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PRELIMINARY REPORT OF AN
UNDERWATER GRAVITY SURVEY,
BRAMBLE CAY TO CAPE ARNHEM

by

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ABSTRACT.

This Report lists the values of gravity read on an underwater gravity traverse from Bramble Cay, near the northern limits of the Great Barrier Reef, to Cape Arnhem, Northern Territory.

The survey was conducted during May and June, 1958, as part of a traverse extending to Wyndham, West Australia.

Ties were made with mainland stations at Port Moresby, Thursday Island and Normanton.

I. INTRODUCTION.

The Bureau of Mineral Resources intended carrying out a regional gravity survey, using an underwater gravity meter, between Port Moresby and Wyndham. Unfavourable weather conditions limited the amount of work that was done in the Gulf of Papua, and the traverse was resumed at Bramble Cay.

This report covers the section of the traverse from Bramble Cay, through Thursday Island and around the coast of Gulf of Carpentaria, to Cape Arnhem.

Field work commenced at Port Moresby on 24th. May, 1958 and the party reached Cape Arnhem on 30th. June, 1958.

II. FIELD WORK.

Because stations were established at 20 mile intervals on this traverse, it was not practicable to return for repeat readings on any stations. Drift control was therefore obtained by checking at stations where the gravity value was known. These stations were Port Moresby, Thursday Island, Normanton and later at Darwin.

Wherever possible the positions of the marine stations were determined by horizontal sextant and/or compass bearings to land marks. When out of sight of land, the positions were calculated from the ships course and distance measured with a patent log, supplemented by astronomical fixes made using a sextant.

It was found necessary to stay reasonably close to the coast of Gulf of Carpentaria because in the more open areas the water was too rough for the gravity meter to be lowered with safety. In fact many readings had to be taken in the lee of islands because of weather conditions.

As the tides varied only approximately 5 feet above and below mean sea level it was considered that tidal effects would be small compared with the accuracy of this survey, and so no allowance has been made for the state of the tide; the anomalies have been reduced to actual sea level at each station. Within sufficient accuracy this can be considered as M.S.L.

A sea water density of 1.03 gm/cm^3 and an average rock density of 2.67 gm/cm^3 were used in calculating the Bouguer Anomalies

III. RESULTS.

The results are presented in the accompanying tables; they are also shown on the map, Plate I.

Between Bramble Cay and Thursday Island the Bouguer anomalies are positive, with a maximum of +56 milligals at Sue Island.

The values remain positive from Thursday Island to the latitude of Mitchell River Mission, (Station 26). From station 26 to station 27 there is a decrease of 31 milligals in about 25 miles, and the values remain negative for 80 miles.

West from the mouth of the Norman River the anomalies become more positive and then decrease to a minimum of -8 milligals about 30 miles west of the Northern Territory - Queensland border.

The anomaly increases rather rapidly from here to a maximum of +49 milligals in the Sir Edward Pellew Group then decreases to about +30 milligals and remains approximately at this level, with smaller local variations, to Cape Arnhem.

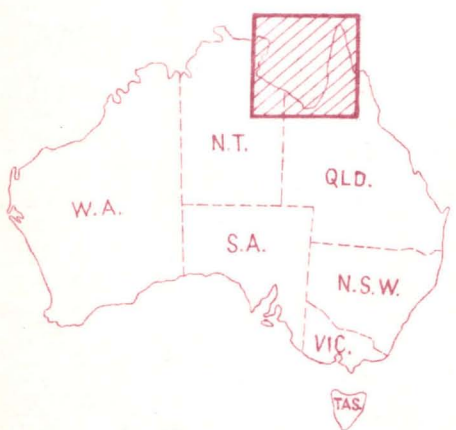
TABLE I.

PRINCIPAL FACTS FOR GRAVITY STATIONS.AREA: Torres Strait and Gulf of Carpentaria.TRAVERSE: Bramble Cay-Cape Arnhem - June 1958.GRAVITY METER: North American Marine.SENSITIVITY: 0.12665 milligal/div.ASSUMED ROCK DENSITY: 2.67ELEVATION DATUM: Mean Sea LevelGRAVITY DATUM: Darwin Pendulum Station.

Station.	Latitude.	Longitude.	Depth (feet).	Observed Gravity.	Normal Gravity.	Free Air Correction.	Free Air Anomaly.	Bouguer Correction.	Bouguer Anomaly
1	9°08.8'	143°52.1'	77.9	978,213.15	978,179.18	-5.28	+28.69	+1.63	+30.3
2	29.8'	33.2'	148.3	218.44	189.19	-10.05	+19.20	+3.10	+22.3
3	36.5'	17.5'	92.5	235.69	192.53	-6.27	+36.89	+1.94	+38.8
4	10°02.5'	03.8'	83.6	262.04	205.58	-5.67	+50.79	+1.75	+52.5
5	08.5'	142°49.5'	67.5	263.43	208.68	-4.57	+50.18	+1.41	+51.6
6	12.2'	48.8'	51.8	269.20	210.61	-3.51	+55.08	+1.08	+56.2
7	27.5'	26.4'	45.1	254.05	218.70	-3.06	+32.29	+0.94	+33.2
8	35.2'	13.1'	19.4	242.86	222.84	-1.31	+18.71	+0.41	+19.1
9	42.1'	20.9'	42.5	257.97	226.60	-2.88	+28.49	+0.89	+29.4
10	55.3'	05.3'	52.0	252.58	233.88	-3.52	+15.18	+1.09	+16.3
11	11°15.2'	01.7'	45.9	265.27	245.14	-3.11	+17.02	+0.96	+18.0
12	36.0'	00.0'	41.7	266.26	257.24	-2.83	+ 6.19	+0.87	+7.1
13	47.0'	141°59'0"	30.6	276.22	263.78	-2.07	+10.37	+0.64	+11.0
14	53.0'	53.0'	36.3	284.86	267.39	-2.46	+15.01	+0.76	+15.8
15	12°12.5'	44.9'	46.7	294.05	279.32	-3.16	+11.57	+0.98	+12.5
16	32.5'	37.8'	42.0	303.82	291.87	-2.85	+ 9.10	+0.88	+10.0
17	42.0'	56.0'	33.0	305.17	297.93	-2.24	+ 5.00	+0.69	+5.7
18	55.0'	43.0'	20.2	320.70	306.36	-1.37	+12.97	+0.42	+13.4
19	58.0'	40.4'	18.2	326.61	308.32	-1.23	+17.06	+0.38	+17.4
20	13°19.0'	41.4'	20.0	348.39	322.25	-1.36	+24.78	+0.42	+25.2
21	40.0'	34.1'	20.4	357.98	336.53	-1.38	+20.07	+0.43	+20.5
22	14°02.5'	35.8'	16.7	375.81	352.21	-1.13	+22.47	+0.35	+22.8
23	24.5'	33.9'	26.8	388.05	367.92	-1.82	+18.31	+0.56	+18.9

TABLE I (Contd.).

Station.	Latitude.	Longitude.	Depth (feet).	Observed Gravity.	Normal Gravity.	Free Air Correction.	Free Air Anomaly.	Bouguer Correction.	Bouguer Anomaly.
24	14°46.5'	141°34.2'	28.7	978,403.99	978,384.00	-1.94	+18.05	+0.60	+18.6
25	15°05.0'	41.0'	16.1	418.53	397.80	-1.09	+19.64	+0.34	+20.0
26	29.3'	32.0'	27.9	434.04	416.32	-1.89	+15.83	+0.58	+16.4
27	49.0'	27.9'	28.1	418.53	431.67	-1.90	-15.04	+0.59	-14.5
28	16°24.5'	18.6'	14.8	457.15	460.04	-1.00	-3.89	+0.31	-3.6
29	40.5'	09.6'	26.2	463.33	473.14	-1.78	-11.59	+0.55	-11.0
30	56.5'	140°58.8'	11.3	483.04	486.41	-0.77	-4.14	+0.24	-3.9
31	17°17.4'	47.0'	31.9	516.54	504.03	-2.16	+10.35	+0.67	+11.0
32	28.0'	50.5'	33.9	519.29	513.09	-2.30	+3.90	+0.71	+4.6
33	37.9'	141°00.5'	11.0	522.89	521.63	-0.75	+0.51	+0.23	+0.7
34	39.8'	05.2'	21.2	520.58	523.27	-1.44	-4.14	+0.44	-3.7
35	29.0'	140°22.2'	35.6	520.19	513.95	-2.41	+3.83	+0.75	+4.6
36	28.2'	00.9'	37.8	522.13	513.26	-2.56	+6.31	+0.79	+7.1
37	27.8'	139°44.6'	24.4	535.10	512.91	-1.65	+20.54	+0.51	+21.0
38	13.4'	32.3'	34.0	528.60	500.64	-2.30	+25.66	+0.71	+26.4
39	16°59.4'	20.1'	35.2	514.67	488.83	-2.39	+23.45	+0.74	+24.2
40	40.0'	13.4'	30.0	485.73	472.72	-2.03	+10.98	+0.63	+11.6
41	35.0'	138°57.2'	52.0	493.58	468.61	-3.52	+21.45	+1.09	+22.5
42	28.5'	37.5'	61.4	493.29	463.30	-4.16	+25.83	+1.29	+27.1
43	22.2'	18.0'	68.5	472.90	458.17	-4.64	+10.09	+1.43	+11.5
44	15.6'	137°58.9'	39.1	449.00	452.84	-2.65	-6.49	+0.82	-5.7
45	07.5'	40.6'	34.4	439.51	446.34	-2.33	-9.16	+0.72	-8.4
46	15°58.0'	22.0'	29.2	445.32	438.77	-1.98	+4.57	+0.61	+5.2
47	46.5'	04.9'	17.2	454.37	429.70	-1.17	+23.5	+0.36	+23.9
48	34.5'	07.2'	42.9	463.26	420.35	-2.91	+40.0	+0.90	+40.9
49	30.7'	00.1'	16.5	467.07	417.40	-1.12	+48.55	+0.35	+48.9
50	12.5'	136°51.1'	78.4	437.67	403.47	-5.31	+28.89	+1.64	+30.5
51	14°55.5'	39.6'	93.9	417.40	390.68	-6.36	+20.36	+1.97	+22.3
52	08.0'	30.1'	11.2	391.50	356.10	-0.76	+34.73	+0.23	+35.0
53	13°53.5'	30.5'	12.3	375.39	345.89	-0.83	+28.67	+0.26	+28.9
54	25.7'	18.0'	28.5	360.22	326.77	-1.93	+31.52	+0.60	+32.1
55	15.0'	33.6'	116.0	344.65	319.57	-7.86	+17.22	+2.43	+19.6
56	12°52.3'	46.1'	33.4	340.56	304.60	-2.26	+33.70	+0.70	+34.4
57	41.8'	43.3'	42.2	332.85	297.81	-2.86	+32.18	+0.88	+33.1
58	18.0'	55.4'	30.5	303.57	282.73	-2.07	+18.77	+0.64	+19.4
59	10.3'	47.3'	28.2	274.81	277.96	-1.91	+24.94	+0.59	+25.5
60	11°52.0'	32.9'	79.1	295.41	266.79	-5.36	+23.26	+1.66	+24.9



RELATIVE BOUGUER ANOMALIES ARE BASED ON THE OBSERVED GRAVITY VALUE OF 978,315.5 MILLIGALS AT R.M.R. No 32 GRAV. PENDULUM STATION, DARWIN, N.T.
FOR THE CALCULATION OF BOUGUER ANOMALIES 1.03 gm/cm^3 HAS BEEN TAKEN AS THE SEA WATER DENSITY AND 2.67 gm/cm^3 AS THE AVERAGE ROCK DENSITY.
UNDERWATER GRAVITY METER WAS USED FOR THIS SURVEY.
ELEVATION DATUM - M.S.L.

• 4 GRAVITY STATION
• 19-1 BOUGUER ANOMALY IN MILLIGALS

REGIONAL GRAVITY SURVEY (1958) GULF OF CARPENTARIA, N.T. / QLD. BOUGUER ANOMALIES

