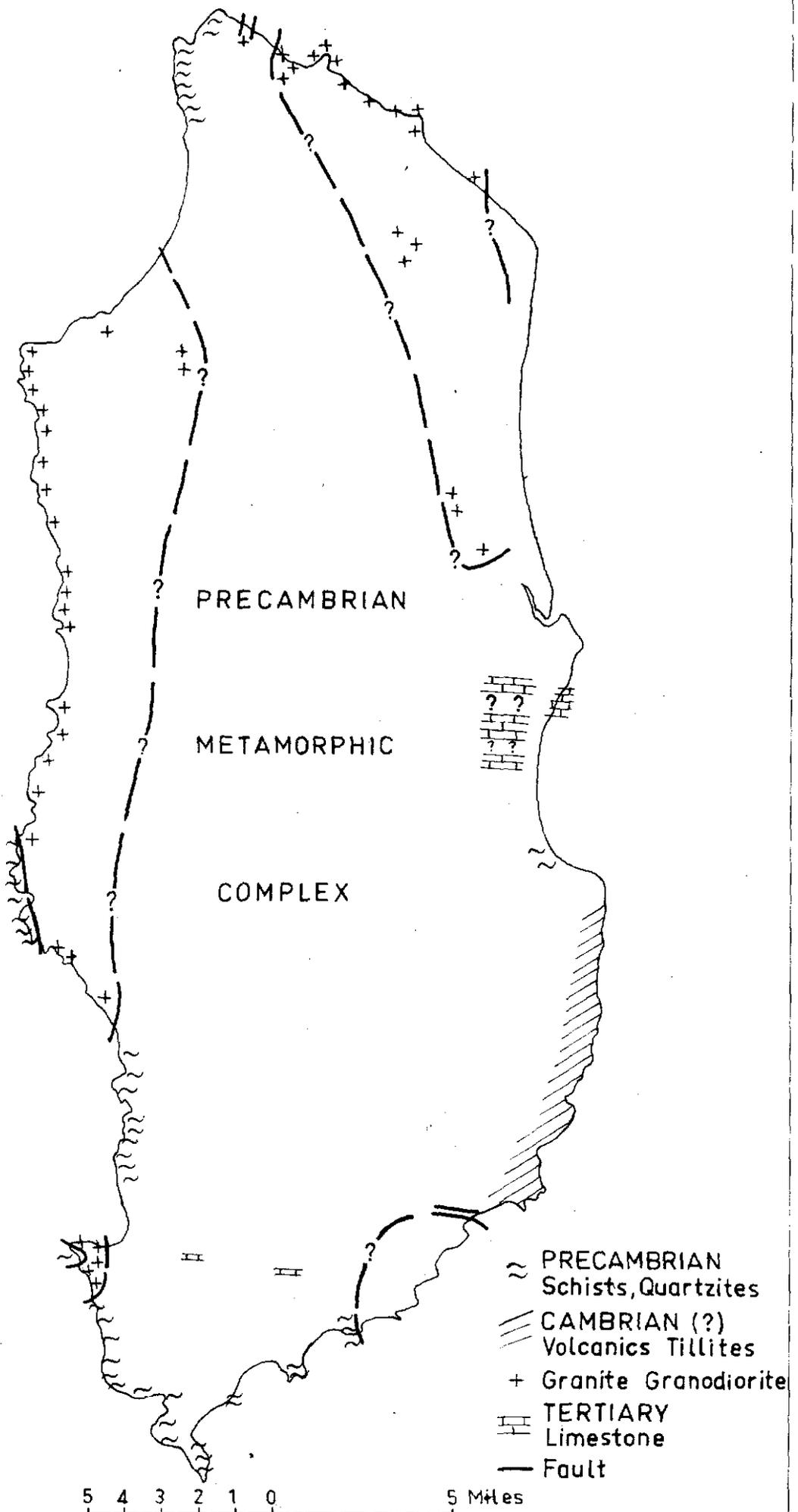
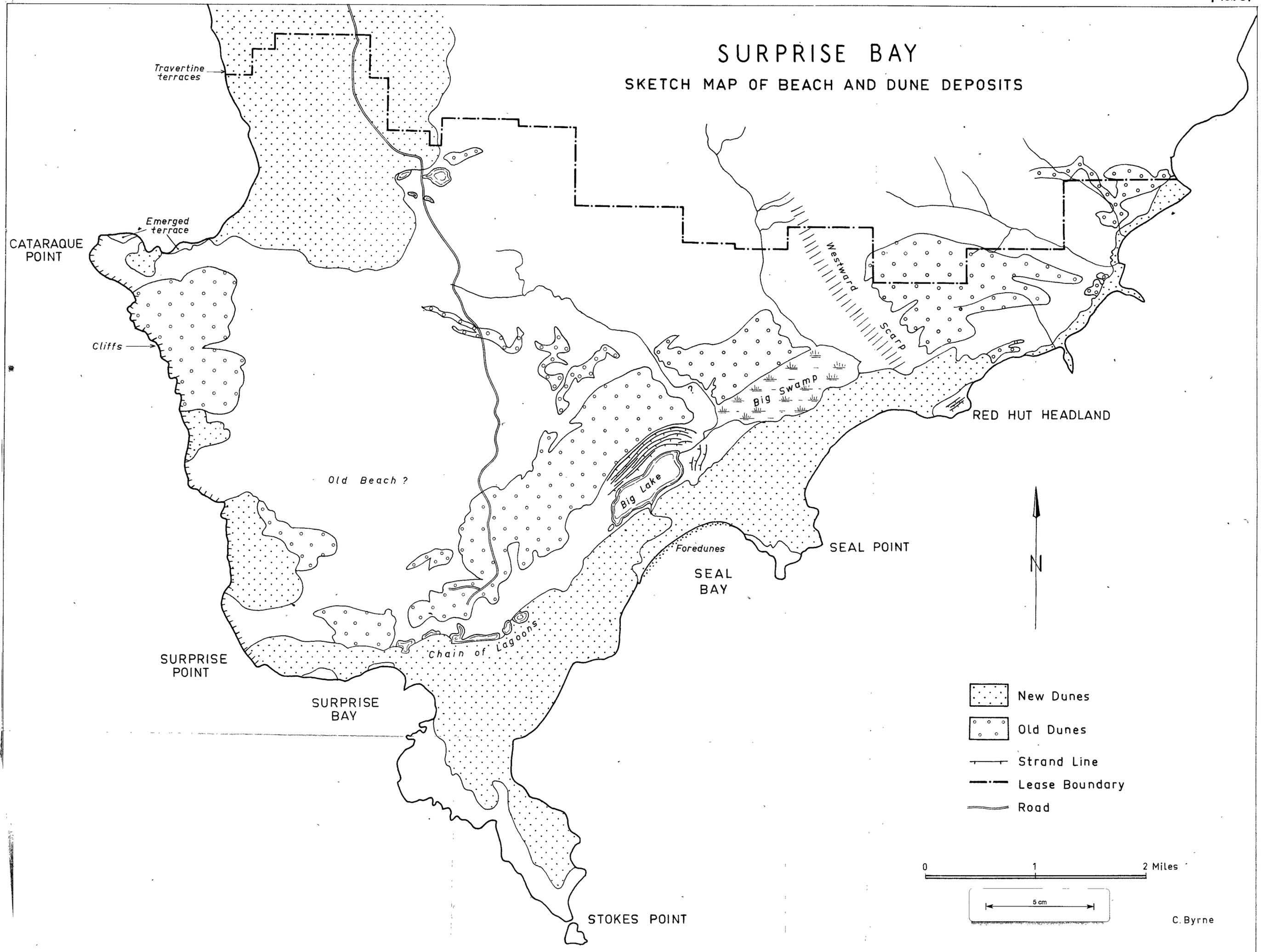


FIG. 2

after Jennings (1959)

# SURPRISE BAY

## SKETCH MAP OF BEACH AND DUNE DEPOSITS



- New Dunes
- Old Dunes
- Strand Line
- Lease Boundary
- Road

0 1 2 Miles

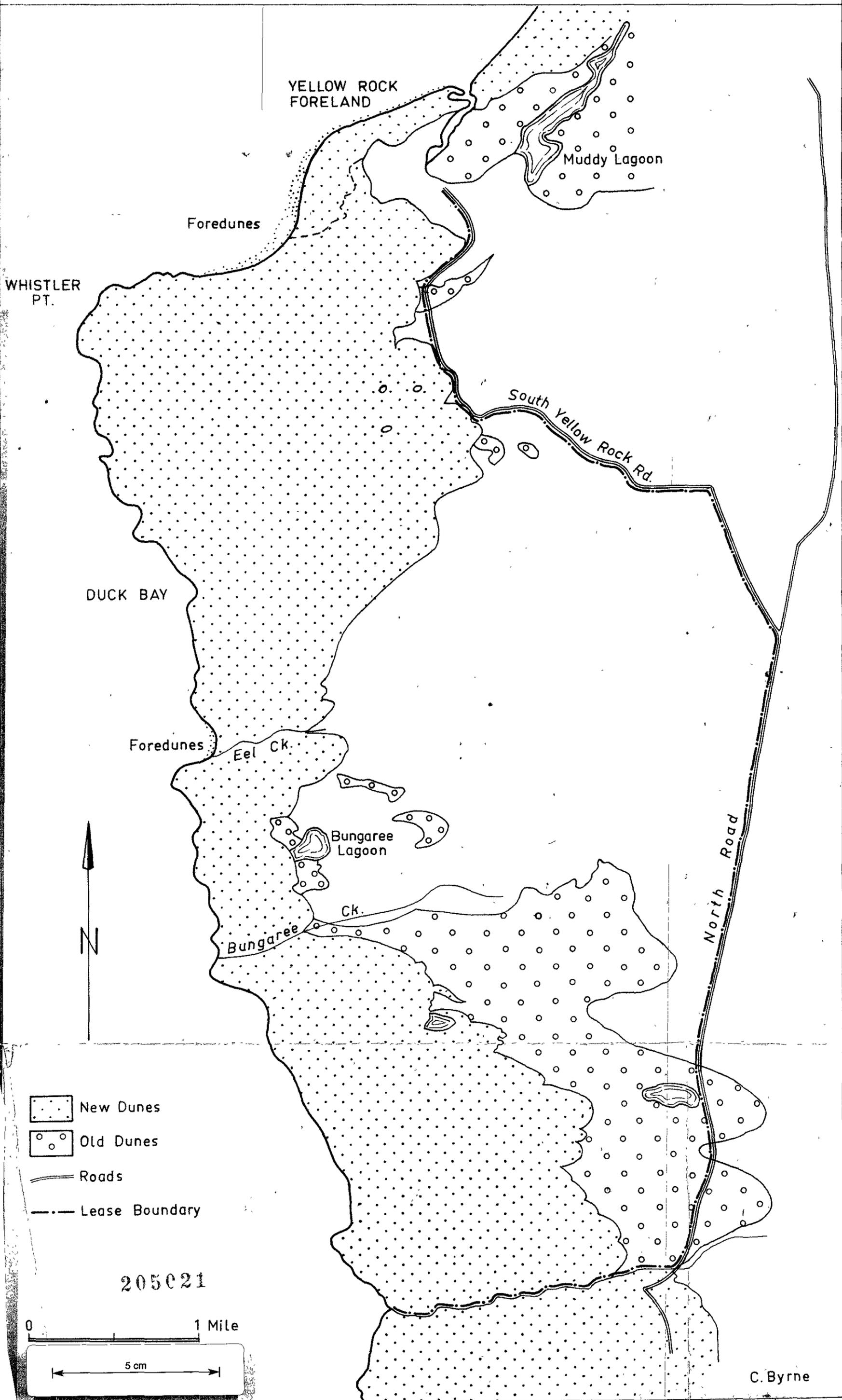
5 cm

C. Byrne

FIG. 4.

# YELLOW ROCK

## SKETCH MAP OF BEACH AND DUNE DEPOSITS



C. Byrne

4229

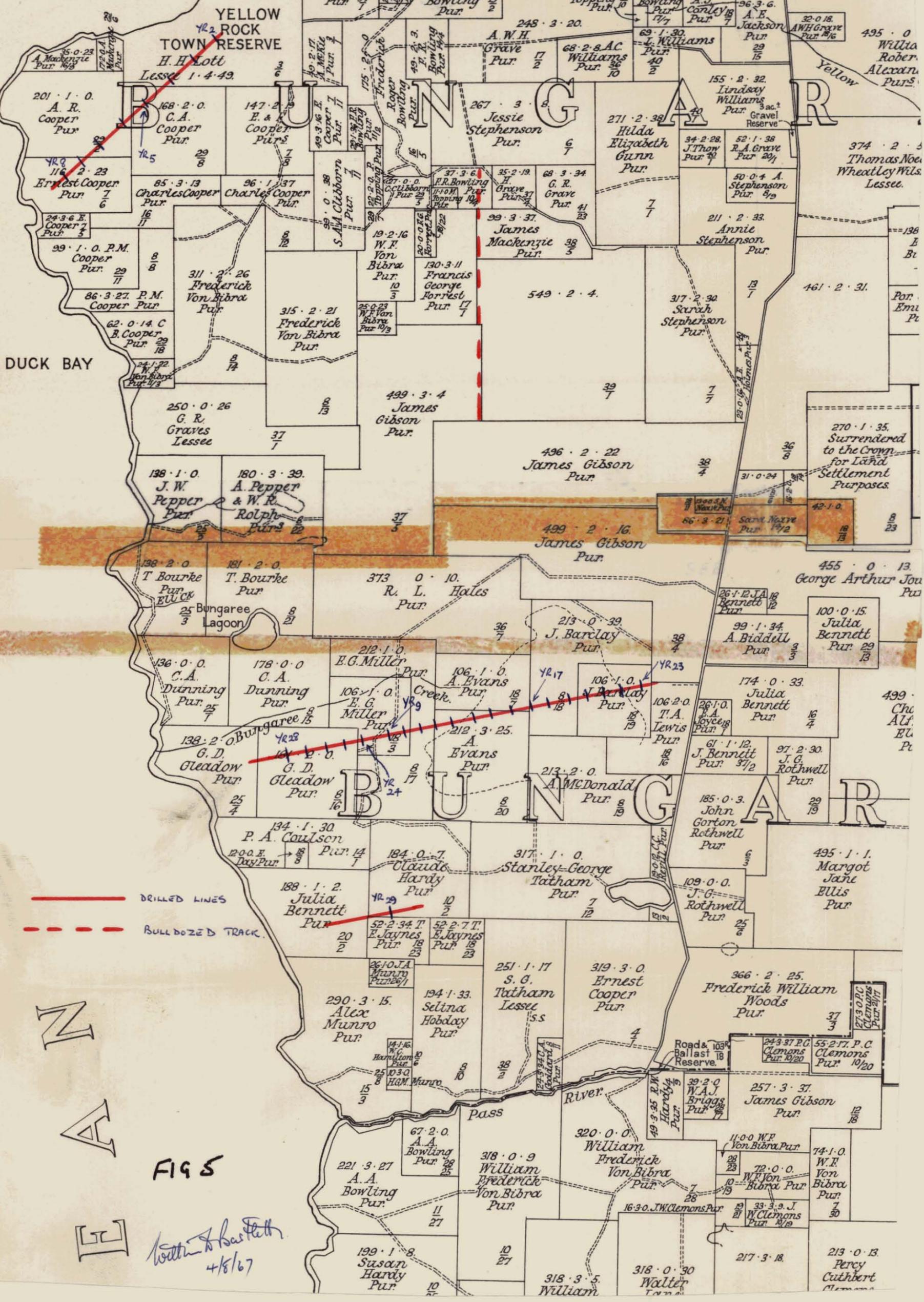
205022

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OUNT

COSTIGIAN

MINES LTD

KING ISLAND



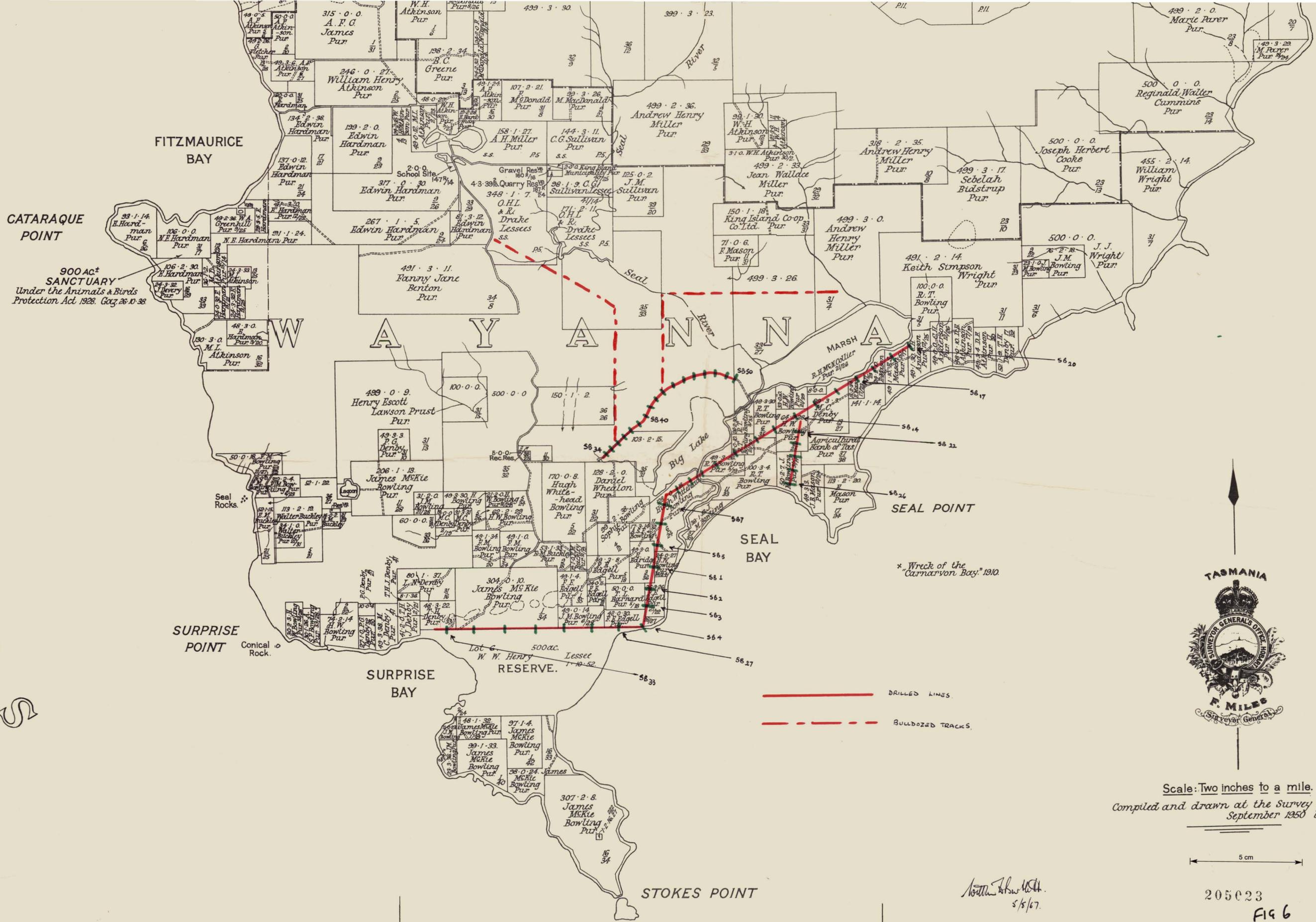
— DRILLED LINES  
 - - - BULLDOZED TRACK.

N

A

E

FIG 5  
 With J. Barlett  
 4/8/67



Scale: Two inches to a mile.  
 Compiled and drawn at the Survey Office Hobart  
 September 1950 by I.E. Day

5 cm

*North from M.H.  
 5/5/67.*

205023  
 FIG 6

MOUNT COSTIGAN MINES LTD.

**KING ISLAND**

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