UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Principle facts for a gravity survey within the Thiells topographic quadrangle, New York

by

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Open-File Report 84-481

1984

Introduction

Gravity measurements were made primarily along 3 profiles within the Thiells quadrangle (7.5 minute series), N.Y. along existing roads and right-of-ways. Dates of the survey were July 13 - July 25, 1980. Geologic structure and previous gravity surveys were considerations in selecting the general locations of the profiles. Ease of traversing the landscape was also an important consideration. Spot elevations within the quadrangle were also occupied for regional coverage. The goal of the study was for an approximate 300 foot spacing of stations along these profiles.

Station I.D.

Stations numbered from 0 to 130 represent profile segments which trend in a generally north-south and east-west direction. Stations numbered in the 200's pertain to a profile beginning near the town of Thiells and continuing in a southeast direction to the town of West Haverstraw. Stations with the prefix 'S' are spot elevation locations. 'BURL' indicates the local base station where a reading was made approximately every two hours to control meter drift. A Worden gravity meter, E-147, was used for the survey.

Latitude-Longitude

Values are listed in degrees and decimal minutes to the nearest one hundredth of a minute. Station positions were surveyed in as distances along roads and right-of-ways using the stadia method. A T-2 theodolite was used to read the stadia rod and vertical angles were turned when necessary. Horizontal distances between stations determined from the surveying were then measured off on the corresponding roads of the Thiells quadrangle. Checks of distance were made as often as possible at intersections of roads. The plotted station locations on the quadrangle map were then digitized to obtain latitude-longitude values. Spot elevations were digitized at corresponding road intersections. Accuracy of stations 122 through 130 may be questionable due to uncertain location of the right-of-way marking on the quadrangle map. The exact location and elevation of base station 'BURL' was not determined and therefore should not be used as an absolute reference station.

Elevation

Elevations are listed to the nearest tenth of a foot. Profile station elevations were recorded simultaneously with horizontal distance determination by using the T-2 theodolite as a level. Vertical angles were used once again to gain longer distances between turning points. Since no physical bench mark was found within the quadrangle, a spot elevation was used as the initial reading. A check was made at each subsequent spot elevation along the profiles and variance was less than 2 feet in all cases. Spot elevation stations used posted values from the topographic map. Accuracy for all spot elevations is assumed to be one tenth of contour interval, or 2 feet in this case.

Observed Gravity

Values listed are to the nearest hundredth of a milligal. The 9 in the hundred thousandths place is assumed for each value and therefore is deleted in the listing. All stations are relative to the International Gravity

Standardization Net-1971 (Morelli, 1974) and tied to a base station at Lehigh University, Bethlehem, Pennsylvania having an observed gravity value of 980137.769± 0.034 milligals. Local base station 'BURL' is located at a private residence off State Hwy. Route 202. The actual survey conducted to tie the local base was carried out by Lehigh University. A value of 980220.47±.2 milligals was then computed for the local base 'BURL' from the data supplied by Lehigh. A computer program written by D. Dansereau and R. Wahl (USGS, unpub. program, 1979) was used to reduce meter reading to observed gravity taking into account earth-tides and a linear meter drift.

Terrain Corrections

Values are listed to the nearest one hundredth of a milligal. Terrain corrections were calculated at 2.67 g/cm^3, corresponding to the value listed in Appendix A, by a program of R. H. Godson (USGS unpub. program, 1978) using the method of Plouff (1977). Inner corrections were computed from the station out to a radius of 0.895 km, and outer corrections from 0.895 km to 166.7 km. These computed terrain corrections use mean elevation data digitized on a 15-second grid for corrections from 0 to 5 km, 1-minute terrain data for correctins from 5 to 21 km, and 3-minute terrain data for corrections from 21 to 166.7 km.

Bouguer Anomalies

Values listed are to the nearest one hundredth of a milligal. The complete Bouguer anomalies for reduction densities of both 2.67 g/cm^3 and 2.50 g/cm^3 were determined by calculations in Godson's program for earth curvature correction, Bouguer slab correction, theoretical gravity using the 1967 formula of the Geodetic Reference System (International Association of Geodesy, 1967), and the previously mentioned terrain correction. Exact equations are given by Cordell and others (1982).

Acknowledgments

Appreciation is acknowledged for the steady hand and unwavering support of Martin Kane, U.S. Geological Survey during the organizing and surveying portion of this survey; Lehigh University for the final tie of my base to an absolute gravity base value and finally to Mrs. Burlingham for her patience and support of this study and its use of her facilities for the base station.

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NY GRAVITY - BASE AT IGSORF
SURVEY CONDUCTED 7-80 WITH WORDEN E-147

STATION	LATITUDE		LONGITUDE		ELEV.	OBSERVED GRAVITY	TERRAIN INNER	TERRAIN OUTER	BOUGUER ANOMALY	
	DEG	MIN	DEG	MIN	FEET	MGAL	MGAL	MGAL	2.67	2.50
BURL	41	9.95	-74	5.68	380.0	80220.47	0.55	0.79	-28.73	-27.98
0	41	13.20	-74	1.73	396.0	80225.29	0.07	0.25	-28.83	-27.98
2	41	13.15	-74	1.62	386.8	80225.41	0.05	0.23	-29.23	-28.39
3	41	13.08	-74	1.62	375.6	80226.35	0.06	0.24	-28.83	-28.02
4	41	13.03	-74	1.62	370.5	80226.58	0.07	0.24	-28.82	-28.02
5	41	12.98	-74	1.62	369.6	80226.94	0.06	0.24	-28.45	-27.65
6	41	12.93	-74	1.60	370.6	80226.72	0.05	0.23	-28.55	-27.75
7	41	12.87	-74	1.58	375.7	80226.14	0.04	0.22	-28.76	-27.95
8	41	12.83	-74	1.55	402.6	80224.43	0.04	0.21	-28.82	-27.95
9	41	12.78	-74	1.50	437.4	80223.69	0.12	0.20	-27.34	-26.40
10	41	12.75	-74	1.47	417.0	80222.48	0.05	0.20	-29.79	-28.89
11	41	12.68	-74	1.47	443.5	80221.75	0.09	0.20	-28.80	-27.84
12	41	12.63	-74	1.48	439.1	80221.78	0.06	0.20	-28.99	-28.04
13	41	12.58	-74	1.48	433.0	80221.90	0.04	0.19	-29.18	-28.25
14	41	12.53	-74	1.48	426.2	80222.15	0.03	0.19	-29.27	-28.35
15	41	12.48	-74	1.50	421.4	80222.22	0.02	0.19	-29.43	-28.51
16	41	12.43	-74	1.50	414.4	80222.62	0.02	0.18	-29.38	-28.48
17	41	12.40	-74	1.50	408.9	80222.79	0.02	0.18	-29.49	-28.60
18	41	12.37	-74	1.52	404.2	80222.75	0.02	0.18	-29.76	-28.89
19	41	12.32	-74	1.52	400.7	80222.96	0.02	0.17	-29.70	-28.83
20	41	12.27	-74	1.53	398.7	80223.14	0.02	0.17	-29.56	-28.70
21	41	12.22	-74	1.55	395.4	80223.31	0.02	0.17	-29.51	-28.66
22	41	12.20	-74	1.55	394.1	80223.11	0.01	0.17	-29.77	-28.92
23	41	12.15	-74	1.55	392.3	80223.32	0.01	0.17	-29.59	-28.74
24	41	12.10	-74	1.52	391.2	80223.11	0.01	0.16	-29.80	-28.95
25	41	12.10	-74	1.70	344.4	80226.39	0.10	0.21	-29.17	-28.43
26	41	12.03	-74	1.90	426.6	80221.29	0.03	0.19	-29.36	-28.44
27	41	12.10	-74	1.92	426.0	80221.17	0.04	0.20	-29.60	-28.68
28	41	12.15	-74	1.92	406.3	80222.28	0.08	0.21	-29.69	-28.82
29	41	12.22	-74	1.93	379.2	80223.91	0.16	0.23	-29.68	-28.87
30	41	12.00	-74	1.88	426.8	80221.20	0.02	0.18	-29.42	-28.49
31	41	11.97	-74	1.93	448.4	80219.75	0.02	0.18	-29.54	-28.56
32	41	11.92	-74	1.97	471.5	80218.22	0.04	0.19	-29.59	-28.57
33	41	11.87	-74	2.00	491.2	80216.57	0.09	0.19	-29.94	-28.88
34	41	11.82	-74	2.03	501.8	80215.69	0.11	0.20	-30.08	-29.00
35	41	11.77	-74	2.05	513.6	80214.75	0.16	0.20	-30.20	-29.09
36	41	11.73	-74	2.08	524.2	80213.94	0.18	0.21	-30.28	-29.16
37	41	11.68	-74	2.10	531.6	80213.58	0.17	0.21	-30.14	-29.00
38	41	11.63	-74	2.12	530.3	80213.32	0.16	0.21	-30.41	-29.27
39	41	11.58	-74	2.15	529.9	80213.55	0.16	0.21	-30.13	-28.99
40	41	11.55	-74	2.17	529.9	80213.51	0.17	0.21	-30.12	-28.98
41	41	11.52	-74	2.18	512.6	80214.54	0.11	0.19	-30.15	-29.04
42	41	11.45	-74	2.20	489.9	80215.95	0.04	0.17	-30.08	-29.01
43	41	11.40	-74	2.20	466.2	80217.50	0.01	0.16	-29.90	-28.89
44	41	11.37	-74	2.22	452.0	80218.27	0.00	0.15	-29.96	-28.97
45	41	11.32	-74	2.23	452.1	80218.01	0.00	0.15	-30.13	-29.15
46	41	11.27	-74	2.23	450.3	80218.18	0.00	0.15	-30.00	-29.02
47	41	11.22	-74	2.25	442.4	80218.68	0.00	0.15	-29.89	-28.93
48	41	11.18	-74	2.25	444.5	80218.59	0.00	0.14	-29.81	-28.84
50	41	11.13	-74	2.18	471.6	80217.07	0.01	0.15	-29.62	-28.59
51	41	11.08	-74	2.20	497.1	80215.84	0.04	0.16	-29.22	-28.14
52	41	11.03	-74	2.22	522.3	80215.06	0.09	0.19	-28.34	-27.21
53	41	10.98	-74	2.22	541.3	80214.40	0.13	0.21	-27.74	-26.57
54	41	10.93	-74	2.20	545.1	80214.51	0.14	0.21	-27.32	-26.14

55	41	10.88	-74	2.17	530.7	80215.42	0.09	0.19	-27.26	-26.11
56	41	10.83	-74	2.12	514.0	80216.42	0.04	0.17	-27.25	-26.13
57	41	10.77	-74	2.05	498.3	80217.36	0.02	0.16	-27.18	-26.10
58	41	10.68	-74	2.00	505.5	80216.71	0.03	0.16	-27.26	-26.16
59	41	10.60	-74	1.97	515.2	80215.73	0.02	0.17	-27.54	-26.42
60	41	10.53	-74	1.95	523.8	80214.80	0.03	0.18	-27.84	-26.70
61	41	10.45	-74	1.93	517.6	80214.87	0.01	0.17	-28.05	-26.92
62	41	10.38	-74	1.93	515.1	80214.81	0.01	0.17	-28.15	-27.03
63	41	10.25	-74	2.02	539.1	80212.83	0.04	0.19	-28.46	-27.29
64	41	10.18	-74	2.07	545.8	80212.06	0.05	0.19	-28.71	-27.53
65	41	10.08	-74	2.07	548.2	80211.61	0.04	0.19	-28.88	-27.69
66	41	9.98	-74	2.05	547.7	80211.59	0.02	0.19	-28.80	-27.61
67	41	9.92	-74	2.03	546.5	80211.69	0.01	0.18	-28.70	-27.51
68	41	9.83	-74	2.03	552.8	80211.18	0.01	0.19	-28.70	-27.49
69	41	9.75	-74	2.02	559.7	80210.79	0.01	0.20	-28.54	-27.33
70	41	9.68	-74	2.02	568.3	80210.34	0.01	0.21	-28.37	-27.13
71	41	9.60	-74	2.03	582.8	80209.53	0.01	0.23	-28.17	-26.91
72	41	9.52	-74	2.05	592.0	80209.08	0.02	0.24	-27.94	-26.65
73	41	9.43	-74	2.07	594.4	80208.98	0.03	0.24	-27.75	-26.46
74	41	9.35	-74	2.07	585.2	80209.63	0.02	0.23	-27.55	-26.28
75	41	9.27	-74	2.07	570.7	80210.55	0.01	0.20	-27.41	-26.17
76	41	9.20	-74	2.05	560.1	80211.39	0.01	0.19	-27.11	-25.89
77	41	9.12	-74	2.05	560.9	80211.48	0.01	0.19	-26.85	-25.63
78	41	8.97	-74	2.07	582.9	80210.00	0.03	0.22	-26.75	-25.48
79	41	8.97	-74	2.17	580.5	80210.03	0.03	0.21	-26.87	-25.61
80	41	8.98	-74	2.28	566.3	80210.52	0.02	0.18	-27.28	-26.05
81	41	9.00	-74	2.43	573.4	80209.56	0.02	0.18	-27.85	-26.60
82	41	9.00	-74	2.53	540.7	80211.33	0.00	0.14	-28.08	-26.90
83	41	9.02	-74	2.62	509.8	80213.17	0.00	0.11	-28.14	-27.03
84	41	9.02	-74	2.70	488.3	80214.17	0.02	0.11	-28.40	-27.34
85	41	9.03	-74	2.82	466.0	80215.44	0.05	0.11	-28.44	-27.43
86	41	9.03	-74	2.92	493.4	80213.40	0.01	0.11	-28.89	-27.82
87	41	9.05	-74	3.07	483.3	80214.03	0.04	0.11	-28.87	-27.81
88	41	8.97	-74	3.13	498.3	80213.19	0.03	0.11	-28.70	-27.62
89	41	8.88	-74	3.20	514.3	80212.16	0.02	0.11	-28.66	-27.53
90	41	8.82	-74	3.25	523.9	80211.41	0.02	0.11	-28.75	-27.60
91	41	8.82	-74	3.42	601.2	80206.40	0.03	0.18	-29.07	-27.76
92	41	8.82	-74	3.52	590.3	80207.03	0.02	0.16	-29.12	-27.84
93	41	8.83	-74	3.62	617.7	80205.25	0.03	0.20	-29.24	-27.89
94	41	8.83	-74	3.72	621.4	80204.78	0.03	0.20	-29.49	-28.13
95	41	8.85	-74	3.87	622.4	80204.55	0.02	0.20	-29.70	-28.34
96	41	8.85	-74	3.97	589.0	80206.56	0.00	0.16	-29.73	-28.45
97	41	8.87	-74	4.05	568.2	80207.79	0.00	0.14	-29.79	-28.55
98	41	8.90	-74	4.15	565.4	80208.03	0.00	0.14	-29.76	-28.53
99	41	8.90	-74	4.28	580.6	80207.10	0.01	0.16	-29.76	-28.49
100	41	8.92	-74	4.37	594.8	80206.17	0.02	0.18	-29.84	-28.55
101	41	8.92	-74	4.48	575.8	80207.18	0.02	0.16	-29.99	-28.73
102	41	8.92	-74	4.57	571.0	80207.42	0.02	0.16	-30.03	-28.79
103	41	8.93	-74	4.68	551.1	80208.54	0.01	0.15	-30.13	-28.93
104	41	8.95	-74	4.82	535.5	80209.63	0.01	0.15	-30.00	-28.83
105	41	8.95	-74	4.95	527.8	80209.82	0.01	0.15	-30.27	-29.12
106	41	8.97	-74	5.07	506.8	80211.17	0.01	0.15	-30.20	-29.09
107	41	8.98	-74	5.22	477.0	80213.06	0.01	0.16	-30.09	-29.05
108	41	8.98	-74	5.33	460.4	80214.05	0.01	0.17	-30.07	-29.07
109	41	8.98	-74	5.47	426.2	80216.25	0.02	0.19	-29.88	-28.95
110	41	9.00	-74	5.57	411.4	80217.28	0.02	0.22	-29.73	-28.84
111	41	9.02	-74	5.68	397.6	80218.35	0.02	0.25	-29.48	-28.62
112	41	9.02	-74	5.82	386.2	80219.21	0.03	0.28	-29.26	-28.43
113	41	9.05	-74	5.95	384.9	80219.65	0.02	0.32	-28.91	-28.09
114	41	8.97	-74	5.98	392.3	80219.12	0.01	0.29	-28.92	-28.08
115	41	8.92	-74	6.02	389.3	80219.07	0.01	0.28	-29.09	-28.25

116	41	8.88	-74	6.12	392.0	80219.26	0.01	0.28	-28.68	-27.83
117	41	8.88	-74	6.23	391.8	80219.39	0.01	0.31	-28.53	-27.69
118	41	8.90	-74	6.32	405.8	80218.79	0.01	0.32	-28.31	-27.44
119	41	8.92	-74	6.38	399.3	80219.29	0.02	0.35	-28.19	-27.34
120	41	8.95	-74	6.43	394.6	80219.60	0.04	0.39	-28.15	-27.31
121	41	9.02	-74	6.38	407.0	80219.08	0.04	0.39	-28.03	-27.17
122	41	9.07	-74	6.45	367.3	80221.91	0.16	0.51	-27.40	-26.64
123	41	9.10	-74	6.60	363.4	80222.00	0.43	0.60	-27.23	-26.49
124	41	9.10	-74	6.62	361.1	80222.39	0.51	0.62	-26.88	-26.15
125	41	9.12	-74	6.68	390.9	80220.19	0.57	0.59	-27.30	-26.51
126	41	9.12	-74	6.78	434.5	80217.35	0.50	0.54	-27.66	-26.77
127	41	9.13	-74	6.85	474.4	80215.02	0.42	0.49	-27.77	-26.78
128	41	9.17	-74	6.93	526.4	80211.75	0.52	0.47	-27.92	-26.82
129	41	9.20	-74	7.00	595.9	80207.59	0.64	0.45	-27.89	-26.65
130	41	9.28	-74	7.10	733.5	80200.19	0.32	0.50	-27.48	-25.92
201	41	12.67	-74	1.38	421.9	80222.88	0.07	0.19	-28.97	-28.06
202	41	12.67	-74	1.30	387.3	80224.88	0.04	0.18	-29.07	-28.23
203	41	12.67	-74	1.25	363.3	80226.54	0.02	0.17	-28.87	-28.08
204	41	12.62	-74	1.23	291.7	80230.83	0.07	0.21	-28.67	-28.05
205	41	12.58	-74	1.22	300.1	80230.02	0.06	0.20	-28.95	-28.30
206	41	12.57	-74	1.17	304.7	80229.57	0.04	0.18	-29.15	-28.49
207	41	12.53	-74	1.10	308.9	80229.34	0.02	0.17	-29.10	-28.43
208	41	12.48	-74	1.05	305.8	80229.43	0.03	0.16	-29.12	-28.45
209	41	12.45	-74	1.00	304.2	80229.19	0.03	0.16	-29.41	-28.75
210	41	12.40	-74	0.95	296.2	80229.60	0.04	0.15	-29.40	-28.76
211	41	12.35	-74	0.90	294.3	80229.78	0.05	0.15	-29.25	-28.61
212	41	12.28	-74	0.85	303.6	80228.96	0.04	0.14	-29.43	-28.77
213	41	12.23	-74	0.87	303.1	80228.93	0.05	0.14	-29.40	-28.75
214	41	12.15	-74	0.90	309.5	80228.61	0.05	0.13	-29.23	-28.56
215	41	12.07	-74	0.90	320.5	80227.93	0.05	0.13	-29.14	-28.44
216	41	12.00	-74	0.88	335.2	80227.01	0.06	0.12	-29.08	-28.35
217	41	12.00	-74	0.78	332.7	80227.33	0.07	0.11	-28.91	-28.19
218	41	12.02	-74	0.63	389.7	80223.95	0.04	0.13	-28.94	-28.09
219	41	11.92	-74	0.60	397.3	80223.36	0.03	0.13	-28.93	-28.07
220	41	11.98	-74	0.43	390.3	80223.81	0.04	0.13	-28.98	-28.13
S1	41	10.25	-74	5.12	432.0	80218.15	0.26	0.58	-28.90	-28.01
S2	41	11.00	-74	4.12	412.0	80220.91	0.10	0.51	-28.68	-27.82
S3	41	10.32	-74	4.10	518.0	80212.63	0.01	0.22	-30.02	-28.89
S4	41	9.95	-74	4.15	576.0	80208.59	0.03	0.21	-30.04	-28.79
S5	41	9.45	-74	4.23	534.0	80210.67	0.01	0.15	-29.80	-28.63
S6	41	9.40	-74	3.27	550.0	80209.74	0.01	0.14	-29.71	-28.51
S7	41	10.47	-74	3.35	435.0	80218.57	0.01	0.17	-29.29	-28.35
S8	41	11.17	-74	3.28	538.0	80213.43	0.12	0.24	-29.17	-28.01
S9	41	11.60	-74	2.75	412.0	80221.77	0.20	0.26	-28.87	-27.99
S10	41	9.37	-74	6.02	388.0	80220.27	0.07	0.49	-28.37	-27.55