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THE PROSPECTS FOR ALLUVIAL AND OTHER SECONDARY TIN DEPOSITS WITHIN S.P.L.323, NORTH EASTERN TASMANIA.

by

J. H. Rattigan

Prospects for Alluvial & other Secondary Tin Deposits within SPL 323, N.E. Tas (Rio Tinto)
by J.H. Rattigan April 1958.

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Plates

Refer compilation of Regional Sheets A,B,C,D,E,F and G, Ringarooma

1. Sketch Plan illustrating extent of Tertiary Basins, and types of possible tin deposits, north east Tasmania.
2. Diagrammatic sections illustrating types of deposits, BOOBYALLA and GREAT NORTHERN PLAIN BASIN.

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INTRODUCTION

This report covers the possibilities of tin deposits which may be undiscovered or unexploited within the R.T.A.E. permits in the Ringarooma District, and is based on a regional mapping recently completed within R.T.A.E. permits and assessment of old records.

The geological background and history of the Tertiary and Quaternary rocks, in which tin deposits occur, are given in some detail so that the prospecting problem can be fully appreciated. Inferences as to the type and scale of possible mining operations are included. Large areas of soil covered Tertiary and Quaternary sediments, which are stanniferous to varying degrees, occur in the permit area, and the information from the limited and poorly recorded past boring operations and surface examination can give little reliable data as to the important questions of depth and tin distribution. Certain areas which offer some hope of sizeable tin deposits have been chosen for testing on the basis of morphological, geological and geophysical surveys. Inferences as to depth, yardage and grade of ore in these areas, made from scattered observed and recorded facts, are to be regarded as speculative guesses, which can only be proved or disproved by boring.

GEOLOGICAL BACKGROUND

GENERAL

Secondary tin deposits of the district occur in Tertiary and Quaternary sediments of fluviatile (true alluvial), lacustrine, estuarine and marine origin. The primary source of the tin concentrations in these rocks was the wide areas of tin bearing granite and veinlets in intruded old quartzites and slates of the contact zone. The thicker sections of Tertiary and Quaternary rocks (> 20') occupy areas totalling of the order of 100 square miles within our permits.

The pre-Tertiary bedrock comprises Silurian (?) slates and quartzites, Devonian (?) granite, Permian sediments and Mesozoic dolerites. These rocks form high country surrounding the Tertiary basins.

GEOLOGICAL HISTORY THROUGH TERTIARY AND QUATERNARY TIMES

For a proper appreciation of prospects and the prospecting problem, the genesis of the Tertiary-Quaternary rocks is dealt with in some detail.

During Lower Tertiary times, the land surface in N.E. Tasmania subsided relative to the then sea level. As this subsidence proceeded, alluvial deposits of some thickness were accumulated, filling the bottoms of the old valleys of the existing drainage systems. This process proceeded first in the lower reaches of the drainage systems, but as subsidence continued, the lower reaches of the river systems became progressively drowned by the formation of wide lakes and estuaries, in which sediments derived from the higher reaches of the original streams were deposited under more stagnant lacustrine or estuarine conditions. Marine waters encroached over the gradually submerging land surface in coastal areas. Thus, over the original pre-Tertiary land surface, true alluvial (fluviatile) deposition in the higher reaches of the old river systems, lacustrine and estuarine sedimentation in the middle reaches and marine sedimentation over the lower reaches of the old drainage system proceeded concurrently. Under these conditions, wide areas of Tertiary sediments were accumulated far inland beyond the present township of Ringarooma.

The net result of sedimentation of the Lower Tertiary period was the formation of alluvial gravels in the actual stream courses which were later progressively buried by lacustrine, estuarine or marine strata. These alluvial leads carried tin concentrations shed from the higher country of the catchments. The lacustrine and estuarine strata also contain some stanniferous wash bands formed by dispersion and reconcentration of cassiterite from the true alluvials, or during periods of more rapid sedimentation.

The thickness of sedimentary deposits formed under these conditions was related to the old morphology (bedrock surface) and degree of subsidence. Thus, in long section down the course of the old river systems, the thickest accumulations occurred in the lower reaches with a gradual thinning towards the headwaters. In cross-section across the old valleys the thickness was greatest on the actual valley floor, with progressive thinning on the flanks of the valleys.

The close of this period of subsidence was marked by extrusions of basalt which spread over the old depressions in which the Tertiary sediments were accumulated but did not completely fill the major valleys. Some minor sedimentation continued between flows. It is not known how far the basalt originally extended, but remnants north of Winnaleah and in the White Rocks district suggest that the greater part of the Tertiary sediments may have been covered.

During, or after the extrusive period, the land surface began rising. The relative elevation of the land caused the emergence of the Tertiary rocks and the consequent retreat of the lacustrine and marine waters. Some of the old stream courses, their uppermost headwaters having been continuously active, were rejuvenated along lines somewhat similar to those existing in pre-Tertiary times, as the major valleys were not completely filled by basalt. Some minor and major deviations from the original stream courses did occur in the lower reaches; the Ringarooma River beyond Herrick is considered to have departed markedly from its original course. It now flows east of Mt. Cameron, whereas originally it is believed to have passed to the west of Mt. Cameron. New drainage systems originated on the surface of the Tertiary rocks.

The present cycle of erosion, initiating in Upper Tertiary or Quaternary times, resulted in partial stripping of the basalt and Tertiary sediments. Sediments accumulated during the present cycle are of some economic importance, as tin bearing alluvial terraces were formed at several levels by the new river systems cutting their present course and tin bearing marine shingle terraces were left by the retreat of the sea. Some fairly thick mixed alluvial and marine deposits (20' - 75') were also accumulated in flats along the present river courses (e.g. Fosters Marshes), and this thickness and type of sedimentation may in part be due to minor fluctuations of sea level during the Pleistocene period.

The net effect at the present time is that the sea has not fully receded to the level existing in pre-Tertiary times, as it would appear from the seismic profiles recently done in the Boobyalla District that the Lower Tertiary bottom in coastal areas may be below sea level.

THE TERTIARY-QUATERNARY SEDIMENTS

Natural exposures are few, and are chiefly observed in the Ringarooma River cliffs in the Derby-Branxholm district. The best outcrops are in the artificial exposures of mine workings, road cuttings and gravel pits.

Over wide areas there are no exposures other than a superficial silicified or ferruginous cappings on higher hills. The typical expression of the Tertiary sediments is a light sandy residual soil known as "drift".

The observed sections show a variety of rock types characteristic of the depositional conditions including fine to coarse conglomerates, siltstones, claystones, sandstones, grits, carbonaceous sandstones and siltstones, and lignitic beds. Individual rock types are lenticular, and rocks show depositional dip, current bedding and interfingering relationships. Consolidation is generally poor, leading to easy working by hydraulic mining. Exceptions are seen where a dense cemented rock has been formed by secondary silicification or ferruginisation, or where the formation of secondary marcasite has resulted in a dense band. Characteristic rock types in deposits of varying origin are listed below:

(1) Lower Tertiary Fluviatiles of Deep Leads

Fine to coarse conglomerates with rounded to sub-angular pebbles; coarse, unsorted arkosic grits and sands.

(2) Lower Tertiary - Lacustrine and Estuarine Deposits

Medium, poorly sorted sandstones and clays; small pebble conglomerate ("birds eye" wash); carbonaceous and lignitic bands.

(3) Lower Tertiary Marine

Fine, white or grey sands.

(4) Upper Tertiary-Quaternary fluviatile terraces

Conglomerate and conglomeratic sands.

(5) Upper Tertiary-Quaternary Marine terraces

"Shingle" conglomerate, with flattened pebbles.

(6) Upper Tertiary-Quaternary Sediments of Foster's Marshes

Basal conglomerate with overlying grey green marine sands and dark muds.

The thickest sections of sediments with in our permits occur in three main areas, for which the term basin is proposed, as the depositing areas were essentially sedimentary basins in which were accumulated not only true alluvials but lacustrine, estuarine and marine strata. The three basins are the Boobyalla Basin, the Great Northern Plain Basin and the Mussel Roe Basin. These basins were to some extent interconnected late in their history, as thin residuals occur over higher basement between them.

THE BOOBYALLA BASIN

GENERAL DESCRIPTION

This is a large embayed area stretching within our permit area from Branxholm to the Boobyalla Delta, the long axis being of the order of 20 miles in length within our permits. The width is variable, ranging from ½ to 7 miles.

Planimetrically the Basin has an irregular outline. Two north east trending narrower strips on the south are the obvious valley fillings of the old Upper Ringarooma and Upper Boobyalla Rivers. The course of these valleys is lost north of Herrick, in a wide central embayed area stretching from Little Mt. Horror to South Mt. Cameron. North of the Shallumar Flats the seaward outlet of the old river systems, over which the basin formed, is constricted. On the coastal plains at Boobyalla, the Tertiary deposits are continuous with those of the Great Northern Plain Basin.

Relief within the basin ranges from 0 to 900 feet above sea level, and it is bounded by high country ranging to 2,500' on the Blue Tier on the south east, 2,000' at Mt. Horror on the south west, and 1,800' at Mt. Cameron on the north east. The greater part of the high shedding country surrounding the basin is of granite.

The main drainage systems within the Basin are those of the Upper Ringarooma River and the Boobyalla River. The headwaters of these arise in the high country bounding the basin, and essentially follow pre-Tertiary lines. Tributaries arising in the actual Basin were formed during the present cycle of erosion.

Between Branxholm and Herrick, basalt in the form of a dissected plateau forms a cover over the Tertiary sediments except where streams have cut through it to expose the underlying sediments. North of Herrick as far as White Gum Hill the terrain consists of high hills and ridges with intervening swampy flats along water courses. The country thereafter has more uniform relief to the coastal plains (Area A). Between the Pioneer and the Endurance workings (Area C), and along the course of the Boobyalla River near the Banca Bridge (Area B), are large areas of lower and fairly uniform relief.

PAST AND PRESENT MINING ACTIVITIES

Within the Boobyalla Basin there are many abandoned and operating workings for tin, but the greatest number including all major workings are localised on the south eastern or eastern margins. The bulk of the area is relatively untested. The peculiar localisation of the workings is due to the fact that most original discoveries were made on actually outcropping stanniferous ground, and the surface indications were followed down and extended towards the centre of the basin. This type of discovery as regards deep leads, is only possible at the margins, as in the central areas, leads are invariably covered with barren lacustrine, etc. strata of varying thickness, depending to a great degree on amount of stripping which has proceeded naturally during the present cycle of erosion.

The bulk of production, which in total approaches 50,000 tons of better than 70% Sn cassiterite concentrates has come from tributary leads of the old Ringarooma Lead at the foot of the Blue Tier. These leads are notably the Arba, Valley Cascade (Briseis Mine), Main Creek (Mutual Hill Workings), Weld (Echo Mine), Wyniford (Pioneer Mine). Operations on a moderate scale are at present in progress on the Endurance Lead and minor workings still proceed on many of the others. The major production came from two leads, the Cascade (>14,000 tons of metallic tin won) and Wyniford (>10,000 tons of metallic tin won). Major operations on most of the leads ceased, not so much from the disappearance of tin concentrations, as from the increasing overburden which prevented economic mining by the methods and plant of the hydraulic mines then operating. This fact is evident from the minor operations still carried out, as in the Arba Lead, which are economic at the present time due to the more stabilised price of tin.

Small workings at Hasties Mine, Monarch Mine and the White Rocks area point to buried leads in the virtually untested areas of the Boobyalla Basin, north of Herrick.

Other types of ground worked besides deep leads are Upper Tertiary-Quaternary deposits which are generally shallow but sometimes quite rich. These include the shingle with marginal values of the Dorset Flats, from which the Dorset Dredge has won some 1,500 tons of cassiterite concentrates over the last 14 years at an annual rate exceeding 100 tons. Shallow terrace deposits in many mines near South Mt. Cameron, and at Dugarde Creek and Dunns workings on the Boobyalla Plains, have yielded small but fairly good returns.

PROSPECTS WITHIN THE BOOBYALLA BASIN

1. Extensions and Remnants of Known Leads

Some patches of tin bearing alluvial ground remain in the worked sections of known leads, but no major production is likely. The extensions of known leads beyond old working faces present some hope of moderate production in the case of the Arba, Weld (Echo Mine), Wynyford (Pioneer Mine) and Endurance Leads, if economic working were possible, or if lead courses (e.g. the Pioneer) changed their trend into lower country. These prospects have not been suggested for testing in our preliminary scout boring programme, as the rough order of values and size of the deposits can be obtained from old records of workings at the face and by boring done ahead of the face. For better information, our own line of bores or a seismic survey to restrict boring targets would be necessary.

2. The Main Bingaroona Lead

The gutter of this has never been worked or located by drilling. The reason for this is that in the southern areas near Derby where the testing width across the old valley filling is relatively restricted (ranging up to one mile), the basalt overburden is practically continuous. In northern areas, without seismic work, which has never until recently been used in the area, the great widths to be explored by boring to locate the gutter, and the absence of any reliable geological mapping restricting to some degree the course of the lead, has, until the present R.T.A.E. survey, never interested the companies with small capital which have operated in the area.

In considering target areas for testing the main lead, the basalt covered section in southern areas has been eliminated, as the great thickness of overburden of both basalt and barren sedimentary strata (as evidenced at the Briseis Face) does not give much hope of economic deposits. North of Herrick, the inferred lead course has a direct linear length of about 15 miles to the coast, and over this length only a few isolated remnants of basalt are known. The actual course of the lead gutter in this area may have a much greater length than 15 miles, due to irregularities or meanders.

This section was traversed during the present R.T.A.E. survey, and the actual bedrock exposures mapped to restrict areas for prospecting. In selecting areas for testing the lead, large areas of lower and fairly uniform relief were looked for, the purpose being to limit testing to areas where the natural stripping of the lacustrine strata would be greatest, and thus true alluvials of the lead gutter would be nearest the surface, and possibly within dredgeable limits.

The largest such area was found north of White Gum Hill (Area A), where swampy flats, plains and some low rises occur in the vicinity of Dead Horse Creek between the Little and Big Boobyalla Rivers. This area was suggested for the B.M.R. seismic survey, and three scout bore holes are proposed on channels indicated on the three seismic survey lines. The interest in this area A is not solely restricted to possible deposits in the gutter of the Main Ringarooma Lead. The area lies within the same distance from the present coast line and within the same present range of relief as the closely adjoining Great Northern Plain Basin where some rich estuarine wash bands are known. None are known from the Boobyalla Basin, as it is untested. Parts of the area are also known to be underlain by marine and fluviatile conglomerates (terrace deposits) carrying more than a trace of tin. These two sources offer some hope of tin contributions from upper levels above the inferred gutter alluvials of the Main Lead, but proof of their actual presence and extent can only be obtained by boring.

There has always been some doubt as to how far tin would carry from the high source country of the Blue Tier, Mt. Cameron, etc. and it is still to be proven whether the main lead carries significant tin values. However, the Lochaber Lead on the Great Northern Plain has rich concentrations of tin, despite the fact that it had no very high country in its catchment, or even a wide source area of granite. The Area A has within a radius of 4 miles known tin concentrations in workings of leads and other types of ground at the recently bored extension of the Endurance Lead, Walpole Creek Workings, Hasties Workings, Dugarde Creek Workings, White Rocks Workings and Delta Workings. There is fair ground for believing therefore, that we have some expectation of tin deposits. The question of economics and method of working can only be solved by boring.

The Area A has been selected as the most interesting target area for the Main Ringarooma Lead from the surface investigations. There remains an area to the south of Area A which contains higher hills with intervening flats and water courses. This area was not suggested for testing in the first instance, despite being closer to the rich tributary leads near Derby and Pioneer. The reason for this was that a much greater barren overburden is generally expected over the lead in this area. The flats are not as extensive as in Area A, and there is less grounds for expecting a dredging property to result. However, if further seismic work be carried out in our permits, it is recommended that two or three traverses be made across this area to restrict areas for test boring the main Lead, as it is possible that a hydraulic mining property of some size could result if the main Lead is proved in Area A to be tin bearing.

3. <u>The Boobyalla Lead</u>

This lead was identified as such during the present R.T.A.E. survey. It has a well defined course following the lower reaches of the present Boobyalla River, but north of the Banca Bridge its identity is lost under widespread lacustrine and estuarine deposits. The lead probably junctions with the Ringarooma Lead.

South of the junction of Trout Creek, boring has established a present thickness of 250', and only traces of tin were found. Some small workings for gold and tin occur on the margins of the lead, possibly in tributaries. This area has little prospects of large deposits on the above recorded information, and this results probably from the complete absence of granite source rocks in the upper catchment.

North of Trout Creek boring and working has shown good tin values near the margins of the Basin on the western bank of the Boobyalla River. These deposits are probably in small tributaries of the Boobyalla Lead, and of themselves offer little hope of anything but minor production. However, there has only been one deep bore put down east of the Boobyalla River. This was an Endurance Co. bore reputedly reaching to 110' and bottoming in shingle. Values were said to be of the order of 4 oz/yard. It is not known whether this bore represents deposits of the Boobyalla Lead. However, as an area of some 800 acres of flats of fairly uniform relief occur in this area, a water supply is adjacent, and the shedding country is granite, a scout bore has been proposed to check the reputed depth and values in the Endurance bore. It is also possible that Upper Tertiary-Quaternary alluvials, such as at Dorset Flats, occur in this area.

4. Undiscovered Tributary Leads

North of Winnaleah there probably exists many tributary leads or alluvial fans of the Old Ringarooma and Boobyalla Rivers. Scattered shallow workings such as Hasties Mine suggest that many depressions in this wide area of the Boobyalla Basin carry tin. However, the relatively narrow widths and possible great depth of overburden over such tributaries may rule out economic production.

There is some chance, however, that tributary leads of the same order as the Endurance Lead might be found through seismic surveys or line boring programmes, and within economic depth. The Endurance Lead, only recognised as such during the last 20 years, has now been proved to carry tin concentrations over a length of 4 miles. Despite the high overburden/paywash ratio (which exceeds 10/1) hydraulic mining is now on a paying basis in an open cut 110' deep. However, capitalisation is low, as plant was to a large extent, acquired from defunct companies. A new discovery of the order of the Endurance Lead (average values 0.75 lb/yard to a depth of 114') could perhaps result in a production of 200-250 tons cassiterite per annum with intensive working over a life of up to 10 years or more.

No scout testing for tributary leads has been proposed in the preliminary scout boring programme , as the chance of striking a narrow lead gutter with a single bore even by limiting areas for testing, is very remote. The Area C, covering flats between the Pioneer and Endurance Mines, is one area selected for possible seismic survey or a line of bores to test for tributary leads, and even possibly the Main Ringarooma Lead, if marked irregularities in the old course existed.

5. Estuarine Wash Beds

The possibility of estuarine wash beds occurring in coastal areas of the Boobyalla Basin has been, to some extent, discussed previously, concerning Area A. Rich wash bands carrying cassiterite with value from ½ lb. - 4 lb. occur on the Great Northern Plain within 8 miles of the present coast line.

Presuming that similar depositing conditions existed in coastal areas in the closely adjoining Boobyalla Basin, there are possibilities that estuarine wash may exist in coastal areas north of say, seismic line A. None are known as very little testing has been done. There is doubt as to how consistent or erratic are both the wash bands and tin values within them on the Great Northern Plain, but there does exist possibilities of discovering relatively shallow deposits of estuarine character in both basins.

The 3 scout holes in Area A will serve as a preliminary test for such possibilities in the Boobyalla Basin.

6. Marine and Alluvial Terraces

Conglomerates encountered near the surface in seismic shotholes of Line B in Area A carry more than traces of tin in some samples washed. These may be extensive, and extend north to the coast. Of themselves, the grade may be too low to work, but they could contribute to production if underlying estuarine or lead deposits were discovered.

GREAT NORTHERN PLAIN BASIN

GENERAL DESCRIPTION

This basin now has the form of a topographically low area extending northwest from Gladstone. The surrounding country is topographically higher but has no marked relief except for the Mt. Cameron mass on the south. The basin is bounded on the south by Mt. Cameron and a lower plateau at its foot, on the north by the Ringarooma Tier and on the east by low hills and ridges. On the west is the coast at Ringarooma Bay.

Relief within the basin ranges from sealevel to about 300 feet. There are wide areas of fairly level and gently sloping country with lower swampy water courses and lagoons. Present drainage is chiefly through Stinking Creek to Foster's Marshes, but some small streams enter the Ringarooma River directly on the south.

The higher plains country is divided into two areas by Foster's Marshes, a wide belt of low lying swamps, through which pass braided courses of the Ringarooma River near its seaward outlet at Boobyalla Delta. On the east lies the Great Northern Plain, and to the west the Boobyalla Plains.

The thickest Tertiary-Quaternary sediments occur north of the Ringarooma River on the Great Northern Plain reaching a known thickness of 130'. In Foster's Marshes, Upper Tertiary-Quaternary deposits reach a depth of 77' subsurface. The Boobyalla Plains, as far as is known, have a shallow covering of Tertiary strata up to 30' in thickness, but some deeper channels are reputed to exist.

The surroundings and bedrock to the Tertiary-Quaternary strata within the basin include Silurian ? quartzites and slates, granite, Permian sediments and Mesozoic dolerite. The generally low surroundings and relatively small area of granite source rocks are features of the basin which has many rich stanniferous occurrences.

PAST MINING ACTIVITY

There is no present mining activity on deposits of the Great Northern Plain. Many small mines have operated in the past, but adequate water supply was never available to small operators. A branch of the Mt. Cameron water race passes across the central areas of the plain, but is no longer in operation, and even when in use, could not supply required quantities of water to all small operators.

Many small workings in shallow ground are present in the remnants of Tertiary strata south of the Ringarooma River. The largest producers were on the northern bank of the Ringarooma River where the greatest activity took place more than 60 years ago. Several types of deposit were worked, including deep leads, estuarine wash beds and alluvial terraces and "surfacing".

Total production probably never exceeded 5,000 tons of concentrates from all sources, though records are poor. The largest production came from the Scotia Mine, where a reputed 1,000 tons of concentrates were won from a worked area of about 35 acres.

PROSPECTS WITHIN THE GREAT NORTHERN PLAIN BASIN

Several types of tin deposits, including leads, estuarine wash beds and alluvial terraces, are known. As several types may occur in one area, the prospects will be considered under localities. A feature also is associated minor quantities of alluvial gold seen in many workings.

1. Area south of the Ringarooma River, west of Gladstone

Several lead deposits have been worked in this area where winter water supplies and a natural fall for tailings allowed. There are still many hundreds of acres of shallow ground to be tested, but from the nature of the worked deposits, any discoveries are likely to be small individually, and suitable only for hydraulic mining. It is possible that a number of individual deposits capable of producing from 50-100 tons annually over a period of 5-10 years could be discovered.

No testing for such deposits has been proposed for our preliminary programme, as sampling of the old workings faces has shown the order of things which may be expected in the area. If a major discovery should be made, some attention might be given to testing, as the combined production from such small deposits could be very useful in supplementing major production.

2. Boobyalla Plains

Four small workings exist in this area, namely the Delta, Davis, Dugarde Creek and Dry Cut Workings. All are shallow (<30') but sampling of the faces and hand augering has shown that the reputed good values (up to 1.5 lb/yard) were indeed present. The tin values are in coarse conglomerates and grits, whose origin is not always clear but may include marine terraces and estuarine wash. It is not known how erratic these bands are in distribution, or whether cassiterite is consistently distributed, but the known richness of the worked deposits gives some incentive for some scout boring to test the extent of such shallow tin bearing ground. Large areas of fairly level country occur between the 4 old mines, and it is possible that shallow dredging would be practicable.

There has been some previous testing done, but near the actual working faces. Bore results are not on record except for some charts of the Delta Tin Mining Co. showing very good values around the Delta mine, where about 40 tons of tin were won from about 2 acres of ground to depths of 25 feet.

3. Foster's Marshes

About 2,000 acres of low swampy country underlain by thick Upper Tertiary-Quaternary alluvials and marine sands and muds, occur near the mouth of the Ringarooma River. The natural dredging advantages have led to partial testing of the Marshes by at least 3 organisations. Delta Tin Mines put down about 33 bores east of the Delta Mine in the southern section of the Marshes, and a summary of data from the boring plan is as follows:-

No. of bores	33
Maximum depth	74'
Minimum depth	32'
Average depth	53'
Area covered	250 acres (approx.)
Maximum values:	1.96
Average values:	0.7 lbs/yard
Maximum thickness of pay wash:	21 feet
Minimum thickness of pay wash:	3 inches

All data except values check with the Dorset Boring programme done to the north. The values are extremely good, but some doubt seems to have been cast upon them by later workers. I have spoken to the man who washed the samples - Mr. L. Watts of Gladstone, who has a reliable reputation locally. He stated that samples he washed included some of the best from deeper bores he had seen in a lifetime of tin mining, and that he did not think that the drillers had "salted" the holes.

In contrast to these Delta records and L. Watts' word, are the figures from recent testing by Dorset, which showed the following:-

No. of bores in actual marshes	22
No. of bores adjacent to marshes:	15
Maximum depth	77½'
Minimum depth	33'
Average depth	54'
Maximum depth of bottom pay wash:	22'
Minimum depth of bottom pay wash:	0'
Average depth of bottom pay wash:	13'
Maximum value	0.47 lb./yard
Minimum values	0.00 lb./yard
Average values	0.133 lb/yard

Dorset encountered a fairly consistent bottom "shingle" in which average values of 0.60 lb/yard were encountered, but the average overburden ratio of about 3/1 indicated that the ground would be unpayable.

Although Dorset boring was done with a 16" Conrad plant, and is generally to the north of the Delta bores, the marked contrast in values suggests that either the Delta bore records are erroneous through "salting" or natural causes, or that Dorset bores did not penetrate a central old river channel of generally thicker paywash with better values. The latter is possible, as the Dorset bores do not cover a central 1,500' width of the Marshes north of the Delta boring.

No boring has ever been done in the northern and north eastern section of the Marshes, and since, in this area the Lochaber Lead is inferred to have entered the Marshes area, there is scope for testing some 1,000 acres of the Marshes, which is as yet untested.

4. Great Northern Plain

This area probably offers the best prospects in the basin for moderate or large operations at a convenient depth, although past workings have never been on a large scale. A considerable amount of boring has been done in southern areas of the plain, but sampling procedure was generally poor and full records are not available. The three types of deposits which have been worked in the past are deep leads, estuarine wash and gravels and alluvial terraces.

(a) Deep Leads

Several topographically high inliers occur on the plain with depressions filled with Tertiary strata between. It is probable that many minor and perhaps two major leads occur on the plain. The only major lead system known is the Scotia-Lochaber Lead, and this has been worked in its upper reaches and bored for a length of 3 miles, though the most intensive boring is restricted to an area of about 300 acres. 855 bores were put down by the Mines Department to test two upper tributaries, the Scotia and Lochaber Leads, and the main lead formed after their junction.

The Scotia Lead has been traced by close boring for a length of 4,550 feet, with a further central unproved length of 2,500 feet. The Lochaber Lead has been suggested by irregular boring over a length of 4,900' towards the inferred junction with the Scotia Lead. The main lead from this junction has been closely bored for a length of 7,000 feet and scout bored for a further 6,300 feet, although the position of the lead cannot be taken as proven over this latter section. A further 11,800 feet extension, inferred to the north, has not been tested.

The records of the boring are poor, and sampling and evaluating practice was not stated in any reports. Good values were found in narrow gutters in the basal 30' of section, ranging from 100' - 300' in width, and at an average depth of bottom about 109'. Five small blocks were evaluated in areas most closely bored from the point of view of a sluicing proposition, and estimated reserves were 4,300,000 yards averaging about 7.78 oz/yard and equivalent tin oxide content was 981 tons. These figures are interesting, though the narrow deep blocks have no appeal for hydraulic mining.

I have been interested in the prospects of the area from the point of view of deep dredging, for the following reasons:-

(1) Large areas of this country are gently sloping or fairly level, and much of the terrain is open and treeless. Relief over 5 miles ranges from 100' - 290'.

(2) Deep dredging with a dredge capable of digging to 90' with 30' banks is a possibility.

(3) If lower values, say of 0.25 - 0.30 lb/c.yd. are considered, widths of 600' - 1200' are possible.

(4) The tin content in lead gutters can be assumed on the indications to be fairly consistent.

(5) Recent investigations have in some northerly areas shown tin bearing estuarine wash bands in the upper Tertiary section. No record of these exists in boring, and they may never have been tested.

A reappraisal of this area in the light of a dredging property is considered necessary. A scout hole to test estuarine gravels, and as a possible check on Government boring near Brown's Prospect, has been recommended, and a further two bores have been proposed in the Mayfield area to test continuity of estuarine wash and possibly the inferred extension of the deep lead.

Besides the known tributaries of the Scotia-Lochaber system, there are also possibilities of other undiscovered tributaries of the same order.

Another lead system may exist in the south western areas of the Great Northern Plain in the vicinity of the McGregor Workings, where Tertiary sediments are known between two high ridges of basement rock, namely Aberfoyle Hill and a ridge north west of the Government Dam. A scout hole to test for a deep lead cannot be positioned within narrow limits. The many workings in the area have chiefly been in small leads, estuarine gravels and alluvial terraces, but if such deposits could be coupled with a main lead gutter, a deposit of interest could result.

(b) Estuarine Wash Beds

Fine conglomerates and coarse grits carrying tin are known in several areas of the Great Northern Plain and extensions can be expected in concealed areas. These beds are generally shallow. Recent investigations in the Mayfield district and near Brown's Prospect have shown interesting indications in near surface testing, but the continuity and depth of these deposits has still to be proven.

Possibilities of shallow dredging occur in at least three areas.

(c) Alluvial Terraces

These are sometimes quite rich, but of themselves are not likely to result in large yardage in any one area. Coupled with deposits of other types, they might contribute significant tin tonnage, or could possibly result in a number of small individual workings.

MUSSEL ROE BASIN

GENERAL DESCRIPTION

South east and east of Gladstone, Tertiary and Quaternary deposits are known from country of variable relief ranging from about 200' - 550' above sea level. The country consists of timbered hills and ridges with some open lower flats and slopes along water courses. This country lies on either side of the divide between the present Ringarooma River and the Mussel Roe River.

Basement rocks surrounding the area, and forming the bottom to the Tertiary sediments are granite and Silurian slates and quartzites. Although its conformation over much of the Tertiary area is not known, the basement appears to have a markedly irregular surface judged on the relief of inliers and bottom in the many workings of the area. The presence of a so called Mussel Roe Lead has been inferred for more than 60 years, but very little information exists concerning it. It is possible that the Tertiary sediments in the area represent the remnants of a lead system in the upper reaches of an old river system (Mussel Roe?) buried by lacustrine or estuarine strata, which in later Tertiary time, may have been continuous with the deposits of the Boobyalla or Great Northern Plain Basins. Very little information is available as to what old river systems many of the worked leads belonged to, as the present Ringarooma course in this district is relatively recent and considerable dissection has taken place since Tertiary times. The area discussed under the Mussel Roe Basin may in time be proved to contain some leads which are high remnants of systems in the Boobyalla Basin

or Great Northern Plain basin, but undoubtedly much of the Tertiary ground was deposited in a Mussel Roe Basin separated by high divides of bedrock from the other two basins during at least the earlier Tertiary period. The outlet of the old Mussel Roe River System is in doubt. Attempts were made to trace its course northwards into the Great Northern Plain or Rushey Lagoon areas within our permit area, but were not successful. All evidence from surface examination suggests these possibilities are very unlikely, though not completely excluded. A further possibility is that the old main river course trends easterly beyond the limits of our permit area. Dorset Tin has permits covering ground near the Icena and Branches Homesteads, and intends to test this theory.

PAST AND PRESENT MINING ACTIVITY

Present activity is restricted to the operation of five or six small sluicing operations in or near workings which have been known for more than 60 years. The largest producer is the Star Hill Syndicate which, with very small capital, has averaged of the order of 25 tons of cassiterite per annum during recent years.

Many scattered workings have been operated in the past, but tin price, water supply and plant difficulties of the small operators, have led to very irregular production. Production records are incomplete, but it is doubtful whether more than 5,000 tons of concentrates have been won from all sources.

PROSPECTS

Prospective tin deposits of the basin within the R.T.A.E. permits are considered to be in individually small lead and bottom gravels suitable only for hydraulic mining. A collective operation incorporating a number of mines seems the only possibility of producing a moderate or large annual tonnage.

Large areas of flats east of our permits are largely untested. Ground in these is believed to be shallow. These have not been recommended for preliminary scout boring, as they largely lie outside our permits. These are the only hope for dredging, but it is doubtful whether values of sufficient continuity would be obtained, though some alluvial terraces with low values are known.

INFERENCES AS TO SCALE AND ECONOMICS OF SELECTED TARGET AREAS

Inferences have been made in the following section as to the size, possible values, methods of working and life of deposits which may exist in several areas. The basic information for such estimates is poor, and they are intended as a speculative guide only, for consideration of exploration expenditure.

1. BOONYALLA BASIN, RINGAROOMA MAIN LEAD, AREA A

(a) Targets

The main target is the Ringarooma Main Lead, the depth and values of which are unknown. Channels were indicated on seismic profiles, but the B.M.R. estimates are liable to considerable error as is also the position of gutter of channels. Contributory sources of tin are hoped for above the buried lead in estuarine wash and marine terraces, but no information as to the continuity and values of such deposits exists.

(b) Dimensions of the Main Lead

The direct linear distance of the southern seismic line A to the coast is about 30,000 feet. Allowing for irregularities, of course, a working length may be 45,000 feet. (The actual bottom gutter with its many marked irregularities in course could be actually more than 100% greater than any working length, and this is important, in that the average values are effectively increased with the greater irregularities of stream course due to greater effective yardage of rich bottom concentrations).

The actual depth is not known, though seismic survey with no reliable depth control suggests the unweathered bedrock profile may be 250' in the deepest part of the channel indicated on seismic line A. In the following calculations, the average depth to bottom of 180' is taken. If deep dredging or hydraulic mining were to be practicable to this depth to get a working width of 600' on bottom, a surface width of the order of 1,200' would probably be necessary. This would result in a working cross section of about 168,000 square feet.

(c) Yardage

An estimate of yardage might be given from the above figures, as -

$$\frac{45,000}{3} \times \frac{168,000}{9} = 286,000,000 \text{ cubic yards.}$$

over an area of approximately 1,250 acres along the lead course.

(d) Values

To be economic in the light of fairly high capitalisation necessary for deep dredging, average values of the order of 0.4 lb/yard would appear to be necessary, and this figure is taken for calculation purposes, though there is no information available regarding values present in this untested area. For sluicing higher values would be necessary to justify higher operating costs.

(e) Total Tin Content

An estimate of tin content on the above inferences for the Area A, calculating concentrates as 70% Sn is -

$$286,000,000 \times 0.4 \times \frac{1}{2240} \times \frac{70}{100} = 35,700 \text{ tons metallic tin}$$

(f) Life

Were the above hopes realised, there would exist scope for an 18 year life for four deep dredges, each treating about 4,000,000 yards per annum, and for a recovery of about 500 tons of metallic tin or in all, say 2,000 tons of metallic tin per annum.

(g) Testing

One scout hole on each of three seismic lines is proposed for preliminary testing of the Area A, which is one of perhaps three hopes of a large operation within our permit area. If depth is greater than indicated by seismic survey, the Main Ringarooma Lead would probably be uneconomic even were values approaching 0.4 lb/yard realised.

2. BOOBYALLA BASIN, AREA B

Very little is known as to the target in this area, beyond the record of the one deep bore in the area, which is reputed to have shown 4 oz. values to 110'. The following inferences are made:-

Area	: 600 acres
Depth	: 120 feet
Yardage	: $600 \times 4840 \times \frac{120}{3} = 115,000,000$ yds.
Values	: 0.25 lb/yard
Tin Content:	$115,000,000 \times \frac{1}{4} \times \frac{1}{2240} \times \frac{7}{10} = 9,000$ tons Sn
Life	: 15 years' life for 2 dredges treating 4,000,000 yards per annum for total recovery of 600 tons Sn per annum.
Testing	: One scout bore is proposed to check the reputed ground.

3. OTHER POSSIBILITIES, BOOBYALLA BASIN

In the event of the Main Lead being relatively barren, there are some other possible deposits in the Boobyalla Basin, which might result in operations on a moderate scale.

(a) Shallow marine terraces and possible estuarine wash

Two areas, each of say 900 acres, in the coastal part of area A, might warrant further testing for such deposits. Surface observations can give little information, but the scale of things suggested is:-

Area:	: 900 acres
Depth	: 50 feet
Yardage	: 53,000,000 yards
Value	: 0.3 lbs/yard
Tin Content:	5,000 tons Sn
Life	: Dredging at rate of 2½ million yards per annum allows a 20 year life for one dredge in each area with an annual production of say 250 tons Sn per annum.
Testing	: The deep scout bores in Area A will give a preliminary test of this possibility.

(b) Tributary Leads and Alluvial Fans

There is the possibility that with more intensive sub-surface exploration tributary leads of the order of size of the Endurance Lead might be found anywhere within the large area of the Boobyalla Basin. Many would probably be uneconomic because of too great an overburden ratio, but the discovery of say, two or three properties which could be worked by hydraulic mining at an annual rate of 500,000 yards for recovery of 200 tons of tin metal over a 10 or 15 year period, is not inconceivable. If widths were great enough and terrain uniform dredging might be possible, but this is not considered likely.

One small area which could possibly be dredged is the Shallaman Flats, where at least 400 acres of flats and shallow rises occur. Tin deposits with values up to 1 lb/yard are known at the head of the flats and have been worked by sluicing in several small mines. Other parts of the flats are reputed to have been bored, but no records exist. Tin was said to be present, but not in sufficient amount to repay sluicing. However, values may have been above cut off for dredging. There could possibly be 20,000,000 yards of ground, and if we assume values of 0.3 lbs. yard as a minimum for our interest, total tin content would be about 1,900 tons Sn. A Dorset type dredging operation would then be possible, with say, working of 1½ million yards per annum for a production of say, 130 tons of tin, over a period of 14 years. It is intended to test this possibility by some "scout" hand boring.

4. LOCHABER LEAD, GREAT NORTHERN PLAIN

This deep lead, its tributaries and possible estuarine wash bands in the overlying section which buries the lead, offers some hope of a large dredging operation if suitable widths exist and values are present. The sections of the lead which have been bored, indicate narrow (<300 ft.) and deep (120') gutter deposits, with average values approaching 0.5 lbs/yard. If, however, the flanks and overlying sections in unbored areas can be proved to have sufficient values, an average of 0.3 lb/yd. over a suitable width maywarrant consideration of the area for dredging.

(a) Length

Proved and indicated sections of the Scotia and Lochaber Leads and their main lead beyond the junction, totals 25,250 feet. A further inferred untested length of the main lead extension to the north west is 11,800 feet. With say, another 3,000' length of undiscovered tributaries, a total length of 40,000 feet can be taken.

(b) Width and Depth

Widths of the richer gutter as indicated by Government boring are narrow, ranging 100' - 300'. However, some bore sections recalculated near Browns deposit show widths of 600 feet and 1,200 feet with values in excess of .25 lbs/yard, over an average depth of about 110 feet.

In the following calculations, a bottom width of 800 feet is taken and a surface width of 900 feet to allow for banks in working. A possible working cross section would be say, 93,000 square feet.

(c) Yardage

Yardage would be -

$$\frac{40,000}{3} \times \frac{93,000}{9} = 138,000,000 \text{ yards}$$

(d) Values

Assuming 0.3 lbs/yard as possible, (anything much less would probably be uneconomic) total tin content would be:-

$$138,000,000 \times \frac{3}{10} \times \frac{1}{2240} \times \frac{7}{10} = 13,000 \text{ tons Sn.}$$

(e) Life

If these figures could be realised, two dredges with say, a 17 year life, could work about 4,000,000 yards per year, each with an annual production of 400 tons tin, or in total, about 800 tons tin.

(f) Testing

The Government boring has given basic information as to the order of things which might be expected in this area, but would need re-analysis and some checking. 3 bores are recommended at the northward extension of the lead, but it is unlikely that these can be sited so as to hit the narrow gutter of the lead. They are more likely to serve as a test for overlying estuarine strata.

5. FOSTERS MARSHES

These, a natural dredging proposition, (were economic; values present) total in all about 2,000 acres of swamps. An inferred course of the Ringarooma River in which stanniferous botton shingle may occur, extends for another 1,500 acres northwards - under higher country in the direction of Bowler's Lagoon.

Some 900 acres of the Marshes have been tested in part, showing a fairly consistent deposit on bottom of stanniferous shingle. The most relisble testing by Dorset however, shows that overall values are uneconomic.

On the Marshes, there remain at least 1,000 acres of lowlying ground which have never been tested, including the portion near the inferred entry of the Scotia Lead. A scout hole has been recommended in this area.

There is, perhaps, some hope that in this area there may be say, 600 acres of ground averaging 54' deep, and with say, values of 0.25 lb/yard.

Yardage would be :-

$$600 \times 4840 \times \frac{54}{3} = 52,000,000 \text{ yards}$$

Total tin content, if a value of 0.25 lb/yard were realised, would be :-

$$52,000,000 \times \frac{1}{4} \times \frac{7}{10} \times \frac{1}{2240} = 4,000 \text{ tons Sn.}$$

Such would support a dredge treating say, 4,000,000 yards per annum for 13 years, for an annual production of about 300 tons Sn per annum.

6. SHALLOW ESTUARINE WASH, GREAT NORTHERN PLAIN

Considered apart from deep leads, shallow estuarine wash bands on the Great Northern Plain may result in a number of mining operations on a moderate scale. The continuity of these would need to be proved, as the danger always exists that the wash bands are lenticular and values within the wash bands are erratic. Promising superficial indications have been found at Brown's Prospect (over the gutter of the Lochaber Lead), and in the Mayfield area where individual wash bands near the surface give values up to 2.5 lb/yard. The McGregor area also offers prospects of shallow ground.

There is some chance that if values can be proved over a depth of say, 30 feet, there may result in two or three areas of 1,000 acres in extent.

For each area, the following estimates may be taken:-

(a) Yardage : $1000 \times 4840 \times \frac{30}{3} = 48,400,000$ yds.

(b) Values : say 0.4 lbs/yard

(c) Total tin content: $48,000,000 \times \frac{4}{10} \times \frac{7}{10} \times \frac{1}{2240} = 6000$ tons Sn.

(d) Life : If such figures could be realised, shallow dredging might be possible if contours are favourable, and for each area a dredge treating say, 2,000,000 yards per year would have a 24 year life for an annual production of 250 tons Sn per annum.

With such deposits, the possibility always exists of a much larger operation if deep ground can be proved, or if they could be supplemented by other types of ground such as deep leads or the shingle of Fosters Marshes.

7. SHALLOW DEPOSITS, SOUTHERN BOOBYALLA PLAINS

The terrain here is uniform and fairly level over wide areas. Four small workings in southern parts of the plain showed rich shallow ground. Much private scout boring has probably been done in the area, but records are lost or never kept, and it is doubtful whether the area was tested in the light of dredging. Though stanniferous ground may be erratic, the scattered rich workings, shallow ground, and fairly uniform terrain, demand some scout boring be done to test for a property or properties on the following scale.

Area	: 1,000 acres
Depth	: 30'
Yardage	: 48,000,000
Tin Content	: (Values 0.4 lb/c.yard) 6,000 ton Sn.
Life	: 24 years at 250 tons Sn. per annum

8. MISCELLANEOUS PROSPECTS, GREAT NORTHERN PLAIN BASIN

The many small mines on the Great Northern Plain on the northern bank of the Ringarooma suggest that some further testing of this area be considered. Deposits in the area include deep leads, estuarine wash and alluvial terraces.

There are prospects of many small individual deposits (say, production of 50 tons per annum over a 15 year life). There are also prospects of dredging areas of say, 20,000,000 yards with a total tin content of 2,000 tons Sn. As many faces and some boring by Dorset have been done in the area, no scout hole was suggested for our preliminary testing. A fuller examination of this area, and records relating to it, is to be made before more concrete recommendations for testing can be made.

COMMENTS ON PROSPECTS AND THE PROSPECTING PROBLEM

Some 100 square miles of prospective country occur within our permits in N.E. Tasmania. Throughout this large area are scattered many moderate and small workings, from which more than 50,000 tons of cassiterite have been won. The workings are restricted to shallower marginal areas of the Tertiary Basins, and where a water supply was readily available, and

terrain suitable for the low capital at the command of the small companies and syndicates who have operated in the area. At the present time, annual production is of the order of 300 tons of concentrates from all sources including the two low capitalised major producers, Dorset Tin Dredging and Endurance Tin Mining Company.

No systematic survey of the whole area has been made in the past, despite the long history of the field. No extensive exploration programmes over the whole area have been carried out. Although scattered boring has been done, the records are now largely destroyed in many areas. The aim of much of the boring was to discover areas where the limited plant being used in small mines could be transported to a new site after exhaustion of an operating mine.

During the present R.T.A.E. survey, attention has been given to selecting areas which show some promise of mining operations on a moderate or large scale. It is obvious that most richer, easily worked exposed deposits would have been found and worked during the long history of the field, and that any hopes of proving economic deposits lie in :-

(a) new discoveries in untested areas, e.g. buried leads and concealed estuarine wash beds. Most, if not all old and presently operating mines in the area were discovered from actually exposed stanniferous ground, and the search was invariably directed to shallow ground of marginal areas.

(b) a reapproach in mining of recorded deposits and unexplored extensions. Past small operators in the area have not been dredge conscious, probably by reason of capital at their disposal. Even with the sluicing methods usually employed, elevating of deeper ground often proved beyond the limits of their resources. Deposits of many small mines were not exhausted, but were abandoned in times of low tin price or lack of adequate water. Later, operations resumed as tin price rose. It is a remarkable fact that all presently operating mines are sited on deposits known for more than 60 years or their nearer extensions.

Many possibilities of deposits occur. The bulk of these are likely to be individually small, but for even a scout of all possibilities which might result in moderate or large scale operations, a large scale sub-surface exploration campaign by seismic methods or boring would be necessary. Seismic methods would be relatively cheap, providing our own surveying is carried out, and would sensibly restrict much boring to test, in particular, buried leads. Surface geological work is limited in that the geologist is faced with huge areas of soil covered prospective country, and it is difficult to restrict within narrow limits buried lead courses. Limited testing by R.T.A.E. with hand augers has been successful in indicating shallow stanniferous ground on the Great Northern Plain, but such methods are only successful above the water-table and where no cemented strata occur near the surface.

A preliminary scout programme totalling about 1,200' of boring has been proposed to test several areas. The greater portion of this (680') has been allotted to test one major possibility only, namely the Main Ringarooma Deep Lead. There remains scope for more intensive scout boring besides that proposed as a preliminary programme. In the preliminary programme, single bores have been recommended at scattered sites, with a view to ascertaining depth, type of ground and possibly tin values. It is very doubtful, however, whether a single bore at any locality is a particularly valid test for tin values. Even though three bores to test the Ringarooma Main Lead are sited on channels indicated on seismic profiles, the following facts are significant:-

(a) Recent testing (3 bores to date) of a seismic target on the Endurance Lead, in an area where surface contours are known and good depth control is available from closely adjacent bore lines and mine workings, has shown that the estimated depths to bottom are liable to error of more than 50%, and that the inferred profile from seismic indications is liable to considerable error, as a deep channel proved by boring is at least 400' laterally displaced from the position on the seismic plot.

(b) Cassiterite in alluvial deposits can be irregularly distributed when considered in detailed plan, though wash generally is quite rich. A hole, particularly of small bore (4" or 5") can quite fortuitously strike either a practically barren or a rich pocket, in either case an erroneous impression of a deposit can result. Several instances have been given in recent comments on proposed scout testing, and have led in the past to neglect of good ground or attempted working of poor ground. As an instance of the former bore lines indicated a poor section of ground along the Endurance Lead, and this was originally avoided in working. On later "prospecting with a nozzle" from adjacent working faces the ground proved as good or better than that which boring originally showed was economic.

It follows that, in general, a valid scout for linear deposits such as buried leads, should demand a line of at least 3 bores on targets indicated by seismic work, or in the absence of this many more. In the case of widely distributed deposits such as estuarine wash, a pattern of several holes at a suitable radius from a central hole would be more suitable for scouting than linear bore lines.

CONCLUSIONS

Some conclusions and recommendations can be made as to any further exploration of our permits.

1. There exists scope for testing many possible tin deposits within our permits.

2. About 100,000 feet of reconnaissance seismic traverses would be sufficient to cover most chances of discovering moderate or larger sized buried leads. (About 25,000' were covered in five weeks in the recent B.M.R. survey in the Boobyalla District).

3. Wild cat boring to test for buried leads would probably involve considerable expense in line boring, as surface examination cannot confine testing to narrow limits.

4. Boring is the only means of exploring for dispersed deposits such as estuarine wash and marine terraces which may occur above a false bottom in Tertiary sediments.

5. Scout Boring of target areas should involve more than one hole at any one locality. The average values from one bore or even several bores are largely meaningless when dealing with alluvial deposits in which the economic mineral can have an irregular and complex distribution.

6. The best indications of tin obtained during the present R.T.A.E. survey came from superficial deposits on the Great Northern Plain, and this area should have high priority in any further exploration considered warranted, by reason of tin indications, relatively shallow depth (with consequently cheaper testing) and large areas of fairly uniform terrain.

7. If the scout bores to test the main Ringarooma Lead in the Boobyalla district show much greater depths than the preliminary seismic estimates, the lead might prove an uneconomic proposition as regards working, unless tin values in the gutter are much richer than can be reasonably expected. If no values are seen in the upper section of Tertiary strata, or if values on bottom are poor, testing of the lead might well be abandoned if depths exceed 250', as other prospects demand more attention by virtue of cheaper testing and observed indications of tin.

J. H. Rattigan
Geologist.

April 21st, 1958.

413023

Cape Portland

MN

RINGAROOMA BAY

RINGAROOMA TIER

Great Mussel Roe R.

Fosters Marsh

BOOBYALLA

Mayfield

Brown's

Delta

McGregor

Dobson's

Aberfoyle

Black Duck

Lochaber

Scotia

Doone

GREAT NORTHERN PLAIN BASIN

GLADSTONE

Star Hill

AMG
571900E
5468400N

Little Boobyalla River

Boobyalla River

Shallaman Flats

Monarch

Boobyalla

White Rocks

MT CAMERON RANGE

Hastie

Clifton

Edina

MUSSEL ROE BASIN

Lanka

Amber Hill

Ringarooma River

SOUTH MOUNT CAMERON

Dorset
1,500 tons
10% Tin

Banca

BASIN

BOOBYALLA

MT HORROR RANGE

FOOTHILLS OF BLUE TIER

PIONEER
10,000 tons

Deeper Tertiary Basins with stanniferous sediment

Pre-Tertiary bedrock with some Tertiary remnants and Quaternary alluvials

Boundary of Tertiary Basins

Inferred positions of Deep Leads

Letter Symbols illustrating types of ground which may occur in various parts of Tertiary Basins

A Major Deep Leads
B Medium " "
C Small " "
D Estuarine bottom & upper level wash bands
E Quaternary Leads
F Alluvial Terraces
G Marine " "

Preliminary Scout Bore Site

Other Suggested Shallow Hand Bores

A Seismic Traverses

WINNALEAH

Eliminated Thick Basalt for Testing Cover

HERRICK

Golden Sovereign

Golden Cora

Echo

MOORINA

AMG
573600E
5446200N

Wynyard R

Arthur R

Frome R

Weld R

Main CK

DERBY

Briseis
10,000 tons

Cascade R.

BLUE TIER TINFIELD

SOUTHERN BOUNDARY OF S.P.L. 323 (approx)

5 cm

AMG REFERENCE POINTS ADDED

022

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

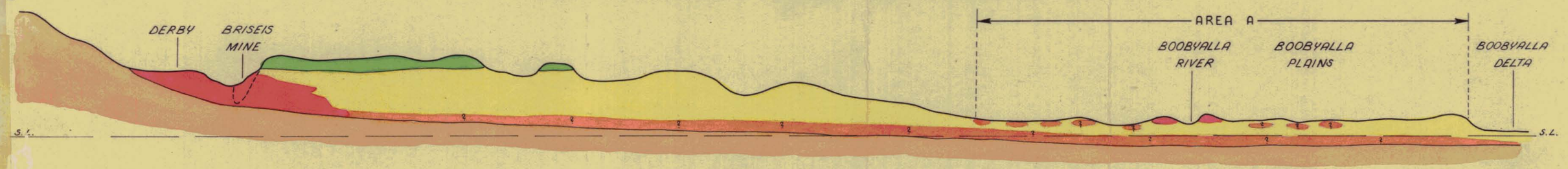
SKETCH PLAN ILLUSTRATING EXTENT OF TERTIARY BASINS AND TYPES OF POSSIBLE TIN DEPOSITS

S.P.L. 323 RINGAROOMA AREA - N.W. TAS.

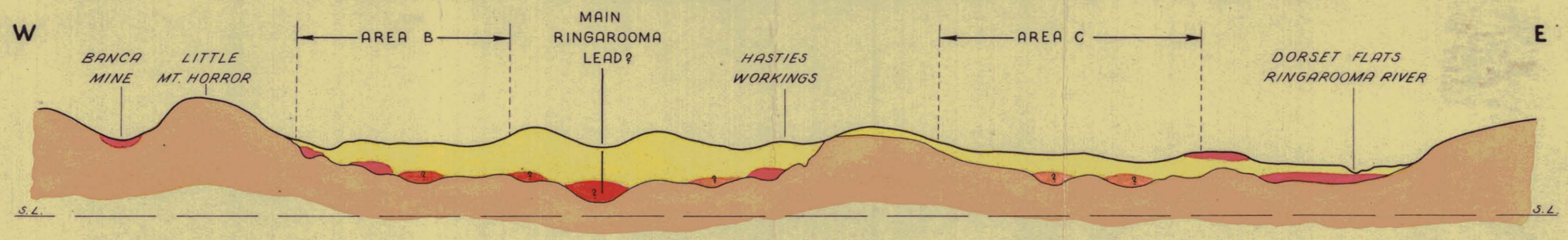
Scale 1 inch to 1 mile	PRP/7/103	Plan No T402
Date May 1958	Geologist J.H. Rattigan	

413024

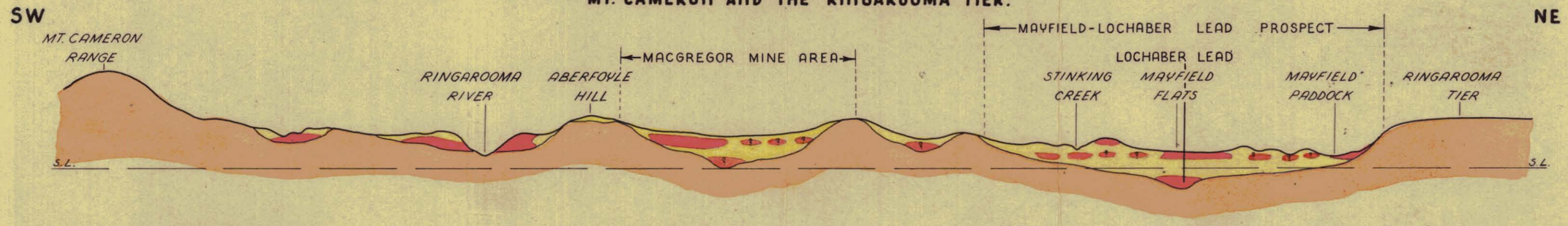
NORTH TRENDING SECTION ALONG LONG AXIS OF BOOBYALLA BASIN BETWEEN DERBY AND RINGAROOMA BAY (GENERALLY FOLLOWING INFERRED MAIN RINGAROOMA LEAD.)



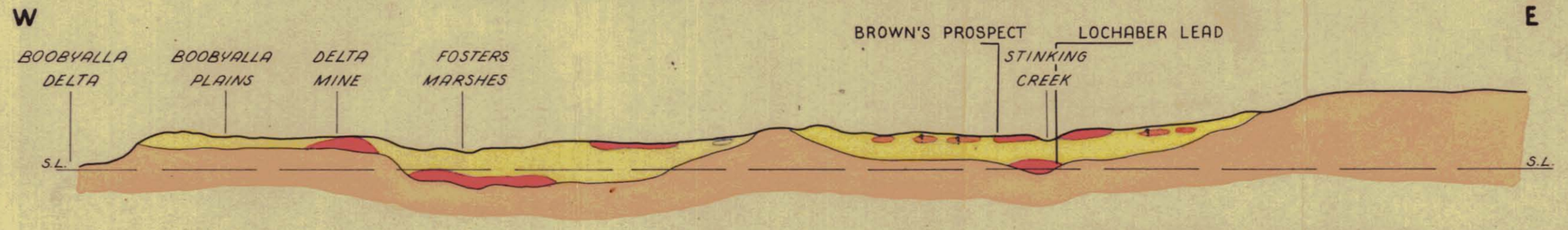
EAST TRENDING SECTION ACROSS BOOBYALLA BASIN BETWEEN LITTLE MT. HORROR AND DORSET FLATS.



NORTH EAST TRENDING SECTION ACROSS GREAT NORTHERN PLAIN BASIN BETWEEN MT. CAMERON AND THE RINGAROOMA TIER.



EAST TRENDING SECTION ALONG LONG AXIS OF THE GREAT NORTHERN PLAIN BASIN FROM BOOBYALLA DELTA TO CAPE PORTLAND ROAD.



023

PRE-TERTIARY BASEMENT

TERTIARY BASALT

TERTIARY-QUATERNARY SEDIMENTS

KNOWN STANNIFEROUS OCCURENCES

? POSSIBLE STANNIFEROUS OCCURENCES

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED.

DIAGRAMMATIC SKETCH SECTIONS ILLUSTRATING OCCURENCE OF ACTUAL AND POSSIBLE TIN DEPOSITS IN THE BOOBYALLA AND GREAT NORTHERN PLAIN BASINS, NE TASMANIA.

Geologist. J.H. Rattigan 6-5-58.	PRP/7/103	PLATE 2	Plan Nº T407
	SCALE :		