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Report from the 21st October to the 17th November, 1965

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"OIL AND GAS EXPLORATION IN SOUTH-EASTERN TASMANIA"

MICROFILMED

RISDON
November 17th, 1965.

L.J. Lucarelli,
Geologist.

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INTRODUCTION.

During this period fifteen days have been devoted to office work; three days to a trip to Rosebery to discuss with the Chief Geologist, Mr. Ray D. Pratten, the results of the first month of investigations and the future developments of the survey. The remaining two days have been spent with officers of the Lands and Surveys Department and the H.E.C. planning contract work to be carried out by them.

Fig. I gives a clear picture of the time involved in the various phases of the work during the past two months.

All my instruments, including a Zeiss mirror stereoscope complete with parallax bar and a pocket stereoscope, have now arrived from overseas; this will give us the possibility to start with field work and photo-interpretation as soon as the base map 1:100,000 and the aerial photographs will be made available to us. The project has followed the programme outlined in the first report.

TOPOGRAPHIC MAPS.

Lands and Surveys Department has offered to us its experienced services to compile the base maps 1:100,000. This will bring along several advantages from the point of view of accuracy and saving of time; first instead of enlarging the 1:250,000 they will enlarge their originals at a scale 1:126,720 (2 miles to 1"), second the H.E.C. will have more time to give to the preparation of the geological information.

The base maps will be ready in about a fortnight, that is before the 25th of this month, as Mr. Miles, Surveyor-General and Secretary for Lands, promised. The cost of the compilation of the base maps and the supply of the originals will be £250.0.0. The information contained in the base maps will be as described in the previous report; an attempt will be made to transfer on it the altimetric contouring existing around Hobart, Glen Huon and Geeveston.

This base map will be useful also for positioning the gravity meter stations in the field.

CONTINENTAL SHELF MAPS.

Additional information regarding the continental shelf has been collected at the H. E. C. (Mr. M. C. Forster) and the E. Z. Library in Risdon. It consists of two maps at 1:126,700 scale covering Eddystone Point to Cape Forestier and Cape Raoul to Cape Forestier; and of a smaller scale map (1:652,500) covering the whole of Tasmania. This last map contains only scattered soundings and it will be used only to fill the gaps between the existing coverage and the step bordering the continental shelf (Plate IX).

The two maps 1:126,700 have been joined together along the parallel of 42° south to form an unique sheet covering the continental shelf in the eastern and south-eastern side of the lease area. The interpretation of the data appearing on these maps lead to the compilation of Plate X representing, as accurately as possible, the shape of the sea floor to the depth of ninety fathoms. Each contour line marks a step of five fathoms.

An examination of Plate X will reveal interesting particulars:

- (a) The submerged eastern slopes of Freycinet Peninsula, Shouten Island, Maria Island and the eastern and southern ones of Tasman Peninsula show a sudden drop to a depth of 30 fathoms. From this depth the sea floor slopes down more gently and regularly giving rise to a tilted platform with quite smooth topography.
- (b) All the bays show depths inferior to the thirty fathoms. Sometimes, as in the cases of Great Oyster Bay (?) Port Arthur and Dunnalley Bay a trough deeper than the bay-mouths exists in the centre of the basin.

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- (c) To the East of the line joining Cape Mistaken (Maria Island) and Fortescue Bay (Tasman Peninsula) a narrow ridge, averaging fifty fathoms in depth, is running straight in a N N E direction; Hippolyte Rocks are its only visible expression at its southern limit.
- (d) No deeply cutted submarine canyons are present in the contoured area, with the exception of a small one having an E-W direction in the vicinity of Tasman Island.

The feature described at (c) could be the expression of a dyke, of a large fault intermittently dyke-filled, or of a dead coral reef extending from Tasman Island to the N E along the outer contour of fifty fathoms.

AERIAL PHOTOGRAPHY.

Aerial photographic coverage of the whole lease area has been ordered to Lands and Surveys Department; printing has started a few days ago.

The aerial photographs will be released to us starting from the north-western corner of the lease area and proceeding eastwards to the sea, following the progressive numeration of the topographic sheets 1 inch to a mile (1:63.360). Delivery will start at Xmas time and it will not be completed before six months from that date; this means processing only thirty prints/day. This slowness is due to the fact that most of the negative film is very old and its handling requires a special care. The aerial photographs will have on printed centres. This will save us some time necessary for their plotting.

The cost of the complete set of aerial photographs will be £835. 7. 0 divided as follows:-

prints	1 +	10	7 sh. each	(1)	3.10. 0
"	11 +	200	5 " "	(190)	47.10. 0
"	201 +	5429	3 " :	(5229)	<u>784. 7. 0</u>
			<u>Total</u>		<u>£835. 7. 0</u>

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A rough estimate can be given now of the expenditure for purchasing the plastic transparent paper (ULTRAPHAN) used to cover the photographs and on which the interpretation is drawn. Any other photographs will have three overlays on (DRAINAGE, PHOTOGEOLOGY, FRACTURES) so that 8145 of them are needed. Ultraphan comes in rolls 30" x 10 yards and the thickness is 0.003" - being the size of the photographs 9" x 9" and 7" x 9", every roll will cover about 135 of them, this amounts to 60 rolls. The cost of one roll, including sales tax, is £4. 4. 6 - the total cost will be £253.10. 0.

GEOLOGY.

All the useful geological maps have been delivered to Mr. Broughton of the H.E.C. in order to have them reduced or enlarged to the same scale as the base map. The processed material will be released to us in a week's time and the compilation of the 1:100,000 geological map can then be started.

On the 3rd and 10th of this month two gentlemen, Mr. Sproule and Mr. Green, who had previously reported to the Company occurrences of oil seepage, were interviewed.

Mr. Sproule told that the oil-seepage occurs in a well 10' deep sunk 24 years ago by the Army half a mile inside of Cape Direction (South Arm), on the second beach towards Hobart at the Rifle Range. He could not give any particulars related to the "oily substance" other than it had the rainbow's colours. I personally think this information worth checking because a true oil show is known to exist in North Bruny in the same stratigraphic sequence. Permission to visit the place is to be asked to the Army Command - Anglesea Barracks - Hobart.

He mentioned also gold occurrences in the vicinity of Bull Bay, North Bruny.

Mr. Green reported that some "pitch" had been found at Port Davey on the South West Coast, far away from the lease area.

The unpublished geological report prepared by A. McIntosh Reid in 1929 concerning oil prospects in North

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Bruny Island has been made available to us by the Mines Department.

The report deals with the investigation carried out for oil exploration on North Bruny Island by an unnamed company. Only two of several oil showings reported turned out to be true ones: at Johnson well and Myles Creek (Fig.II). A bore hole (dry) was drilled to a depth of 431 feet on the northern shore of the "Lagoon", and a description of the stratigraphic sequence encountered was recorded; this has been used to draw the lithologic column in Plate XI, which shows also on the right side a tentative correlation between the formations drilled and the ones outcropping nearby and described in the report. No mention is made of fossils, ages, height above sea level of the top of the bore hole and of the stratigraphic position of the formations in which the true oil-showings have been discovered. The result of the report are negative due to geology and structure considered unfavourable for economic oil accumulation.

One of the problems to be faced during the interpretation of the geophysical data and later on in evaluating the possible occurrence of economic reservoirs within the lease area, also if favourable structure is present, will be the one concerning the lithologic composition of the formations occurring in the basement.

Only few outcrops of sedimentary rocks older than the Permian occur in this region and all of them on the rims of the basin (east of Leprena and Lune River in the south west, Maria Island in the north east) far apart from each other so that any conclusion regarding their presence elsewhere would be quite hazardous without the help of stratigraphic test wells.

While discussing this point with Mr. I. B. Jennings, Chief Geologist of the Mines Department, he suggested that a possible way to find out some information about the basement could be to search the zones around the Cainozoic volcanic centres for evidence of rocks carried up by the melted lavas.

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A junior geologist or a University student in geology could be entrusted with this task. If this attempt would prove itself successful very valuable information could be obtained at a very low cost.

GEOPHYSICS.

The gravimetric survey is due to start early in December and it will be carried out by Mr. B. R. Cameron, senior geophysics student.

A Worden gravity meter, provided by the University, will be used during the survey. The Company will provide Mr. Cameron with the transportation for field work.

Readings will be taken with a mile spacing whenever possible, using as reference the grid superimposed on the 1:100,000 base map.

At the location of every station the rock type should be recorded and a brief description of it given in the field book.

L. J. Lucarelli

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REPORT FROM THE 20th SEPTEMBER TO THE 20TH OCTOBER 1965

"OIL AND GAS EXPLORATION IN SOUTH-EASTERN TASMANIA"

RISDON

OCTOBER 20TH, 1965

L.J. LUCARELLI
GEOLOGIST.

INTRODUCTION

My arrival in Hobart from Captains Flat (N.S.W.) was on Sunday, September 19th, and since that time I have been working at Risdon's offices.

Contacts have been made, through Mr. Ray Pratten, during the first two days, with people from the Lands Department, the Mines Department, the Geological Department of the Tasmanian University and the Hydro-Electric Commission; all of them turned out very useful. A total of five days were spent for this purpose during this period.

Eighteen days have been devoted to office work, collecting and checking the geological and geophysical information in relation to the lease area and preparing plates illustrating the assembled data.

The lease covers an area of 8,000 sq. miles in South Eastern Tasmania and its boundaries are; to the North the International grid line 810,000 yards; to the West the International grid line 470,000 yards; to the South the parallel of $43^{\circ} 35'$ south latitude and to the East the meridian of $148^{\circ} 20'$ longitude.

TOPOGRAPHIC MAPS (PLATE I)

The topographic information available up to date for the lease area consists of maps at 1:250,000 scale (sheets Nos. 6 and 8) and, in the South-Western corner, of two sheets 1:31,680 scale (Glen Huon and Geeveston) which have altimetric contour lines.

The existing information concerning the continental shelf consists of two maps at 1:107,000 and 1:10,000 scales covering D'Entrecasteaux - Storm Bay and the Port of Hobart.

AERIAL PHOTOGRAPHY (PLATE II)

Aerial photographs are available at the Lands Department for the whole area. The photo indexes

showing the run numbers, the photos numbers and the flying path are divided in sheets of $0^{\circ} 30'$ of longitude and $0^{\circ} 15'$ of latitude. The photographs have various scales, that is

5%	1:23,760	
80%	1:15,840	
15%	1:15,840	or 1:35,640

All the photographs at 1:15,840 scale have been taken from 1945 to 1950, the other ones in 1950 and 1960. Almost all the flight lines are in an East-West direction.

No photomosaics, controlled or uncontrolled, exist for any part of the lease.

The total number of photographs needed to cover stereoscopically the whole area is 5429. A letter has been forwarded to the Secretary of the Lands Department, together with a detailed list of the photos needed, enquiring about the cost and the time necessary to release them to us. No answer has yet been received.

GEOLOGY (PLATE III)

All maps and reports dealing with the geology of the country, with special attention to those concerning the South-Eastern part, have been checked. The attached plate gives an idea of the usable coverage and its scales.

Some of the information consists of very sketchy geological maps with scarce structural and stratigraphic data; some is enough detailed and reliable. For some areas the only available geological and structural maps will be the 1:506,880 scale published by the Geological Survey of the Mines Department

Reports on bore-holes are known to exist for the Mersey Valley and Bruny Island; unfortunately we do not yet have the ones concerning Bruny Island drilled by the Adelaide Oil Exploration Company in 1924. However, the small depth reached in these holes would be of little help to us.

Plate IV shows a generalised section of the known stratigraphy in Tasmania and, although at this stage it would be quite hazardous to make any statement concerning the oil possibilities of such formations, it looks like that only the Permian, the Early Devonian-Silurian and the Upper Ordovician could develop as reasonable prospects. The presence of a thick sedimentary section of marine Tertiary on the continental shelf, once ascertained, could be regarded as another prospect. It is worth mentioning that no indication of oil seepage or gas show has been reported in any formation outcropping in Tasmania.

Plate V and VI refer to the Permian. The first one shows the approximate locations of the measured cross-sections and the limit of Permian outcrops within the Tamar-Derwent basin; the second one shows the correlations between the cross-sections more closely related to our exploration area, arranged along two lines crossing the basin from S.W. to N.E. The analysis of plate VI suggests that the thickest section of Permian formations to be expected in the lease area is not more than 673 mts (or 2212'). Most of the correlations are tentative due to lack of information.

The lithologic symbols used in plates IV and VI are the ones adopted by Esso Standard N.Y.

GEOPHYSICS (PLATE VII)

A gravimetric map prepared by the Geophysical Department of the Tasmanian University is the only geophysical information available; it covers about 900 sq. miles (about 2500 sq. kms) of the lease area. Arrangements have been made with Dr. Green and a copy has been delivered to us. Dr. Green suggested also that if we are going to extend the gravimetric coverage we could rent the gravimeter for a fair price and a student-operators would be willing to work in the field during the summer vacations, if we would pay for their living expenses. The processing and recording of the data is fully automated and the cost of operating the computer would be £2. 0. 0 per minute (the computer processes 30 readings per minute).

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Enclosed is a sample sheet used to record readings in the field.

SUGGESTIONS FOR FURTHER WORK

(a) Geological exploration:-

The first step is to produce a topographic map of the area to be used as a base to plot the available geological information collected. The scale of this map should be 1:100,000, suitable also to record the results of the geologic interpretation of the aerial-photographs. This could be accomplished by enlarging the existing 1:250,000 (sheets Nos. 6 and 8), which contains the drainage pattern the roads net and the International grid lines, enough details to help us in transferring the geology to a unique map. As shown in Plate III, the geological maps we can use for this purpose have a wide range of scales and are about forty; the fastest and cheapest way to bring them to the final scale is to reduce them photographically.

To keep the dimensions of the 1:100,000 topographic map down to a reasonable size, I suggest to divide it in four equal sheets (see Plate VIII) of about 91 x 74 cms each one.

At the moment all this work can be done only by the H.E.C. which has the necessary photographic equipment and personnel. After a meeting with Mr. Broughton, I have been submitted a rough estimate of the costs which range up to £300. 0. 0 No indication was given to me regarding the time necessary for this job.

As soon as the abovementioned maps are ready, it would be advisable to make a reconnaissance trip in the field in order to get acquainted with the various rock formations and to find keys to use in the photo-interpretation.

The next step should be the stereoscopic study of the aerial photographs which should consist of:

1. plotting of the centres of the aerial photographs and transferring them on the 1:100,000 base maps and geological maps.

2. covering the alternative photographs with three plastic transparent overlays on which to draw the interpretation and to transfer the centres on each one of them.
3. the photo interpretation, that is : morphological analysis, photogeology and fracture analysis.
4. assembling of results.

I feel that the photo interpretation will be of great help in completing the geological coverage of the blank areas and in clarifying the structural patterns. Moreover, it will save us time and keep expenses down.

No loss of time would occur between phase one and two because the photo interpretation could start as soon as some of the photographs are available and my stereoscope has arrived.

No estimate can be given now about the time needed for this particular job, depending mostly on availability of personnel and instrumentation.

Field trips will be necessary during and after the study of the photographs to check the results, to clear up doubtful interpretations and to have more cross-sections measured in the Permian in order to obtain a clearer picture of its stratigraphy.

(b) Geophysical Exploration

1. Gravimetry and Magnetometry: due to the fact that a large part of the lease area is covered with Jurassic dolerite and Tertiary basalts and taking into consideration the high expenses involved in detailed ground magnetometric and gravimetric surveys, I am not too inclined to use them extensively in our lease; first because the thick basic volcanic blanket will mask the information about the basement and second because of the time needed to cover the whole area with a reasonably spaced net. Anyway, if a gravimetric survey off-shore will be carried out, it would be advisable to complete the one inland; its results, by way of comparison, could help in the interpretation of the sub-marine geology and structure.

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An airborne-magnetometric survey could better answer our aims. The advantages of an airborne magnetometric survey are: less time needed for the survey and the plotting of the results, the flying height would reduce the noise of outcropping basic volcanic rocks to a minimum, and the survey could be carried out in the same time over land and water.

2. Marine Reflection Seismic: this new tool of geophysical exploration at sea is now widely used, together with gravimetry and aerial magnetometry in any off-shore project for oil and gas throughout the world; and it is the one which has proved itself more reliable in choosing targets at sea.

All the geophysical work should be carried out by qualified contractors who should be willing to furnish us with the interpretation of the results of the survey and to co-operate with us during the various phases of the exploration programme.

Specifications regarding instruments, flight control equipment, type of boat and aircraft etc., to be used during the geophysical surveys cannot be given at this stage; their selection should be made only when the geology and the structural pattern of the inland lease area is completed or near completion.

L.J. LUCARELLI

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REPORT FROM THE 17TH NOVEMBER TO THE 14TH DECEMBER, 1965.

"OIL AND GAS EXPLORATION IN SOUTH-EASTERN TASMANIA"

L. J. LUCARELLI

GEOLOGIST.

RISDON,
DECEMBER 15th, 1965.

INTRODUCTION (Fig. V)

The entire month has been spent at Risdon's office collecting further geological information, compiling more accurate stratigraphic sections for the Ordovician, Silurian, Devonian and Permian and contouring the maps covering the southern part of the continental shelf. The aerial photographs delivered by Lands & Surveys Department have been filed divided by runs and by sheet.

On the 7th and 8th of this month the Chief Geologist Mr. Ray D. Pratten, was in Hobart to take vision of the progress of the work. On the 8th a visit was paid to the Surveyor-General, Lands and Surveys Department, to introduce Mr. Pratten.

GEOLOGIC AND TOPOGRAPHIC MAPS.

Reductions and enlargements to 1:100,000 scale of the geological maps have been completed by officers of the H.E.C. The cost of this operation will be around £30. 0. 0

The 1:100,000 topographic base maps are not ready so that the transferring of the geological information on to them can't be started yet. I hope to have them delivered within the next ten days.

CONTINENTAL SHELF MAPS.

Plate XIII has been prepared using the information recorded on an Admiralty map covering the southern part of the continental shelf included in the lease area from Storm Bay to South East Cape; its scale is 1:107,000 at 43°20' South Latitude. The contour lines mark steps of five fathoms down to a depth of ninety five. The belt between the shore line and the five fathoms contour line does not show any, or only few soundings, this being due to the fact that this zone was too crowded with data and their recording would have resulted in making the map more difficult to read.

Remarkable particulars shown on this plate are:

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- (a) The steepest slope is located around South East Cape and Second Lookout Point where the coast is facing the open sea to the South; the same happens in Plate X between Cape Raoul and Tasman Island. This could be the result of strong erosional currents coming from the South Western quadrants; deposition would so occur along the coasts facing East producing gentler slopes as it is the case in Plates X and XIII. The anomalous slope on the Southern part of Bruny Island could be explained by the presence of the rougher submarine relief existing seaward and by a meridional submerged ridge running South Easterly from Leprena. These obstacles could reduce the strength of the current avoiding the erosional processes affecting the other parts of the South and South East facing coasts.
- (b) Three parallel submerged ridges run in a N.W. - S.E. direction between Tasman Head and Recherche Bay. The first one starts at the mouth of the Lagoon north of Recherche Bay and through Acteon Island ends at a depth of fifty fathoms in a domal shaped feature; Sidmouth Rock could be its extreme appendix to the South. The second one begins at Cape Bruny and finishes in an oval shaped feature, elongated in the same direction as the ridge, at a depth of twenty-seven fathoms. The third one moves from Tasman Head and through Friar Rocks, reaches its end at a depth of thirty-five fathoms. The second and the third ones are closely spaced; the first and second ones are farther apart and divided by a fairly deep submarine valley.
- (c) All the bays as in Plate X, show depths inferior to thirty fathoms and narrow troughs are present; most of them reach twenty fathoms as between Frederick Henry Bay and Norfolk Bay, between Opossum Bay and Blackman's Bay; in D'Entrecasteaux Channel the average depth of the troughs is twenty-five fathoms with a maximum of thirty-three in its Northernmost part.
- (d) A large submarine plateau is located South-South-East of Bruny Island at a depth from forty-five to fifty fathoms; its slope has an average gradient of $0.39^{\circ}/\text{oo}$.

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The boundary between the continental shelf and slope is marked by the fifty fathoms contour line where a sudden drop of at least forty-five fathoms occur. Towards South-West and North-East the plateau evolves into gentle slopes with a sensibly increased gradient. Nothing more can be said about this interesting feature and other portions of the map due to lack of information and more data are required to confirm this interpretation.

A compilation of a map at 1:250,000 scale will be made by reducing Plate X and XIII and enlarging another map at a scale of 1:652,500; This last one will supply some data useful to fill up the existing gaps and to better the picture of the shelf in this region.

AERIAL PHOTOGRAPHY.

On the 15th and 16th of this month Lands and Surveys Department delivered to me 1591 aerial photographs covering Lake Echo, Interlaken, Tooms, Swansea, Ouse and Oatlands sheets in the Northern part of the lease area, amounting to about 30% of the total number requested.

The quality of the aerial photographs is good and suitable for photogeological interpretation.

A first look at a few strips has shown that some of the photographs have less than 50% overlap; this will result in the fact that they can't be assembled together by slotted template or radial line methods and more time consuming devices must be used.

GEOLOGY.

Plate XII illustrates in detail the stratigraphic sequence of Ordovician, Silurian and Devonian rocks in Tasmania. The stratigraphic units appearing in this plate are representative of the composition of the groups, formations and beds in zones as close as possible to the lease area.

An analysis of Plate XII reveals that the Junee group includes rocks which can be regarded as source beds. Such is the case for the Gordon Limestone, about 1500 mts thick, which in its upper portion show traces of bituminous

matter and syngenetic (?) sulphides indicating reducing conditions during deposition. As reservoirs can be taken into consideration the arenaceous beds of the Gordon Limestone and possibly the sandstones present in the Mathinna beds. Favourable structure could have been imposed on these rocks by the Tabberabberan orogeny of middle Devonian times. A structural pattern oriented around a N - S direction, and more or less parallel to the Eastern flank of the Tyennan Geanticline should be expected to affect the lease area, if, as it seems possible, both Junee group and/or Mathinna beds are continuous under the more recent cover. This last hypothesis would sound more acceptable if, as it has been suggested by others, could be proved that some of the basal beds of the Mathinna series are a lateral facies of the Junee group, and the other ones a lateral facies of the Eldon group. Being Mathinna beds present along the Eastern coast as far South as Maria Island and so not far away from outcrops of the Junee and Eldon groups makes the possibility of their continuity under overlying sediments more probable.

It will be the task of a phase of the photo-interpretation to ascertain the presence and evaluate the importance of the structure developed on these formations. Cap rocks for the above mentioned reservoirs could be the Fenestella shale (where present) or the claystones interlayered in the Mathinna beds. Of interest are also the unconformities in the Junee Group and the disconformities at the base of the Eldon group and Mathinna beds.

Figs. III and IV show tentative isopach form lines for the Gordon limestone and the Caroline Creek sandstone as drawn using all the information available up to date; they represent a subjective interpretation of data derived from N. R. Banks.

Maximum deposition of Caroline Creek sandstone occurred in Central North, West and South-West Tasmania, while minimum deposition occurred in North West and Central West areas along an axis oriented North-West - South-East at its upper end and almost East-West at its lower end. This formation should be present in the Central West and South-West of the lease area with a thickness of up to 400 feet decreasing Eastwards; the lithological members should be sandstone and siltstone giving place to finer sediments to the East.

Maximum thickness of Gordon limestone is recorded in Central North and South-West Tasmania, minima near Beaconsfield, on the South East coast, in the North West area, near Queenstown and Mt King William. The axis of the maxima form an arch, convex to the South East, passing approximately through Ulverstone, Mole Creek and Adamsfield. Regularity and extension of this formation suggest that sudden hiatus should not be expected within a few miles, so that it might be inferred that the Gordon limestone too contributes to form the basement, at least in the Western part of the lease area, with thicknesses ranging possibly between 800 and 4000 feet.

Facies changes occur in the outcropping areas of Caroline Creek and Prion Bay where sandstone and siltstone respectively are interbedded with the limestone; consequently the same might be suggested to happen within the lease area. The doubt remains to whether the sediments are of a fine or coarse-grained type.

Plates XIV and XIVa refer to the correlations in the Permian system of Tasmania. The first one shows the approximate locations and the areal relationships of the measured cross-sections which have been assembled together taking as a reference the top of the Darlington limestone, the base of the Ferntree group or the top of the Cascades group; each group or formation has been given a different colour with the exclusion of the Malbina formation and the Cascades group in the North-Western quadrant where they are undistinguishable from each other, and so bear both colours. Cross sections in this Plate have two different scales but their difference is so small that can be disregarded. Remarkable is the fact that thicknesses within the same group or formation are very changeable also when cross-sections are separated by a relatively short distance; sometimes the entire group pinches out and disappears as it is the case for Golden Valley and Quarby groups in sections 7, 8, 14 and 15.

The second one shows the lithological composition, accessory minerals and fossils of the groups and formations in the same cross-sections which here have a unique scale 1:5000. The colours represent the depositional environments under which the sediments were accumulated; the key to colours is:

	Dark brown	-	Terrestrial
	Light brown	-	Mostly Terrestrial
Marine	(Yellow	-	Littoral - Sub-Littoral
	(Green	-	Shallow
	(Blue	-	Deep waters

Most of the Permian sediments appear to be deposited under terrestrial and littoral or sub-littoral conditions, a few in shallow sea and a minimum part in deep waters.

As it is the case for thicknesses, also lithology within the same group or formation is very variable from place to place.

Oil shales are present in the Mersey and Quaraby groups in North-western, North and Central Tasmania and can be regarded as fairly good source beds; unfortunately they are absent in the lease area. In the South East (excluding Coles Bay and Maria Island) and South-West the basal silt of the Quaraby group was deposited in a quiet and reducing environment in deep waters as supported by the presence of carbonaceous matter, pyrite and lack of coarse clastic materials, all of them favourable conditions for hydrocarbons accumulation. If the true oil-seepages reported to occur on Bruny Island in the last report are located in these sediments, which can't be ascertained now for lack of geological information, this hypothesis could be given more credit. No other Permian sediments can be considered as source rocks because of their composition, origin and types of fossils (most of them living in oxygenated and turbulent waters) indicating unfavourable depositional environments. As possible reservoirs can be taken into account all those sediments having good porosity derived by good grain sorting and poor cementing, and those ones which could have developed a secondary permeability (i.e. limestones). The mudstones could represent the cap-rocks.

The global structural pattern of the Permian is synclinal with the main axis slightly West of North; indications of minor positive or negative structures have been recorded in many places in Tasmania and have been imposed on these sediments either by faulting during

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Jurassic and Cainozoic or folding before Triassic. Interesting positive structures, not caused by intrusions of basic rocks, are present inside or near the lease area at Slopen Island, Eaglehawk Neck and Russell River; the first one has its axis oriented NNW, the second one NW-SE and plunges to the South-East, the third one NE-SW plunging South-Westerly. The ones at Slopen Island and Eaglehawk Neck are believed to be of compactional origin over an uneven basement which makes them more interesting from the point of view of potential oil prospects.

Two sedimentary cycles have been recognised in the Permian (Plate XIVA, sections 16, 15 and 3). The lowest one starts with the Wynyard Tillite or the Basal Conglomerates and ends within the Mersey group; the upper one begins within the Mersey group and is closed by the Cygnet Coal Measures. In both cycles are represented sediments deposited in continental, littoral, shallow marine and deep water environments and back in a reverse sequence. This demonstrates that movements or appreciable changes in sea-level occurred since lower Permian times. A major and wide-spread uplift is shown in the upper lower Permian by the continental or sub-littoral sediments of the Mersey group; this movement could have concurred together with the upper Permian one to shape structurally the sediments accumulated in the earlier Permian and among them also the silts of the Quaraby group, considered to be good source rocks.

GEOPHYSICS.

Mr. B. R. Cameron left for the field and started the gravity survey on the 13th of December.

Surveying will be carried out in the Southern part of the lease area using as ground references the bench marks laid down by Lands and Surveys Department until the base maps 1:100,000 will be ready.

L. J. Lucarelli

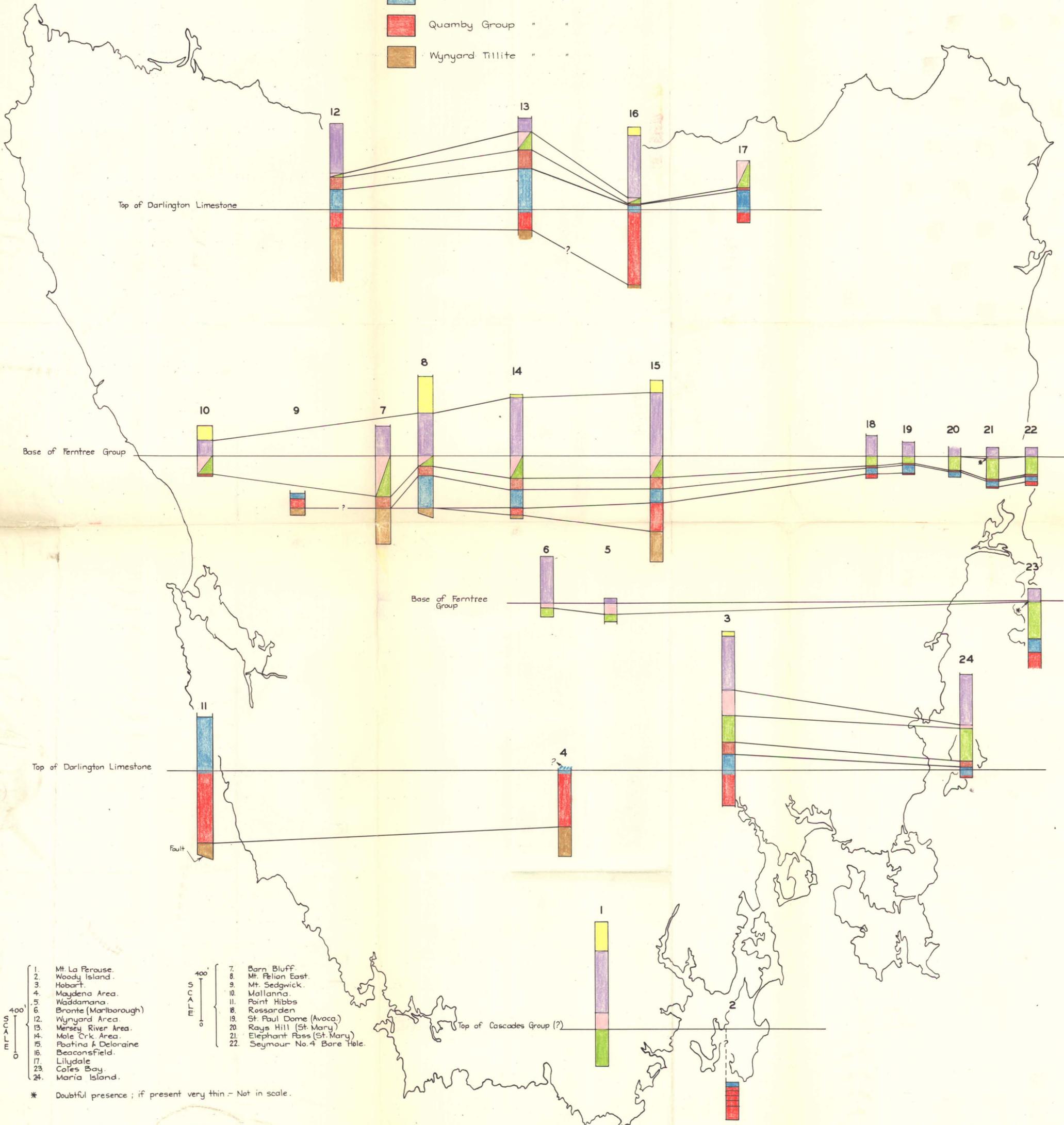
L. J. LUCARELLI.

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Legend

- Cygnet Coal Measures
- Ferntree Group & Correlates
- Malbina Formation & Correlates
- Cascades Group " "
- Mersey Group " "
- Golden Valley G. " "
- Quamby Group " "
- Wynyard Tillite " "



- 1. Mt. La Perouse.
- 2. Woody Island.
- 3. Hobart.
- 4. Maydena Area.
- 5. Waddamana.
- 6. Bronte (Marlborough).
- 7. Wynyard Area.
- 8. Mersey River Area.
- 9. Mole Crk. Area.
- 10. Boatina & Deloraine.
- 11. Beaconsfield.
- 12. Lilydale.
- 13. Coles Bay.
- 14. Maria Island.

- 7. Barn Bluff.
- 8. Mt. Pelion East.
- 9. Mt. Sedgwick.
- 10. Mallanna.
- 11. Point Hibbs.
- 12. Rossarden.
- 13. St. Paul Dome (Avoca).
- 14. Rays Hill (St. Mary).
- 15. Elephant Pass (St. Mary).
- 16. Seymour No. 4 Bare Hole.

Top of Cascades Group (?)

* Doubtful presence; if present very thin - Not in scale.