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LAUNCESTON BASIN PROJECT

REPORT ON PHASE I EXPLORATORY DRILLING

IN THE LAUNCESTON BASIN AREA, TASMANIA

EL 16/72

AMG REFERENCE POINTS ADDED

T.W. Middleton
March, 1973

Getty Oil Development Company Limited
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LAUNCESTON BASIN PROJECT

REPORT ON PHASE I EXPLORATORY DRILLING IN THE LAUNCESTON BASIN AREA, TASMANIA

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SUMMARY AND CONCLUSIONS

A comprehensive rotary drilling program, in the Launceston Tertiary Basin, comprising 122 holes, has failed to discover significant radioactivity, the maximum encountered being four times background.

Fluviatile deposition has provided substantial sand-silt and even conglomeratic facies over large areal extent, which, having a reducing environment and abundant carbonaceous material present, might have provided suitable hosts for deposition of sedimentary uranium. In addition these favourable units are often constrained vertically by impermeable clay units and laterally by facies changes.

The only significant zone of apparently ferruginised material that lies beneath the present surface oxidation limit is located at the north areas of R and S sections. It is present over considerable vertical extent, and includes ferruginous sands and clays. Some low order anomalous radioactivity is present in this zone towards the north of section R, but does not appear to show typical roll front characteristics.

The sediments of the basin are generally poorly compacted and have been laid down during the early to middle part of the Tertiary. The source rocks, for the most part, have not been metamorphosed. Permian and Triassic sedimentary rocks and Jurassic dolerite occupy about 90% of the land surface of the present drainage basin. The Ben Lomond Granite has been buried by Tertiary sedimentation, as have basal Permian beds.

The role of another possible source, Cambrian metasediments and metavolcanics, is unknown. However, minor anomalous radioactivity detected in the basin near Cressy may have been derived from a nearby (albeit small) area of these rocks.

Evidence of pyroclastic activity in the basin area is absent. The only form of effusive rock is an olivine rich basalt which occurs over two large areas. This probably emanated from fissure flows associated with renewed tensional activity late in the Tertiary.

INTRODUCTION

At the request of Getty Oil Development Company Limited, the writer commenced duties in Launceston, Tasmania, on October 24, 1972, in field preparation for the Phase I exploratory drilling of the Launceston Basin, a suspected sedimentary uranium environment. This is in Exploration Licence 16/72, held by Tenneco Australia, Inc.

During the drilling program, 122 effective rotary holes were completed in the period November 23, 1972, to January 28, 1973, by Austral United Geophysical Pty. Ltd. using two rotary rigs.

The drilling program was managed by the writer and supervised by Mr. P.A. Riddell Australasian Manager of Getty Oil Development Company Limited and Mr. G. Miller, Senior Geologist.

Competent assistance was given to the writer by way of sampling and logging drill cuttings by Messrs. P. Griffiths, B.Sc. and R. Willink, both of whom have passed Geology II stage of the University of Tasmania.

Appreciation is also extended to Mr. O. Szokoloczi of Blackwood Creek, for his public relations work with landowners of the area.

This report has been compiled to describe the results of the drilling program and to give a reasonably comprehensive guide to the history and physical nature of the Launceston Basin.

The complete set of geological logs is appended to this report as are the geophysical logs, showing gamma, S.P. and resistivity functions. A set of base plans at one inch = ½ mile scale, to show drill hole locations, etc. and set of cross sections at one inch = 400 feet horizontal scale and one inch = 50 feet vertical scale, to show lithologies, has been prepared by draftsman M. Chatenay. These are also appended.

AREA DEFINITION

Location and Accessibility

Exploration Licence 16/72 of 1460 square miles encompasses the whole of the Northern Midlands Plains and adjacent areas of known Tertiary sediments. It extends from Tunbridge, in the south, north to Dilston on the Tamar River, with the towns of Poatina, Westbury and Frankford on the western flank.

Within the E.L. the area recently investigated extends as a swathe from just east of Conara down the South Esk Valley to Evandale, thence west through the Cressy-Longford region to a line between Bracknell and Carrick, representing approximately 250 square miles.

The centre of the area has the co-ordinates $41^{o}41'S$, $147^{o}15'E$.

The whole area is served by the regional city of Launceston (population+60,000) at the head of the Tamar Estuary, whose wharves can accommodate vessels drawing a maximum of 18', i.e. up to about 2500 tons gross. The main port facilities are at Bell Bay near the mouth of the Tamar, about 25 miles from Launceston. A new rail link is almost completed. Vessels of up to 755 ft. length, drawing a maximum of 35', i.e. up to 55,000 tons, can be accommodated here.

The main north-south railway (3'6" gauge) extends from Launceston through Conara Junction where a branch line runs east up the South Esk Valley. The main north-west line branches off at Western Junction, near Evandale, and runs through Longford and Westbury.

Launceston Airport at Western Junction handles daily passenger and cargo traffic to Hobart and Melbourne/Sydney and its runway is able to accommodate aircraft to Boeing 727 size.

The Midlands Highway (2 lane bitumen) extending from Launceston through Conara serves the eastern part of the area, with the Bass Highway extending west from Launceston through Westbury, flanking the northern side. The whole area is very well served by secondary bitumen roads and with all weather gravel roads serving local farming centres. Access to all of the country covered is very good with the exception of the Epping Forest tracts through Epping and Conara. Here access is restricted to property tracks. The relatively low to moderate rainfall of the area makes most property tracks trafficable the whole year round with the possible exception of brief periods during the winter.

Small towns in the area south of Launceston with a population of around 1000 or more are Longford, Westbury, Evandale and Campbell Town while other small towns or villages within the area examined are Cressy, Carrick, Bishopsbourne, Perth, Epping, Conara, Cleveland and Nile.

Property Tenure

The area investigated falls within Exploration Licence 16/72 of 1460 square miles issued on November 3, 1972, and in force until May 1, 1973. The E.L. has been issued by the Tasmanian Government to Tenneco Australia, Inc., which in turn has agreed to Getty Oil Development Company Limited earning a 50% interest in the property for the expenditure of $150,000. Getty Oil has functioned as the operator and manager of the just completed exploration phase.

Under the terms of the E.L., exploration work may be carried out on all private lands in respect of which objections initially raised have been withdrawn, or resolved by the Mining Warden, plus Crown Lands apart from National Parks, municipal and public reserves and existing mining tenements.

Land Tenure

Most of the work done in the exploration phase has been on private, freehold land (this does not carry mineral rights - these being vested in the State).

When the original application for the E.L. was made, landowners holding over 50% of the area objected officially to the application being granted. The great majority of these objections were later withdrawn after an elaborate compensation agreement was drawn up by lawyers representing all parties.

Prior to any operations being carried out on private land, whether subject to compensation agreement or otherwise, approach was made by a Getty representative and formal notification of entry sent in writing from the Getty Sydney office.

Generally little opposition was expressed by landowners and amicable relations were maintained throughout.

HISTORY OF EXPLORATION

The recently completed program represents the first uranium exploration venture in the exploration licence area.

At the time of the mid-1950's uranium exploration "boom" throughout Australia, associated with the discovery of the Mary Kathleen deposit in N.W. Queensland, prospecting activities resulted in the discovery of several minor uranium occurrences in the Avoca district about 20 miles ENE of Conara Junction. Near Rossarden, 10 miles N of Avoca, two small uraniferous veins in altered granite were discovered. On of these, Chwalczyks Prospect, was tested by means of three diamond drill holes and a short adit which revealed a 9 inch quartz-sericite vein bearing minor pitchblende, iron sulphides and secondary uranium products in sheared altered granite. This and another small occurrence, Hughes Prospect, one mile south of the former, showed no apparent continuity or hope of economic mineralization.

Anomalous radiation was discovered in basal Permian black shales overlying granite in Castle Carey Creek, six miles north of Avoca, this being tested by shallow trenching. The source of the anomaly was ascribed to a thucolitic hydrocarbon (Blisset, 1959).

Torbernite was discovered in a cassiterite bearing greisen at Royal George, 10 miles ESE of Avoca at this period, but considered to be of academic interest only.

Airborne scintillometer surveys were conducted over the Ben Lomond granite in the Avoca district in 1956, by the Bureau of Mineral Resources. This showed the granite to be markedly radioactive, as a whole >3 x background for regional area (B.M.R. 1956).

The Launceston Basin's possible potential as a sedimentary uranium environment was brought to the attention of Getty Oil Development Company Limited by Tenneco Australia, Inc. in 1971, this leading to the recently completed exploration program.

PHYSICAL FEATURES

(a) Physiography

The Launceston Tertiary Basin area, which is regionally classified as the Northern Midland Plains, is flat to gently undulating and varies in altitude from around 700 ft. in the Conara-Campbell Town area of 450 ft. about Longford. This is related to the South Esk River thalweg - being about 600 ft. in the area, five miles NE of Conara and 450 ft. downstream from Perth.

A discontinuous NW trending median "high" marked by the Hummocky Hills (summit 1574 ft.) and the Mt. Arnon Hills (summit 1035 ft.) divides the plains area. This represents a complex horst situation.

In the eastern part of the area, fault controlled tiers trending NW rise away to the Ben Lomond massif (5000 ft.) while from a line west of Campbell Town, Bracknell and Westbury, foothills rise back to the prominent Western Tiers. (4000 - 4500 ft.) rimming the Central Plateau (3000- 4000 ft.)

The principal permanent rivers are the South Esk, Macquarie, Lake and Meander, all of which show mature valley characteristics of anabranches, ox-bows and meandering courses on entering the plains (Appendix I).

The Plains are at present undergoing a slow degradation due to the drainage course of the South Esk being entrenched in resistant dolerite between Hadspen and Launceston.

The plains area drops away sharply north of Evandale, down to the Launceston area at the head of the Tamar Estuary. Incipient stream capture is threatened here by the Rose Rivulet on the South Esk River.

(b) Vegetation

The vast majority of the area is cleared of the native bush and given over to farming - predominantly grazing of sheep and cattle. This ranges from larger "run" type properties of varyingly improved pasture up to about 10,000 acres in the Conara-Campbell Town area to intensively cultivated properties of a few hundred acres in the Cressy-Bishopsbourne area, where growing of wheat, oats, barley, peas is also undertaken. Some dairying takes place in the higher rainfall area near Bracknell and Bishopsbourne.

Tracts of native forest remain in the Conara-Epping area and elsewhere. Principal trees are of eucalypt species including Eucalyptus linearis, Eucalyptus pauciflora, Eucalyptus viminalis and Eucalyptus amygdelina. The timbers from this rainfall belt are not of good milling quality but meet some local agricultural requirements The better stands are suitable for chipping to be made into paper pulp. Various species of acacia, e.g. Acacis dealbata are fairly common.

(c) Climate

The overall climate of the area is temperate with most precipitation in the winter. Rainfalls vary from 26.64 inches at Launceston City (5 year mean), 27.56 inches at Launceston Airport (Western Junction), 24.83 at Longford and 21.84 at Campbell Town, the latter two showing the effect of the rain shadow created by the Western Tiers on the prevailing westerly air stream.

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Launceston City has a mean summer temperature range of 75.1 - 51.6 (63.4°F av.) and mean winter range of 54.8 - 37.8 (46.3°F av.), (Tas. Year Book 1972). Temperatures in the more inland areas around Cressy and Conara appear to be similar apart from slightly greater extremes.

(d) Water, Power, etc.

The South Esk River, Macquarie, Lake and Meander Rivers are permanent, as are a number of their tributaries, and use is made of these for irrigation pumping and town water supplies, which appear to be met adequately. The natural drainage is boosted by water from the Great Lake storage on the Central Plain through the Poatina hydro-electric scheme, this in turn being channelled into an irrigation scheme in the Cressy-Longford area.

Little attempt has been made to tap the considerable underground potential which has been shown to exist by widespread Mines Department drilling.

Electricity at 240 volts - 60 cycles is transmitted throughout the whole area with major easements running west of Cressy and Longford to Launceston and one running just south of Conara to the Upper South Esk Valley.

Power costs for the medium sized industrial consumers appear to be at the rate of about 1.4 - 1.75¢ per kilowatt hour with major industrial consumption being open to negotiation. For supply exceeding 100 kilowatts the price can fall to 0.73¢ per kilowatt hour.

EXPLORATION METHODS

(i) Program Basis

During the past five years, the Tasmanian Mines Department has bored about 80 rotary and cable tool percussion holes, averaging 400 -500 ft. in the basin area between Westbury, Cressy and Conara. Cuttings from these holes have been systematically sampled and described by A.D. Melzer for Tenneco Australia, Inc. This information was supplied to Getty Oil.

Using the bore hole logs, maps were drawn showing isopachs of the total sand-silt thicknesses and also the percentage sand-silt encountered in the holes. From these maps could be determined areas with inferred continuous sand units which might provide the criteria required by the Wyoming type host units. This data delineated the area from Conara, down the South Esk Valley, through Cressy-Longford to Bracknell-Bishopsbourne with a northern expression from Evandale west through Longford to Carrick.

To initially test this area, drill traverses were plotted normal to the trend (generally) at intervals of about four miles with drill sites one half mile apart along the traverse.

(ii) Drill hole location (Figs. 1 to 7)

The bulk of the area tested is covered by air photography designated "South Esk" flown in 1966 at 13,000 ft. and having a scale of 40 chains : 1 inch. The true scale was found from controlled maps and vehicle odometer observations to be about 40 chains : 0.94 inch.

The far western section (line T) is covered by the "Beaconsfield-Quamby" flying (1963 at 65 chains : 1 inch, true scale about 40 chains : 0.62 inch).

The proposed traverses were plotted on photographs and then examined in the field. Drill hole locations were often slightly modified in line with ease or availability of access, avoidance of crop paddocks and amenability of individual farmers. The sites as drilled, however, have been marked on the backs of the relevant photographs.

The altitude of drill sites was measured with initially a "Tamoya" altimeter and later a "Thommen" instrument, the heights being taken relative to existing Mines Department holes previously measured. Thus any one line would be correct relative to the nearest Mines Department hole and not necessarily correct compared to another line. The possibility of rapidly fluctuating barometric pressures makes this type of measurement open to some degree of error.

(iii) Drilling

A tender from Austral United Geophysical Pty. Ltd., of Brisbane, was accepted in November, 1972, to drill and log at least 30,000 ft. That contractor had mobilized one Mayhew 1000 rotary rig into the area by November 21, 1972, with drilling operations commencing on November 23, 1972. A further Mayhew 1000 rig commenced on December 7, 1972, and drilling was completed on January 28, 1973. Drilling was continuous on a 7-day week, 10-12 hour a day basis, apart from a break between December 22 and January 3, 1973.

A total of 122 effective holes were drilled for 39,783 ft., This footage including a small number of redrills due to difficult conditions.

Both rigs were truck mounted with rotary table, air compressor functions and mud pump all being driven by power take-offs from the truck motor - an International diesel V8. The initial rig had a 15 ft. "Kelly" mast and the second a 20 ft. "Kelly" mast.

Typical drilling practice was to bore about 3 ft. with a 5-3/4 inch blade bit, insert a 5 ft. stand pipe; bore to the end of the "Kelly" with 5-3/4 inch then change to a 4½ inch blade bit for the remainder of the hole. Most holes were drilled from start to finish with water to which was added bentonite drilling mud and occasionally bran, when excessive water loss was encountered. Sludge and drill cuttings were flumed from the stand pipe onto a screen (1/32 - ¼ inch, depending on the nature of the cuttings) and into a sludge tank, the medium then being recirculated.

Initially some air drilling was attempted. However, when it became obvious that the water table was at a relatively shallow depth, this was discontinued. It was necessary to use a roller rock bit for penetrating basalt, and down-the-hole hammer drilling was attempted once, in trying to penetrate basalt.

Drilling difficulties encountered occasionally were - inability to penetrate fresh basalt in places (lines B, C, D, W); caving in of recent gravels; complete or partial loss of circulation - down-the-hole or through cracks near the collar - this occasionally necessitating casing up to 40 ft.; frequent excessive thickening of the drilling medium necessitating flushing of the hole and changing the water, especially in silt-clay sections.

(iv) Gamma Logging

A probing unit supplied by the drilling contractor was mounted on a small 4-wheel drive truck. The system was powered by a 110 volt, 50 cycle A.C. unit driven by the truck motor.

The probing unit measured gamma ray intensity, continuously recorded at a scale of 10 cps per inch; single point resistivity (relative) at a scale of 20 ohms per inch and spontaneous potential at a scale of 10 millivolts per inch.

Normal probing practice was to first flush out the hole with fresh water then run the probe (diameter 1-5/8 inch) through the drill rotary table and to the bottom of the hole and paper log on the way up.

The logging was carried out at a speed of 15 ft. per minute and recorded so as to produce a scale of 10 ft. per inch.

(v) Sampling and Geological Logging

Sampling of drill cuttings was carried out on the basis of a representative split being taken from each 5 ft. of advance. Sludge from the hole, flumed onto the screen, was representatively split from the bulk (discarded) and about one shovelful for each 5 ft. of advance placed on the ground, in rows representing 100 ft. At the end of each 15 ft. drill rod used, medium was pumped until all cuttings had surfaced, thus for each 15 ft. of advance the three intervals sampled would in total represent the 15 ft. interval, however, lag down the hole would mean some overlapping in the three individual samples. In addition continuous caving in some lithologic units would lead to inevitable contamination in the uncased hole.

From each 5 ft. sample on the ground, a grab sample was placed in a 6 in. x 4 in. calico bag, dried and taken to the field office for future reference.

The cuttings were logged at the drill site, generally while still wet, on the basis of a complete physical, macrocropic description for the whole column. Particular emphasis was placed on recording the presence and nature of iron, carbonaceous and organic matter and felspar. Closer examination of some of the materials was carried out at the field office by means of a binocular microscope.

Hand radiometric logging of cuttings and also general surface examination was carried out with a Scintrex model BGS-1S scintillation counter.

BASIN AND ENVIRONS - GEOLOGICAL HISTORY

(a) Precambrian

The earliest rocks exposed in the Launceston Basin Catchment area are probably of Upper Proterozoic age and outcrop over an area of 2-3 square miles, five miles south of Deloraine, in the Meander River drainage. These are NW trending quartz-mica schists and quartzites which are possibly related to similar rocks found in the west of Tasmania (Wells, 1957).

(b) Cambrian

Unconformably overlying the Precambrian are rocks of Cambrian age. These outcrop in scattered areas making up 3-5 square miles in the Lake River drainage, about eleven miles south of Cressy and as larger areas south and west of Deloraine in the Meander River drainage. The rocks near Deloraine are a 7000 ft. sequence of slates, phyllites, greywackes, siltstones and acid and basic volcanics which are broadly classified as quartz keratophyres and spillites (Wells, 1957). The rocks near Cressy appear similar and probably represent a continuance of the south easterly trend, only relatively recently exposed beneath the younger rocks.

These rocks were folded and metamorphosed at the end of the Cambrian during the Tyennan Orogeny, and appear to be an expression of the eastern limb of the north-south Tyennan Geanticline which probably acted as a landmass up until the Premian.

(c) Ordovician

The Precambrian-Cambrian rocks near Deloraine are overlain by a 2300 ft. sequence of conglomerate, sandstone and limestone of Ordovician age. These rocks are exposed over a significant area in the Meander drainage where they appear strongly folded and metamorphosed.

(d) Silurian

An extensive belt of rocks of this age, the Mathinna Beds, exists to the east of the basin area and is drained by the upper South Esk system and by the North Esk System.

Arenaceous and argillaceous sediments of considerable thickness were laid down in geosynclinal conditions, often as turbidites, (Banks, et al, 1962), and are of upper Devonian - ? lower Silurian age. During the Tabberabberan Orogeny of the middle Devonian, the rocks were intensively folded along NW trending axes and subjected to low grade regional metamorphism resulting in cleaved phyllites and slates plus massive quartzite.

(e) Devonian

During the upper Devonian to lower Carboniferous, granite intrusion took place in the area about Avoca (now outcropping over 40-50 square miles to the north and southeast of Avoca). This body, the Ben Lomond Granite, is

porphyritic with predominant soda orthoclase, and quartz, subordinate plagioclase, minor biotite, muscovite and tourmaline. The acid igneous activity gave rise to the Aberfoyle/Storeys Creek cassiterite-wolframite lodes in the Silurian rocks and to late stage greisen lodes emplaced in the granite. This granite indicates 3 to 4 times background radioactivity.

An intrusion of hornblende-biotite granodiorite extends as a north south tongue to the east of Mt. Barrow with the bulk of the body extending away to the NE.

(f) Permian

Following granite intrusion there was a long period of erosion and peneplanation during which time the granite was exposed and glaciation followed at the beginning of the Permian.

Marine sedimentation took place over the whole basin area throughout the Permian giving rise up to 2000 ft. of mudstones, sandstones, felspathic sandstones and shales with minor conglomerates, and limestones, in a variable depositional environment.

The Permian stratigraphic column is well exposed around the Western Tiers and less so about the Mt. Barrow, Ben Lomond area and upper South Esk areas.

(g) Triassic

Following uplift late in the Permian, sedimentation continued through the Triassic but largely in fresh water lakes and swamps which extended over much of the area. Up to 700 ft. of sandstone, felspathic sandstone and shale with coal measures in the upper part was deposited conformably and unconformably on the Permian. It has been suggested (Hale in Banks et al, 1962) that part of the felspathic material, and other possibly volcanic fragments, in the sandstones, was derived from trachytic or andesitic tuffs. However, there has been no positive identification of the sources of vulcanism.

The Triassic rocks are exposed around the Western Tiers, the north eastern highlands and as remnants in the Longford area.

(h) Jurassic

Following further uplift and minor faulting the Permo-Triassic system was intruded concordantly by massive dolerite sheets up to 1200 ft. thick, generally in the lower part of the Triassic rocks. Normal faulting accompanied the intrusion. The dolerite is composed largely of labradorite, augite and hypersthene and is generally tholeiitic.

The dolerite outcrops prominently throughout the hilly parts of the basin, It forms the capping of the Central Plateau and the other hills which bound the Tertiary Basin, and occurs as remnants therein. It is also the effective basement virtually throughout the basin.

(i) Tertiary

Following a long period of erosion and peneplanation, during which most of the dolerite was exposed, a major period of normal faulting took place, probably in the Paleocene Epoch. This faulting, which shows a general NW trend, produced a series of major horst-graben structures throughout Tasmania (Banks, et al, 1962). However, in the Launceston area the resultant Tamar Trough has been shown to be due to a series of stepped normal faults dipping vertical to steeply east and down-throwing to the east (Carey, 1946 modified by Longman 1966). The individual faults throw up to several hundred feet and caused tilting of the fault blocks.

The Tamar Trough extends from the present mouth of the Tamar through Launceston and Campbell Town over a width of up to about eight miles, with a basement of just below present sea level at Launceston. A further trough to the west, the Cressy Trough, extends from Campbell Town through Cressy to Westbury. It has an effective width up to ten miles and a basement in the deepest parts, greater than 1500 ft. below present sea level.

Throughout the Tertiary, the Cressy Trough was largely separated from the Tamar Trough by the Hummocky Hills "high" and hills to the north of Perth.

Following the basin formation, rapid sedimentation took place probably by the rivers in existence today with the South Esk, Macquarie, Meander and North Esk accounting for most of the activity. Sedimentation commenced in the Paleocene-lower Eocene Epochs, as shown by plant fossils, in Launceston bores (Gill in Banks et al, 1962), and spores identified in water bores (W.L. Matthews, pers. comm.) and continued throughout the Tertiary, probably aided by rejuvenation due to further movement on fault lines.

During this period, more than 1000 ft. of sediments was laid down in the Cressy Trough, with lesser depths in the Tamar. The chief source of the sediments was the sandstones, siltstones and mudstones of the Permo-Triassic, both capping and underlying the dolerite, these providing pebbles, sands, silts and clay material; the dolerite itself, being more open to chemical attack, provided finer silt and clay material. The lower Paleozoic rocks, in particular the Mathinna Beds, provided resistant quartzite pebbles down to silt grade material. It appears doubtful whether much of the Ben Lomond Granite would have been exposed over the greater part of the Tertiary, as shown by an apparent lack of granite detritus in Tertiary sediments under basalt in a small basin about Avoca (Reid & Henderson, 1929). The granodiorite in the upper North Esk-St. Patricks system, although exposed, would have shed material via the North Esk into the Tamar Trough near Launceston and not to the south.

Depositional conditions prevailing in the troughs alternated considerably throughout the Tertiary from fluviatile to lacustrine, with swamps and dry ground existing in places, covered by dense sub-tropical forests as indicated by the major accummulation of part carbonized wood and plant remains. Much scouring of existing material and refilling appears to have taken place judging from rapid vertical and lateral facies changes.

At an unknown time in the late Tertiary, probably Miocene or Pliocene, the rift system initiated a phase of vulcanism in the Conara-Epping and Evandale areas. Olivine rich basaltic lava emanated, presumably from fissures associated with the tensional faults.

This gave rise to a continuous sheet of uniform, vesicular basalt in the area from Campbell Town through Conara, almost to Epping with a thickness of up to 150 ft. The base of the flow appears to have been more or less level, at about 600 ft. ASL in the area around Conara (vide Sections B, C) lower at 550 - 600 ft. near Cleveland and higher, 600-620 ft. SE of Epping.

Near Evandale, the sheet, presumably contemporaneous with the southern one, has a base around 400-450 ft. and a thickness of up to about 300 ft

There appears to be no evidence of pyroclastic materials in the basin area and no volcanic centres have been located.

Following the basalt outpouring, a period of warm wet-dry seasonal conditions in the Pliocene caused deep weathering of the basalt sheet resulting in kaolinisation and in situ bauxitisation of at least the upper 50 ft. A lateritic crust was precipitated on the surface, this also forming in areas where no basalt was present.

Remnants of this surface are extensive around the Conara-Cleveland area and are marked in places by a number of depressions with internal drainage and perched water tables which exist as swampy lagoons at about 650 ft. ASL. Similar lagoons occur west of Longford-Cressy at 550-600 ft. ASL.

Late in the Pliocene, scouring again took place, removing part of the basalt decomposition products in places (Sections B, C, D, W) and elsewhere all of the basalt (Sections C, D, F).

There is little evidence of life other than plants, indicated by the Tertiary sediments, the only other form being possibly foraminifera siliceous tests which appear common at depth in the Cressy-Bishopsbourne area. Some fragments of hard, white, bonelike material, which turned deep blue on exposure, were occasionally encountered in drilling. This is possibly vivianite, an iron phosphate which may represent altered, remobilised organic material.

Paleo drainage throughout the Tertiary would appear to have been to the north as is the case at present. The South Esk River, which enters the basin near Conara, appears to have been in existence as evidenced by Tertiary sediments overlain by basalts in the valley section near Avoca. It was probably successively rejuvenated by uplift throughout the Tertiary as were the other rivers. The thalweg of the Tamar Trough extends to the north and it can only be assumed the ground water drainage has been likewise (Appendix II).

(j) Quaternary

During the Pleistocene and possibly associated with fluvio-glacial activity, there was a considerable period of sedimentation which extended in height of 700 ft. in the Conara-Epping area, burying the scoured kaolinized basalt (Sections C, D, F).

From the Tertiary and through the Quaternary, the northernmost end of the Tamar Trough was being eroded down to present sea level, leaving the southern end elevated behind the basalt barrier at Evandale. Relatively rapid dissection of the area around Conara has taken place. This was slower in the areas around Longford due to the South Esk River, which was diverted by the basalt, becoming entrenched in resistant dolerite hills west of Launceston (Appendix II).

TERTIARY REGIONAL LITHOLOGIES

(i) Conara-Cleveland (Sections B, C, D) (Fig. Nos. 8, 9, 10)

Little information is available on lower Tertiary sediments of this area due to inability to penetrate basalt. However, at B/6, there is 225 ft. of sub-basaltic sediments; at C/2, 185 ft. and at D/3, 297 ft., which is close to the maximum. This sub-basin is constricted downstream by narrowing dolerite banks. The sediments are fine and carbonaceous at B/6, with thick clay sections down to basement, incorporating much partly carbonized wood, indicating settled lacustrine or swampy conditions. At C/1-C/2 and D/3-W3C, there is abundant sand and silt with gravel sections, indicating more fluviatite conditions. The sands are predominantly of colourless quartz and are grey overall, except for surface oxidised sections. Minor pyritic cement is present at the base of the sediments in C/1.

The basalt which rests on a fairly level surface at 600-650 ft. above sea level, possibly averaged 100 ft. thick originally and has been very deeply leached, leaving a kaolinitic, and in places bauxitic residuum. It has been largely stripped (C/1, C/10, C/12) and entirely removed elsewhere (W3C, W2B) where the Tertiary sediments were reburied under Pleistocene sediments.

(ii) Epping-Nile (Sections F, H, J) (Fig. Nos. 11, 12, 13)

A wide range of sediments occur at section F representing deltaic conditions where the paleo drainage course of the South Esk entered the main part of the basin. Only shallow silts rest on the deeply weathered undulating dolerite basement and above this is an alternating sequence of sands, silts and gravels. A marker bed of carbonized wood fragments occurs between F/2 and F/5 at about 200 ft. depth while a gravel marker extends across the whole section at an average of 100 ft. depth, forming a thick sequence at F/1-F/2. The sands and gravels contain a fair amount of white felspar, often quite coarse, partly kaolinized, which may be largely derived from Permo-Triassic rocks, or else locally from rapidly stripped dolerite.

The maximum thickness observed is at F/4, at about 300 ft. This is probably all Tertiary, as its collar is below the level of basalt. A lateritic capping between F/2-F/3 would indicate a pre-Pleistocene surface.

Across section H more settled conditions are indicated by thick silt-clay sequences in the lower parts. Shallow gravels here may in part be recent as the South Esk meanders over a wide present day flood plain after emerging from a dolerite entrenched tract, east of section F. This course was probably assumed after diversion, caused by basalt to the south.

The carbonaceous silty sands from H/4-H/6 have a grey-green appearance with much fine lithic material, probably derived from dolerite.

In H/4, dolerite basement is at about 200 ft. above sea level, under 370 ft. of sediments, of which about 320 ft. is probably Tertiary.

Similar settled conditions are indicated by sandy-silt-clay sequences at Section J.

(iii) Chintah-Hummocky Hills (Section M) (Fig. No. 14)

Thick clay sequences occur here, with a depth greater than present sea level in the centre of the section. The clay is dark greyish brown with unbleached fine carbonaceous matter with bands of grey brown siderite in places. Only minor drab grey sand-silt sequences occur.

Information from holes W23, M/4 and W67 indicate that there is no continuous high dolerite "horst" structure between the Tamar and Cressy Troughs and that these were possibly connected throughout the Tertiary.

A narrow band of anomalous radiation was detected in M/4 at 283 ft. - 43 cps (background x 2½) in silty carbonaceous clay.

(iv) Panshanger (Section O) (Fig. No. 15)

This section was sited close to a high dolerite ridge, as it turned out, and not to a small "monadnock" as originally thought, therefore littoral conditions related to this possibly prevailed.

The outstanding feature is a deep valley at about O/1, apparently filled with fine sand to present sea level. A high dolerite bar as indicated at O/2 and a high bar of Triassic felspathic sandstone with coal seams at O/7. The latter is somewhat weathered due to decomposition of felspar during resubmergence in the Tertiary.

An ironstone cemented gravel is present on the surface between O/4 and O/6, representing a pre-Pleistocene lateritised surface and not a Pleistocene terrace as originally mapped (Blake, 1959).

Significant carbonaceous sand-silt sequences are present in O/4 to O/6, with some iron oxide staining persistent to basement in O/4. Deep weathering of the dolerite is indicated in O/4 and O/6.

(v) Cressy-Bishopsbourne (Sections P, Q, R, S/1-S/14, T) (Fig. Nos. 16, 22, 17, 18, 19, 20, 21

It is convenient to treat these as one entity, covering the central part of the Cressy Trough, in which fairly uniform conditions of sedimentation have prevailed.

The trough is possibly very deep in parts. A petroleum-gas exploratory hole, ½ mile west of S/5, drilled by C. Sulzberger to 2256 ft. was stopped in dolerite. Clays and sands were encountered throughout (pers. comm. C. Sulzberger).

On the average, the upper 300 ft. down to 200-300 ft. above sea level, is clay. This has been leached and oxidised down to an average of 50-60 ft. roughly reflecting the surface profile. The surface clays are mottled grey-buff-orange with hard limonite bands. Below the 50-60 ft. level uniform dark greyish brown with non-bleached carbonaceous material occur with occasional thin bands of brownish grey siderite (W.L. Matthews, pers. comm.) mistakenly logged as silcrete.

From about 250 ft. above sea level down to 0 ft. above sea level (being the lower limit of penetration over most of the area) there is considerable variation in mainly drab grey sands, silts and clays with fairly rapid facies changes evident, indicating periods of fluviatile and deltaic

depositional conditions. Many of the lower sequences exhibit rhythmical deposition of clay, silt and sand as thin alternating bands.

It is possible to attempt correlation on individual sections in places only. This would not be legitimate over some parts of the area. One outstanding marker unit is a pebbly sand or gravel bed dipping from 300 ft. above sea level in P/7 to 220 ft. above sea level in Section R, two miles to the west. Carbonized wood accumulations which are common between 0-100 ft. above sea level in P/4-P/7 extend through W46 on Section R (-200 ft. to 50 ft. above sea level) and to S/12-S/13 (0-100 ft. above sea level) indicating that heavily forested swamps existed for a considerable time in the area.

Minor orange iron oxide staining occurs at depth in sands and clays throughout much of the area. Ferruginous staining below the limit of recent oxidation is present in a belt between R/8A-R/14 to S/9-S/12. In R/8A-R/14 the zone is up to 200 ft. thick, between the limit 0 ft. above sea level - 300 ft. above sea level, roughly reflecting the surface profile, and manifested as orange stained clays, silts and quartz sands. In Section S, the zone is less definable, from about 0 ft. above sea level - 250 ft. above sea level and occurs as orange to reddish brown stained clay, often containing foraminifera tests.

A number of narrow anomalous gamma radiation zones were detected in Section R/2-R/3, R/7-R/14 and T/5, (listed at the rear). A trend from R/7-R/11 shows anomalies of 40, 54, 47, 35, 32 cps (all background x 2-3) in holes R/7, R/8, R/9, R/10, R/11 respectively, between the limits of 150-200 ft. above sea level. The former three are in sands and the latter two in ferruginous stained clays. Detail holes drilled 1000 ft. either side of the section line between R/8-R/9 indicated similar order anomalies. A further hole (R/2B) was drilled ¼ mile SE of hole R/3,(which registered 63 cps at 252 ft.) indicated a reading of 64 cps at 314 ft.

Detail holes R/5A, R/5B drilled 1000 ft. east and west of T/5 encountered narrow background x 2 anomalies only.

The source of the anomalous gamma activity is not known.

(vi) Longford-Carrick (Sections S/15-S/16, V) (Fig. Nos. 23, 24, 20)

This area represents an embayment in dolerite, where littoral conditions probably prevailed. The dolerite basement is strongly weathered and laterised in places, (V/8, V/11, V/12) and steeply undulating, suggesting the presence of fault scarps, especially between V/4B-V/5.

Sand sequences are prevalent between S/15-S/16, V/6-V/13 and V/1-V/2 with settled and occasionally swampy forest conditions indicated in a deep trough at V/3-V/4B.

A basement of Triassic pebbly felspathic sandstone or greywacke is indicated at V/1-V/2, with a thin indurated shale roof pendant in dolerite at V/6.

No gamma radiation above background x 2 was encountered in this area.

(vii) Evandale (Section W) (Fig. No. 25)

Penetration through the basalt in this area was not possible. Erosion in the Tertiary down to 100 ft. above sea level in Rose Rivulet, about four miles north of Evandale, indicates significant thicknesses of sediment. The base of the flow is generally above 400 ft. above sea level, north of Evandale (Blake, 1959). Drilling in W/1 stopped at 350 ft. above sea level in hard fine grained basalt. This also occurs in W65, where it was mistakenly identified as dolerite. It is not known whether this is part of an individual flow, or an earlier one. The 150 ft. of clays, etc. in W/1 and W65 are either late Tertiary or Pleistocene.

The South Esk River at Evandale, which is 500 ft. above sea level, was diverted by the basalt onto its present course.

POTENTIAL URANIUM SOURCE AREAS

Brief mention is made here of possible sources of uranium in the South Esk Catchment.

(a) Ben Lomond Granite

An airborne scintillometer survey by the Bureau of Mineral Resources (1956) showed that all of the outcropping granite bodies north of Avoca, and the apophysis SE of Avoca in the St. Pauls Valley are markedly radioactive. Uranium mineralization has been detected at the Royal George Mine, about ten miles ESE of Avoca, where a large quartz-tourmaline-Fe-sulphide greisen dyke in porphyritic granite has been opencut for cassiterite (opencut dimensions 850 ft. long x 10-80 ft. wide x 40 ft. deep, according to Reid and Henderson, 1929). Sheared, greisenised wall rock, where examined, has sparsely distributed coatings and plates of torbernite on fractures, occasionally associated with cassiterite bearing stringers. Local patches of the wall indicated scintillometer readings to 1200 cps, with the whole opencut registering 150-200 cps. Other large greisen zones have been worked for tin at this locality and these may have associated torbernite.

Chwalczyks Prospect is located about two miles SSW of Rossarden. Here a nine inch mineralized shear in porphyritic granite, showing late stage microgranitic intrusions, carries Fe sulphides, minor pitchblende and secondary uranium minerals. The vein was followed by an adit and a peak reading of 12,600 cpm was obtained in 1957 - 4% U_3O_8 (Blisset, 1959, after Langron, 1957). Only patchy mineralization occurs generally and the vein is of no great longitudinal extent.

A small greisen lens about ½ mile south of this, known as Hughes Prospect. Some Fe sulphide associations registered up to 700 cpm (background x 5) using a Phillips Austronic counter (Blisset, 1959). No uranium mineralization was identified.

It appears likely that many of the greisen bodies in the granite, carrying cassiterite and/or wolframite plus Fe sulphides, show greater than normal radioactivity. Blisset, 1959, mentions the Ben Lomond Tin Mine. Here a quartz-fluorite-tourmaline vein system in greisen registered background x 3 radioactivity.

The Rex Hill Mine, about six miles NW of Avoca, examined by the writer, is a pipe like expression resultant from strong cross fracturing on a quartz greisen lode. At an opencut, the lode is 70 ft. long and 55 ft. wide (Blisset, 1959), and massive quartz and greisen is seen to carry prominent large pods of sphalerite, galena, pyrite-chalcopyrite and arsenopyrite, cassiterite reportedly becoming more common with depth. The opencut walls registered 250-300 cps on the scintillometer with the walls of an adit up to 300-400 cps. Slightly greisenous granite boulders registered to 150 cps.

(b) Permian Sequence Overlying Ben Lomond Granite

Remnants of the basal Permian rocks, which unconformably overly the granite are radioactive. At Prospect Creek, a small tributary of Castle Carey Creek, about six miles north of Avoca, a wedge of basal Permian rocks has been

downfaulted into the granite. The basal beds are arkoses and greywacke-siltstones with thin black shale bands. Where seen exposed in a small cut, a twelve inch band of highly carbonaceous shale registered 300 cps. A small pile of this material showing elongate nodules of pyrite to 2-3 inches registered up to 600 cps. Weathered quartz veined granite in a road cutting above the creek registered 160-200 cps.

Recent limited percussion drilling by International Mining Corporation N.L. in Permian sequences in the area has failed to locate significant anomalous radioactivity (A.J. Noldart, Pers. comm.)

(c) Triassic sequence close to Ben Lomond Granite

Triassic felspathic sandstone with coal seams high in the sequence has been down faulted against the granite near the Stanhope Colliery, about five miles NW of Avoca. Mullock dumps here (½ mile from the granite contact) registered 50-60 cps, while away from the dumps 25-30 cps was recorded. It seems possible that uranium bearing sub-surface drainage from the granite has entered the perm. able Triassic beds per media of fault planes and related fractures.

(d) Cambrian metavolcanics-metasediments

Small areas of reputedly Cambrian metasediments and metavolcanics outcrop in the O'Connors Peak-Lake River area about eleven miles south of Cressy. Schistose, quartz poor keratophyre around the northern flanks of O'Connors Peak did not register above background radioactivity. About one mile further up the Lake River, a small hillock with float of dark grey to yellow slate registered 35-40 cps (background x 2).

It is possible that the low order anomalous radioactivity detected in the Tertiary sediments of the Cressy area may be associated with the Cambrian rocks.

Larger areas of Cambrian acid to basic volcanics and sediments are exposed in the area south of Deloraine, drained by the Meander River system, and although not examined, these may have acted as a minor source of radioactive material to the sediments of the Cressy Trough.

0-4

RECOMMENDATIONS

In view of the inability to detect significantly anomalous radioactivity during the drilling program just completed or to detect evidence of the existence of "geochemical cells", further work in Exploration Licence 16/72 does not appear warranted.

March, 1973

T.W. Middleton

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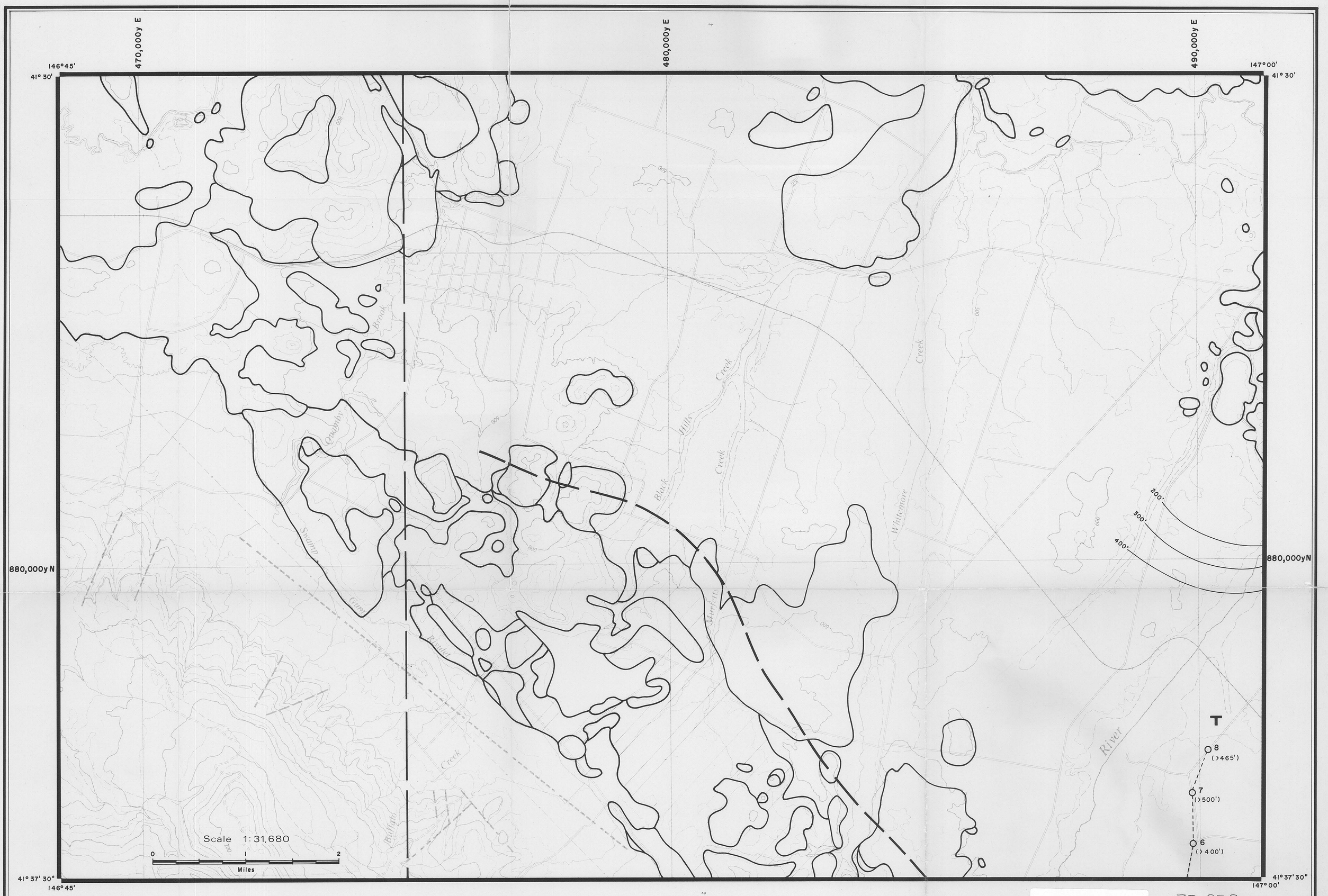

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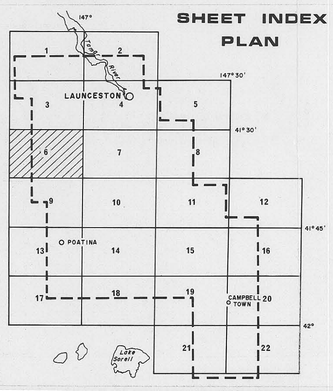
SHEET INDEX PLAN



LEGEND

— —	Inferred limit of significant Tertiary sedimentation
100	Isopachs indicating thickness of Tertiary-Quaternary sediments
(35')	Depth to basement (Dolerite unless otherwise indicated)
(>190')	Hole not bottomed

- TERTIARY (Eocene-Miocene) - Quaternary Tertiary mostly obscured by Pleistocene - Recent alluvium and superficial deposits
- TERTIARY (Pliocene) Basalt
- JURASSIC - Dolerite
- JURASSIC - Predominately Dolerite
- TRIASSIC - Felspathic Sandstone
- TRIASSIC - Knocklofty Sandstone
- PERMIAN - Ferntree Mudstone

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TENNECO JOINT VENTURE E.L. 16/72

OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G.Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M.Chatenay	Date: Jan. '73
Revised:	FIGURE No. 1

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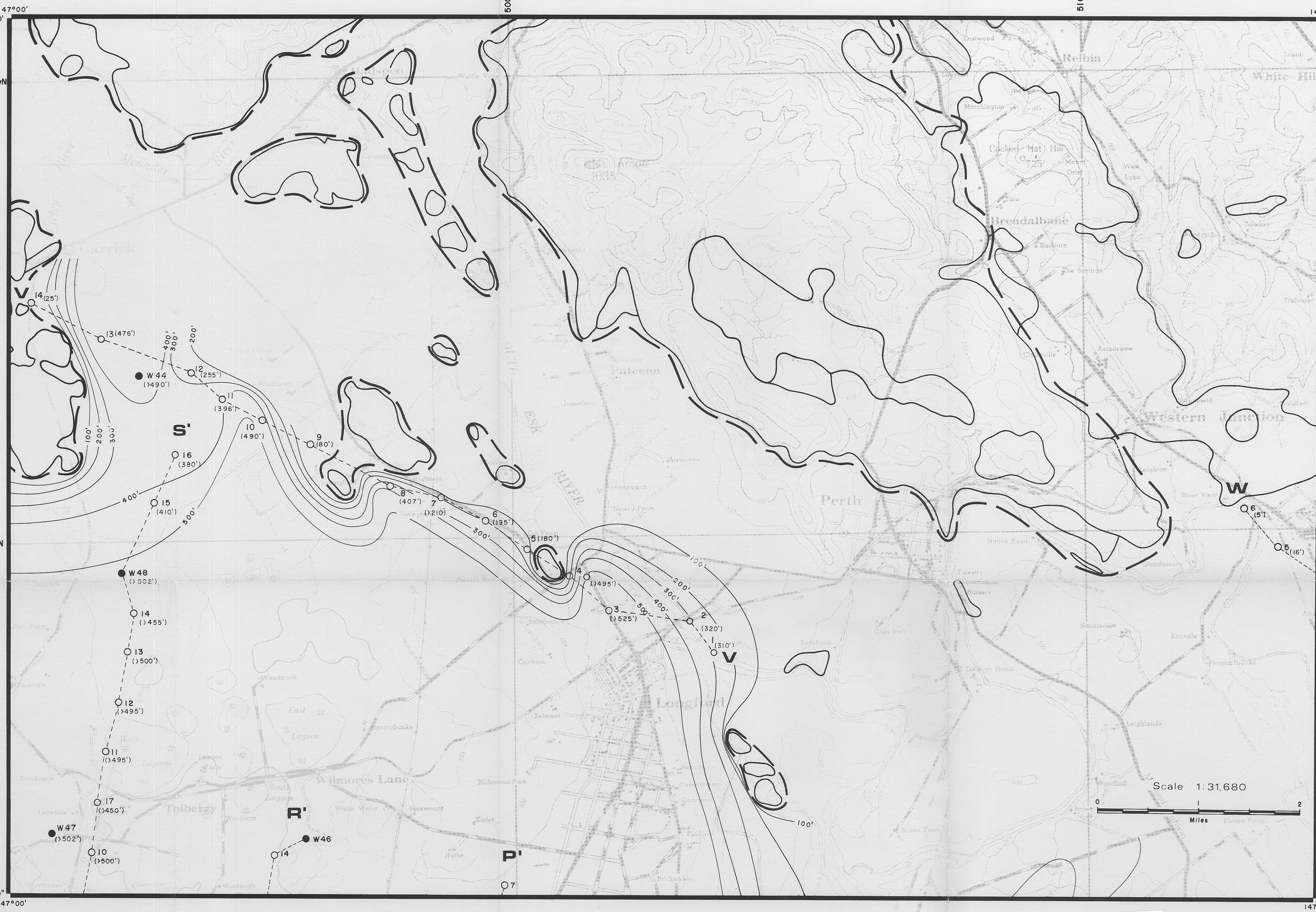

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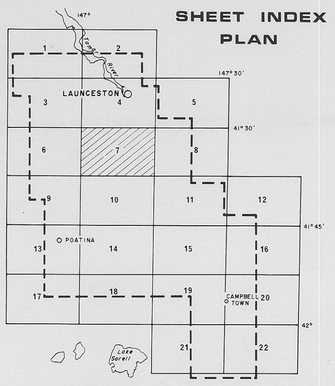
SHEET INDEX PLAN



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OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G.Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M.Chatenay	Date: Jan. '73
Revised:	FIGURE No. 2

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OPEN FILE 73-939 47/1

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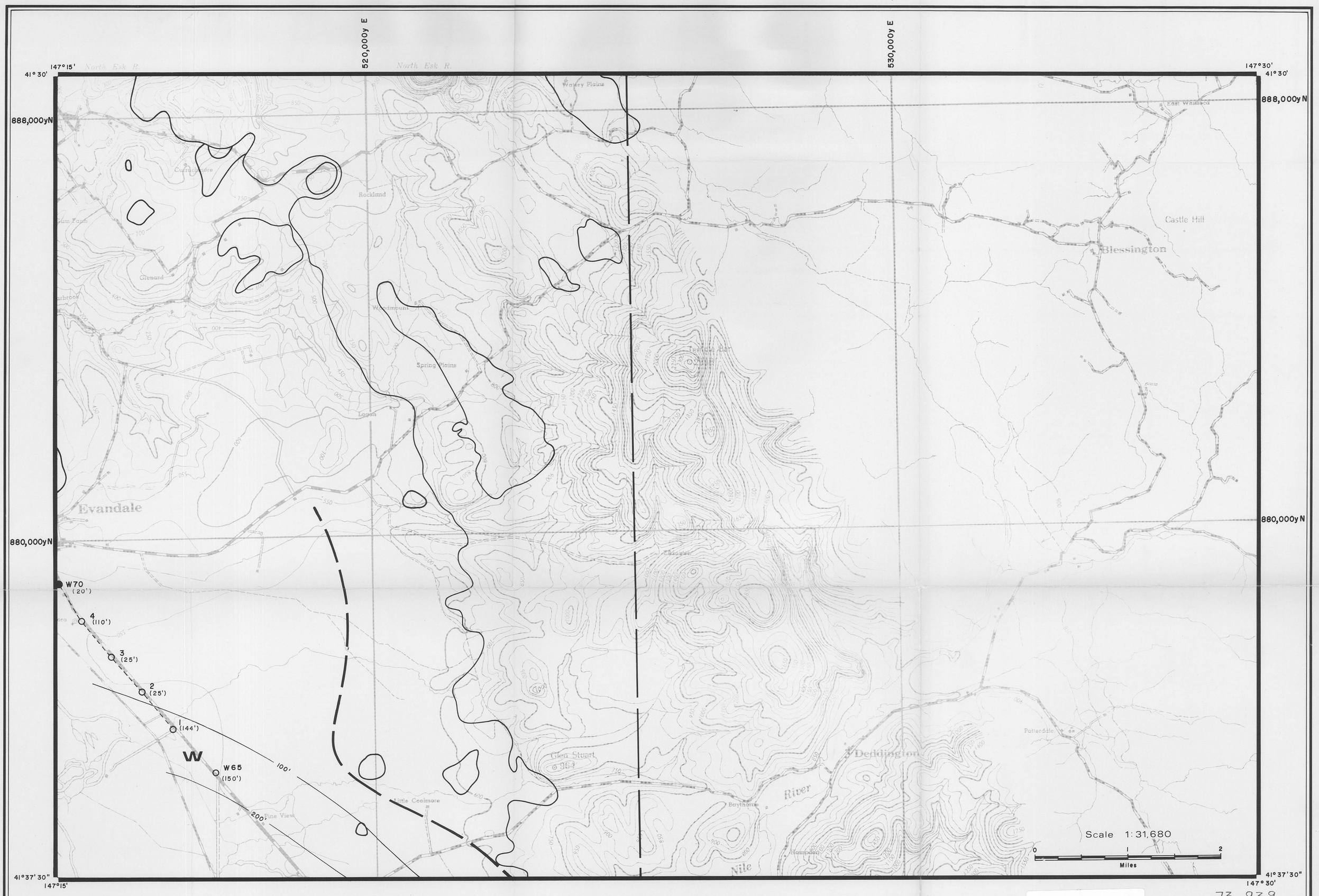

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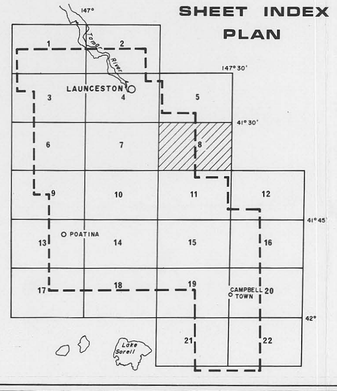
5 cm

SHEET INDEX PLAN



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100	Isopachs indicating thickness of Tertiary-Quaternary sediments
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OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G.Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M.Chatenay	Date: Jan. '73
Revised:	FIGURE No. 3

692030 1280 10/LAU/29

470,000y E
480,000y E
490,000y E
146°45'
147°00'
41°37'30"
41°45'
870,000y N
860,000y N

Cobblers Creek
Bluff Creek
Myrtle Creek
Liffey
Bullock Holes Creek
Creek

5a
5b
4 (>450)
3 (>450')
W/45 (>510')
2 (365')
1
T

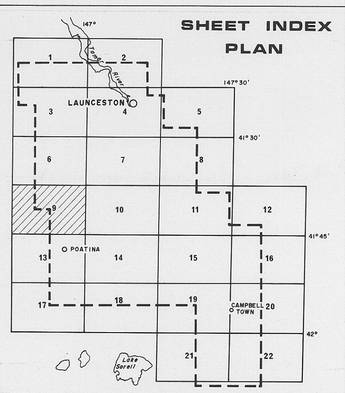
100'
200'
300'
400'
500'

Scale 1:31,680
0 1 2
Miles

5 cm

73-939

SHEET INDEX PLAN



LEGEND

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- 100 — Isopachs indicating thickness of Tertiary-Quaternary sediments
- (35') — Depth to basement (Dolerite unless otherwise indicated)
- (>190') — Hole not bottomed

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TENNECO JOINT VENTURE E.L. 16/72

OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G. Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M. Chatenay	Date: Jan. '73
Revised:	FIGURE NO. 4

692031 1281 10/LAU/30

147°00'
147°15'
41°37'30"
41°45'
500,000y E
510,000y E
870,000yN
860,000yN

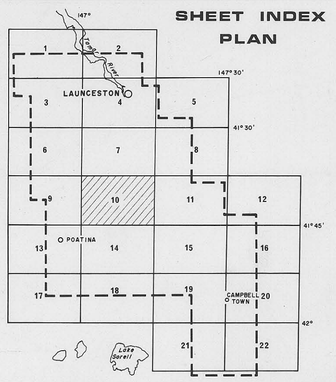
Scale 1:31,680

0 1 2 Miles

5 cm

73-939

SHEET INDEX PLAN



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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE E.L. 16/72

OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G. Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M. Chatenay	Date: Jan. '73
Revised:	FIGURE NO. 5

692032 1282 OPEN FILE 73-939 4/11

10/LAU/31

520,000y E

530,000y E

147° 15'

147° 30'

41° 37' 30"

870,000y N

860,000y N

41° 45'

Clarendon

Clarendon Ho

Plumpton

Symmons Plains

Lochmaben 551'
Astronomical Station

Lochmaben

Strathmore

Nile

Coelmore

Glen Mavis

Upper Camperdown

Camperdown

Feldon

Winburn

Eskdale

Powranna

Hawkridge

SOUTH ESK RIVER

Main Line

Forton

The Bend

Fairfield

Strowan

Fern Hill

Glasgletch

Elmo Vale

Esk Vale

Belle Vue

Vineys S.L.

Upper Kelvin Grove

Kelvin Grove

Ben Lomond Rivulet

York Park

Willow Glen

W68 (>475')

W15 (>125')

W79 (240'?)

1 (>195')

W11 (>215')

W14 (>180')

6 (>210')

5 (>265')

4 (370')

W13

W10 (>190')

3 (>120')

2 (>240')

W12 (>190')

1 (335')

W9 (>175')

J

J'

H

H'

100'

200'

300'

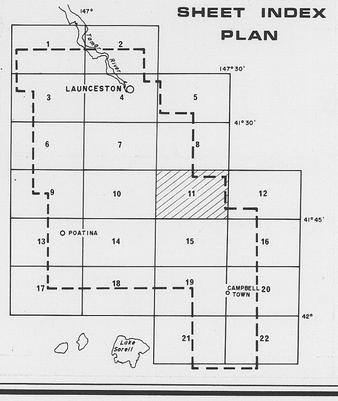
Scale 1:31,680

0 1 2 Miles

5 cm

73-939

SHEET INDEX PLAN



LEGEND

- Inferred limit of significant Tertiary sedimentation
- 100 — Isopachs indicating thickness of Tertiary - Quaternary sediments
- (35') — Depth to basement (Dolerite unless otherwise indicated)
- (>190') — Hole not bottomed

- TERTIARY (Eocene-Miocene) - Quaternary — Tertiary mostly obscured by Pleistocene - Recent alluvium and superficial deposits
- TERTIARY (Pliocene) Basalt
- JURASSIC - Dolerite
- JURASSIC - Predominately Dolerite
- TRIASSIC - Felspathic Sandstone
- TRIASSIC - Knocklofty Sandstone
- PERMIAN - Ferntree Mudstone

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GETTY OIL DEVELOPMENT COMPANY LIMITED

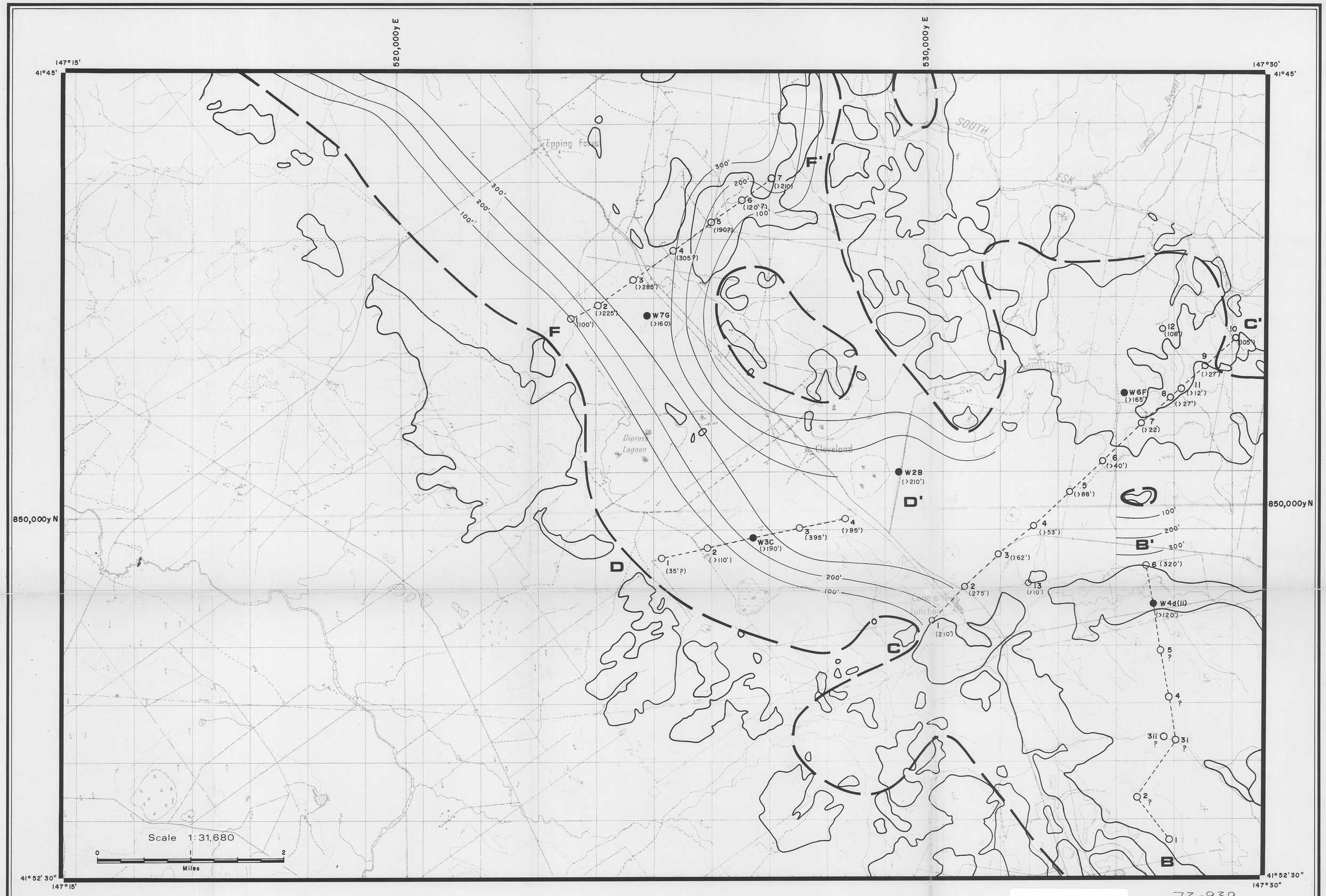
TENNECO JOINT VENTURE E.L. 16/72

OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G. Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M. Chatenay	Date: Jan. '73
Revised:	FIGURE No. 6

692033

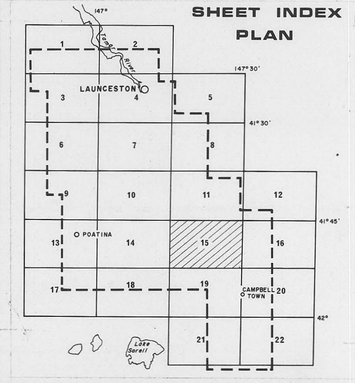
1283 10/LAU/32



5 cm

73-939

SHEET INDEX PLAN



LEGEND

— —	Inferred limit of significant Tertiary sedimentation
100	Isopachs indicating thickness of Tertiary - Quaternary sediments
(35')	Depth to basement (Dolerite unless otherwise indicated)
(>190')	Hole not bottomed

- TERTIARY (Eocene-Miocene) - Quaternary Tertiary mostly obscured by Pleistocene - Recent alluvium and superficial deposits
- TERTIARY (Pliocene) Basalt
- JURASSIC - Dolerite
- JURASSIC - Predominately Dolerite
- TRIASSIC - Felspathic Sandstone
- TRIASSIC - Knocklofty Sandstone
- PERMIAN - Ferntree Mudstone

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TENNECO JOINT VENTURE E.L. 16/72

OUTLINE OF TERTIARY BASIN AND TOTAL SEDIMENT THICKNESS

Author: G. Miller / T. Middleton	Scale: 1 inch = ½ mile
Drawn: M. Chatenay	Date: Jan. '73
Revised:	FIGURE No. 7

692034 1284 OPEN FILE 73-939 47/1 10/LAU/33

1285

N

S

B-6
677' A.S.L.

B-5
705' A.S.L.

B-4
707' A.S.L.

B-3
699' A.S.L.

B-2
717' A.S.L.
Projected 10 miles from W.

T.D.360'

T.D.100'

T.D.110'

T.D.42'

T.D.97'

Thin laterite partly stripped for road gravel

Clay possibly derived from deep weathering of basalt.

Interculated sediments indicating several lava flows

800 ft

600 ft

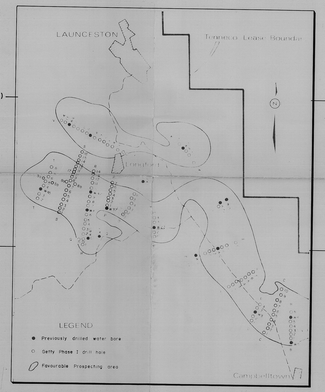
400 ft

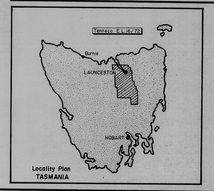
200 ft

0 (Sea Level)

200 ft

400 ft





LEGEND

Recent Alluvium	Sand	Basalt —	TERTIARY (Pliocene)
Ironstone Gravel Laterite	Arkosic Sand	Dolerite —	JURASSIC
Clay	Gravel	Sandstone —	TRIASSIC
Silt	Wood, Peat, Carbonaceous Material		

SCALE

1600' 1200' 800' 400'

HORIZONTAL SCALE
1 inch = 400 Feet

150'
100'
50'

VERTICAL SCALE
1 Inch = 50 Feet

5 cm

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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE
E.L. 16/72

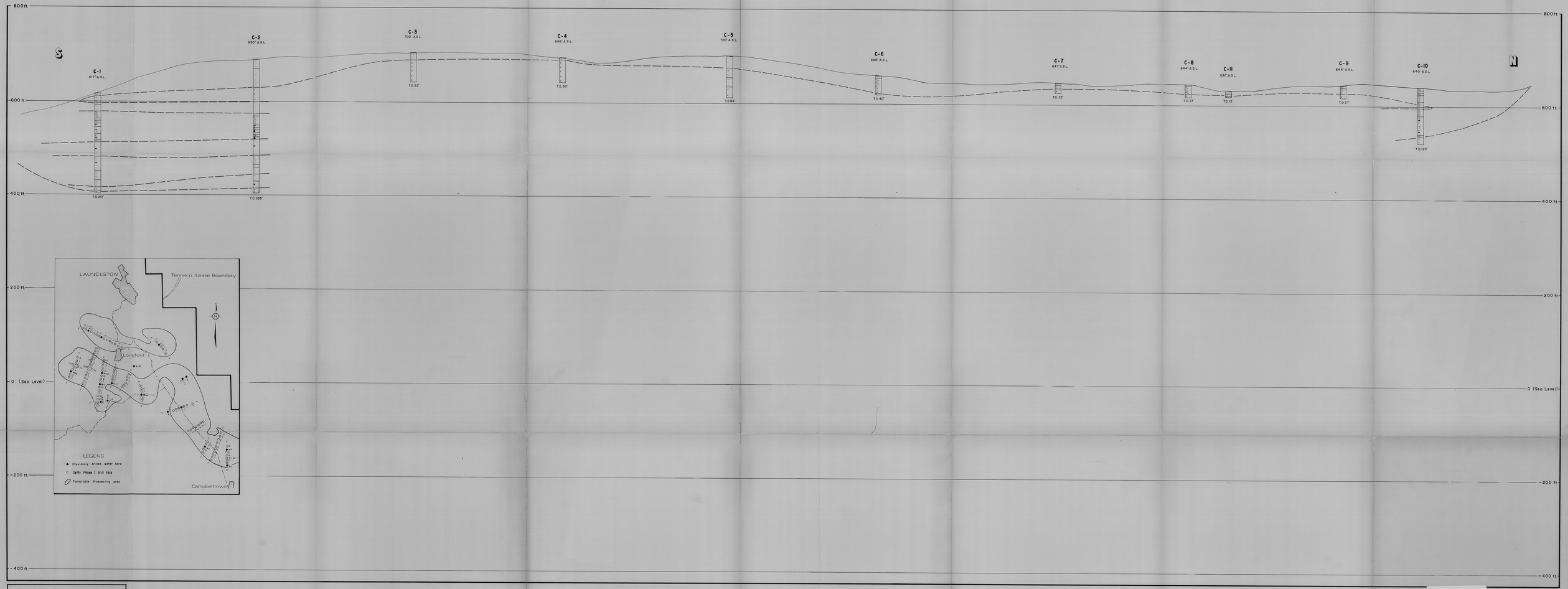
GEOLOGICAL CROSS SECTION B

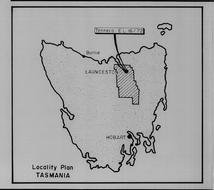
Author: G Miller / T Middleton	Scale: As shown
Drawn: D Anderson	Date: Feb '73
Revised:	FIGURE No. 8

692035 1285

10/LAU/34

1285





Locality Plan
TASMANIA

LEGEND

Recent Alluvium	Sand	Basalt — TERTIARY (Pliocene)
Ironstone Gravel Laterite	Arkosic Sand	Dolerite — JURASSIC
Clay	Gravel	Sandstone — TRIASSIC
Silt	Wood, Peat, Carbonaceous Material	

SCALE

150'
100'
50'
VERTICAL SCALE
1 Inch = 50 Feet

1600' 1200' 800' 400'
HORIZONTAL SCALE
1 Inch = 400 Feet

5 cm

692036

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TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION C

Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb '73
Revised:	FIGURE No. 9

1286 10/LAU/35

73-939 Q41/1

1287

1287

S

N

800 ft.

600 ft.

400 ft.

200 ft.

0 (Sea Level)

-200 ft.

-400 ft.

D-1
673' A.S.L.
Clay after dolerite ?
T.D. 73'

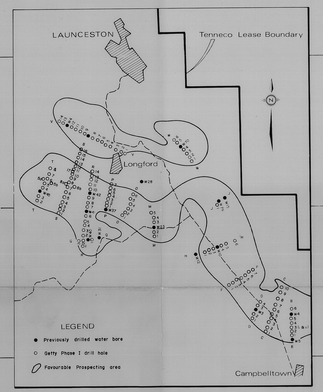
D-2(i)
647' A.S.L.
T.D. 110'

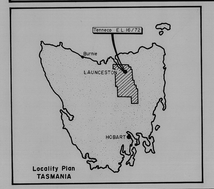
W3C
689' A.S.L.
Probably largely Pleistocene-Recent sediments
T.D. 160'

D-3(ii)
671' A.S.L.
Remnants of formerly extensive basalt flow. Partly eroded during the Pleistocene
T.D. 400'

D-4(i)
679' A.S.L.
T.D. 95'

W2B
679' A.S.L.
projected approx. 0·6 miles from N.
Probably largely Pleistocene - Recent sediments
T.D. 210'





LEGEND

- Recent Alluvium
- Ironstone Gravel Laterite
- Clay
- Silt
- Sand
- Arkosic Sand
- Gravel
- Wood, Peat, Carbonaceous Material
- Basalt — TERTIARY (Pliocene)
- Dolerite — JURASSIC
- Sandstone — TRIASSIC

SCALE

VERTICAL SCALE
1 Inch = 50 Feet

150'
100'
50'

1600' 1200' 800' 400'

HORIZONTAL SCALE
1 Inch = 400 Feet

692837

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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION D

Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb. 73
Revised:	FIGURE No. 10

1287

10/LAU/36

73-939 Q 47/1 1287

1288

1288

W

E

800 ft.

600 ft.

400 ft.

200 ft.

0 (Sea Level)

-200 ft.

-400 ft.

F-1
projected approx.
270' from N
670' A.S.L.
T.D. 120'

F-2
694' A.S.L.
T.D. 225'

F-3
680' A.S.L.
T.D. 280'

F-4
650' A.S.L.
T.D. 330'

F-5
680' A.S.L.
T.D. 210'

F-6
656' A.S.L.
T.D. 132'

F-7
654' A.S.L.
T.D. 210'

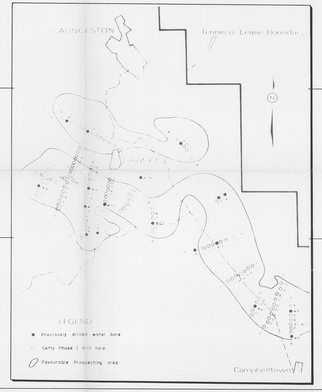
Thin laterite crust

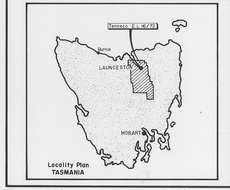
Main North-South Midlands Highway

Surface (Approx)

Scattered Basalt Boulders

?





LEGEND

	Recent Alluvium		Sand		Basalt — **TERTIARY (Pliocene)**
	Ironstone Gravel Laterite		Arkosic Sand		Dolerite — **JURASSIC**
	Clay		Gravel		Sandstone — **TRIASSIC**

SCALE

VERTICAL SCALE
1 Inch = 50 Feet

HORIZONTAL SCALE
1 Inch = 400 Feet

692038

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TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION F

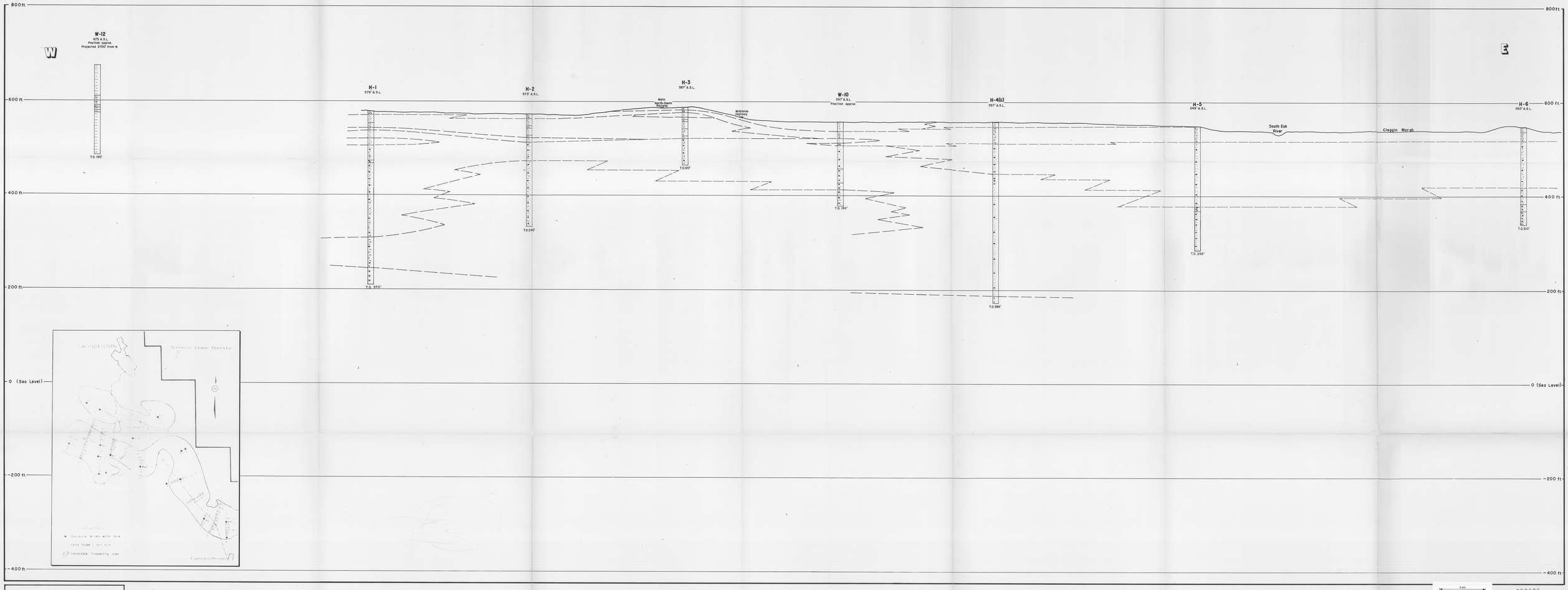
Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb. 73
Revised:	FIGURE No. 11

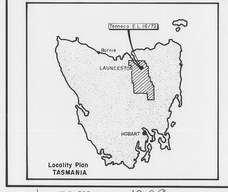
10/LAU/57

Getty 73-989

1288

1288





Locality Plan
TASMANIA

LEGEND

Recent Alluvium	Sand	Basalt — TERTIARY (Pliocene)
Ironstone Gravel Laterite	Arkosic Sand	Dolerite — JURASSIC
Clay	Gravel	Sandstone — TRIASSIC
Silt	Wood, Peat, Carbonaceous Material	

SCALE

150'
100'
50'
VERTICAL SCALE
1 Inch = 50 Feet

1600' 1200' 800' 400'
HORIZONTAL SCALE
1 Inch = 400 Feet

5 cm

692839

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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION H

Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb. '73
Revised:	FIGURE No. 12

947/1 73-989 1289

1289

10/LAU/38

1290

SW

NE

800 ft

600 ft

400 ft

200 ft

0 (Sea Level)

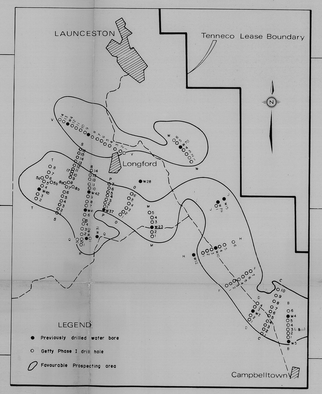
-200 ft

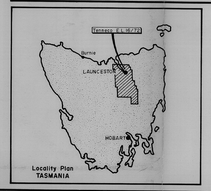
-400 ft

J-1
563' A.S.L.
T.D. 195'

W79
575' A.S.L.
T.D. 240'

W15
596' A.S.L.
T.D. 125'





LEGEND

- Recent Alluvium
- Ironstone Gravel Laterite
- Clay
- Silt
- Sand
- Arkosic Sand
- Gravel
- Wood, Peat, Carbonaceous Material
- Basalt — TERTIARY (Pliocene)
- Dolerite — JURASSIC
- Sandstone — TRIASSIC

SCALE

VERTICAL SCALE
1 Inch = 50 Feet

HORIZONTAL SCALE
1 Inch = 400 Feet

5 cm

692°40

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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION J

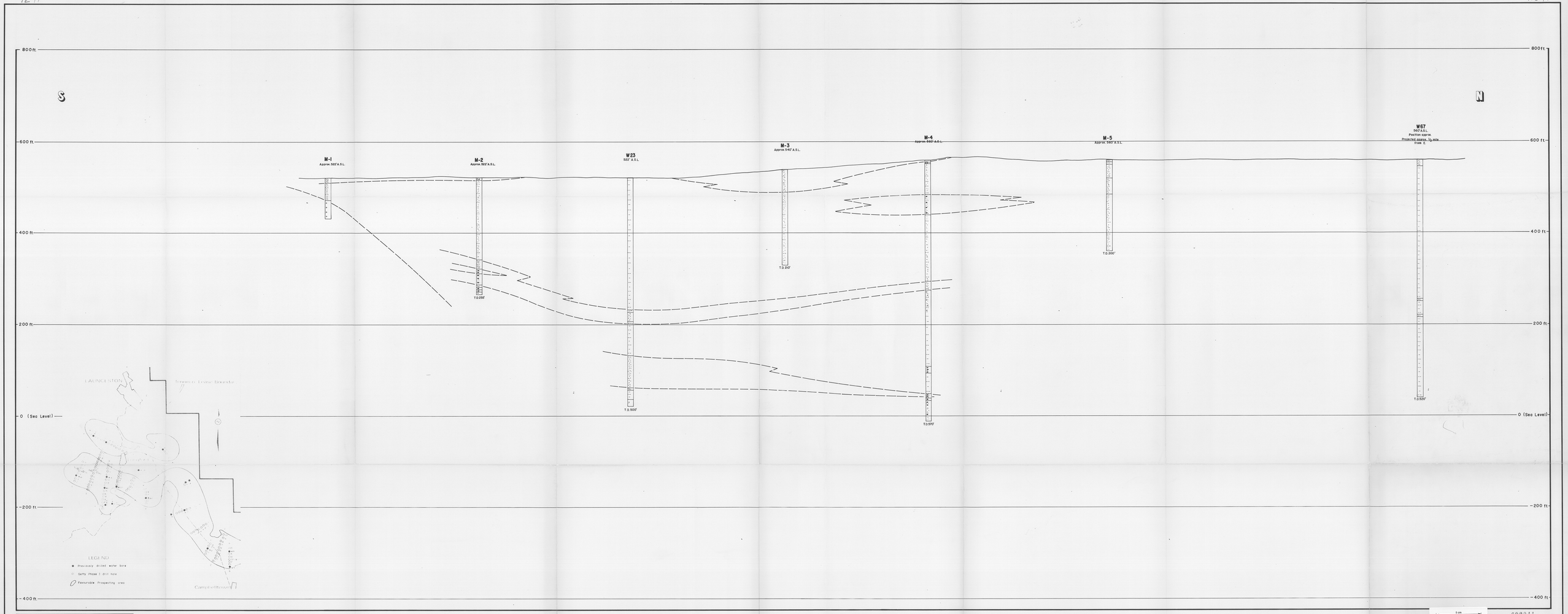
Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb. 73
Revised:	FIGURE No. 13

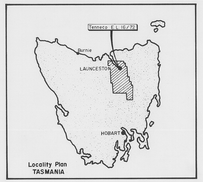
1290

10/GAU/39

Qwell 73-939 1290

1291





Locality Plan
TASMANIA

LEGEND

Recent Alluvium	Sand	Basalt — TERTIARY (Pliocene)
Ironstone Gravel Laterite	Arkosic Sand	Dolerite — JURASSIC
Clay	Gravel	Sandstone — TRIASSIC
Silt	Wood, Peat, Carbonaceous Material	

SCALE

150'
100'
50'
1600' 1200' 800' 400'

VERTICAL SCALE
1 Inch = 50 Feet

HORIZONTAL SCALE
1 Inch = 400 Feet

5 cm

692041

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TENNECO JOINT VENTURE
E.L. 16/72

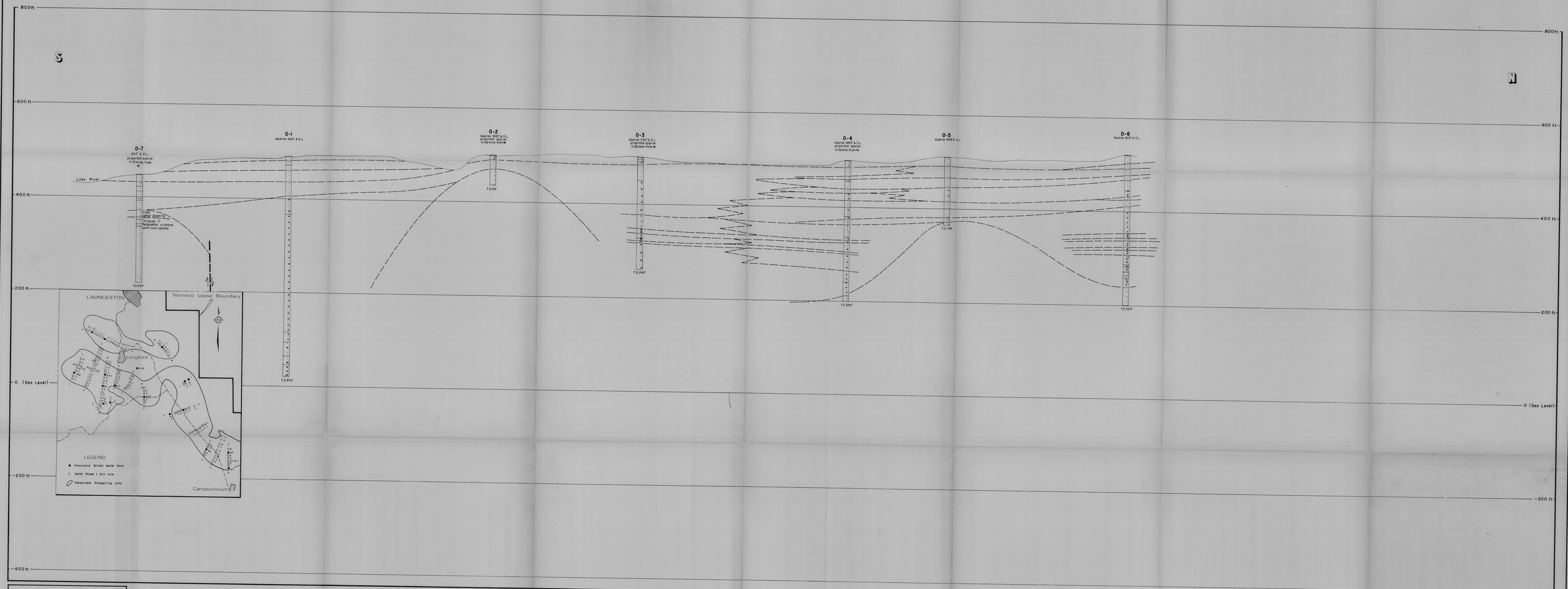
GEOLOGICAL CROSS SECTION M

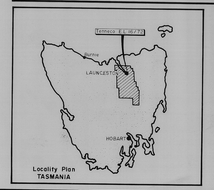
Author: G. Miller / T. Middleton	Scale: As shown
Drawn: D. Anderson	Date: Feb. '73
Revised:	FIGURE No. 14

1291

10/LAU/40

Q47/1 73-939 1291





Locality Plan
TASMANIA

LEGEND

Recent Alluvium	Sand	Basalt — TERTIARY (Pliocene)
Ironstone Gravel Laterite	Arkosic Sand	Dolerite — JURASSIC
Clay	Gravel	Sandstone — TRIASSIC
Silt	Wood, Peat, Carbonaceous Material	

SCALE

150'
100'
50'
VERTICAL SCALE
1 Inch = 50 Feet

1600' 1200' 800' 400'
HORIZONTAL SCALE
1 Inch = 400 Feet

5 cm

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GETTY OIL DEVELOPMENT COMPANY LIMITED

TENNECO JOINT VENTURE
E.L. 16/72

GEOLOGICAL CROSS SECTION O

Author: G Miller / T Middleton	Scale: As shown
Drawn: D Anderson	Date: Feb. 73
Revised:	FIGURE No. 15

692042 1292 10/LAU/41

G47/1 73-939 1292