COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS
1959 NO. 70

PRELIMINARY REPORT ON UNDERWATER GRAVITY SURVEY GREAT BARRIER REEF AREA THURSDAY ISLAND TO ROCKHAMPTON

by

M.J. GOODSPEED and L.W. WILLIAMS

RECORDS 1959 - NO. 70.

"PRELIMINARY REPORT ON UNDERWATER GRAVITY SURVEY, GREAT BARRIER REEF AREA, THURSDAY ISLAND TO ROCKHAMPTON"

BY

M. J. GOODSPEED AND L. W. WILLIAMS.

C O N T E N T S.

P L A T E S.

A B S T R A C T.

An underwater gravity traverse was run between Thursday Island and Rockhampton, following the inner steamer channel of the Great Barrier Reef. In addition five cross traverses were run from the Queensland coast to the edge of the Reef. Positive Bouguer anomalies tending to increase with distance from the coast were found with the highest anomalies at the seaward end of a cross traverse in Princess Charlotte Ba-, where the Reef is closest to the coast.

1. INTRODUCTION.

In October 1958 the Geophysical Section of the Bureau of Mineral Resources commenced a regional gravity survey along the Inner Steamer Channel of the Great Barrier Reef from Thursday Island to Maryborough. The underwater gravity meter used (North American UW-2R-7) was mounted on M.V. "Kano", a 60ft. launch chartered from Mines Administration Pty.Ltd.

Stations were occupied at approximately twenty mile intervals along the Channel and in addition eight cross traverses were run from the coast to the inner edge of the Reef with a nominal station interval of five miles. Humber Barrier Reef Oils Pty.Ltd. and Lucky Strike Drilling Co. contributed the charter costs for the vessel when it was operating within the areas of their respective Authorities to Prospect for Oil, viz. 53P and 42P.

This report deals with the part of the survey extending South from Thursday Island to Rockhampton. Most of this part lies within the "Authority to Prospect" area of Humber Barrier Reef Oils Pty.Ltd. The boundaries of this Authority are shown on Plate 1. The part of the survey south of Rockhampton is dealt with by Dooley (1959) and Dooley and Goodspeed (1959).

2. FIELD WORK.

The survey commenced on 16th October, 1958 with the re-occupation of an underwater station at Thursday Island where the gravity value had been measured during a previous survey (Williams and Waterlander, 1958). Long term drift control for the first part of the survey was obtained by using the known value at Thursday Island, and a value at Cairns Wharf obtained by measuring the interval from the wharf to B.M.R. Pendulum Station No.52, Cairns Aerodrome (Dooley, et.al., 1959). This interval was measured using a Worden gravity meter. In the same way long term drift control was obtained between the pendulum stations at:-

i) Cairns and Townsville.

ii) Townsville and Rockhampton.

The control measurements at the wharves were made as close as possible to the position of the underwater gravity readings, and were adjusted for differences in altitude and differences arising from attractions of water and rock between the two stations.

Short term drift control for the semi-detailed cross traverses was obtained by re-occupation of control stations located close to islands on the traverses.

Positions of stations at sea were obtained where possible by the measurement of horizontal angles between pairs of prominent known features such as islands and mountain peaks. At the seaward end of some cross traverses no such angles could be measured but it was sometimes possible to take compass bearings on single features. Otherwise dead reckoning methods were used.

Depths at the positions of observation were measured by means of a pressure-sensitive transducer incorporated in the underwater gravity-meter system.

The positions of the gravity stations occupied are shown on Plate 1.

During the early part of the survey, from Thursday Island to Townsville, the weather was good and it was possible to proceed without any significant delays. At Townsville trouble developed in the thermostat system of the equipment and, immediately after this had been rectified, a period of rough weather intervened. A total delay of three weeks at Townsville resulted. Subsequent short spells of rough weather did not result in any significant delays, but the time lost at Townsville made it impossible to complete the survey in 1958 as planned. The survey was resumed and completed in 1959 (Dooley and Goodspeed, 1959).

On cross traverse 5 (Plate 2) a gap of ten miles exists between station BR108 and the terminating station at Bell Cay. It was not possible to occupy stations in this gap because the depth exceeded the operational limit of 240 feet which had been set for the equipment.

3. COMPUTATIONS.

The results of the survey were recorded as gravity meter readings with an observed water depth at a certain time. It was first necessary to adjust the gravity readings for the difference between sea level at the time of observation and Mean Sea Level. Admiralty Tide Tables, which give tide predictions at selected points, were used to find these differences, interpolating as seemed best for each gravity station between the restricted range of points listed. The corrections resulting were small (.013 milligal per foot of sea water).

In addition to corrections for the effects of ocean tides, corrections were applied for earth tide variations resulting from the attractions of the sun and moon (Geophysical Prospecting Vol.V, Suppl.1, 1957). These corrections were also small, reaching a maximum of 0.26 milligal.

After these corrections had been applied the mean rate of drift between the pendulum station observations was computed and applied as a correction to the intervening readings. In the case of the readings on the cross traverses, extra drift corrections derived from the re-occupation of control stations on these traverses were applied. The drift rates found were consistent and low (about +0.3 milligals per day), although a change occurred after the thermostats were altered at Townsville.

The gravity values obtained in this way are listed in the Tables under the heading "Observed Gravity". The depths shown are depths below Mean Sea Level.

The gravity values were then corrected to Mean Sea Level. In addition to the normal Free Air correction factor, allowance had to be made for the attraction of a sheet of water equal in thickness to the corrected depth. This attraction acts upwards at the point of observation but downwards at Mean Sea Level. The resulting corrections, proportional to depth, are listed under "Free Air Correction" in the Tables.

The remaining correction is the simple Bouguer correction, equivalent to replacing the sea water (assumed density 1.03 gm./cc) by rock of standard density 2.67 gm./cc. No terrain correction (which would be principally affected by sea bed topography) was applied.

4. RESULTS.

The results are tabulated in Tables 1-6. They agree well, at points where comparison is possible, with measurements by Marshall and Narain (1954) and with results obtained in 1954 by J.C. Dooley (unpublished). Confidence in their reliability is also afforded by the consistency of the observed drift rates for the gravity meter.

5. DISCUSSION OF RESULTS.

A: REGIONAL RESULTS.

It will be seen that, with only two exceptions, the Bouguer Anomalies are positive and that there is a strong tendency for the anomaly to increase with distance from the coast as far as a line just west of the inner edge of the Reef. Two of the cross traverses (Plate 2) show a maximum close to, but west of, the inner edge, and the highest anomalies observed are at the seaward end of Traverse 1 (Plate 2), where the edge of the reef sweeps round very close to the coast in the vicinity of Cape Melville. The observations are consistent with the picture of a ridge of positive Bouguer anomaly running close to the edge of the Reef along its entire length, declining from about +100 milligals at the northern end to about +40 milligals at the southern end.

A gravity rise of this order would be expected off the coast of a continent from the rise in level of the subsurface density discontinuity associated with the seismologists' Mohorovicic discontinuity. However, the shallow water off the coast as far east as the Reef, and the existence of the Reef itself, suggest that the water between the Reef and the coastline may merely submerge an extension of the true continental land mass. If this is so then the offshore gravity rise probably represents a basement rise. The geology of the area is discussed by Hill (1954).

B: CROSS TRAVERSES.

The locations of the five cross traverses are shown on Plate 1 and the results from each are plotted in detail on (Plate 2).

In each case the rise in the positive Bouguer anomalies eastwards from the coast is apparent. In the case of Traverses 4 and 5 a maximum is reached west of the edge of the Reef, followed by a decline to the east.

Irregularities in this general trend are apparent on all the traverses, particularly near the coast.

6. REFERENCES.

DOOLEY, J.C., 1959. - Preliminary Report on underwater gravity survey, Hervey Bay, Queensland. Bureau of Mineral Resources, Geology and Geophysics, Records 1959/68.

DOOLEY, J.C., McCARTHY, E., KEATING, W.D., MADDERN, C.A., AND WILLIAMS, L.W., 1959. - Pendulum measurements of gravity in Australia, 1950-51. Bureau of Mineral Resources, Geology and Geophysics Bulletin 46 (in press).

DOOLEY, J.C., AND GOODSPEED, M.J., 1959. - Preliminary Report on underwater gravity survey, Great Barrier Reef area - Rockhampton to Gladstone. Bureau of Mineral Resources, Geology and Geophysics. Records 1959/69.

GOGUEL, J., 1954 - A Universal table for the prediction of the Lunar-Solar correction in gravimetry. Geophysical Prospecting, Vol.II, Suppl.

HILL, DOROTHY, 1954. - The geology of the Great Barrier Reefs in relation to oil potential. (unpubl. manuscript).

MARSHALL, C.E. AND NARAIN, H., 1954. - Regional gravity investigations in the Eastern and Central Commonwealth. University of Sydney, Department of Geology and Geophysics. Mem.1954/2.

WILLIAMS, L.W. AND WATERLANDER, S., 1958. - Preliminary report, underwater gravity survey - Bramble Cay to Cape Arnhem. Bureau of Mineral Resources, Geology and Geophysics. Record 1958/102.

Table 1.

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude ° '	East Longitude ° '	Depth Feet	Observed Gravity	Normal Gravity.	Free Air Correction.	Free Air Anomaly	Bouguer Correction.	Terrain Corr	Bouguer Anomaly.
BR1	10 42.6	142 35.3	53	978 264.8	978 226.9	-3.6	+34.3	+1.1	-	+35.4
BR2	10 53.8	142 45.4	51	271.1	233.0	-3.4	+34.7	+1.1	-	+35.8
BR3	11 14.2	142 54.7	87	297.6	244.6	-5.9	+47.1	+1.8	-	+48.9
BR4	11 35.3	142 56.5	83	316.2	256.8	-5.6	+53.8	+1.7	-	+55.5
BR5	11 46.9	143 04.7	92	313.2	263.7	-6.2	+43.3	+1.9	-	+45.2
BR6	11 59.8	143 15.5	144	307.1	271.5	-9.8	+25.8	+3.0	-	+28.8
BR7	12 15.0	143 15.4	96	333.6	280.9	-6.5	+46.2	+2.0	-	+48.2
BR8	12 35.5	143 24.5	20	327.8	293.8	-1.4	+32.6	+0.4	-	+33.0
BR9	12 53.1	143 35.2	85	353.3	305.1	-5.7	+42.5	+1.8	-	+44.3
BR10	13 08.5	143 36.9	81	366.1	315.2	-5.5	+45.4	+1.7	-	+47.1
BR11	13 28.4	143 41.0	53	384.4	328.6	-3.6	+52.2	+1.1	-	+53.3
BR12	13 40.6	143 41.0	79	397.2	336.9	-5.4	+54.9	+1.7	-	+56.6
BR13	13 56.1	143 44.7	58	406.0	347.7	-4.0	+54.3	+1.2	-	+55.5
BR14	14 08.1	143 59.4	97	415.7	356.2	-6.6	+52.9	+2.0	-	+54.9
BR21	14 05.6	144 19.4	47	436.6	354.4	-3.2	+79.0	+1.0	-	+80.0
BR24	14 04.9	144 34.7	79	451.7	353.9	-5.4	+92.4	+1.7	-	+94.1
BR25	14 20.8	144 39.3	34	414.6	365.2	-2.3	+47.1	+0.7	-	+47.8
BR26	14 32.3	144 59.2	46	422.1	373.6	-3.1	+45.4	+1.0	-	+46.4
BR27	14 51.3	145 17.0	51	447.6	387.6	-3.4	+56.6	+1.1	-	+57.7
BR28	15 05.0	145 28.5	106	459.0	397.8	-7.2	+54.0	+2.2	-	+56.2
BR29	15 16.5	145 24.1	88	454.0	406.5	-6.0	+41.5	+1.8	-	+43.3
BR30	15 26.4	145 20.0	60	978 448.9	978 414.1	-4.0	+30.8	+1.2	-	+32.0
BR31	15 27.8	145 15.1	20	439.1	415.2	-1.3	+22.6	+0.4	-	+23.0
BR32	15 44.6	145 26.0	47	458.6	428.2	-3.2	+27.2	+1.0	-	+28.2
BR33	16 02.7	145 33.0	97	478.8	442.5	-6.6	+29.7	+2.0	-	+31.7
BR34	16 25.8	145 29.4	53	483.4	461.1	-3.6	+18.7	+1.1	-	+19.8
BR35	16 23.9	145 39.2	108	504.9	459.6	-7.3	+38.0	+2.3	-	+40.3
BR36	16 55.5	145 46.8	36	499.6	485.6	-2.4	+11.6	+0.8	-	+12.4
BR37	16 47.0	145 55.8	107	524.6	478.5	-7.3	+38.8	+2.2	-	+41.0
BR38	16 54.9	146 07.4	144	549.3	485.1	-9.8	+54.4	+3.0	-	+57.4
BR39	17 14.0	146 05.6	93	531.4	501.1	-6.3	+24.0	+2.0	-	+26.0
BR44	17 30.7	146 17.9	126	540.3	515.4	-8.5	+16.4	+2.6	-	+19.0
BR45	17 44.2	146 09.8	32	558.3	527.1	-2.2	+29.0	+0.7	-	+29.7
BR46	18 02.8	146 12.9	78	557.2	543.4	-5.3	+8.5	+1.6	-	+10.1

Area Great Barrier Reef Traverse Thursday Island-Rockhampton Date of Survey 16/10/58 - 14/12/58.

Meter North Amer. AG1-147 Sensitivity 0.12665 Datum Thursday Island & B.M.R. Pendulum Stations. Density Factor Sea-water 1.03 Rock 2.67

Map Reference Admiralty Charts. Worked M.J.G. Checked A.R. Date

Table 1. (Cont'd.)

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude ° '	East Longitude ° '	Depth Feet	Observed Gravity	Normal Gravity.	Free Air Correction.	Free Air Anomaly	Bouguer Correction.	Terrain Corr	Bouguer Anomaly
BR47	18 20.5	146 20.2	52	567.1	559.1	-3.5	+4.5	+1.1	-	+5.6
BR48	18 40.3	146 29.8	85	593.9	577.0	-5.8	+11.1	+1.8	-	+12.9
BR49	19 01.4	146 36.5	35	614.4	596.3	-2.4	+15.7	+0.7	-	+16.4
BR57	19 07.5	146 53.4	37	624.6	602.0	-2.5	+20.1	+0.8	-	+20.9
BR58	19 15.7	146 49.3	13	629.8	609.6	-0.9	+19.3	+0.3	-	+19.6
BR59	19 11.0	147 00.6	16	630.2	605.2	-1.1	+23.9	+0.3	-	+24.2
BR69	19 17.0	147 21.8	53	659.4	610.8	-3.6	+45.0	+1.1	-	+46.1
BR70	19 44.2	147 44.5	20	642.3	636.5	-1.4	+ 4.4	+0.4	-	+ 4.8
BR71	19 49.8	148 03.6	79	665.4	641.9	-5.4	+18.1	+1.7	-	+19.8
BR73	20 04.0	148 53.0	35	678.3	655.5	-2.4	+20.4	+0.7	-	+21.1
BR86	20 23.4	148 56.3	133	702.0	674.4	-9.0	+18.6	+2.8	-	+21.4
BR87	20 41.5	149 02.9	55	719.7	692.2	-3.7	+23.8	+1.2	-	+25.0
BR88	20 58.8	149 12.0	33	730.4	709.5	-2.2	+18.7	+0.7	-	+19.4
BR89	21 06.6	149 13.5	17	739.3	717.3	-1.2	+20.8	+0.4	-	+21.2
BR90	21 24.3	149 46.9	60	748.9	735.3	-4.1	+9.5	+1.3	-	+10.8
BR91	21 36.8	149 46.9	40	752.2	748.1	-2.7	+1.4	+0.8	-	+2.2
BR92	21 54.5	150 06.3	24	978 795.5	978 766.3	-1.6	+27.6	+0.5	-	+28.1
BR104	21 57.5	150 40.3	68	788.0	769.4	-4.6	+14.0	+1.4	-	+15.4
BR110	22 20.4	150 43.4	165	797.9	793.4	-11.2	- 6.7	+3.4	-	-3.3
BR111	22 41.5	150 50.9	08	826.4	815.8	-6.0	+4.6	+1.8	-	+6.4
BR112	23 22.8	150 31.2	16	872.2	860.4	-1.1	+10.7	+0.3	-	+11.0

Area Great Barrier Reef Traverse Date of Survey 16/10/58 - 14/12/58.
Thursday Island-Rockhampton.

Meter North American AG1-147 Sensitivity 0.12665 Datum Thursday Island, and B.M.R. Pendulum Stations. Density Factor 1.03 Rock 2.67 Sea Water

Map Reference Admiralty Charts Worked M.J.G. Checked A.R. Date

Table 2

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude ° '	East Longitude ° '	Depth Feet	Observed Gravity.	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction.	Terrain Corr	Bouguer Anomaly.
BR17	14 07.8	143 44.8	32	978 407.2	978 356.0	-2.1	+49.1	+0.7	-	+49.8
BR16	14 07.7	143 49.3	56	416.2	355.9	-3.8	+56.5	+1.2	-	+57.7
BR15	14 07.9	143 54.5	67	412.4	356.0	-4.5	+51.9	+1.4	-	+53.3
BR14	14 08.1	143 59.4	97	415.7	356.2	-6.6	+52.9	+2.0	-	+54.9
BR18	14 06.2	144 05.6	96	420.1	354.8	-6.5	+58.8	+2.0	-	+60.8
BR19	14 04.9	144 09.4	126	431.4	353.9	-8.5	+69.0	+2.6	-	+71.6
BR20	14 05.4	144 13.6	59	434.0	354.3	-4.0	+75.7	+1.2	-	+76.9
BR21	14 05.6	144 19.4	47	436.6	354.4	-3.2	+79.0	+1.0	-	+80.0
BR22	14 05.0	144 24.3	89	438.7	354.0	-6.1	+78.6	+1.9	-	+80.5
BR23	14 03.3	144 29.0	98	440.4	352.8	-6.7	+80.9	+2.1	-	+83.0
BR24	14 04.9	144 34.7	79	451.7	353.9	-5.4	+92.4	+1.7	-	+94.1

Area	Traverse	DATE of Survey
Princess Charlotte Bay	1	20 - 22/10/58

Meter	Sensitivity	Datum	Density Factor Sea Water
North American AG1 - 147	0.12665	BR 14 BR21	1.03 Rock 2.67

Map Reference	Worked	Checked	Date
Admiralty Chart	M.J.G.	A.R.	

Table 3

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude o '	East Longitude o '	Depth Feet	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Terrain Corr	Bouguer Anomaly
BR40	17 13.4	146 01.0	56	978 518.6	978 500.6	-3.8	+14.2	+1.2	-	+15.4
BR39	17 14.0	146 05.6	93	531.4	501.1	-6.3	+24.0	+2.0	-	+26.0
BR41	17 14.3	146 09.7	99	533.0	501.4	-6.7	+24.9	+2.1	-	+27.0
BR42	17 14.9	146 13.3	131	534.2	501.9	-8.9	+23.4	+2.7	-	+26.1
BR43	17 14.0	146 18.4	147	547.2	501.1	-10.0	+36.1	+3.1	-	+39.2

Area	Traverse	Date of Survey
Russell Island	2	29 - 30/10/58.

Meter	Sensitivity	Datum	Density Factor
North American AG1-147	0.12665	BR39	Sea 1.03 Rock 2.67

Map Reference	Worked	Checked	Date
Admiralty Chart	M.J.G.	A.R.	

Table 4

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude ° '	East Longitude ° '	Depth Feet	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Terrain Corr	Bouguer Anomaly
BR51	19 01.2	146 26.8	27	978 594.6	978 596.2	-1.8	-3.4	+0.6	-	-2.8
BR50	19 01.1	146 31.2	50	607.0	596.1	-3.4	+7.5	+1.0	-	+8.5
BR49	19 01.4	146 36.5	35	614.4	596.3	-2.4	+15.7	+0.7	-	+16.4
BR52	19 01.9	146 41.6	59	619.0	596.8	-4.0	+18.2	+1.2	-	+19.4
BR53	19 02.7	146 47.2	64	611.0	597.6	-4.3	+ 9.1	+1.4	-	+10.5
BR54	19 03.3	146 52.7	80	621.6	598.1	-5.4	+18.1	+1.7	-	+19.8
BR55	19 04.2	146 58.0	83	625.4	599.0	-5.6	+20.8	+1.7	-	+22.5
BR56	19 05.0	147 03.6	88	633.4	599.7	-6.0	+27.7	+1.8	-	+29.5
BR60A	19 07.2	147 06.7	82	634.6	601.7	-5.6	+27.3	+1.7	-	+29.0
BR61A	19 07.6	147 11.2	81	633.2	602.1	-5.5	+25.6	+1.7	-	+27.3
BR62A	19 07.1	147 16.6	92	634.4	601.6	-6.2	+26.6	+1.9	-	+28.5
BR63A	19 08.4	147 21.4	98	650.9	602.8	-6.6	+41.5	+2.1	-	+43.6
BR64A	19 09.5	147 26.8	108	650.7	603.9	-7.3	+43.5	+2.3	-	+45.8
BR65A	19 09.0	147 31.4	118	654.1	603.4	-8.0	+42.7	+2.5	-	+45.2
BR66A	19 11.0	147 38.4	138	663.3	605.2	-9.4	+48.7	+2.9	-	+51.6

Area: Magnetic Island

Traverse: 3

Date of Survey: 31/10/58 - 27/11/58

Meter: North American AG1 - 147

Sensitivity: 0.12665

Datum: BR49 BR59

Density Factor: Sea 1.0, rock 2.67

Map Reference: Admiralty Charts 348, 2349

Worked: M.J.G.

Checked: A.R.

Date:

Table 5

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics.

GRAVITY SURVEY

Station	South Latitude ° '	East Longitude ° '	Depth Feet	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Terrain Corr	Bouguer Anomaly
BR79	20 01.5	148 15.0	29	978 665.0	978 653.1	-2.0	+9.9	+0.6	-	+10.5
BR78	20 00.1	148 20.8	58	668.3	651.8	-3.9	+12.6	+1.2	-	+13.8
BR72	19 57.6	148 26.4	132	674.2	649.4	-8.9	+15.9	+2.8	-	+18.7
BR77	19 59.0	148 33.3	128	673.4	650.7	-8.7	+14.0	+2.7	-	+16.7
BR76	20 00.5	148 37.7	151	672.2	652.2	-10.2	+9.8	+3.2	-	+13.0
BR75	20 02.8	148 43.7	123	672.8	654.4	-8.3	+10.1	+2.6	-	+12.7
BR74	20 03.3	148 48.1	119	675.2	654.9	-8.1	+12.2	+2.5	-	+14.7
BR73	20 04.0	148 53.0	35	678.3	655.5	-2.4	+20.4	+0.7	-	+21.1
BR80	20 02.5	148 58.1	192	701.0	654.1	-13.0	+33.9	+4.0	-	+37.9
BR81	20 01.9	149 02.5	226	706.7	653.5	-15.3	+37.9	+4.7	-	+42.6
BR82	20 02.5	149 07.1	227	700.9	654.1	-15.4	+31.4	+4.7	-	+36.1
BR83	20 02.5	149 11.6	217	698.8	654.1	-14.7	+30.0	+4.5	-	+34.5
BR84	20 02.0	149 16.6	228	694.3	653.6	-15.5	+25.2	+4.8	-	+30.0
BR85	20 03.2	149 24.0	224	693.9	654.8	-15.2	+23.9	+4.7	-	+28.6

Area: Gloucester Island — Traverse: 4 — Date of Survey: 30/11/58 - 3/12/58

Meter: North American AG1-147 — Sensitivity: 0.12665 — Datum: BR73 — Density Factor: Soa 1.03, rock 2.67

Map Reference: Admiralty Chart — Worked: M.J.G. — Checked: A.R. — Date:

Table 6

Geophysical Section, Bureau of Mineral Resources, Geology & Geophysics.

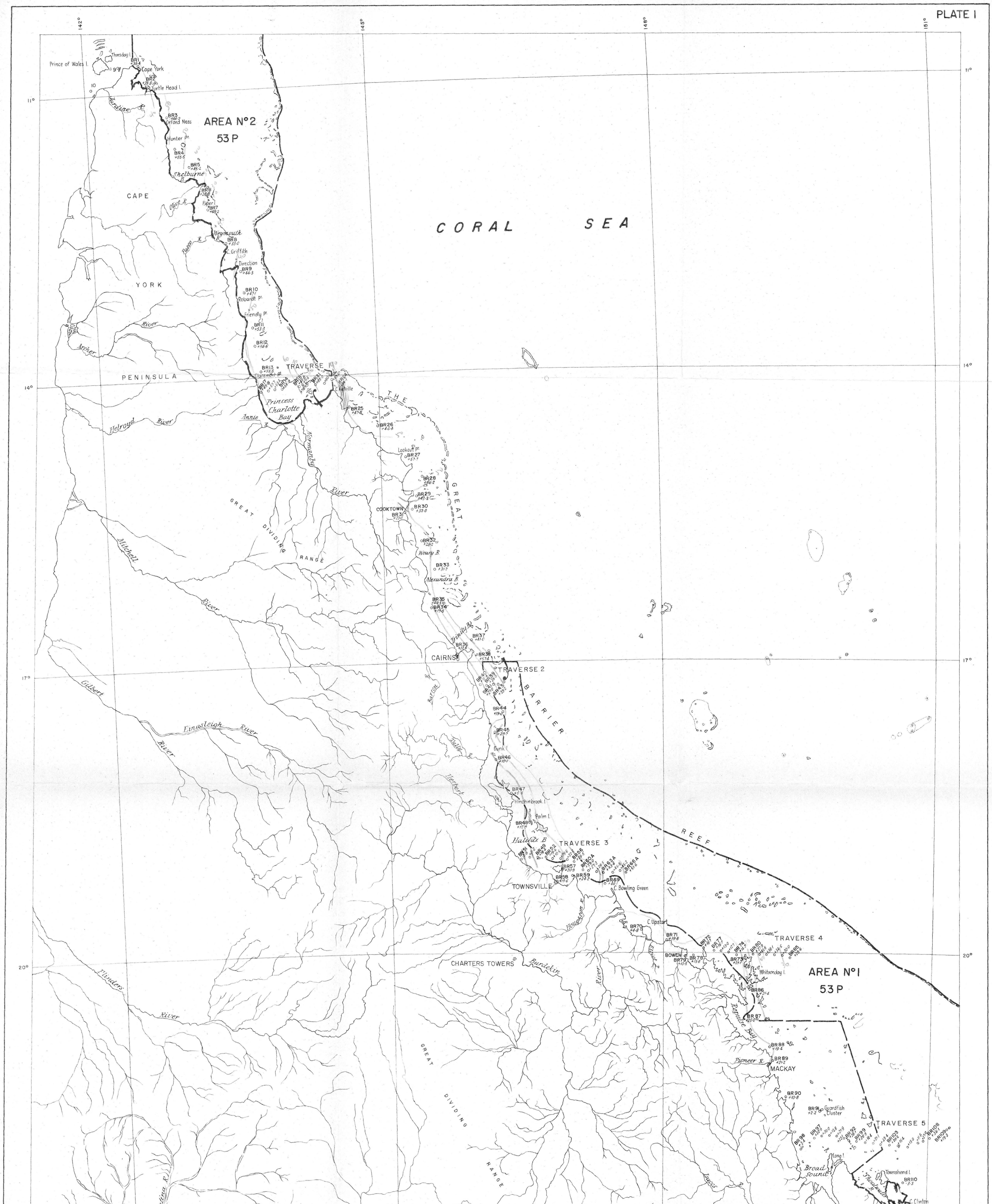
GRAVITY SURVEY

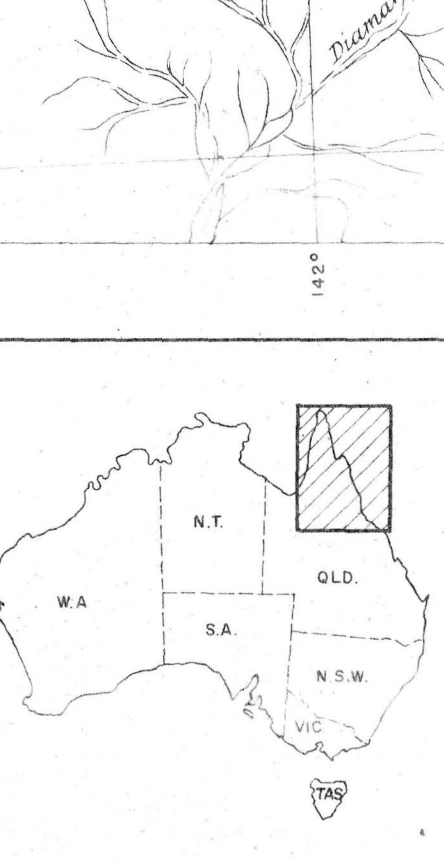
Station	South Latitude o '	East Longitude o '	Depth Feet	Observed Gravity	Normal Gravity	Free Air Correction	Free Air Anomaly	Bouguer Correction	Terrain Corr	Bouguer Anomaly.
BR98	22 00.0	149 33.3	26	978 776.8	978 772.1	-1.8	+2.9	+0.5	-	[illegible]4
BR97	21 53.5	149 40.5	57	790.9	765.3	-3.9	+21.7	+1.2	-	+22.9
BR96	21 53.0	149 47.5	83	798.6	764.8	-5.6	+28.2	+1.8	-	+30.0
BR95	21 53.0	149 53.1	71	780.7	764.8	-4.8	+11.1	+1.5	-	+12.6
BR94	21 52.9	149 57.3	68	789.8	764.7	-4.	+20.5	+1.4	-	+21.9
BR93	21 54.0	150 03.9	73	791.3	765.8	-4.9	+20.6	+1.5	-	+22.1
BR92	21 54.5	150 06.3	24	795.5	766.3	-1.6	+27.6	+0.5	-	+28.1
BR99	21 54.2	150 12.0	92	797.2	766.0	-6.2	+25.0	+1.9	-	+26.9
BR100	21 55.1	150 18.4	107	786.5	767.0	-7.3	+12.2	+2.2	-	+14.4
BR101	21 56.2	150 25.3	145	796.0	768.1	-9.8	+18.1	+3.0	-	+21.1
BR102	21 56.5	150 29.4	160	799.2	768.4	-10.8	+20.0	+3.4	-	+23.4
BR103	21 56.5	150 34.7	167	796.4	768.4	-11.3	+16.7	+3.5	-	+20.2
BR104	21 57.5	150 40.3	68	788.0	769.4	- 4.6	+14.0	+1.4	-	+15.4
BR105	21 58.2	150 46.2	214	793.2	770.2	-14.5	+8.5	+4.5	-	+13.0
BR106	21 54.3	150 51.7	219	787.9	766.1	-14.8	+7.0	+4.6	-	+11.6
BR107	21 53.0	150 55.6	197	801.0	764.8	-13.3	+22.9	+4.1	-	+27.0
BR108	21 50.6	151 00.5	234	809.4	762.3	-15.9	+31.2	+4.9	-	+36.1
BR109	21 46.2	151 13.5	150	784.0	757.7	-10.2	+16.1	+3.2	-	+19.3

Area: Broad Sound — Traverse: 5 — Date of Survey: 8/12/58 - 11/12/58.

Meter: North American AG1 - 147 — Sensitivity: 0.12665 — Datum: BR92 BR104 — Density Factor: Sea 1.03, rock 2.67

Map Reference: Admiralty Chart — Worked: M.J.G. — Checked: A.R. — Date:


142°
145°
148°
151°
11°
14°
17°
20°
23°
Thursday I.
Prince of Wales I.
BR1 +35·4
Cape York
BR2 +35·8
Turtle Head I.
Jardine R.
BR3 +46·9
Orford Ness
AREA N°2
53 P
Hunter Pt.
BR4 +55·5
BR5 +45·2
Shelburne B.
CAPE
BR6 +28·8
Olive R.
Piper I.
BR7 +48·2
Weymouth B.
BR8 +33·0
Pascoe R.
C. Griffith
C. Direction
BR9 +44·3
YORK
BR10 +47·1
Robardt Pt.
Friendly Pt.
BR11 +53·3
River
BR12 +56·6
Archer
BR13 +55·5
TRAVERSE 1
Claremont Pt.
PENINSULA
BR17 +49·8
BR14 +54·9
BR18
BR21 +80·0
C. Melville
Princess Charlotte Bay
Holroyd River
Annie R.
BR25 +47·8
BR26 +46·4
Normanby River
Lookout Pt.
BR27 +57·7
BR28 +56·2
BR29 +43·3
COOKTOWN
BR30 +32·0
BR31 +23·0
BR32 +28·2
Weary B.
BR33 +31·7
Alexandra B.
BR35 +40·3
BR34 +19·8
GREAT DIVIDING RANGE
Mitchell River
CORAL SEA
THE GREAT BARRIER REEF
Trinity B.
BR37 +41·0
BR36 +12·4
CAIRNS
BR38 +57·4
TRAVERSE 2
BR40
BR39
BR41 +27·0
BR43 +39·2
Barron R.
BR44 +19·8
BR45 +29·7
Dunk I.
BR46 +10·1
Tully R.
Gilbert River
Einasleigh River
Herbert R.
BR47 +5·6
Hinchinbrook I.
Palm I.
BR48 +12·9
Halifax B.
TRAVERSE 3
BR51
BR49
BR52
BR56
BR57 +20·9
BR60A
BR63A
BR66A +51·6
BR58 +19·6
BR59 +24·2
BR69 +46·1
TOWNSVILLE
C. Bowling Green
Houghton R.
C. Upstart
BR70 +4·8
BR71 +19·8
BR72 +18·7
BR77 +16·7
BR74 +14·7
BR80
BR85 +28·6
TRAVERSE 4
CHARTERS TOWERS
Burdekin River
Elliot R.
BOWEN
BR79 +10·5
BR78 +13·8
BR73 +21·1
Whitsunday I.
AREA N°1
53 P
BR86 +21·4
Repulse Bay
BR87 +25·0
BR88 +19·4
Pioneer R.
BR89 +21·2
MACKAY
BR90 +10·8
BR91 +2·2
Guardfish Cluster
TRAVERSE 5
BR98 +3·4
BR97 +22·9
BR92
BR99 +26·9
BR103 +20·2
BR108 +36·1
BR109 +19·3
Long I.
Broad Sound
Isaacs R.
Townshend I.
BR110 -3·3
Shoalwater B.
C. Clinton
BR111 +6·4
Herbert C.
Fitzroy R.
Flinders River
GREAT DIVIDING RANGE
Diamantina R.



RELATIVE BOUGUER ANOMALIES ARE BASED ON THE OBSERVED GRAVITY VALUES OF FOLLOWING B.M.R. GRAVITY PENDULUM STATIONS:-

CAIRNS: 978,500·1 MILLIGALS
TOWNSVILLE: 978,623·1 ..
ROCKHAMPTON: 978,869·9 ..

FOR THE CALCULATION OF BOUGUER ANOMALIES 1·03 GM/CCM. HAS BEEN TAKEN AS THE SEA WATER DENSITY AND 2·67 GM/CCM. AS THE AVERAGE ROCK DENSITY.

NORTH AMERICAN UNDERWATER GRAVITY METER WAS USED FOR THIS SURVEY

ELEVATION DATUM – M.S.L.

GRAVITY STATIONS ORIGINALLY PLOTTED ON THE ADMIRALTY CHARTS N°346–348, 2349–2350, 2354, 2764, 2921–2924

PETROLEUM PROSPECTING LEASES FROM QUEENSLAND DEPT. OF MINES 40 MILES TO 1 INCH MAP.

○ BR3 *GRAVITY STATION*

+19·3 *BOUGUER ANOMALY IN MILLIGALS*

— — *LEASE BOUNDARY AS AT 31·12·58*

M. J. Goodspeed
GEOPHYSICIST

REGIONAL GRAVITY SURVEY (1958)
GREAT BARRIER REEF, QLD.
(THURSDAY ISLAND – ROCKHAMPTON)

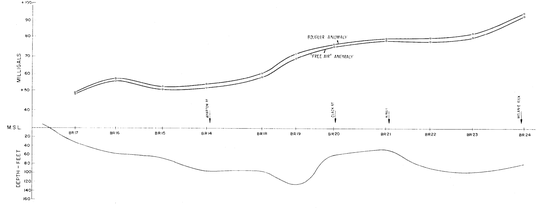
STATION LOCATIONS AND BOUGUER ANOMALIES

SCALE IN MILES
40 0 40 80 120 160

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

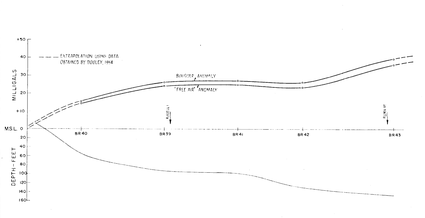
G317-8

TO ACCOMPANY RECORDS 1959 N°70



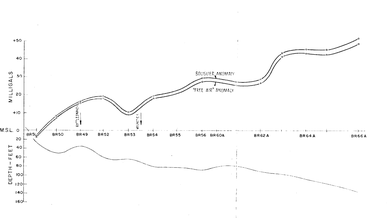
TRAVERSE 1

SCALE IN NAUTICAL MILES



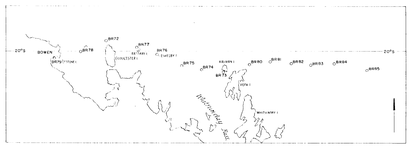
TRAVERSE 2

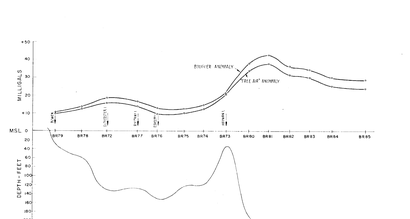
SCALE IN NAUTICAL MILES



TRAVERSE 3

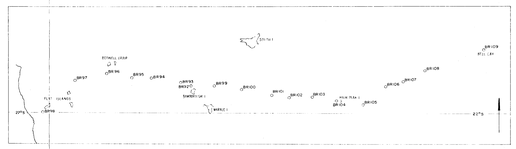
SCALE IN NAUTICAL MILES

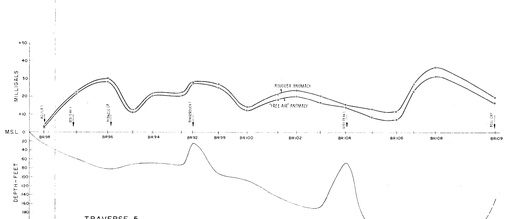




TRAVERSE 4

SCALE IN NAUTICAL MILES





TRAVERSE 5

SCALE IN NAUTICAL MILES

REGIONAL GRAVITY SURVEY (1958) GREAT BARRIER REEF, QLD.

(THURSDAY ISLAND – ROCKHAMPTON)

LOCALITY MAPS OF GRAVITY TRAVERSES AND GRAVITY ANOMALY PROFILES

G.J. Hodgson
GEOPHYSICIST

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

G317-9

TO ACCOMPANY RECORDS 1959/87 (2)