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GEOLOGICAL SURVEY

Principal Facts for Gravity Stations in and near the  
Madison and Gallatin Divide Roadless Areas, Montana

by

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Principal Facts for Gravity Stations in and near the  
Madison and Gallatin Divide Roadless Areas, Montana  
Studies Related to Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a gravity survey of the Madison Roadless Area, Gallatin and Beaverhead National Forests, Gallatin and Madison Counties, Montana and the Gallatin Divide Roadless Area in the Gallatin National Forest, Gallatin and Park Counties, Montana. The Madison Roadless Area comprises Madison RARE II area No. 1549, parts E, J, N, R, and S, which were classified as further planning areas during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979. The Gallatin Divide Roadless area as referred to here is composed of the Gallatin Divide and Hyalite Roadless areas that were designated wilderness study areas by the 1977 Montana Wilderness Study Act (Public Law 95-150) and were classified as further planning areas during RARE II by the U.S. Forest Service, January 1979.

Introduction

A gravity survey of the Madison and Gallatin Ranges, Montana, was conducted by the U.S. Geological Survey. The survey was made to aid the evaluating of the mineral resource potential of the Madison and Gallatin Divide Roadless Areas, Gallatin, Madison, and Park Counties, Montana. This report presents the principal facts of the gravity stations and a station location map.

## Data Collection and Reduction

During the summers of 1979-1982, 616 gravity stations were measured by the authors in the Madison and Gallatin Ranges of southwestern Montana. The area covered is shown on figure 1.

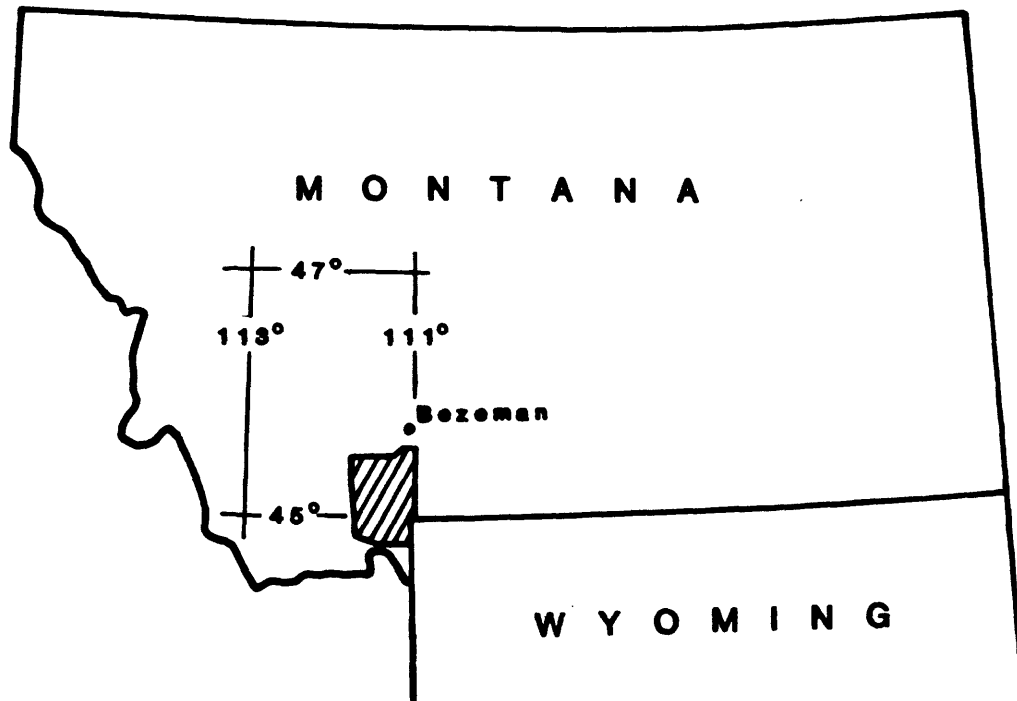


Figure 1.--Hachured area shows location of gravity survey discussed in this report.

LaCoste and Romberg gravimeters G-2 and G-159 were used. Observed gravity values are referenced to the Butte, Montana, base station (Aeronautical Chart and Information Center code number 0443-0) of the World Relative Gravity Reference Network (Defense Mapping Agency, 1974). Eight local gravity bases were established in the area and are referenced to the Butte base station. Data for the local bases are given in Appendix A.

Horizontal and vertical control for station locations were obtained from USGS topographic maps at the scale of 1:62,500 with contour intervals of 40

and 80 feet. Most stations were read at bench marks or spot elevations indicated on the maps. The elevations for those stations read at other identifiable points were determined by interpolating between contour lines and could be in error by  $\pm 40$  feet resulting in a Bouguer gravity anomaly error of  $\pm 2.40$  milligals (mgals).

Data reduction was accomplished using computer programs on a Digital Equipment Corp. VAX-11/750 computer. Observed gravity values were calculated from gravimeter readings using a program by M. W. Webring, D. A. Dansereau, and R. R. Wahl (U.S. Geological Survey, unpublished) that corrects for earth tide and meter drift. Terrain, Bouguer, and earth curvature corrections and free air and Bouguer gravity anomalies were computed using a program written by R. H. Godson (U.S. Geological Survey, 1978, unpublished) which uses the 1967 formula of the Geodetic Reference System (International Association of Geodesy, 1971) to calculate theoretical gravity values. The equations and related expansions used are given by Cordell and others (1982). Terrain corrections were computed from each station to a distance of 166.7 kilometers using a modification of the method of Plouff (1977) in conjunction with digital terrain data for the conterminous United States obtained from the U.S. Department of Defense. In addition, corrections for Hammer zones A through C (Hammer, 1939) were estimated in the field for each station and added to the correction obtained from the digital data. Terrain corrections ranged from 0.56 mgals for base station BQOB1 at Bozeman to 36.40 mgals at station AQ141 at the north end of Cedar Mountain.

Table 1 lists the principal facts for the gravity stations. The base stations used are listed once at the beginning of the table. Stations BQ001 through BQ218 were read with meter G-159 during 1979 and 1980. Stations BQ225 through BQ480 were read with meter G-2 during 1980 through 1982. All of the

AQ stations were read with meter G-159 during 1981 and 1982. An explanation of some of the column headings on table 1 follows:

ST	Two letter state abbreviation
GRAVITY- THEORETICAL	Theoretical gravity, in milligals, computed using the Geodetic Reference System 1967 (International Association of Geodesy, 1971)
CORRECTIONS- TERRAIN	Corrections due to effects of topography at a density of $2.67 \text{ g/cm}^3$ in milligals. Column a-f lists the computer correction for Hammer zones A-F plus estimated correction for Hammer zones A-C. Column g-x lists the computer correction from Hammer zone G to a radial distance of 166.7 km from the station.
BOUGUER	Bouguer slab correction in milligals
CURV	Corrections in milligals due to curvature of the earth
ANOMALIES- FREE AIR	Free-air anomaly in milligals
COMPLETE-BOUGUER	Complete Bouguer anomaly in milligals for densities of $2.67$ and $2.45 \text{ g/cm}^3$

### Station Location Plots

Figure 2 is an index of figures 2A-2D, which show the locations of gravity stations listed in this report. On figures 2A-2D the eight local base stations are shown with a square while the other stations are marked with an x.

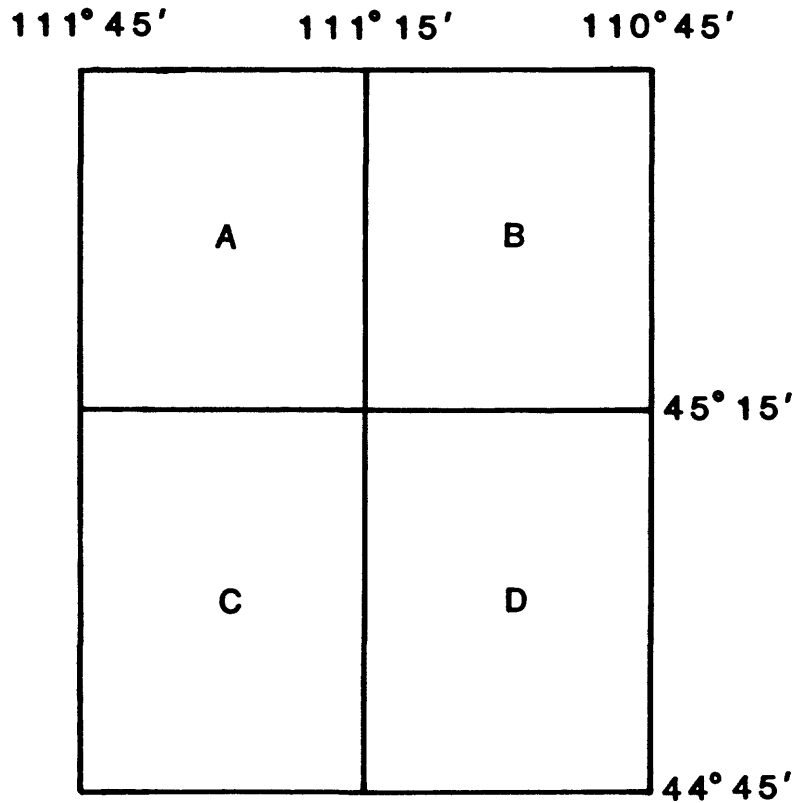
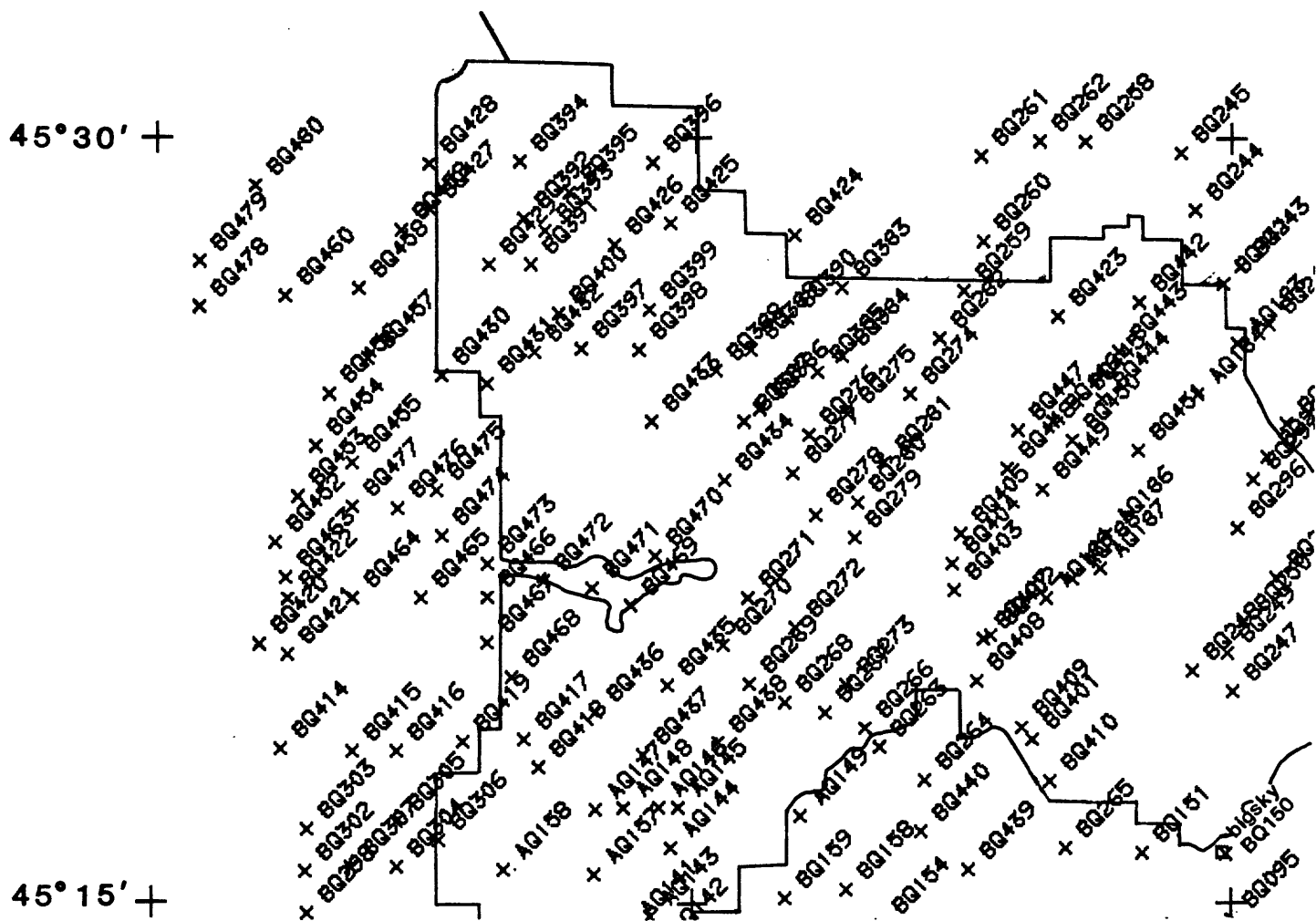


Figure 2.—Index of plots for figures 2A through 2D.

111° 15'

X 80257

**Approximate boundary of  
Madison Roadless Area**

 $45^{\circ}30' +$ 

**Figure 2A,**

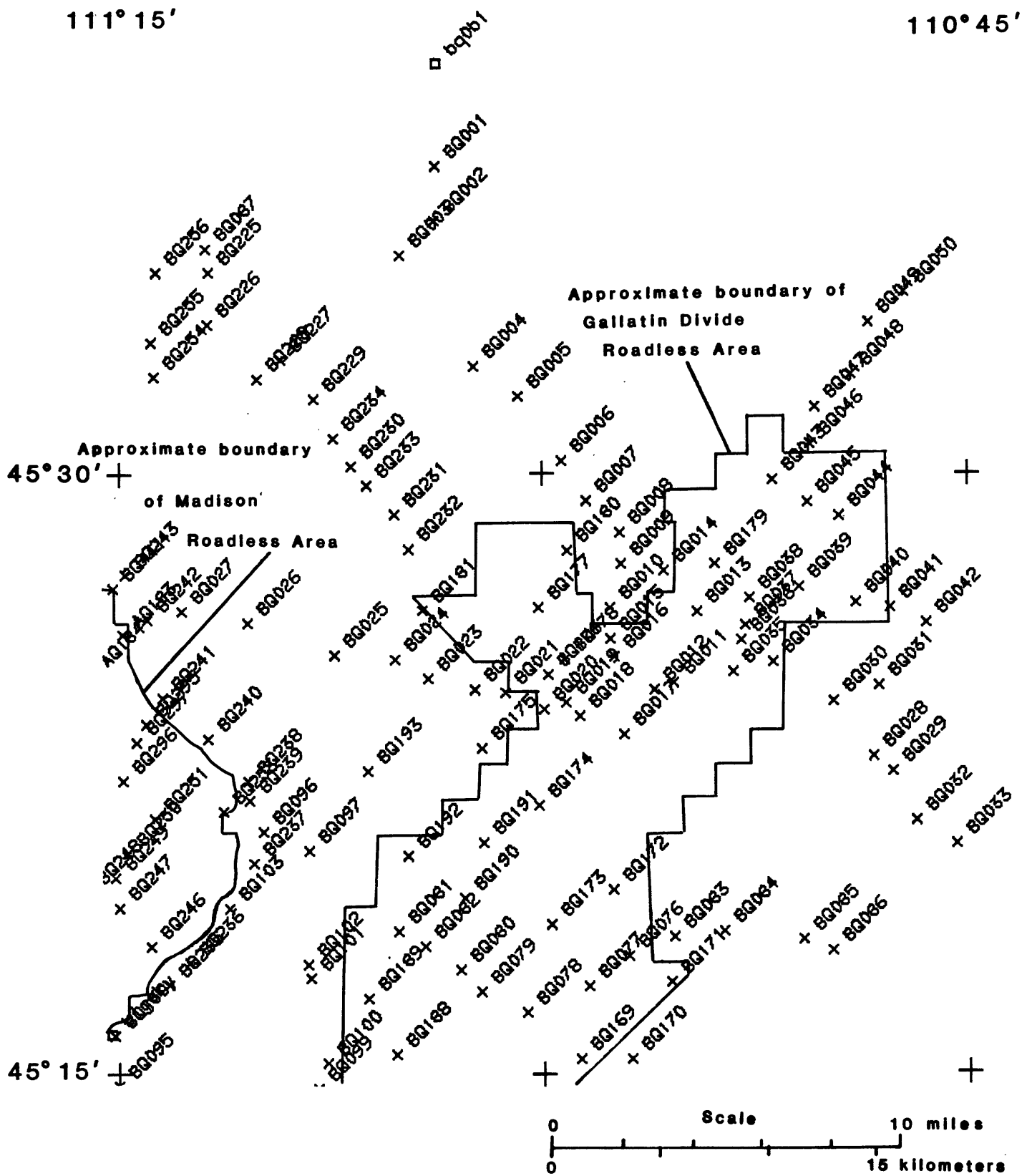


Figure 2B.







## References

- Cordell, Lindrith, Keller, G. R., and Hildenbrand, T. G., 1982, Bouguer gravity map of the Rio Grande Rift: U.S. Geological Survey Geophysical Investigations Map GP-949.
- Defense Mapping Agency, 1974, World Relative Gravity Reference Network, North America, Part 2: DMAAC Ref. Pub. No. 25 with supplement updating gravity values to the International Gravity Standardization Net 1971, Aerospace Center, St. Louis, AFS, NO, 1635 p.
- Hammer, S., 1939, Terrain corrections for gravimeter stations: Geophysics, v. 4, no. 3, p. 184-194.
- International Association of Geodesy, 1971, Geodetic reference system 1967: International Association of Geodesy, Special Publication No. 3, 116 p.
- Plouff, D., 1977, Preliminary documentation for a Fortran program to compute gravity terrain corrections based on topography digitized on a geographic grid: U.S. Geological Survey Open-File Report 77-535, 43 p.

Table 1.--Principal facts for 676 gravity stations in the Madison and Gallatin Ranges, MT. Stations BQ001-BQ218 and all the AQ stations were read with LaCoste and Romberg meter G-159 while stations BQ225-BQ480 were read with LaCoste and Romberg meter G-2.

BOUGUER GRAVITY DATA									
Madison and Gallatin Ranges, Montana									
STATION ID	LATITUDE deg min	LONGITUDE deg min	ELEV (in ft)	ST	GRAVITY		CORRECTIONS		ANOMALIES
					OBSERVED	THEORETICAL	TERRAIN a-f	BOUGUER g-x	
butte	45 57.50	-112 29.50	5554.0	MT	980159.89	980705.77	0.00	-189.43	-23.77
bq0b1	45 40.26	-111 3.70	4861.0	MT	980202.05	980679.78	0.01	-165.79	-20.74
bq0b2	45 12.31	-110 54.11	4992.0	MT	980141.68	980637.62	0.11	-170.26	-26.63
bq104	45 12.75	-111 14.82	6136.0	MT	980061.28	980638.28	0.65	-209.28	-0.19
bq106	45 10.16	-111 14.59	6258.0	MT	980049.64	980634.38	2.11	-213.44	3.54
aq0b1	44 46.40	-111 6.74	6580.0	MT	979991.46	980598.53	0.02	-224.42	11.47
blgsky	45 16.00	-111 15.24	6020.0	MT	980075.55	980643.19	0.76	-205.32	-1.73
cameron	45 12.85	-111 40.70	5347.0	MT	980100.65	980638.43	0.01	-192.37	-35.11
stagger	44 49.62	-111 27.38	6195.0	MT	980022.49	980603.39	2.24	-211.29	1.46
BQ001	45 37.67	-111 3.73	5096.0	MT	980175.43	980675.88	0.01	-173.81	-21.37
BQ002	45 36.30	-111 3.77	5246.0	MT	980159.90	980673.80	0.02	-178.93	-20.73
BQ003	45 35.46	-111 4.97	5355.0	MT	980151.62	980672.54	0.01	-182.64	-17.50
BQ004	45 32.67	-111 2.39	5856.0	MT	980129.82	980668.33	3.03	-199.73	11.99
BQ005	45 31.92	-111 0.82	6150.0	MT	980114.85	980667.20	0.51	-209.76	25.78
BQ006	45 30.32	-110 59.31	6410.0	MT	980090.76	980664.79	0.88	-218.63	28.52
BQ007	45 29.32	-110 58.46	6730.0	MT	980067.60	980663.27	0.40	-229.54	36.95
BQ008	45 28.54	-110 57.30	6731.0	MT	980065.32	980662.10	0.31	-229.58	35.93
BQ009	45 27.74	-110 57.24	6795.0	MT	980058.80	980660.89	2.10	-231.76	36.63
BQ010	45 26.63	-110 57.64	7040.0	MT	980042.60	980659.22	2.37	-240.11	45.13
BQ011	45 24.77	-110 55.40	8900.0	MT	979914.79	980656.41	4.12	-303.55	94.85
BQ012	45 24.57	-110 56.04	9180.0	MT	979897.11	980656.11	1.84	-313.10	103.77
BQ013	45 26.52	-110 54.57	7570.0	MT	980000.75	980659.05	4.21	-258.19	53.23
BQ014	45 27.58	-110 55.70	7020.0	MT	980040.32	980660.66	1.92	-239.43	39.53
BQ015	45 25.86	-110 57.62	7280.0	MT	980023.60	980658.05	2.26	-248.30	49.84
BQ016	45 25.41	-110 57.46	7490.0	MT	979998.55	980657.38	2.74	-255.46	45.19
BQ017	45 23.48	-110 57.15	8870.0	MT	979918.07	980654.47	1.83	-302.53	97.26
BQ018	45 23.93	-110 58.70	9770.0	MT	979853.65	980655.15	2.88	-333.23	116.68
BQ019	45 24.27	-110 59.16	8980.0	MT	979915.55	980655.66	2.15	-306.28	103.88
BQ020	45 24.11	-110 59.96	8320.0	MT	979953.17	980655.42	5.17	-283.77	79.74
BQ021	45 24.51	-111 1.30	7400.0	MT	980006.28	980656.02	2.93	-252.39	45.83
BQ022	45 24.57	-111 2.39	7135.0	MT	980025.47	980656.11	1.90	-243.35	40.03
BQ023	45 24.84	-111 4.07	7203.0	MT	980027.57	980656.52	0.96	-245.67	48.11
BQ024	45 25.35	-111 5.20	6640.0	MT	980057.04	980657.29	1.95	-226.47	23.91
BQ025	45 25.42	-111 7.34	6136.0	MT	980089.19	980657.39	1.01	-209.28	8.61
BQ026	45 26.27	-111 10.42	5736.0	MT	980117.80	980658.68	1.70	-195.64	-1.66
BQ027	45 26.56	-111 12.78	5457.0	MT	980136.46	980659.12	3.10	-186.12	-9.65
BQ028	45 22.94	-110 48.32	6240.0	MT	980072.54	980653.66	0.53	-212.83	5.46
BQ029	45 22.56	-110 47.65	5900.0	MT	980092.23	980653.08	0.19	-201.23	-1.49
BQ030	45 24.29	-110 49.72	8469.0	MT	979928.71	980655.69	2.93	-288.85	69.01
BQ031	45 24.69	-110 48.13	7600.0	MT	979988.71	980656.30	1.21	-259.21	46.77
BQ032	45 21.32	-110 46.82	5140.0	MT	980133.41	980651.21	0.03	-175.31	-34.59
BQ033	45 20.73	-110 45.40	4925.0	MT	980139.82	980650.32	0.04	-167.98	-47.49
BQ034	45 25.27	-110 51.86	8886.0	MT	979909.12	980657.16	0.70	-303.08	87.11
BQ035	45 25.03	-110 53.30	8772.0	MT	979918.93	980656.80	1.79	-299.19	86.57
BQ036	45 25.80	-110 52.98	7760.0	MT	979995.55	980657.97	4.56	-264.67	66.96
BQ037	45 26.20	-110 52.86	7440.0	MT	980007.47	980658.57	4.75	-253.76	48.22
BQ038	45 26.89	-110 52.72	7043.0	MT	980029.69	980659.61	3.75	-240.22	32.11
BQ039	45 27.15	-110 50.94	6315.0	MT	980070.69	980660.00	2.13	-215.39	4.31
BQ040	45 26.77	-110 48.93	5980.0	MT	980087.64	980659.43	4.54	-203.96	-9.64
BQ041	45 26.64	-110 47.72	5780.0	MT	980099.58	980659.23	3.48	-197.14	-16.30

Madison and Gallatin Ranges, Montana

Meter ID:

STATION

ID	LATITUDE deg	LONGITUDE deg	ELEV (in ft)	ST	OBSERVED	THEORETICAL	T E R R A I N a-f	g-x	BOUGUER	CURV	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45
BQ042	45 26.24	-110 46.44	5580.0	MT	980115.47	980658.63	4.28	6.62	-190.32	-1.47	-18.60	-199.49
BQ043	45 29.82	-110 51.85	8280.0	MT	979971.18	980664.03	0.69	5.00	-282.41	-1.45	85.38	-192.78
BQ044	45 28.94	-110 49.53	9040.0	MT	979909.08	980662.70	2.50	12.44	-308.33	-1.35	95.99	-198.75
BQ045	45 29.28	-110 50.62	8500.0	MT	979948.39	980663.22	2.28	6.60	-289.91	-1.42	84.07	-198.38
BQ046	45 30.71	-110 50.52	7030.0	MT	980056.37	980665.38	3.98	5.88	-239.77	-1.52	51.80	-179.63
BQ047	45 31.63	-110 50.33	7000.0	MT	980063.73	980666.76	0.41	3.30	-238.75	-1.52	54.95	-181.60
BQ048	45 32.46	-110 49.05	6390.0	MT	980100.93	980668.02	0.58	2.79	-217.94	-1.51	33.59	-182.50
BQ049	45 33.77	-110 48.42	5913.0	MT	980131.57	980669.99	0.75	2.30	-201.68	-1.49	17.43	-182.69
BQ050	45 34.51	-110 47.17	5861.0	MT	980137.69	980671.11	0.43	2.26	-199.90	-1.49	17.54	-181.16
BQ051	45 6.09	-111 13.10	6481.0	MT	980030.90	980628.23	1.21	4.74	-221.05	-1.51	11.89	-204.72
BQ052	45 6.52	-111 11.33	6660.0	MT	980017.37	980628.88	2.14	4.73	-227.15	-1.52	14.53	-207.27
BQ053	45 7.20	-111 10.22	6900.0	MT	980003.22	980629.91	1.08	3.41	-235.34	-1.52	21.91	-210.46
BQ054	45 7.52	-111 9.12	7230.0	MT	979981.07	980630.39	0.36	2.01	-246.59	-1.51	30.28	-215.45
BQ055	45 8.02	-111 8.37	7520.0	MT	979963.94	980631.15	0.57	1.76	-256.49	-1.50	39.63	-216.02
BQ056	45 9.43	-111 6.67	8450.0	MT	979909.99	980633.27	0.75	3.68	-288.21	-1.43	70.93	-214.28
BQ057	45 8.05	-111 6.29	8520.0	MT	979900.87	980631.20	0.82	3.60	-290.59	-1.42	70.46	-217.14
BQ058	45 8.02	-111 4.77	7480.0	MT	979968.80	980631.15	1.82	4.09	-255.12	-1.50	40.74	-209.98
BQ059	45 7.64	-111 3.07	6910.0	MT	980001.04	980630.57	0.80	4.39	-235.68	-1.52	20.01	-212.00
BQ060	45 7.49	-111 1.96	6730.0	MT	980017.72	980630.34	0.66	5.09	-229.54	-1.52	20.00	-205.31
BQ061	45 8.36	-111 0.20	6580.0	MT	980031.10	980631.66	1.41	4.91	-224.42	-1.52	17.98	-201.64
BQ062	45 9.66	-110 58.14	6303.0	MT	980067.10	980633.62	0.09	3.63	-214.98	-1.51	25.99	-186.78
BQ063	45 10.74	-110 56.87	5862.0	MT	980094.33	980635.25	0.36	4.61	-199.94	-1.49	10.14	-186.31
BQ064	45 12.16	-111 3.63	7660.0	MT	979992.69	980637.39	2.23	4.94	-261.26	-1.49	75.29	-180.29
BQ065	45 13.10	-111 4.98	8440.0	MT	979942.98	980638.81	1.50	3.57	-287.86	-1.43	97.43	-186.79
BQ066	45 13.18	-111 5.17	8900.0	MT	979916.37	980638.93	2.56	4.16	-303.55	-1.37	113.91	-184.29
BQ067	45 12.81	-111 4.58	8190.0	MT	979959.23	980638.38	0.61	3.77	-279.34	-1.45	90.64	-185.78
BQ068	45 10.86	-111 6.52	9060.0	MT	979885.80	980635.43	0.67	5.00	-309.01	-1.35	101.87	-202.82
BQ069	45 11.04	-111 6.09	8830.0	MT	979906.72	980635.70	0.85	3.74	-301.17	-1.38	100.92	-197.04
BQ070	45 11.34	-111 4.74	8200.0	MT	979954.39	980636.16	0.52	3.84	-279.68	-1.45	88.96	-187.81
BQ071	45 12.69	-111 2.48	7252.0	MT	980016.73	980638.19	2.70	6.65	-247.34	-1.51	60.21	-179.30
BQ072	45 13.12	-111 0.06	6860.0	MT	980052.39	980638.84	2.87	5.13	-233.97	-1.52	58.38	-169.11
BQ073	45 13.14	-110 58.48	6700.0	MT	980055.99	980638.87	2.12	3.81	-228.52	-1.52	46.93	-177.17
BQ074	45 13.06	-110 56.88	6160.0	MT	980083.46	980638.75	0.74	4.26	-210.10	-1.50	23.78	-182.83
BQ075	45 12.86	-110 56.06	5808.0	MT	980098.42	980638.45	0.87	4.65	-198.09	-1.48	5.97	-188.09
BQ076	45 17.93	-110 57.00	5840.0	MT	980087.66	980646.09	9.79	9.91	-199.19	-1.49	-9.44	-190.41
BQ077	45 17.19	-110 58.40	6060.0	MT	980078.26	980644.98	4.68	9.63	-206.69	-1.50	2.95	-190.93
BQ078	45 16.51	-111 0.58	6520.0	MT	980054.01	980643.95	2.26	7.48	-222.38	-1.51	22.95	-191.21
BQ079	45 17.04	-111 2.19	7280.0	MT	980012.78	980644.75	3.01	4.66	-248.30	-1.51	52.33	-191.21
BQ080	45 17.60	-111 2.92	7660.0	MT	979988.58	980645.60	2.97	5.04	-261.26	-1.49	62.97	-191.77
BQ081	45 18.55	-111 5.10	9580.0	MT	979860.15	980647.03	2.87	10.37	-326.75	-1.26	113.46	-201.31
BQ082	45 18.18	-111 4.20	8480.0	MT	979939.05	980646.48	2.26	4.69	-289.23	-1.42	89.59	-194.11
BQ083	45 18.41	-110 55.41	5680.0	MT	980099.82	980646.82	3.53	8.31	-193.73	-1.48	-13.04	-196.40
BQ084	45 18.56	-110 53.65	5430.0	MT	980117.47	980647.05	2.38	6.31	-185.20	-1.46	-19.11	-197.08
BQ085	45 18.34	-110 50.80	5034.0	MT	980139.96	980646.71	0.32	4.42	-171.70	-1.41	-33.50	-201.87
BQ086	45 18.06	-110 49.80	4942.0	MT	980139.14	980646.29	0.09	4.04	-168.56	-1.40	-42.54	-208.37
BQ087	45 35.60	-111 11.88	4941.0	MT	980200.03	980672.75	0.01	0.88	-168.52	-1.40	-8.21	-177.24
BQ088	45 13.18	-111 13.54	6220.0	MT	980053.76	980638.93	1.69	4.59	-212.15	-1.51	-0.47	-207.84
BQ089	45 12.69	-111 12.45	6420.0	MT	980041.48	980638.19	0.33	4.19	-218.97	-1.51	6.79	-209.17
BQ090	45 12.57	-111 11.30	6570.0	MT	980031.60	980638.01	0.84	5.11	-224.08	-1.52	11.18	-208.46
BQ091	45 12.37	-111 10.04	6960.0	MT	980006.71	980637.71	1.44	5.45	-237.39	-1.52	23.23	-208.78

## Madison and Gallatin Ranges, Montana

Meter ID: STATION ID	L O C A T I O N S LATITUDE deg min	ELEV (in ft)	G R A V I T Y OBSERVED	T E R R A I N a-f	C O R R E C T I O N S BOUGUER	C U R V	A N O M A L I E S FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45					
B0092	45 11.83	-111 7.70	8170.0	MT	979940.12	980636.89	0.81	3.25	-278.66	-1.46	71.13	-204.92	-182.17
B0093	45 12.71	-111 6.75	9240.0	MT	979888.37	980638.22	0.99	5.69	-315.15	-1.32	118.56	-191.23	-165.71
B0094	45 13.14	-111 6.80	9831.0	MT	979844.35	980638.87	4.33	11.03	-335.31	-1.22	129.40	-191.76	-165.30
B0095	45 14.68	-111 14.99	6053.0	MT	980067.53	980641.20	0.75	4.87	-206.45	-1.50	-4.65	-206.98	-190.31
B0096	45 21.05	-111 9.88	5969.0	MT	980087.49	980650.80	1.09	6.04	-203.59	-1.49	-2.19	-200.14	-183.83
B0097	45 20.56	-111 8.26	6390.0	MT	980069.32	980650.06	1.04	5.30	-217.94	-1.51	19.93	-193.18	-175.62
B0098	45 14.04	-111 7.95	9060.0	MT	979900.75	980640.23	0.76	5.06	-309.01	-1.35	112.03	-192.51	-167.42
B0099	45 14.59	-111 7.96	8400.0	MT	979941.94	980641.05	2.12	3.63	-286.50	-1.43	90.39	-191.79	-168.54
B0100	45 15.26	-111 7.63	8080.0	MT	979959.15	980642.07	0.63	3.54	-275.59	-1.46	76.53	-196.35	-173.87
B0101	45 17.39	-111 8.22	7280.0	MT	980003.72	980645.28	0.88	5.66	-248.30	-1.51	42.73	-200.54	-180.49
B0102	45 17.72	-111 8.30	7120.0	MT	980017.98	980645.78	1.44	6.39	-242.84	-1.51	41.46	-195.07	-175.58
B0103	45 19.11	-111 11.10	5840.0	MT	980089.60	980647.88	1.25	9.47	-199.19	-1.49	-9.28	-199.23	-183.58
B0104	45 12.75	-111 14.82	6136.0	MT	980061.28	980638.28	0.65	4.30	-209.28	-1.50	-0.19	-206.02	-189.06
B0105	45 11.05	-111 14.28	6218.0	MT	980052.75	980635.72	1.80	5.74	-212.08	-1.51	1.55	-204.50	-187.52
B0106	45 10.16	-111 14.59	6258.0	MT	980049.64	980634.38	2.15	6.24	-213.44	-1.51	3.54	-203.02	-186.00
B0107	45 7.60	-111 13.86	6390.0	MT	980032.80	980630.52	3.17	8.54	-217.94	-1.51	2.96	-204.79	-187.67
B0108	45 4.57	-111 12.10	6580.0	MT	980025.64	980625.95	1.73	4.48	-224.42	-1.52	18.23	-201.50	-183.40
B0109	45 2.69	-111 7.95	6741.0	MT	980021.64	980623.11	0.26	3.55	-229.92	-1.52	32.19	-195.43	-176.68
B0110	45 1.67	-111 6.36	6822.0	MT	980018.92	980621.57	1.82	4.66	-232.68	-1.52	38.62	-189.09	-170.33
B0111	45 3.73	-111 10.07	6671.0	MT	980020.57	980624.67	1.27	3.73	-227.53	-1.52	22.98	-201.06	-182.60
B0112	45 3.66	-111 13.52	6685.0	MT	980017.73	980624.57	1.96	4.25	-228.01	-1.52	21.55	-201.76	-183.36
B0113	45 3.67	-111 16.30	6844.0	MT	980009.18	980624.59	0.93	2.69	-233.43	-1.52	27.93	-203.40	-184.33
B0114	45 2.39	-111 16.86	7040.0	MT	979995.32	980622.66	1.09	2.85	-240.11	-1.52	34.42	-203.27	-183.69
B0115	45 4.27	-111 18.32	6988.0	MT	979998.39	980625.49	0.45	2.57	-238.34	-1.52	29.76	-207.07	-187.56
B0116	45 4.51	-111 20.39	7104.0	MT	979989.35	980625.85	0.74	3.31	-242.30	-1.51	31.26	-208.50	-188.74
B0117	45 4.86	-111 22.39	7512.0	MT	979964.35	980626.38	0.63	2.91	-256.21	-1.50	44.06	-210.11	-189.17
B0118	45 5.73	-111 23.29	8466.0	MT	979904.26	980627.70	2.47	3.10	-288.75	-1.43	72.27	-212.33	-188.88
B0119	45 6.18	-111 24.41	7800.0	MT	979947.75	980628.37	8.28	4.15	-266.04	-1.48	52.53	-202.56	-181.54
B0120	45 7.46	-111 24.99	7652.0	MT	979957.07	980630.30	1.50	4.07	-260.99	-1.49	46.01	-210.90	-189.73
B0121	45 7.91	-111 26.09	7467.0	MT	979969.93	980630.98	1.12	4.06	-254.68	-1.50	40.81	-210.19	-189.51
B0122	45 8.29	-111 27.16	7810.0	MT	979952.10	980631.55	0.34	2.92	-266.38	-1.48	54.64	-209.96	-188.16
B0123	45 7.15	-111 29.65	7000.0	MT	979999.57	980629.84	1.25	5.73	-238.75	-1.52	27.73	-205.56	-186.34
B0124	45 7.44	-111 28.75	7100.0	MT	979993.57	980630.27	1.64	4.92	-242.16	-1.51	30.68	-206.43	-186.89
B0125	45 8.20	-111 28.44	7420.0	MT	979975.86	980631.41	0.84	4.43	-253.07	-1.50	41.90	-207.41	-186.87
B0126	45 6.94	-111 24.15	7840.0	MT	979942.35	980629.52	1.72	3.83	-267.40	-1.48	49.74	-213.59	-191.89
B0127	45 11.39	-111 15.67	6915.0	MT	980013.78	980636.23	1.03	2.62	-235.85	-1.52	27.56	-206.16	-186.90
B0128	45 10.39	-111 16.05	7520.0	MT	979977.82	980634.72	0.30	2.61	-256.49	-1.50	49.95	-205.13	-184.11
B0129	45 10.59	-111 16.82	7840.0	MT	979958.94	980635.02	0.56	2.83	-267.40	-1.48	60.82	-204.67	-182.80
B0130	45 10.33	-111 17.48	8350.0	MT	979925.66	980634.63	0.64	4.24	-284.79	-1.44	75.84	-205.51	-182.33
B0131	45 9.31	-111 19.36	9370.0	MT	979852.73	980633.09	3.16	10.44	-319.58	-1.30	100.25	-207.03	-181.71
B0132	45 9.52	-111 20.62	9314.0	MT	979860.08	980633.41	2.78	8.32	-317.67	-1.31	102.03	-205.85	-180.48
B0133	45 10.02	-111 21.91	9315.0	MT	979862.21	980634.16	1.32	6.59	-317.71	-1.31	103.50	-207.61	-181.97
B0134	45 10.47	-111 23.92	9480.0	MT	979857.64	980634.84	0.40	6.39	-323.34	-1.28	113.75	-204.08	-177.89
B0135	45 9.80	-111 24.09	9581.0	MT	979839.75	980633.83	3.91	8.53	-326.78	-1.26	106.36	-209.24	-183.24
B0136	45 9.28	-111 23.30	9360.0	MT	979852.60	980633.05	4.32	6.88	-319.24	-1.30	99.24	-210.11	-184.62
B0137	45 8.31	-111 22.26	9300.0	MT	979849.43	980631.59	5.63	7.68	-317.20	-1.31	91.89	-213.31	-188.16
B0138	45 9.57	-111 24.57	8390.0	MT	979922.82	980633.48	6.81	3.30	-286.16	-1.43	77.91	-199.57	-176.71
B0139	45 9.33	-111 25.26	8160.0	MT	979932.44	980633.13	0.53	3.37	-278.31	-1.46	66.28	-209.59	-186.86
B0140	45 9.90	-111 26.82	8465.0	MT	979916.14	980633.98	2.81	4.11	-288.72	-1.43	77.77	-205.45	-182.11
B0141	45 9.93	-111 27.90	8820.0	MT	979897.30	980634.03	1.58	4.80	-300.82	-1.38	92.23	-203.60	-179.22

Madison and Gallatin Ranges, Montana

Meter ID:

STATION

ID

L O C A T I O N S  
LATITUDE LONGITUDE ELEV ST  
deg min deg min (in ft)

BOUGUER GRAVITY DATA

G R A V I T Y  
OBSERVED THEORETICAL  
a-f

C O R R A I N  
g-x

C O R R E C T I O N S  
BOUGUER CURV

A N O M A L I E S  
FREE COMPLETE-BOUGUER  
AIR d1=2.67 d2=2.45

table page 4

B0142	45 10.90	-111 22.53	9060.0	MT	979885.90	980635.49	0.32	4.39	-309.01	-1.35	101.91	-203.74	-178.56
B0143	45 11.16	-111 22.50	8950.0	MT	979895.19	980635.88	0.36	4.14	-305.26	-1.37	100.48	-201.65	-176.75
B0144	45 10.81	-111 24.87	9465.0	MT	979861.83	980635.35	0.92	6.45	-322.82	-1.28	116.02	-200.72	-174.62
B0145	45 11.06	-111 26.08	9280.0	MT	979875.71	980635.73	0.74	5.07	-316.51	-1.32	112.14	-199.88	-174.17
B0146	45 11.78	-111 27.44	8770.0	MT	979912.65	980636.82	1.30	3.95	-299.12	-1.39	100.09	-195.17	-170.84
B0147	45 13.68	-111 28.49	8680.0	MT	979925.93	980639.69	0.41	4.10	-296.05	-1.40	102.05	-190.89	-166.75
B0148	45 13.80	-111 28.61	8640.0	MT	979928.53	980639.87	0.44	4.21	-294.69	-1.41	100.72	-190.72	-166.71
B0149	45 12.28	-111 28.21	8810.0	MT	979914.14	980637.57	1.17	4.00	-300.48	-1.38	104.59	-192.11	-167.66
B0150	45 15.96	-111 15.16	5992.0	MT	980076.49	980643.13	0.81	6.16	-204.37	-1.50	-3.35	-202.25	-185.86
B0151	45 15.98	-111 17.47	6201.0	MT	980065.12	980643.16	0.03	4.76	-211.50	-1.51	4.88	-203.33	-186.18
B0152	45 14.55	-111 20.37	6664.0	MT	980042.29	980641.00	0.37	3.17	-227.29	-1.52	27.71	-197.56	-178.99
B0153	45 14.28	-111 22.10	6760.0	MT	980037.46	980640.59	1.73	4.56	-230.56	-1.52	32.32	-193.47	-174.87
B0154	45 14.59	-111 24.75	7170.0	MT	980015.55	980641.05	0.82	4.97	-244.55	-1.51	48.45	-191.82	-172.02
B0155	45 12.58	-111 24.76	8020.0	MT	979956.86	980638.02	3.45	3.92	-273.54	-1.47	72.65	-194.99	-172.93
B0156	45 13.41	-111 24.39	7530.0	MT	979992.01	980639.27	4.10	3.83	-256.83	-1.50	60.52	-189.88	-169.25
B0157	45 14.28	-111 22.46	6790.0	MT	980034.57	980640.59	1.55	4.72	-231.59	-1.52	32.24	-194.59	-175.90
B0158	45 15.28	-111 25.73	7500.0	MT	979997.05	980642.10	2.58	5.08	-255.80	-1.50	59.91	-189.73	-169.16
B0159	45 15.11	-111 27.43	7840.0	MT	979980.22	980641.84	1.30	5.21	-267.40	-1.48	75.28	-187.09	-165.47
B0160	45 13.75	-111 21.12	6910.0	MT	980026.03	980639.79	1.32	3.50	-235.68	-1.52	35.78	-196.60	-177.45
B0161	45 13.32	-111 20.93	7150.0	MT	980005.69	980639.14	1.43	3.13	-243.87	-1.51	38.63	-202.19	-182.35
B0162	45 13.25	-111 15.91	6256.0	MT	980056.28	980639.04	0.80	3.50	-213.37	-1.51	5.33	-205.25	-187.90
B0163	45 12.17	-111 18.23	6850.0	MT	980017.57	980637.41	1.13	3.81	-233.63	-1.52	24.06	-206.15	-187.18
B0164	45 13.39	-111 18.32	7640.0	MT	979974.25	980639.25	1.74	3.14	-260.58	-1.49	53.12	-204.07	-182.88
B0165	45 8.53	-111 11.26	7300.0	MT	979977.40	980631.91	1.08	2.56	-248.98	-1.51	31.66	-215.19	-194.85
B0167	45 10.81	-111 3.52	10015.0	MT	979814.97	980635.35	7.32	16.40	-341.58	-1.18	120.81	-198.23	-171.94
B0169	45 15.35	-110 58.68	8540.0	MT	979940.07	980642.20	1.10	7.07	-291.27	-1.42	100.53	-184.00	-160.55
B0170	45 15.36	-110 56.90	7810.0	MT	979987.39	980642.22	3.46	4.39	-266.38	-1.48	79.26	-180.75	-159.33
B0171	45 17.28	-110 55.48	8240.0	MT	979933.57	980645.12	2.17	11.34	-281.04	-1.45	62.93	-206.05	-183.89
B0172	45 19.59	-110 57.55	8320.0	MT	979936.42	980648.60	5.67	9.91	-283.77	-1.44	69.81	-199.82	-177.60
B0173	45 18.71	-110 59.71	8571.0	MT	979916.19	980647.27	7.77	8.54	-292.33	-1.41	74.48	-202.95	-180.09
B0174	45 21.72	-111 0.13	9560.0	MT	979855.46	980651.81	2.53	10.72	-326.06	-1.27	102.11	-211.97	-186.09
B0175	45 23.13	-111 2.15	8480.0	MT	979946.80	980653.94	8.04	5.97	-289.23	-1.42	89.88	-186.76	-163.97
B0176	45 24.97	-110 59.83	10333.0	MT	979808.53	980656.72	10.56	21.63	-352.43	-1.11	122.87	-198.48	-172.00
B0177	45 26.63	-111 0.16	10154.0	MT	979827.14	980659.22	13.40	21.82	-346.32	-1.15	122.17	-190.09	-164.36
B0178	45 25.33	-110 59.25	9020.0	MT	979917.23	980657.26	1.49	6.74	-307.65	-1.36	107.71	-193.06	-168.28
B0179	45 27.74	-110 53.93	9260.0	MT	979895.60	980660.89	4.38	13.09	-315.83	-1.32	104.99	-194.69	-169.99
B0180	45 28.09	-110 59.13	7320.0	MT	980031.66	980661.42	3.44	5.34	-249.66	-1.51	58.28	-184.11	-164.13
B0181	45 26.57	-111 4.26	9480.0	MT	979877.65	980659.13	3.97	15.64	-323.34	-1.28	109.47	-195.54	-170.41
B0183	45 10.40	-111 10.71	8680.0	MT	979892.18	980634.73	1.81	5.53	-296.05	-1.40	73.26	-216.85	-192.95
B0184	45 9.10	-111 9.53	8632.0	MT	979887.78	980632.77	5.34	5.65	-294.41	-1.41	66.31	-218.52	-195.05
B0185	45 5.79	-111 9.47	7630.0	MT	979960.71	980627.78	0.76	1.56	-260.24	-1.49	50.11	-209.30	-187.93
B0186	45 6.46	-111 6.53	8590.0	MT	979895.37	980628.80	2.53	4.07	-292.98	-1.41	73.93	-213.86	-190.15
B0187	45 5.87	-110 59.97	10095.0	MT	979790.69	980627.91	7.11	17.63	-344.31	-1.16	111.49	-209.24	-182.81
B0188	45 15.46	-111 5.19	9180.0	MT	979891.87	980642.37	1.69	6.18	-313.10	-1.33	112.27	-194.29	-169.03
B0189	45 16.87	-111 6.17	9940.0	MT	979833.99	980644.50	4.12	14.24	-339.02	-1.19	123.64	-198.22	-171.70
B0190	45 19.38	-111 2.79	10061.0	MT	979820.54	980648.28	5.91	16.04	-343.15	-1.17	117.77	-204.60	-178.04
B0191	45 20.78	-111 2.11	9941.0	MT	979825.07	980650.40	8.31	17.08	-339.06	-1.19	108.91	-205.95	-180.00
B0192	45 20.43	-111 4.78	9986.0	MT	979818.29	980649.87	11.48	21.91	-340.59	-1.18	106.89	-201.50	-176.09
B0193	45 22.56	-111 6.21	6320.0	MT	980068.85	980653.08	1.69	6.22	-215.56	-1.51	9.87	-199.28	-182.05
B0194	45 5.32	-111 19.30	7930.0	MT	979941.01	980627.07	2.14	2.51	-270.47	-1.48	59.30	-207.99	-185.97

## Madison and Gallatin Ranges, Montana

Meter ID:

## BOUGUER GRAVITY DATA

table page 5

STATION ID	L O C A T I O N		ELEV (in ft)	S T	G R A V I T Y		C O R R E C T I O N S		A N O M A L I E S					
	LATITUDE deg	LONGITUDE deg			OBSERVED	THEORETICAL	T E R R A I N a=f	C U R V g-x	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45				
BQ195	45	6.32	-111 22.74	9347.0	MT	979845.99	980628.59	4.08	8.49	-318.80	-1.30	95.87	-211.67	-186.33
BQ196	45	6.02	-111 21.60	9017.0	MT	979869.39	980628.13	4.35	6.21	-307.54	-1.36	88.72	-209.61	-185.03
BQ197	45	6.48	-111 20.16	8814.0	MT	979882.46	980628.82	4.52	5.94	-300.62	-1.38	82.04	-209.50	-185.48
BQ198	45	1.95	-111 22.95	7680.0	MT	979946.42	980621.99	0.39	3.92	-261.94	-1.49	46.31	-212.82	-191.47
BQ199	45	0.46	-111 23.00	8000.0	MT	979925.73	980619.74	1.21	4.29	-272.86	-1.47	57.92	-210.90	-188.75
BQ200	45	0.84	-111 22.85	7980.0	MT	979930.49	980620.31	0.46	3.89	-272.17	-1.47	60.24	-209.06	-186.87
BQ201	45	2.92	-111 22.19	7230.0	MT	979974.03	980623.45	1.95	5.17	-246.59	-1.51	30.18	-210.80	-190.95
BQ202	45	3.71	-111 21.42	7190.0	MT	979981.69	980624.65	0.60	3.92	-245.23	-1.51	32.88	-209.34	-189.38
BQ203	45	1.72	-111 17.96	7400.0	MT	979972.03	980621.64	0.45	2.76	-252.39	-1.51	45.96	-204.72	-184.07
BQ204	45	0.85	-111 18.29	7600.0	MT	979962.11	980620.33	1.89	3.06	-259.21	-1.50	56.14	-199.62	-178.54
BQ205	45	0.18	-111 19.90	9215.0	MT	979854.41	980619.32	4.43	5.92	-314.30	-1.33	101.15	-204.12	-178.97
BQ206	45	0.85	-111 19.39	8080.0	MT	979928.85	980620.33	1.28	3.04	-275.59	-1.46	67.98	-204.75	-182.28
BQ207	45	1.94	-111 15.77	7600.0	MT	979962.85	980621.98	0.52	1.77	-259.21	-1.50	55.24	-203.18	-181.89
BQ208	45	1.43	-111 14.51	8410.0	MT	979911.05	980621.20	0.24	3.24	-286.84	-1.43	80.30	-204.50	-181.03
BQ209	45	0.34	-111 14.53	8500.0	MT	979905.64	980619.56	1.28	3.22	-289.91	-1.42	84.99	-201.85	-178.21
BQ211	45	2.57	-111 19.96	8090.0	MT	979923.74	980622.92	1.09	2.43	-275.93	-1.46	61.21	-212.65	-190.09
BQ212	45	3.73	-111 19.15	7460.0	MT	979969.82	980624.67	0.91	1.93	-254.44	-1.50	46.36	-206.74	-185.89
BQ213	45	5.21	-111 17.03	7120.0	MT	979992.65	980626.91	0.51	2.06	-242.84	-1.51	35.01	-206.78	-186.85
BQ214	45	5.57	-111 18.25	7180.0	MT	979988.11	980627.45	0.35	2.26	-244.89	-1.51	35.56	-208.23	-188.14
BQ215	45	6.96	-111 14.70	7150.0	MT	979993.05	980629.55	1.27	3.12	-243.87	-1.51	35.59	-205.40	-185.55
BQ216	45	7.20	-111 16.39	8170.0	MT	979926.53	980629.91	0.57	2.81	-278.66	-1.46	64.53	-212.20	-189.40
BQ217	45	7.39	-111 18.46	7266.0	MT	979982.42	980630.20	0.85	2.71	-247.82	-1.51	35.21	-210.56	-190.31
BQ218	45	7.81	-111 19.15	7200.0	MT	979987.39	980630.83	0.46	3.46	-245.57	-1.51	33.35	-209.82	-189.78
BQ225	45	35.02	-111 11.78	4978.0	MT	980192.90	980671.88	0.00	1.02	-169.79	-1.41	-10.99	-181.16	-167.14
BQ226	45	33.72	-111 11.81	5094.0	MT	980171.89	980669.91	0.03	1.40	-173.74	-1.42	-19.13	-192.87	-178.55
BQ227	45	32.85	-111 9.25	5439.0	MT	980141.10	980668.60	0.22	2.00	-185.51	-1.46	-16.19	-200.93	-185.71
BQ228	45	32.35	-111 10.07	5400.0	MT	980145.48	980667.84	0.23	2.59	-184.18	-1.45	-14.72	-197.53	-182.47
BQ229	45	31.86	-111 8.08	6180.0	MT	980111.11	980667.11	0.85	2.59	-210.78	-1.50	24.94	-183.90	-166.70
BQ230	45	30.16	-111 6.72	6725.0	MT	980077.58	980664.55	0.65	3.38	-229.37	-1.52	45.18	-181.68	-162.98
BQ231	45	28.97	-111 5.24	7200.0	MT	980044.21	980662.75	1.22	3.56	-245.57	-1.51	58.24	-184.07	-164.10
BQ232	45	28.11	-111 4.74	7740.0	MT	980007.42	980661.45	2.16	3.83	-263.99	-1.49	73.48	-186.01	-164.63
BQ233	45	29.69	-111 6.20	6880.0	MT	980063.41	980663.84	0.49	3.45	-234.66	-1.52	46.28	-185.95	-166.82
BQ234	45	30.87	-111 7.36	6630.0	MT	980085.85	980665.62	1.52	2.96	-226.13	-1.52	43.46	-179.71	-161.32
BQ235	45	17.25	-111 13.23	5931.0	MT	980080.85	980645.07	1.28	9.89	-202.29	-1.49	-6.67	-199.28	-183.41
BQ236	45	17.80	-111 12.52	5875.0	MT	980083.61	980645.90	3.17	10.35	-200.38	-1.49	-10.00	-198.35	-182.83
BQ237	45	20.24	-111 10.23	5753.0	MT	980094.69	980649.58	1.30	9.07	-196.22	-1.48	-14.07	-201.40	-185.96
BQ238	45	22.31	-111 10.42	5666.0	MT	980106.30	980652.70	2.76	8.59	-193.25	-1.47	-13.76	-197.14	-182.03
BQ239	45	21.84	-111 10.37	5679.0	MT	980101.03	980651.99	4.35	9.12	-193.69	-1.48	-17.09	-198.79	-183.82
BQ240	45	23.36	-111 11.84	5591.0	MT	980114.05	980654.29	1.87	11.26	-190.69	-1.47	-14.65	-193.68	-178.93
BQ241	45	24.40	-111 13.46	5493.0	MT	980121.21	980655.86	5.03	12.91	-187.35	-1.46	-18.26	-189.13	-175.05
BQ242	45	26.36	-111 13.99	5407.0	MT	980142.80	980658.81	2.54	8.02	-184.42	-1.45	-7.71	-183.02	-168.58
BQ243	45	27.48	-111 14.76	5310.0	MT	980152.87	980660.50	1.39	7.91	-181.11	-1.44	-8.44	-181.70	-167.42
BQ244	45	28.57	-111 16.05	5241.0	MT	980160.64	980662.15	2.76	6.68	-178.76	-1.44	-8.80	-179.55	-165.49
BQ245	45	29.72	-111 16.41	5210.0	MT	980168.24	980663.88	0.53	4.84	-177.70	-1.43	-5.85	-179.61	-165.29
BQ246	45	18.19	-111 13.86	6880.0	MT	980030.17	980646.48	0.97	5.26	-234.66	-1.52	30.40	-199.54	-180.59
BQ247	45	19.14	-111 13.98	7750.0	MT	979981.26	980647.92	5.24	6.68	-264.33	-1.49	61.79	-192.11	-171.19
BQ248	45	19.55	-111 16.10	8820.0	MT	979924.65	980648.54	1.33	6.25	-300.82	-1.38	105.07	-189.56	-165.28
BQ249	45	19.92	-111 15.11	9840.0	MT	979853.14	980649.10	4.18	15.34	-335.61	-1.21	128.80	-188.51	-162.37
BQ250	45	20.51	-111 14.68	9608.0	MT	979865.54	980649.98	2.45	12.31	-327.70	-1.26	118.52	-195.68	-169.79
BQ251	45	21.37	-111 13.74	9413.0	MT	979880.51	980651.28	5.37	14.08	-321.05	-1.29	113.88	-189.01	-164.05



Madison and Gallatin Ranges, Montana

Meter ID:  
STATION  
ID

BOUGUER GRAVITY DATA

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STATION ID	L O C A T I O N S		ST	G R A V I T Y		C O R R E C T I O N S		A N O M A L I E S					
	LATITUDE deg min	LONGITUDE deg min		ELEV (in ft)	OBSERVED THEORETICAL	T E R R A I N a-f	C U R V g-x	F R E E A I R	C O M P L E T E - B O U G U E R d1=2.67 d2=2.45				
BQ253	45 21.55	-111 11.31	7737.0	MT	979980.98	980651.55	6.10	7.71	-263.89	-1.49	56.65	-194.92	-174.19
BQ254	45 32.41	-111 13.70	5065.0	MT	980174.79	980667.94	0.20	2.18	-172.75	-1.42	-16.98	-188.77	-174.62
BQ255	45 33.28	-111 13.83	5032.0	MT	980180.25	980669.25	0.07	1.61	-171.63	-1.41	-15.94	-187.30	-173.18
BQ256	45 35.02	-111 13.63	4954.0	MT	980194.41	980671.88	0.03	1.05	-168.97	-1.41	-11.74	-181.03	-167.08
BQ257	45 34.35	-111 16.72	5481.0	MT	980171.87	980670.87	0.05	0.93	-186.94	-1.46	16.26	-171.16	-155.72
BQ258	45 29.94	-111 19.12	5430.0	MT	980161.87	980664.21	1.57	3.25	-185.20	-1.46	8.12	-173.71	-158.73
BQ259	45 27.00	-111 22.52	6080.0	MT	980115.46	980659.78	1.51	4.67	-207.37	-1.50	27.23	-175.47	-158.76
BQ260	45 27.97	-111 21.98	6120.0	MT	980117.12	980661.24	0.26	2.38	-208.74	-1.50	31.18	-176.42	-159.31
BQ261	45 29.67	-111 22.06	5660.0	MT	980147.36	980663.80	0.92	2.18	-193.05	-1.47	15.63	-175.79	-160.01
BQ262	45 29.92	-111 20.37	5512.0	MT	980154.80	980664.18	0.46	2.55	-188.00	-1.46	8.79	-177.66	-162.30
BQ263	45 18.05	-111 24.84	7810.0	MT	979985.41	980646.27	0.05	2.87	-266.38	-1.48	73.22	-191.72	-169.89
BQ264	45 17.41	-111 23.54	7445.0	MT	980005.26	980645.31	0.24	3.21	-253.93	-1.50	59.74	-192.24	-171.48
BQ265	45 16.10	-111 19.62	6550.0	MT	980050.66	980643.34	0.15	3.53	-223.40	-1.51	23.03	-198.21	-179.98
BQ266	45 18.44	-111 25.23	7605.0	MT	979998.04	980646.87	0.32	3.17	-259.38	-1.50	66.00	-191.39	-170.18
BQ267	45 18.73	-111 26.34	7190.0	MT	980021.78	980647.30	0.84	4.27	-245.23	-1.51	50.32	-191.32	-171.41
BQ268	45 18.95	-111 27.44	7200.0	MT	980024.58	980647.63	1.05	3.72	-245.57	-1.51	53.72	-188.59	-168.62
BQ269	45 19.31	-111 28.44	6720.0	MT	980054.05	980648.18	0.82	4.26	-229.20	-1.52	37.55	-188.09	-169.50
BQ270	45 20.06	-111 29.15	6240.0	MT	980079.80	980649.31	1.83	5.98	-212.83	-1.51	17.07	-189.46	-172.44
BQ271	45 21.00	-111 28.52	7030.0	MT	980038.14	980650.73	0.45	3.82	-239.77	-1.52	48.22	-188.80	-169.27
BQ272	45 20.43	-111 27.18	7280.0	MT	980021.91	980649.87	0.35	3.94	-248.30	-1.51	56.33	-189.19	-168.96
BQ273	45 19.28	-111 25.75	7320.0	MT	980015.66	980648.13	0.30	3.69	-249.66	-1.51	55.58	-191.61	-171.24
BQ274	45 24.97	-111 24.00	6450.0	MT	980084.17	980656.72	1.46	8.90	-219.99	-1.51	33.77	-177.38	-159.98
BQ275	45 24.61	-111 25.77	7520.0	MT	980024.86	980656.17	1.70	4.31	-256.49	-1.50	75.53	-176.45	-155.69
BQ276	45 24.19	-111 26.80	7880.0	MT	980003.10	980655.54	1.66	4.77	-268.76	-1.48	88.22	-175.59	-153.85
BQ277	45 23.43	-111 27.25	8740.0	MT	979952.07	980654.39	0.81	5.89	-298.10	-1.39	119.12	-173.67	-149.54
BQ278	45 22.61	-111 26.61	8900.0	MT	979935.91	980653.16	1.57	6.81	-303.55	-1.37	119.22	-177.32	-152.89
BQ279	45 22.17	-111 25.55	8440.0	MT	979955.80	980652.49	2.39	6.39	-287.86	-1.43	96.57	-183.94	-160.83
BQ280	45 22.87	-111 25.44	7840.0	MT	980000.05	980653.55	3.19	6.52	-267.40	-1.48	83.40	-175.77	-154.41
BQ281	45 23.66	-111 24.72	7000.0	MT	980050.89	980654.74	1.89	9.17	-238.75	-1.52	54.14	-175.07	-156.18
BQ282	45 26.09	-111 23.19	6160.0	MT	980108.80	980658.41	2.43	7.67	-210.10	-1.50	29.45	-172.05	-155.45
BQ283	45 12.19	-111 39.47	5416.0	MT	980091.04	980637.44	0.00	1.73	-184.72	-1.45	-37.24	-221.69	-206.49
BQ284	45 12.19	-111 36.98	5662.0	MT	980085.71	980637.44	0.08	3.16	-193.11	-1.47	-19.46	-210.80	-195.04
BQ285	45 10.87	-111 36.35	5707.0	MT	980084.14	980635.45	0.02	2.91	-194.65	-1.48	-14.80	-208.00	-192.08
BQ286	45 9.58	-111 35.73	5837.0	MT	980079.91	980633.50	0.03	2.70	-199.08	-1.49	-4.88	-202.72	-186.42
BQ287	45 9.77	-111 33.86	6040.0	MT	980066.37	980633.79	0.53	4.75	-206.01	-1.50	0.37	-201.86	-185.19
BQ288	45 9.40	-111 33.17	6240.0	MT	980052.07	980633.23	1.64	5.86	-212.83	-1.51	5.43	-201.41	-184.36
BQ289	45 8.97	-111 32.09	6700.0	MT	980021.15	980632.58	5.25	6.57	-228.52	-1.52	18.38	-199.84	-181.86
BQ290	45 9.26	-111 30.97	7200.0	MT	979990.10	980633.02	2.66	5.94	-245.57	-1.51	33.87	-204.61	-184.96
BQ291	45 8.46	-111 35.75	5840.0	MT	980075.92	980631.81	0.06	2.80	-199.19	-1.49	-6.89	-204.70	-188.40
BQ292	45 6.95	-111 35.72	5875.0	MT	980057.72	980629.53	0.06	2.88	-200.38	-1.49	-19.52	-218.45	-202.06
BQ293	45 5.63	-111 35.16	5951.0	MT	980045.89	980627.54	0.03	3.49	-202.97	-1.49	-22.22	-223.16	-206.61
BQ294	45 5.18	-111 36.99	5727.0	MT	980055.39	980626.86	0.02	2.39	-195.33	-1.48	-33.09	-227.49	-211.47
BQ295	45 23.74	-111 14.01	6160.0	MT	980085.83	980654.86	4.32	10.01	-210.10	-1.50	10.03	-187.24	-170.99
BQ296	45 22.33	-111 14.85	7110.0	MT	980024.53	980652.73	5.65	9.71	-242.50	-1.51	40.12	-188.54	-169.70
BQ297	45 23.29	-111 14.38	6540.0	MT	980058.04	980654.18	5.13	9.61	-223.06	-1.51	18.63	-191.21	-173.92
BQ298	45 14.78	-111 40.68	5268.0	MT	980111.26	980641.34	0.06	1.58	-179.68	-1.44	-34.84	-214.32	-199.53
BQ299	45 13.89	-111 40.67	5290.0	MT	980106.64	980640.00	0.10	1.57	-180.43	-1.44	-36.05	-216.24	-201.40
BQ300	45 13.92	-111 38.93	5389.0	MT	980099.35	980640.05	0.02	2.28	-183.80	-1.45	-34.08	-217.03	-201.96
BQ301	45 13.91	-111 36.99	5809.0	MT	980084.32	980640.03	0.10	3.99	-198.13	-1.48	-9.63	-205.15	-189.04
BQ302	45 15.61	-111 40.72	5256.0	MT	980114.24	980642.59	0.00	1.55	-179.27	-1.44	-34.23	-213.39	-198.63

## Madison and Gallatin Ranges, Montana

Meter ID:

STATION

ID

LATITUDE  
deg minLONGITUDE  
deg minELEV  
(in ft)

ST

OBSERVED

THEORETICAL

T E R R A I N

a-f

g-x

C O R R E C T I O N S

BOUGUER

CURV

FREE

AIR

A N O M A L I E S

COMPLETED-BOUGUER

d1=2.67 d2=2.45

## BOUGUER GRAVITY DATA

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ID	LATITUDE deg min	LONGITUDE deg min	ELEV (in ft)	ST	OBSERVED	THEORETICAL	T E R R A I N a-f	I N g-x	BOUGUER	CURV	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45
BQ303	45 16.45	-111 40.69	5216.0	MT	980118.78	980643.86	0.05	1.59	-177.90	-1.43	-34.72	-212.42
BQ304	45 15.70	-111 38.21	5418.0	MT	980107.94	980642.73	0.06	3.31	-184.79	-1.45	-25.46	-193.26
BQ305	45 16.58	-111 38.21	5457.0	MT	980107.97	980644.06	0.05	3.05	-186.12	-1.46	-23.09	-192.37
BQ306	45 16.21	-111 37.05	5820.0	MT	980091.71	980643.50	1.22	5.66	-198.50	-1.49	-4.67	-197.78
BQ307	45 15.70	-111 39.46	5293.0	MT	980111.23	980642.73	0.04	2.13	-180.53	-1.44	-33.91	-198.90
BQ308	45 11.20	-111 40.65	5411.0	MT	980094.76	980635.95	0.00	1.40	-184.55	-1.45	-32.50	-201.90
BQ309	45 12.19	-111 38.22	5484.0	MT	980090.48	980637.44	0.04	2.30	-187.04	-1.46	-31.42	-202.24
BQ310	45 13.05	-111 35.73	6202.0	MT	980060.62	980638.73	0.90	5.77	-211.53	-1.51	4.90	-184.47
BQ311	45 13.82	-111 33.68	7520.0	MT	979984.96	980639.90	4.51	8.96	-256.49	-1.50	51.91	-172.46
BQ312	45 9.57	-111 40.65	5474.0	MT	980090.16	980633.48	0.14	1.39	-186.70	-1.46	-28.72	-199.98
BQ313	45 8.69	-111 40.64	5507.0	MT	980090.18	980632.16	0.47	1.43	-187.83	-1.46	-24.27	-196.22
BQ314	45 7.47	-111 39.86	5448.0	MT	980088.75	980630.32	0.02	1.72	-185.82	-1.46	-29.41	-199.65
BQ315	45 10.46	-111 40.66	5443.0	MT	980092.57	980634.83	0.04	1.38	-185.65	-1.46	-30.57	-200.95
BQ316	45 12.85	-111 40.70	5347.0	MT	980100.65	980638.43	0.01	1.45	-182.37	-1.45	-35.11	-202.44
BQ317	45 9.59	-111 39.45	5511.0	MT	980084.87	980633.52	0.01	1.52	-187.96	-1.46	-30.57	-202.98
BQ318	45 8.71	-111 39.43	5534.0	MT	980082.16	980632.19	0.05	1.53	-188.75	-1.46	-29.79	-202.88
BQ319	45 2.61	-111 35.71	6110.0	MT	980028.16	980622.98	1.13	4.76	-208.39	-1.50	-20.46	-207.65
BQ320	45 0.83	-111 38.81	5835.0	MT	980044.60	980620.30	0.03	2.36	-199.02	-1.49	-27.16	-208.95
BQ321	45 0.85	-111 36.98	6096.0	MT	980030.85	980620.33	0.05	2.55	-207.92	-1.50	-16.42	-206.20
BQ322	45 1.71	-111 38.81	5783.0	MT	980048.69	980621.63	0.02	2.27	-197.24	-1.48	-29.29	-209.54
BQ323	45 2.57	-111 38.79	5745.0	MT	980052.44	980622.92	0.08	2.17	-195.95	-1.48	-30.41	-209.51
BQ324	45 6.14	-111 38.97	5487.0	MT	980080.08	980628.31	0.44	1.98	-187.15	-1.46	-32.41	-203.25
BQ325	45 5.21	-111 38.78	5580.0	MT	980071.91	980626.91	0.01	1.95	-190.32	-1.47	-30.43	-204.62
BQ326	45 4.34	-111 38.74	5662.0	MT	980067.01	980625.59	0.08	1.96	-193.11	-1.47	-26.31	-203.00
BQ327	45 2.60	-111 37.00	5835.0	MT	980039.29	980622.97	0.02	3.00	-199.02	-1.49	-35.15	-216.36
BQ328	45 1.73	-111 35.73	6196.0	MT	980021.58	980621.66	0.57	4.55	-211.33	-1.50	-17.63	-208.22
BQ329	45 3.45	-111 36.95	5732.0	MT	980048.71	980624.25	0.06	3.04	-195.50	-1.48	-36.69	-214.59
BQ330	45 4.32	-111 36.95	5709.0	MT	980054.26	980625.56	0.05	2.73	-194.72	-1.48	-34.61	-212.09
BQ331	45 3.85	-111 34.91	6210.0	MT	980023.78	980624.86	0.73	4.57	-211.81	-1.51	-17.31	-208.18
BQ332	45 5.18	-111 35.76	5844.0	MT	980046.00	980626.86	0.06	3.20	-199.32	-1.49	-31.48	-212.76
BQ333	45 6.73	-111 30.65	6570.0	MT	980016.65	980629.20	1.88	9.35	-224.08	-1.52	5.04	-191.67
BQ334	45 6.41	-111 31.50	6400.0	MT	980027.00	980628.72	4.10	10.88	-218.29	-1.51	-0.10	-188.04
BQ335	45 6.03	-111 33.57	6100.0	MT	980047.18	980628.14	2.28	6.83	-208.05	-1.50	-7.53	-191.46
BQ336	45 11.34	-111 36.97	5622.0	MT	980086.24	980636.16	0.01	2.74	-191.75	-1.47	-21.40	-196.18
BQ337	45 10.86	-111 34.50	6060.0	MT	980064.96	980635.43	0.92	4.81	-206.69	-1.50	-0.80	-186.57
BQ338	45 6.28	-111 34.69	5954.0	MT	980055.32	980628.52	0.21	4.29	-203.07	-1.49	-13.49	-197.07
BQ339	45 3.61	-111 32.26	7060.0	MT	979975.87	980624.49	4.55	10.73	-230.80	-1.51	15.01	-193.32
BQ340	45 3.84	-111 32.54	6930.0	MT	979986.21	980624.84	3.59	9.58	-236.36	-1.52	12.78	-193.41
BQ341	45 3.85	-111 31.18	9160.0	MT	979853.76	980624.86	3.05	10.65	-312.42	-1.33	89.80	-185.53
BQ342	45 4.66	-111 33.26	6620.0	MT	980009.07	980626.08	2.34	6.73	-225.79	-1.52	5.28	-194.97
BQ343	45 5.61	-111 33.62	6390.0	MT	980029.16	980627.51	0.52	5.12	-217.94	-1.51	2.33	-193.87
BQ344	45 10.43	-111 33.30	6331.0	MT	980046.16	980634.78	0.90	5.20	-215.93	-1.51	6.51	-187.42
BQ345	45 10.59	-111 32.91	6370.0	MT	980041.36	980635.02	3.53	6.29	-217.26	-1.51	5.14	-186.60
BQ346	45 11.46	-111 33.06	7450.0	MT	979983.66	980636.34	0.98	5.65	-254.10	-1.50	47.59	-180.87
BQ347	45 12.77	-111 33.09	8880.0	MT	979895.12	980638.31	0.29	11.12	-306.28	-1.36	100.79	-171.03
BQ348	45 12.31	-111 32.92	8870.0	MT	979897.16	980637.62	2.03	11.45	-302.53	-1.38	93.20	-173.30
BQ349	45 11.55	-111 31.64	7320.0	MT	979992.44	980636.47	2.45	5.85	-249.66	-1.51	44.02	-178.84
BQ350	44 54.24	-111 23.63	7460.0	MT	979959.21	980610.36	3.92	9.87	-254.44	-1.50	50.06	-192.09
BQ351	44 53.40	-111 25.28	8520.0	MT	979895.28	980609.09	1.86	5.34	-290.59	-1.42	86.98	-172.13
BQ352	44 52.69	-111 26.24	9040.0	MT	979860.90	980608.02	1.33	5.89	-308.33	-1.35	102.51	-175.03

Madison and Gallatin Ranges, Montana

Meter ID:

STATION

ID

BOUGUER GRAVITY DATA

table page 8

	deg	min	deg	min	(in ft)		a-f	g-x		AIR	d1=2.67	d2=2.45			
BQ353	44	53.60	-111	26.08	9040.0	MT	979862.78	980609.39	1.60	5.74	-308.33	-1.35	103.02	-199.32	-174.41
BQ354	44	50.38	-111	25.15	6420.0	MT	980014.92	980604.54	5.30	10.60	-218.97	-1.51	13.89	-190.69	-173.84
BQ355	44	51.32	-111	23.25	6405.0	MT	980017.92	980605.95	1.97	10.40	-218.46	-1.51	14.06	-193.54	-176.43
BQ356	44	49.62	-111	27.38	6195.0	MT	980022.49	980603.39	2.28	7.46	-211.29	-1.50	1.46	-201.60	-184.86
BQ357	44	50.01	-111	29.29	6190.0	MT	980019.36	980603.98	0.03	4.52	-211.12	-1.50	-2.73	-210.80	-193.66
BQ358	44	49.87	-111	30.77	6072.0	MT	980023.55	980603.77	0.21	3.01	-207.10	-1.50	-9.42	-214.79	-197.87
BQ359	44	48.84	-111	31.52	6263.0	MT	980012.86	980602.21	0.06	1.67	-213.61	-1.51	-0.60	-213.99	-196.41
BQ360	44	50.10	-111	32.88	6162.0	MT	980004.42	980604.12	0.35	2.16	-210.17	-1.50	-20.44	-229.60	-212.36
BQ361	44	51.30	-111	33.40	6060.0	MT	980007.92	980605.92	1.28	2.82	-206.69	-1.50	-28.32	-232.41	-215.60
BQ362	44	52.99	-111	35.03	5930.0	MT	980014.46	980608.48	1.32	3.75	-202.26	-1.49	-36.56	-235.23	-218.86
BQ363	44	59.31	-111	38.99	5763.0	MT	980050.98	980618.01	0.05	3.05	-196.56	-1.48	-25.27	-220.21	-204.14
BQ364	44	59.02	-111	36.87	6100.0	MT	980030.65	980617.57	0.10	2.46	-208.05	-1.50	-13.49	-220.48	-203.43
BQ365	44	58.10	-111	35.19	6358.0	MT	980008.51	980616.18	0.26	2.82	-216.85	-1.51	-10.00	-225.28	-207.54
BQ366	44	57.61	-111	37.49	5770.0	MT	980042.61	980615.45	0.09	3.65	-196.80	-1.48	-30.41	-224.95	-208.92
BQ367	44	56.46	-111	36.65	5837.0	MT	980034.96	980613.71	0.17	3.99	-199.08	-1.49	-30.03	-226.44	-210.26
BQ368	44	54.69	-111	35.89	5904.0	MT	980021.37	980611.04	0.25	3.87	-201.37	-1.49	-34.66	-233.40	-217.02
BQ369	44	55.07	-111	33.95	6280.0	MT	980003.22	980611.61	0.87	3.57	-214.19	-1.51	-18.04	-229.30	-211.90
BQ370	44	55.69	-111	32.59	6950.0	MT	979972.07	980612.55	0.95	3.60	-237.04	-1.52	12.82	-221.19	-201.91
BQ371	44	57.65	-111	22.88	8000.0	MT	979926.43	980615.50	1.14	4.18	-272.86	-1.47	62.87	-206.14	-183.97
BQ372	44	57.73	-111	23.64	8240.0	MT	979910.33	980615.63	3.04	4.58	-281.04	-1.45	69.19	-205.68	-183.03
BQ373	44	57.67	-111	24.85	8780.0	MT	979875.19	980615.53	2.85	4.94	-299.46	-1.39	84.87	-208.19	-184.05
BQ374	44	58.00	-111	26.70	9520.0	MT	979836.53	980616.03	2.00	5.53	-324.70	-1.27	115.21	-203.23	-176.99
BQ375	44	57.43	-111	26.52	9540.0	MT	979835.60	980615.17	0.67	5.53	-325.38	-1.27	117.02	-203.43	-177.03
BQ376	44	56.52	-111	26.39	9420.0	MT	979840.26	980613.80	1.97	5.72	-321.29	-1.29	111.78	-203.11	-177.16
BQ377	44	51.21	-111	32.20	6122.0	MT	980007.54	980605.79	0.21	3.11	-208.80	-1.50	-22.75	-229.73	-212.68
BQ378	44	52.09	-111	31.65	6497.0	MT	979992.80	980607.12	0.41	3.94	-221.59	-1.51	-3.58	-222.34	-204.32
BQ379	44	52.89	-111	31.66	6700.0	MT	979983.91	980608.32	0.32	4.70	-228.52	-1.52	5.40	-219.62	-201.08
BQ380	44	52.07	-111	33.43	6039.0	MT	980009.15	980607.09	0.32	3.28	-205.97	-1.50	-30.24	-234.11	-217.31
BQ381	44	54.46	-111	33.12	6640.0	MT	979985.21	980610.69	0.16	3.04	-226.47	-1.52	-1.30	-226.09	-207.57
BQ382	44	54.20	-111	32.11	6990.0	MT	979969.89	980610.30	0.18	3.89	-238.41	-1.52	16.65	-219.20	-199.77
BQ383	45	27.07	-111	25.92	6570.0	MT	980095.57	980659.88	0.39	3.38	-224.08	-1.52	53.27	-168.55	-150.28
BQ384	45	25.73	-111	25.93	7980.0	MT	980004.21	980657.86	0.73	4.78	-272.17	-1.47	96.40	-171.73	-149.64
BQ385	45	25.42	-111	26.57	7980.0	MT	980005.75	980657.39	0.43	4.15	-272.17	-1.47	98.41	-170.65	-148.48
BQ386	45	24.71	-111	28.17	8350.0	MT	979981.14	980656.32	1.56	5.02	-284.79	-1.44	109.63	-170.02	-146.98
BQ387	45	24.44	-111	28.60	8870.0	MT	979943.61	980655.91	0.85	6.92	-302.53	-1.38	121.35	-174.79	-150.39
BQ388	45	25.44	-111	29.40	7660.0	MT	980026.51	980657.42	1.83	5.23	-261.26	-1.49	89.08	-166.61	-145.55
BQ389	45	25.87	-111	28.44	7270.0	MT	980060.32	980658.07	2.49	4.97	-247.96	-1.51	85.60	-156.40	-136.46
BQ390	45	26.47	-111	27.40	6900.0	MT	980075.94	980658.98	2.26	4.25	-235.34	-1.52	65.55	-164.79	-145.81
BQ391	45	27.53	-111	34.59	7480.0	MT	980041.61	980660.58	0.52	4.09	-255.12	-1.50	84.11	-167.90	-147.13
BQ392	45	28.40	-111	34.78	7400.0	MT	980051.41	980661.89	0.40	3.97	-252.39	-1.51	85.08	-164.45	-143.89
BQ393	45	28.18	-111	34.19	7440.0	MT	980049.86	980661.55	0.05	3.57	-253.76	-1.50	87.63	-164.01	-143.28
BQ394	45	29.53	-111	34.90	7900.0	MT	980023.10	980663.59	0.43	7.94	-269.45	-1.48	102.04	-160.51	-138.87
BQ395	45	28.92	-111	33.54	7684.0	MT	980037.33	980662.67	1.21	4.56	-262.08	-1.49	96.90	-160.90	-139.66
BQ396	45	29.53	-111	31.22	7100.0	MT	980080.23	980663.59	0.23	2.79	-242.16	-1.51	84.01	-156.64	-136.81
BQ397	45	25.87	-111	33.18	8600.0	MT	979970.51	980658.07	0.96	8.22	-293.32	-1.41	120.73	-164.82	-141.29
BQ398	45	25.85	-111	31.54	8560.0	MT	979973.64	980658.04	0.75	6.43	-291.96	-1.42	120.14	-166.06	-142.47
BQ399	45	26.63	-111	31.29	8451.0	MT	979980.53	980659.22	1.07	6.63	-288.24	-1.43	115.61	-166.36	-143.12
BQ400	45	26.56	-111	33.80	8201.0	MT	979996.49	980659.12	0.74	6.71	-279.71	-1.45	108.19	-165.53	-142.97
BQ401	45	18.20	-111	20.57	7320.0	MT	980005.41	980646.50	2.53	6.39	-249.66	-1.51	46.96	-195.29	-175.33
BQ402	45	20.26	-111	21.72	8760.0	MT	979930.35	980649.61	2.65	5.41	-298.78	-1.39	104.07	-188.04	-163.98

## BOUGUER GRAVITY DATA

Madison and Gallatin Ranges, Montana

Meter ID:

STATION ID	LATITUDE		C A T I O N S ELEV (in ft)	ST	G R A V I T Y		C O R R E C T I O N S		A N O M A L I E S				
	deg	min			OBSERVED	THEORETICAL	T E R R A I N a-f	C U R V g-x	F R E E A I R	C O M P L E T E - B O U G U E R d1=2.67 d2=2.45			
BQ403	45 21.16	-111 22.75	9280.0	MT	979903.50	980650.97	3.61	6.43	-316.51	-1.32	124.69	-183.09	-157.73
BQ404	45 21.65	-111 22.83	9520.0	MT	979892.93	980651.71	1.25	7.75	-324.70	-1.27	135.92	-181.05	-154.93
BQ405	45 22.25	-111 22.55	9180.0	MT	979915.30	980652.61	2.79	7.15	-313.10	-1.33	125.46	-179.04	-153.95
BQ407	45 20.19	-111 21.95	8620.0	MT	979944.08	980649.51	2.09	5.61	-294.00	-1.41	104.74	-182.97	-159.26
BQ408	45 19.37	-111 22.11	7960.0	MT	979979.89	980648.27	2.98	5.65	-271.49	-1.47	79.80	-184.53	-162.75
BQ409	45 18.45	-111 20.84	7400.0	MT	980002.60	980646.88	3.00	6.50	-252.39	-1.51	51.29	-193.11	-172.97
BQ410	45 17.40	-111 20.05	7090.0	MT	980021.69	980645.30	1.44	5.20	-241.82	-1.51	42.84	-193.86	-174.35
BQ411	45 8.78	-111 36.96	5682.0	MT	980078.10	980632.29	0.01	2.12	-193.80	-1.48	-20.04	-213.18	-197.26
BQ412	45 9.57	-111 36.98	5708.0	MT	980080.82	980633.48	0.01	2.09	-194.68	-1.48	-16.07	-210.13	-194.14
BQ413	45 9.59	-111 38.05	5605.0	MT	980080.68	980633.52	0.01	1.79	-191.17	-1.47	-25.92	-216.76	-201.04
BQ414	45 18.01	-111 41.44	5119.0	MT	980132.25	980646.22	0.22	1.42	-174.59	-1.42	-32.73	-207.10	-192.74
BQ415	45 17.95	-111 39.44	5405.0	MT	980114.16	980646.13	0.04	1.71	-184.35	-1.45	-23.85	-207.90	-192.74
BQ416	45 17.97	-111 38.22	5629.0	MT	980101.26	980646.16	0.03	2.13	-191.99	-1.47	-15.73	-207.03	-191.27
BQ417	45 18.17	-111 34.69	6280.0	MT	980074.33	980646.46	1.92	5.99	-214.19	-1.51	18.21	-189.58	-172.46
BQ418	45 17.64	-111 34.28	6610.0	MT	980051.97	980645.66	2.41	6.24	-225.45	-1.52	27.66	-190.65	-172.67
BQ419	45 18.16	-111 36.37	5969.0	MT	980088.78	980646.45	0.17	3.61	-203.59	-1.49	3.45	-197.85	-181.26
BQ420	45 20.07	-111 42.04	4967.0	MT	980152.64	980649.32	0.03	1.39	-169.41	-1.41	-29.72	-199.12	-185.16
BQ421	45 19.87	-111 41.29	5045.0	MT	980142.89	980649.02	0.01	1.41	-172.07	-1.42	-31.84	-203.91	-189.73
BQ422	45 20.96	-111 41.31	4936.0	MT	980154.04	980650.66	0.11	1.53	-168.35	-1.40	-32.58	-200.70	-186.84
BQ423	45 26.52	-111 19.85	8272.0	MT	979973.29	980659.05	4.29	10.14	-282.13	-1.45	91.72	-177.43	-155.26
BQ424	45 28.09	-111 27.25	7157.0	MT	980063.32	980661.42	1.04	2.87	-244.10	-1.51	74.64	-167.07	-147.16
BQ425	45 28.33	-111 30.72	7190.0	MT	980065.96	980661.78	1.33	3.09	-245.23	-1.51	80.02	-162.31	-142.34
BQ426	45 27.91	-111 32.25	7301.0	MT	980058.04	980661.15	0.34	3.13	-249.02	-1.51	83.16	-163.90	-143.54
BQ427	45 28.61	-111 37.41	6021.0	MT	980127.07	980662.20	4.34	3.58	-205.36	-1.50	30.87	-168.07	-151.68
BQ428	45 29.50	-111 37.43	6100.0	MT	980123.93	980663.55	4.45	3.61	-208.05	-1.50	33.81	-167.69	-151.08
BQ429	45 27.52	-111 35.77	7662.0	MT	980024.76	980660.56	2.51	7.51	-261.33	-1.49	84.38	-168.43	-147.60
BQ430	45 25.35	-111 37.04	5581.0	MT	980138.26	980657.29	0.85	5.35	-190.35	-1.47	5.63	-179.99	-164.70
BQ431	45 25.18	-111 35.79	7106.0	MT	980044.85	980657.03	6.13	7.54	-242.37	-1.51	55.77	-174.44	-155.47
BQ432	45 25.81	-111 34.50	8590.0	MT	979961.51	980657.98	3.11	12.41	-292.98	-1.41	110.88	-168.00	-145.02
BQ433	45 24.46	-111 31.22	9770.0	MT	979885.17	980655.95	3.32	16.95	-333.23	-1.23	147.41	-166.78	-140.89
BQ434	45 23.28	-111 29.13	10175.0	MT	979844.00	980654.16	8.63	23.90	-347.04	-1.14	146.05	-169.60	-143.59
BQ435	45 19.26	-111 30.71	8057.0	MT	979965.19	980648.10	5.01	7.44	-274.80	-1.47	74.37	-189.44	-167.70
BQ436	45 18.76	-111 32.72	7882.0	MT	979977.78	980647.35	2.07	6.25	-268.83	-1.48	71.28	-190.71	-169.12
BQ437	45 17.90	-111 31.37	10304.0	MT	979791.53	980646.05	15.32	33.32	-351.44	-1.11	113.82	-190.10	-165.06
BQ438	45 18.14	-111 29.28	7030.0	MT	980027.65	980646.41	1.53	5.81	-239.77	-1.52	42.04	-191.91	-172.63
BQ439	45 15.67	-111 22.33	7380.0	MT	980003.14	980642.69	0.36	2.66	-251.71	-1.51	54.14	-196.05	-175.44
BQ440	45 16.42	-111 23.64	8728.0	MT	979918.74	980643.82	2.77	7.39	-297.69	-1.40	95.24	-193.68	-169.88
BQ441	45 27.14	-111 15.23	6110.0	MT	980108.28	980659.99	1.71	3.85	-208.39	-1.50	22.65	-181.68	-164.85
BQ442	45 26.78	-111 17.59	7850.0	MT	980004.43	980659.45	0.69	6.57	-267.74	-1.48	82.83	-179.14	-157.55
BQ443	45 25.84	-111 18.18	8910.0	MT	979932.53	980658.03	4.72	12.92	-303.89	-1.37	111.91	-175.72	-152.02
BQ444	45 24.89	-111 18.64	8990.0	MT	979929.11	980656.59	1.22	11.06	-306.62	-1.36	117.44	-178.26	-153.90
BQ445	45 24.86	-111 19.32	9563.0	MT	979883.43	980656.55	6.69	17.66	-326.17	-1.27	125.62	-177.46	-152.49
BQ446	45 24.46	-111 20.00	9395.0	MT	979898.25	980655.95	6.44	12.83	-320.44	-1.30	125.27	-177.19	-152.27
BQ447	45 24.27	-111 20.97	9715.0	MT	979876.40	980655.66	6.01	15.45	-331.35	-1.24	133.76	-177.37	-151.73
BQ448	45 23.53	-111 21.25	10180.0	MT	979843.44	980654.55	6.15	19.10	-347.21	-1.14	145.58	-177.53	-150.90
BQ449	45 23.11	-111 20.28	8350.0	MT	979968.12	980653.91	1.92	6.27	-284.79	-1.44	99.02	-179.02	-156.11
BQ450	45 24.07	-111 19.47	7580.0	MT	980006.87	980655.36	4.70	7.95	-258.53	-1.50	63.99	-183.39	-163.01
BQ451	45 23.89	-111 17.62	6580.0	MT	980072.24	980655.09	2.51	11.07	-224.42	-1.52	35.68	-176.68	-159.18
BQ452	45 22.06	-111 41.64	4893.0	MT	980163.55	980652.33	0.17	1.49	-166.89	-1.40	-28.78	-195.40	-181.67
BQ453	45 22.95	-111 41.01	4890.0	MT	980165.05	980653.67	0.08	1.62	-166.78	-1.40	-28.90	-195.39	-181.67

## BOUGUER GRAVITY DATA

Madison and Gallatin Ranges, Montana

**Meter ID:**

STATION ID	L O C A T I O N S		ELEV (in ft)	ST	G R A V I T Y		T E R R A I N a-f	C O R R E C T I O N S		A N O M A L I E S			
	LATITUDE deg	LONGITUDE min			OBSERVED	THEORETICAL		CURV	FREE AIR	COMPLETE-BOUGUER			
B0454	45 23.94	-111 40.54	4840.0	MT	980169.28	980655.16	0.31	1.90	-165.08	-1.39	-30.86	-195.12	-181.59
B0455	45 23.60	-111 39.50	5018.0	MT	980154.32	980654.65	0.03	1.94	-171.15	-1.41	-28.58	-199.17	-185.11
B0456	45 24.99	-111 40.17	4820.0	MT	980170.85	980656.74	0.28	2.20	-164.40	-1.39	-32.75	-196.05	-182.60
B0457	45 25.68	-111 39.11	4830.0	MT	980178.57	980657.79	0.38	3.40	-164.74	-1.39	-25.14	-187.48	-174.11
B0458	45 27.04	-111 39.38	4820.0	MT	980189.46	980659.84	0.79	3.66	-164.40	-1.39	-17.23	-178.57	-165.27
B0459	45 28.19	-111 38.23	4820.0	MT	980191.04	980661.57	3.56	7.18	-164.40	-1.39	-17.39	-172.43	-159.66
B0460	45 26.90	-111 41.41	4824.0	MT	980181.18	980659.63	0.12	1.91	-164.53	-1.39	-24.93	-188.82	-175.32
B0461	44 57.35	-111 32.43	6980.0	MT	979974.79	980615.05	0.32	5.64	-238.07	-1.52	15.86	-217.77	-198.52
B0462	44 58.10	-111 32.09	7640.0	MT	979935.46	980616.18	1.18	6.13	-260.58	-1.49	37.40	-217.36	-196.37
B0463	45 21.38	-111 41.32	4913.0	MT	980158.07	980651.30	0.17	1.55	-167.57	-1.40	-31.34	-198.59	-184.81
B0464	45 20.97	-111 39.48	5240.0	MT	980131.50	980650.68	0.05	1.54	-178.72	-1.44	-26.57	-205.13	-190.42
B0465	45 20.99	-111 37.61	5372.0	MT	980125.89	980650.71	0.02	2.14	-183.22	-1.45	-19.80	-202.32	-187.28
B0466	45 20.99	-111 35.76	5528.0	MT	980125.98	980650.71	0.04	3.76	-188.54	-1.46	-5.06	-191.26	-175.92
B0467	45 20.10	-111 35.75	5623.0	MT	980115.22	980649.37	0.07	3.80	-191.78	-1.47	-5.54	-194.93	-179.32
B0468	45 19.43	-111 35.04	5930.0	MT	980098.03	980648.36	1.52	5.82	-202.26	-1.49	7.13	-189.28	-173.10
B0469	45 20.85	-111 31.74	5860.0	MT	980108.43	980650.50	1.50	6.59	-199.87	-1.49	8.80	-184.46	-168.54
B0470	45 21.80	-111 31.10	6862.0	MT	980052.57	980651.94	0.43	4.45	-234.04	-1.52	45.66	-185.02	-166.02
B0471	45 21.18	-111 32.84	5751.0	MT	980115.35	980651.00	0.84	6.96	-196.15	-1.48	4.98	-184.85	-169.21
B0472	45 21.32	-111 34.17	5590.0	MT	980121.65	980651.21	4.90	7.69	-190.66	-1.47	-4.06	-183.60	-168.80
B0473	45 21.66	-111 35.76	5411.0	MT	980137.03	980651.72	1.18	5.11	-184.55	-1.45	-6.00	-185.72	-170.91
B0474	45 22.20	-111 37.03	5241.0	MT	980143.57	980652.54	0.20	3.34	-178.76	-1.44	-16.26	-192.91	-178.36
B0475	45 23.09	-111 37.19	5300.0	MT	980138.60	980653.88	0.25	3.23	-180.77	-1.44	-17.03	-195.76	-181.03
B0476	45 22.73	-111 38.26	5115.0	MT	980146.32	980653.34	0.14	2.44	-174.46	-1.42	-26.15	-199.45	-185.17
B0477	45 22.74	-111 39.51	5005.0	MT	980153.57	980653.35	0.25	1.92	-170.71	-1.41	-29.25	-199.20	-185.20
B0478	45 26.68	-111 43.81	4905.0	MT	980168.10	980659.30	0.09	1.43	-167.30	-1.40	-30.07	-197.24	-183.47
B0479	45 27.55	-111 43.78	4909.0	MT	980169.44	980660.61	0.26	1.53	-167.43	-1.40	-29.67	-196.71	-182.94
B0480	45 29.05	-111 42.25	5376.0	MT	980155.10	980662.87	0.14	1.12	-183.36	-1.45	-2.37	-185.92	-170.80
AQ002	44 52.59	-111 9.47	8395.0	MT	979908.44	980607.87	1.12	2.22	-286.33	-1.43	89.62	-194.81	-171.37
AQ003	44 52.09	-111 7.34	7580.0	MT	979966.16	980607.12	0.38	1.96	-258.53	-1.50	71.53	-186.16	-164.93
AQ004	44 52.95	-111 8.00	7918.0	MT	979945.03	980608.41	0.27	2.13	-270.06	-1.48	80.86	-188.28	-166.10
AQ005	44 53.77	-111 7.46	8400.0	MT	979918.82	980609.65	1.64	2.32	-286.50	-1.43	98.69	-185.28	-161.89
AQ006	44 51.88	-111 9.10	8160.0	MT	979926.64	980606.80	1.57	1.98	-278.31	-1.46	86.82	-189.40	-166.64
AQ007	44 51.07	-111 9.07	7840.0	MT	979946.69	980605.58	0.87	1.85	-267.40	-1.48	78.02	-188.14	-166.21
AQ008	44 50.31	-111 8.76	7660.0	MT	979948.66	980604.43	0.69	1.66	-261.26	-1.49	64.23	-196.17	-174.72
AQ009	44 49.61	-111 7.19	7540.0	MT	979956.14	980603.38	1.44	1.50	-257.17	-1.50	61.50	-194.23	-173.16
AQ010	44 48.81	-111 7.90	7015.0	MT	979977.74	980602.17	0.74	1.51	-239.26	-1.52	34.98	-203.55	-183.90
AQ011	44 50.21	-111 12.16	7030.0	MT	979990.07	980604.28	1.92	4.54	-239.77	-1.52	46.60	-188.22	-168.87
AQ012	44 49.42	-111 13.59	8721.0	MT	979877.85	980603.09	4.08	10.68	-297.45	-1.40	94.44	-189.65	-166.24
AQ013	44 50.85	-111 13.15	7395.0	MT	979969.96	980605.24	2.39	4.56	-252.22	-1.51	59.83	-186.95	-166.62
AQ014	44 51.17	-111 11.74	7590.0	MT	979956.46	980605.73	1.72	3.53	-258.87	-1.50	64.16	-190.96	-169.94
AQ015	44 52.13	-111 11.24	8605.0	MT	979897.68	980607.18	0.70	2.89	-293.49	-1.41	99.27	-192.04	-168.04
AQ016	44 52.90	-111 11.01	9070.0	MT	979869.92	980608.34	0.39	4.10	-309.35	-1.35	114.04	-192.17	-166.94
AQ017	44 53.38	-111 11.66	8704.0	MT	979892.33	980609.06	0.59	2.75	-296.87	-1.40	101.34	-193.59	-169.29
AQ018	44 53.59	-111 12.57	8475.0	MT	979905.99	980609.38	0.21	2.59	-289.06	-1.42	93.18	-194.50	-170.80
AQ019	44 49.55	-111 11.82	6820.0	MT	979998.85	980603.28	3.03	4.71	-232.61	-1.52	36.66	-189.73	-171.08
AQ020	44 55.64	-111 21.54	7170.0	MT	979976.15	980612.47	0.33	5.65	-244.55	-1.51	37.65	-202.43	-182.65
AQ021	44 56.36	-111 21.37	7600.0	MT	979955.62	980613.55	0.46	3.54	-259.21	-1.50	56.43	-200.28	-179.13
AQ022	44 56.44	-111 21.28	7670.0	MT	979951.98	980613.68	0.40	3.37	-261.60	-1.49	59.24	-200.09	-178.72
AQ023	44 56.94	-111 21.40	7850.0	MT	979937.42	980614.43	0.66	3.09	-267.74	-1.48	60.84	-204.63	-182.76
AQ024	44 57.67	-111 21.65	8060.0	MT	979926.64	980615.53	1.20	3.04	-274.90	-1.46	68.69	-203.44	-181.02

Madison and Gallatin Ranges, Montana

Meter ID:

STATION

BOUGUER GRAVITY DATA

table page 11

STATION ID	LATITUDE deg	LONGITUDE deg	ALTITUDE min	ELEVATION (in ft)	STATION	GRAVITY OBSERVED	GRAVITY THEORETICAL	TEMPERATURE a-f	CORRECTION g-x	BOUGUER	CURVATURE	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45
AQ025	44 58.89	-111 22.15	8560.0	MT	979894.36	980617.38	1.97	2.57	-291.96	-1.42	81.53	-207.30	-183.50
AQ026	44 58.74	-111 21.47	8950.0	MT	979874.96	980617.15	1.86	3.13	-305.26	-1.37	98.99	-202.65	-177.79
AQ027	44 59.36	-111 20.28	8360.0	MT	979906.85	980618.09	0.60	2.72	-285.14	-1.44	74.52	-208.73	-185.39
AQ028	44 58.26	-111 21.05	9120.0	MT	979854.17	980616.42	4.08	4.42	-311.06	-1.34	94.89	-209.00	-183.96
AQ029	44 57.20	-111 19.34	9270.0	MT	979855.39	980614.83	1.89	5.07	-316.17	-1.32	111.80	-198.73	-173.15
AQ030	44 56.52	-111 19.41	8920.0	MT	979876.32	980613.80	0.90	4.05	-304.24	-1.37	100.88	-199.77	-175.00
AQ031	44 55.80	-111 19.05	8240.0	MT	979916.82	980612.71	0.67	2.50	-281.04	-1.45	78.60	-200.73	-177.71
AQ032	44 55.42	-111 18.86	8140.0	MT	979931.85	980612.14	0.70	2.42	-277.63	-1.46	84.80	-191.17	-168.43
AQ033	44 55.10	-111 18.67	8000.0	MT	979933.98	980611.66	0.49	2.36	-272.86	-1.47	74.26	-197.21	-174.85
AQ034	44 54.62	-111 18.80	8015.0	MT	979938.53	980610.93	1.87	2.57	-273.37	-1.47	80.95	-189.44	-167.16
AQ035	44 54.33	-111 19.54	7330.0	MT	979971.75	980610.49	0.83	3.57	-250.01	-1.51	50.26	-196.86	-176.49
AQ036	44 54.77	-111 20.21	7550.0	MT	979954.90	980611.16	0.81	2.92	-257.51	-1.50	53.41	-201.87	-180.83
AQ037	44 54.75	-111 21.56	6920.0	MT	979987.64	980611.13	0.67	7.23	-236.02	-1.52	27.00	-202.64	-183.72
AQ038	44 53.53	-111 21.25	6630.0	MT	980006.04	980609.29	2.75	9.63	-226.13	-1.52	19.98	-195.28	-177.55
AQ039	44 52.03	-111 21.68	6560.0	MT	980012.96	980607.02	0.11	6.70	-223.74	-1.52	22.59	-195.85	-177.85
AQ040	44 53.13	-111 19.60	6830.0	MT	979995.03	980608.69	3.80	5.87	-232.95	-1.52	28.37	-196.43	-177.91
AQ041	44 53.79	-111 19.07	6950.0	MT	979993.21	980609.68	1.13	5.21	-237.04	-1.52	36.83	-195.39	-176.26
AQ042	44 54.16	-111 17.41	7190.0	MT	979986.58	980610.24	1.13	4.65	-245.23	-1.51	52.18	-188.78	-168.92
AQ043	44 54.76	-111 16.97	7820.0	MT	979954.41	980611.14	1.12	2.89	-266.72	-1.48	78.30	-185.89	-164.12
AQ044	44 54.24	-111 15.84	7590.0	MT	979963.07	980610.36	0.61	3.53	-258.87	-1.50	66.14	-190.09	-168.98
AQ045	44 53.75	-111 15.54	7770.0	MT	979945.65	980609.62	1.04	2.66	-265.01	-1.49	66.37	-196.43	-174.78
AQ046	44 48.41	-111 5.79	6733.0	MT	979996.92	980601.56	0.53	1.31	-229.64	-1.52	28.27	-201.05	-182.15
AQ047	44 52.53	-111 2.77	7047.0	WY	980000.29	980607.78	1.07	2.06	-240.35	-1.51	54.92	-183.82	-164.15
AQ048	44 53.67	-111 3.09	7217.0	WY	979995.62	980609.50	0.16	1.87	-246.15	-1.51	64.50	-181.13	-160.89
AQ049	44 55.71	-111 3.16	7200.0	WY	979998.62	980612.58	0.71	2.03	-245.57	-1.51	62.82	-181.52	-161.38
AQ050	44 57.52	-111 4.00	7092.0	MT	980006.28	980615.30	0.48	3.35	-241.89	-1.51	57.62	-181.96	-162.22
AQ051	44 58.27	-111 4.67	7020.0	MT	980009.16	980616.44	2.02	5.48	-239.43	-1.52	52.59	-180.85	-161.62
AQ052	44 59.56	-111 4.77	6960.0	MT	980014.89	980618.38	0.69	5.07	-237.39	-1.52	50.74	-182.40	-163.19
AQ053	44 51.15	-111 3.76	6890.0	MT	980000.72	980605.70	1.92	2.52	-235.00	-1.52	42.69	-189.39	-170.27
AQ054	44 47.49	-111 8.33	6588.0	MT	979992.73	980600.18	0.00	1.18	-224.70	-1.52	11.84	-213.20	-194.66
AQ055	44 48.22	-111 10.28	6603.0	MT	980002.24	980601.28	0.84	2.81	-225.21	-1.52	21.66	-201.42	-183.04
AQ056	44 48.22	-111 11.74	6608.0	MT	980003.78	980601.28	0.06	2.23	-225.38	-1.52	23.67	-200.94	-182.43
AQ057	44 48.08	-111 14.08	6582.0	MT	980014.03	980601.07	0.21	2.19	-224.49	-1.52	31.69	-191.92	-173.50
AQ058	44 48.83	-111 15.31	6570.0	MT	980008.53	980602.20	0.13	3.08	-224.08	-1.52	23.93	-198.46	-180.13
AQ059	44 49.56	-111 16.14	6589.0	MT	980008.15	980603.30	0.28	4.13	-224.73	-1.52	24.23	-197.60	-179.33
AQ060	44 50.48	-111 17.86	6552.0	MT	980009.71	980604.69	0.50	4.46	-223.47	-1.51	20.93	-199.10	-180.97
AQ061	44 51.88	-111 19.99	6570.0	MT	980011.87	980606.80	1.06	5.91	-224.08	-1.52	22.67	-195.96	-177.95
AQ100	44 58.67	-111 23.86	9345.0	MT	979842.60	980617.04	2.55	5.03	-318.73	-1.30	103.84	-208.62	-182.87
AQ101	44 59.17	-111 25.81	9380.0	MT	979844.75	980617.80	0.38	5.35	-319.92	-1.30	108.52	-206.98	-180.98
AQ102	45 0.37	-111 27.49	9420.0	MT	979842.74	980619.61	2.79	5.65	-321.29	-1.29	108.45	-205.69	-179.80
AQ103	45 0.59	-111 28.31	9760.0	MT	979828.42	980619.94	1.45	7.63	-332.89	-1.23	125.74	-199.30	-172.52
AQ104	45 0.94	-111 28.85	10040.0	MT	979804.69	980620.47	2.45	9.72	-342.44	-1.17	127.77	-203.67	-176.36
AQ105	44 59.19	-111 31.02	9760.0	MT	979808.11	980617.83	5.98	13.93	-332.89	-1.23	107.53	-206.67	-180.78
AQ106	44 57.07	-111 30.00	10120.0	MT	979773.67	980614.63	10.97	17.65	-345.16	-1.16	110.11	-207.59	-181.41
AQ107	44 56.84	-111 28.66	9700.0	MT	979821.30	980614.28	0.97	7.91	-330.84	-1.24	118.63	-204.57	-177.94
AQ108	44 55.62	-111 28.24	9640.0	MT	979821.66	980612.44	2.90	8.22	-328.79	-1.25	115.20	-203.72	-177.44
AQ109	44 55.01	-111 29.87	10039.0	MT	979776.50	980611.52	10.14	20.51	-342.40	-1.17	108.43	-204.49	-178.71
AQ110	44 53.30	-111 29.43	10100.0	MT	979768.58	980608.94	7.12	21.71	-344.48	-1.16	108.83	-207.99	-181.88
AQ111	44 51.45	-111 29.24	8220.0	MT	979890.86	980606.15	6.32	9.47	-280.36	-1.45	57.32	-208.70	-186.78
AQ112	44 51.24	-111 26.74	9970.0	MT	979781.53	980605.84	7.40	21.52	-340.05	-1.19	112.67	-199.64	-173.91

## BOUGUER GRAVITY DATA

Madison and Gallatin Ranges, Montana

Meter ID:

STATION ID	L O C LATITUDE deg min	A T I O N LONGITUDE deg min (in ft)	S T	G R A V I T Y OBSERVED	T H E O R E T I C A L	T E R R A I N a-f	C O R R E C T I O N S g-x	C U R V	A N FREE AIR	O M A L I E S COMPLETE-BOUGUER d1=2.67 d2=2.45	
AQ113	44 53.29	-111 27.67	9270.0	MT	979842.91	980608.93	1.01	6.80	105.21	-204.47	-178.95
AQ114	44 54.53	-111 26.94	10080.0	MT	979795.89	980610.80	1.74	9.43	132.40	-201.39	-173.89
AQ115	44 55.19	-111 24.54	10190.0	MT	979780.25	980611.79	7.17	15.03	126.10	-200.39	-173.49
AQ116	44 52.44	-111 18.47	8580.0	MT	979889.72	980607.64	5.33	6.78	88.50	-193.44	-170.21
AQ117	44 51.83	-111 17.09	8864.0	MT	979868.47	980606.73	7.25	8.67	94.84	-192.94	-169.23
AQ118	44 52.15	-111 14.05	9490.0	MT	979835.82	980607.20	5.27	9.84	120.51	-189.33	-163.80
AQ119	44 54.59	-111 12.01	10160.0	MT	979797.33	980610.89	6.53	12.71	141.26	-187.18	-160.12
AQ120	44 56.28	-111 11.59	10175.0	MT	979792.46	980613.44	9.63	12.68	135.25	-190.62	-163.77
AQ121	44 56.69	-111 8.21	9800.0	MT	979826.68	980614.05	4.46	10.32	133.64	-187.06	-160.63
AQ122	44 55.10	-111 6.34	8160.0	MT	979942.48	980611.66	0.59	2.03	97.79	-179.36	-156.52
AQ123	44 58.61	-111 10.27	10085.0	MT	979806.46	980616.95	3.77	12.99	137.28	-191.09	-164.03
AQ124	44 58.89	-111 18.58	9500.0	MT	979839.07	980617.38	3.09	7.11	114.53	-200.57	-174.60
AQ125	44 56.73	-111 17.37	8880.0	MT	979884.29	980614.12	0.59	2.73	104.77	-196.15	-171.36
AQ126	44 56.23	-111 15.76	9680.0	MT	979831.15	980613.36	3.11	8.20	127.53	-192.56	-166.19
AQ127	44 58.04	-111 12.21	8498.0	MT	979907.72	980616.09	2.29	2.46	90.35	-196.17	-172.56
AQ128	44 59.50	-111 12.87	8100.0	MT	979934.33	980618.30	0.78	1.98	77.37	-197.60	-174.95
AQ129	44 47.74	-111 16.52	6580.0	MT	980015.16	980600.55	0.22	2.22	33.14	-190.36	-171.95
AQ130	44 50.69	-111 19.29	6552.0	MT	980013.32	980605.01	3.32	6.12	24.22	-191.33	-173.57
AQ131	44 49.81	-111 19.33	6720.0	MT	980006.83	980603.68	2.91	5.36	34.84	-187.61	-169.28
AQ132	44 49.04	-111 17.64	6552.0	MT	980015.54	980602.52	0.48	3.29	28.93	-192.29	-174.06
AQ133	44 47.66	-111 17.97	6880.0	MT	980005.25	980600.44	0.24	2.90	51.54	-181.50	-162.30
AQ134	44 46.57	-111 16.53	6580.0	MT	980014.92	980598.79	0.82	2.95	34.67	-187.50	-169.19
AQ135	44 45.41	-111 16.37	6610.0	MT	980009.16	980597.04	0.53	3.24	33.47	-189.72	-171.33
AQ136	44 44.02	-111 13.84	6550.0	MT	980005.97	980594.95	0.23	1.33	26.74	-196.61	-178.21
AQ137	44 45.41	-111 9.77	6572.0	MT	980001.91	980597.04	0.02	0.61	22.65	-202.38	-183.84
AQ138	45 0.90	-111 7.47	7170.0	MT	979996.93	980620.41	2.06	5.07	50.49	-188.44	-168.75
AQ139	44 59.64	-111 9.34	8280.0	MT	979930.75	980618.51	4.38	3.96	90.48	-185.03	-162.33
AQ140	45 0.10	-111 7.94	7600.0	MT	979970.29	980619.20	2.65	4.84	65.46	-187.76	-166.90
AQ141	45 14.53	-111 31.75	10493.0	MT	979783.68	980640.97	12.62	23.78	128.79	-193.76	-167.18
AQ142	45 14.17	-111 30.90	9530.0	MT	979868.54	980640.42	1.35	9.33	123.76	-191.87	-165.86
AQ143	45 14.73	-111 31.17	8640.0	MT	979926.37	980641.27	3.22	7.51	97.16	-188.21	-164.69
AQ144	45 16.08	-111 30.60	7760.0	MT	979983.71	980643.30	2.02	5.33	69.80	-189.01	-167.69
AQ145	45 16.87	-111 30.43	7360.0	MT	980006.71	980644.50	0.98	5.73	54.02	-191.80	-171.55
AQ146	45 16.88	-111 30.92	7300.0	MT	980008.14	980644.52	1.99	6.56	49.80	-192.14	-172.21
AQ147	45 16.84	-111 32.69	6910.0	MT	980025.23	980644.45	4.50	9.89	30.31	-192.50	-174.14
AQ148	45 16.85	-111 31.89	7080.0	MT	980019.83	980644.47	3.57	9.03	40.87	-189.53	-170.54
AQ149	45 16.70	-111 26.99	11166.0	MT	979732.68	980644.24	15.13	39.59	137.71	-189.30	-162.35
AQ150	45 9.65	-111 28.61	10440.0	MT	979764.10	980633.61	9.52	25.59	111.60	-210.45	-183.92
AQ151	45 6.42	-111 26.01	9483.0	MT	979836.89	980628.73	3.77	10.17	99.39	-211.39	-185.78
AQ152	45 5.21	-111 25.56	9900.0	MT	979804.26	980626.91	5.37	13.68	107.75	-212.06	-185.71
AQ153	45 5.70	-111 27.56	8040.0	MT	979931.90	980627.65	0.25	3.95	59.95	-211.54	-189.17
AQ154	45 4.12	-111 29.32	9240.0	MT	979849.90	980625.27	3.55	7.23	93.05	-212.65	-187.46
AQ155	45 5.19	-111 30.41	10000.0	MT	979789.85	980626.88	7.00	20.11	102.77	-212.38	-186.41
AQ156	45 8.07	-111 31.77	8680.0	MT	979894.46	980631.22	2.90	9.85	79.05	-205.65	-182.19
AQ157	45 15.54	-111 32.73	9936.0	MT	979824.74	980642.49	7.12	20.67	116.02	-196.27	-170.54
AQ158	45 15.63	-111 35.24	8301.0	MT	979936.93	980642.63	4.89	11.23	74.51	-193.93	-171.81
AQ159	44 46.07	-111 20.95	9148.0	MT	979829.82	980598.04	3.51	6.98	91.56	-211.30	-186.34
AQ160	44 48.89	-111 22.90	9845.0	MT	979791.00	980602.29	9.85	18.77	113.95	-194.43	-169.02
AQ161	44 47.53	-111 21.89	9864.0	MT	979800.91	980600.23	9.64	15.21	127.70	-185.10	-159.32
AQ162	45 0.96	-111 25.23	10030.0	MT	979792.35	980620.50	7.64	11.46	114.46	-209.71	-183.00

## BOUGUER GRAVITY DATA

Madison and Gallatin Ranges, Montana

Meter ID:

STATION

ID

ID	LATITUDE		LONGITUDE		ELEV (in ft)	ST	OBSERVED	THEORETICAL	T E R R A I N a-f	BOUGUER	CURV	FREE AIR	COMPLETE-BOUGUER		
	deg	min	deg	min									d1=2.67	d2=2.45	
AQ163	45	2.21	-111	27.49	11286.0	MT	979702.60	980622.38	14.77	25.46	-384.93	-0.86	140.77	-204.79	-176.32
AQ164	45	3.38	-111	25.81	9582.0	MT	979833.04	980624.15	3.25	7.26	-326.81	-1.26	109.42	-208.14	-181.98
AQ165	45	2.77	-111	29.47	10880.0	MT	979730.96	980623.23	8.66	21.23	-371.09	-0.97	130.16	-212.00	-183.81
AQ166	45	2.00	-111	31.71	9890.0	MT	979796.14	980622.06	9.30	16.49	-337.32	-1.20	103.54	-209.20	-183.43
AQ167	45	2.47	-111	34.22	7710.0	MT	979936.67	980622.77	1.52	6.16	-262.97	-1.49	38.60	-218.18	-197.02
AQ168	45	12.03	-111	29.73	8820.0	MT	979892.96	980637.20	2.41	5.35	-300.82	-1.38	84.73	-209.72	-185.46
AQ169	45	11.32	-111	19.47	7480.0	MT	979983.90	980636.13	1.60	3.67	-255.12	-1.50	50.86	-200.49	-179.78
AQ170	45	2.80	-111	11.81	6790.0	MT	980014.40	980623.27	1.16	3.97	-231.59	-1.52	29.39	-198.59	-179.80
AQ172	45	0.30	-111	11.19	7900.0	MT	979965.30	980619.50	2.30	3.35	-269.45	-1.48	88.34	-176.93	-155.07
AQ173	45	1.07	-111	11.68	7600.0	MT	979974.78	980620.66	0.46	2.71	-259.21	-1.50	68.48	-189.06	-167.84
AQ174	45	1.51	-111	11.67	7400.0	MT	979979.71	980621.33	1.38	2.89	-252.39	-1.51	53.96	-195.67	-175.10
AQ175	45	2.23	-111	11.47	7160.0	MT	979994.50	980622.41	1.59	3.25	-244.21	-1.51	45.11	-195.77	-175.92
AQ176	44	58.47	-111	29.64	9320.0	MT	979845.94	980616.74	1.22	6.87	-317.88	-1.31	105.12	-205.97	-180.34
AQ177	44	58.11	-111	28.60	10020.0	MT	979797.79	980616.20	1.95	8.39	-341.75	-1.18	123.26	-209.33	-181.92
AQ178	44	58.81	-111	27.93	9040.0	MT	979861.15	980617.25	3.12	6.84	-308.33	-1.35	93.53	-206.19	-181.50
AQ179	44	59.77	-111	28.60	8640.0	MT	979882.78	980618.70	3.33	6.76	-294.69	-1.41	76.14	-209.86	-186.30
AQ180	45	0.31	-111	30.61	7600.0	MT	979940.16	980619.52	7.34	11.77	-259.21	-1.50	35.00	-206.60	-186.69
AQ181	45	0.65	-111	32.95	6920.0	MT	979975.15	980620.03	2.36	8.60	-236.02	-1.52	5.60	-220.98	-202.31
AQ182	45	0.30	-111	34.04	6740.0	MT	979991.78	980619.50	0.80	5.23	-229.88	-1.52	5.85	-219.52	-200.95
AQ183	45	25.98	-111	14.87	5740.0	MT	980124.15	980658.24	3.79	7.00	-195.77	-1.48	5.50	-180.96	-165.60
AQ184	45	24.97	-111	15.96	6060.0	MT	980098.03	980656.72	3.43	10.58	-206.69	-1.50	10.98	-183.20	-167.20
AQ186	45	22.24	-111	18.53	7230.0	MT	980022.53	980652.59	3.97	10.87	-246.59	-1.51	49.53	-183.73	-164.51
AQ187	45	21.58	-111	18.69	7600.0	MT	980011.96	980651.60	2.78	8.97	-259.21	-1.50	74.72	-174.24	-153.73
AQ188	45	21.35	-111	19.47	7900.0	MT	979989.14	980651.26	2.42	7.33	-269.45	-1.48	80.42	-180.75	-159.23
AQ189	45	21.00	-111	20.20	8450.0	MT	979952.40	980650.73	1.15	5.41	-288.21	-1.43	95.88	-187.20	-163.87



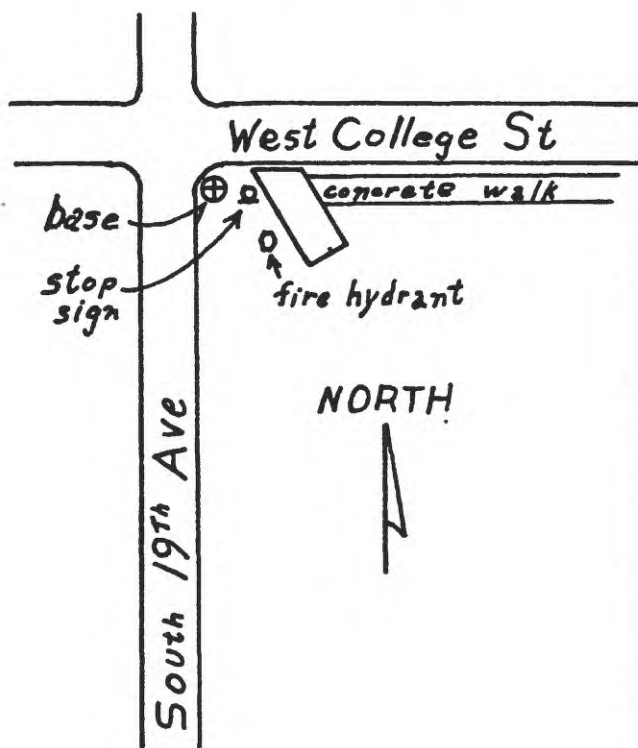
# Appendix A

## U.S. GEOLOGICAL SURVEY GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION BQOB1		OBSERVED GRAVITY 980,202.05 mgals
NEAREST TOWN Bozeman		LONGITUDE 111°03.70'		LATITUDE 45°40.26'
ELEVATION 1481.6 m 4861 ft		TOPOGRAPHIC MAP(S) Bozeman 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
8-16-81	Kaufmann & Hassemer	G-159	Butte	980,159.88 mgals

### DESCRIPTION/SKETCH

The station is read on the ground between the edge of the pavement and a stop sign at the southeast corner of the intersection of S. 19th Ave. and W. College St. in the southwestern part of Bozeman. No marker is present.



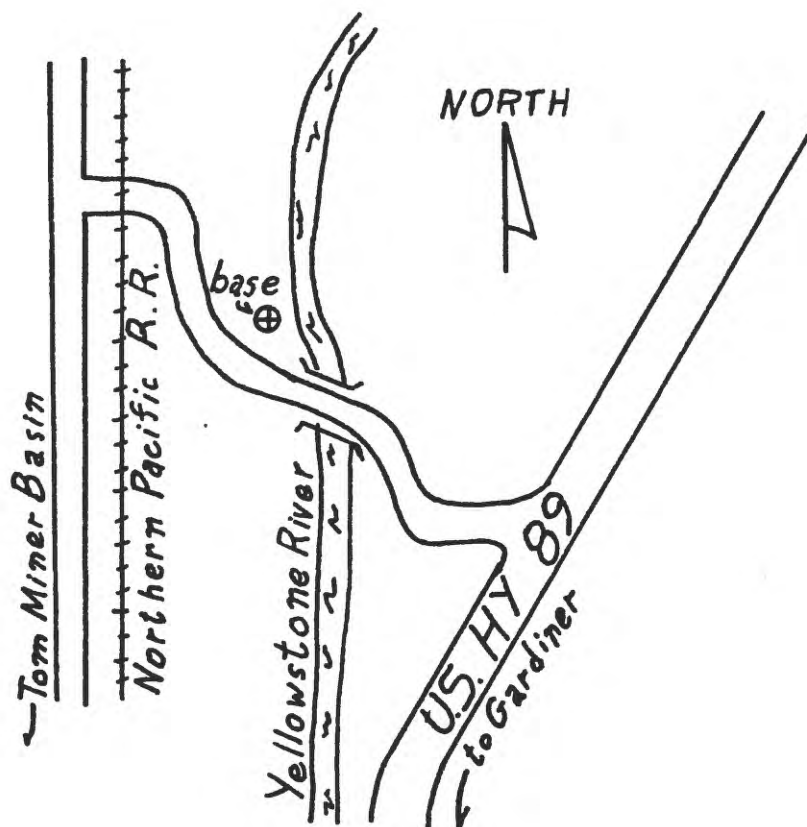
looking north

U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION BQOB2		OBSERVED GRAVITY 980,141.68 mgals
NEAREST TOWN Gardiner		LONGITUDE 110°54.11'		LATITUDE 45°12.31'
ELEVATION 1521.6 m 4992 ft		TOPOGRAPHIC MAP(S) Miner 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
9-15-79	Kaufmann & Hassemer	G-159	Butte	980,159.88 mgals

DESCRIPTION/SKETCH

Station is read on the ground at a section marker, sections 19, 20, 29, and 30, located about 50 feet off the road to Tom Miner Basin and on the west side of the Yellowstone River approximately 16 miles north of Gardiner.

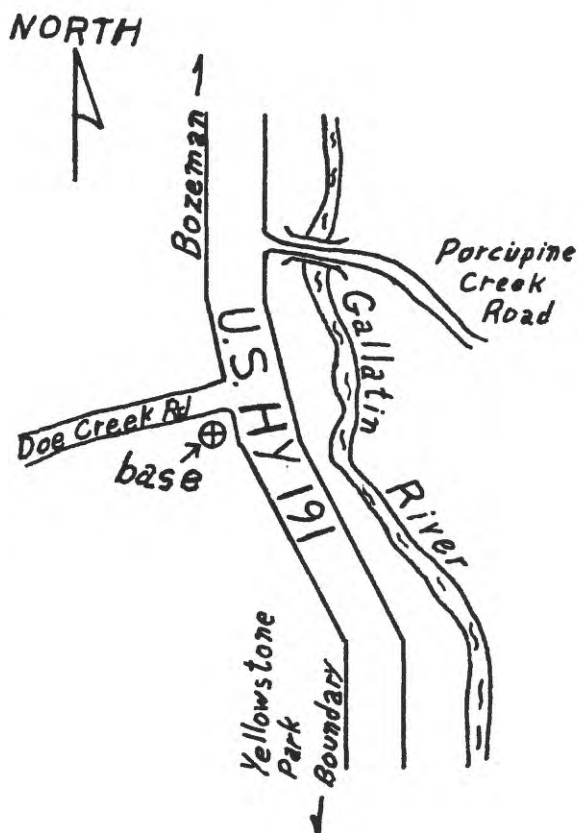


U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION BQ104		OBSERVED GRAVITY 980,061.28 mgals
NEAREST TOWN Bozeman		LONGITUDE 111°14.82'		LATITUDE 45°12.75'
ELEVATION 1870.2 m    6136 ft		TOPOGRAPHIC MAP(S) Crown Butte 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
7-29-80	Kaufmann	G-159	Bozeman (BQOB1)	980,202.05 mgals

DESCRIPTION/SKETCH

Base station is read on top of bench mark, elevation 6136 feet, located a few feet southwest of the intersection of Doe Creek road and U.S. highway 191, about 46 miles south of Bozeman and 13 miles north of Yellowstone National Park boundary.

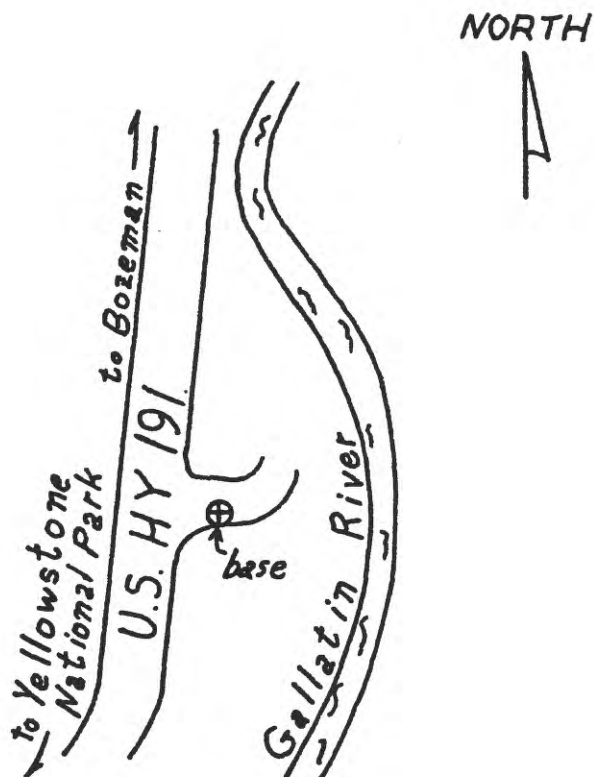


U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION BQ106		OBSERVED GRAVITY 980,049.64 mgals
NEAREST TOWN Bozeman		LONGITUDE 111°14.59'		LATITUDE 45°10.16'
ELEVATION 1907.4 m    6258 ft		TOPOGRAPHIC MAP(S) Crown Butte 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
7-29-80	Kaufmann	G-159	Bozeman	980,202.05 mgals

DESCRIPTION/SKETCH

Base station is read on the ground about ten feet east of and two feet below the pavement of U.S. highway 191 at an old entrance for the Red Cliff campground, about 10 miles north of the boundary for Yellowstone National Park. This entrance road is no longer in use and there is no marker for the base station.

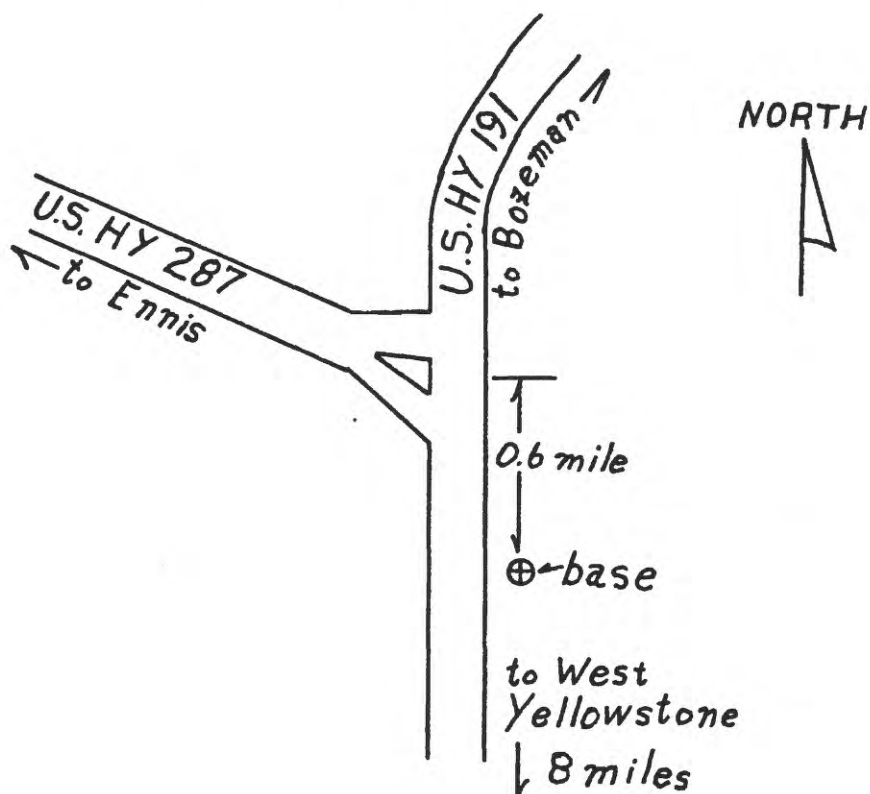


U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION AQOB1		OBSERVED GRAVITY 979,991.46 mgals
NEAREST TOWN West Yellowstone		LONGITUDE 111°06.74'		LATITUDE 44°46.40'
ELEVATION 2005.6 m    6580 ft		TOPOGRAPHIC MAP(S) Tepee Creek 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
8-16-81	Kaufmann	G-159	Butte	980,159.88 mgals

DESCRIPTION/SKETCH

Base station is read on top of USC&G bench mark 45E1, reset 1964 as 111 BPR, located about 50 feet east of U.S. highway 191 & 287 and 0.6 mile south of intersection of U.S. highways 191 & 287.

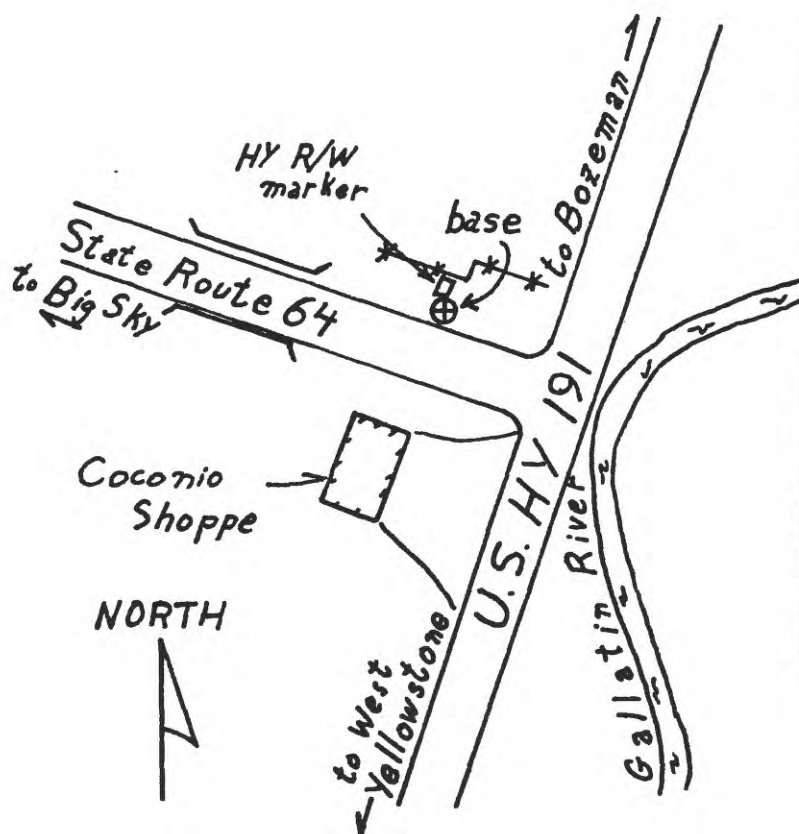


U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION Bigsky		OBSERVED GRAVITY 980,075.55 mgals
NEAREST TOWN Bozeman		LONGITUDE 111°15.24'		LATITUDE 45°16.00'
ELEVATION 1834.9 m 6020 ft		TOPOGRAPHIC MAP(S) Spanish Peaks 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
8-9-80	Hassemer	G-2	BQOB1	980,202.05 mgals
8-9-80	Kaufmann	G-159	BQOB1	980,202.05 mgals

DESCRIPTION/SKETCH

Base is read on the ground just south of a 4x4" concrete highway R/W (right of way) marker on the north side of Montana State route 64. The marker is west of U.S. highway 191 and approximately 100 feet east of a bridge.

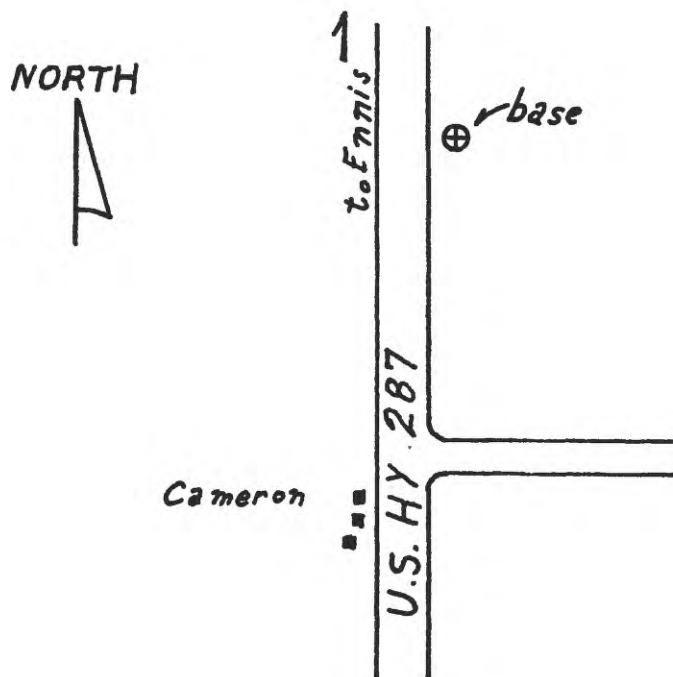


U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION Cameron		OBSERVED GRAVITY 980,100.65 mgals
NEAREST TOWN Ennis		LONGITUDE 111°40.70'		LATITUDE 45°12.85'
ELEVATION 1629.8 m 5347 ft		TOPOGRAPHIC MAP(S) Cameron 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
8-16-80	Hassemer	G-2	BQOB1	980,202.05 mgals
8-16-80	Kaufmann	G-159	Butte	980,159.88 mgals
8-21-81	Hassemer	G-2	Bigsby	980,075.55 mgals

DESCRIPTION/SKETCH

Station is read on the ground at the west side of USC&GS bench mark H139 located 0.75 miles north of Cameron on the east side of U.S. highway 287.





U.S. GEOLOGICAL SURVEY  
GRAVITY BASE STATION

STATE/COUNTRY Montana		STATION DESIGNATION Stagger		OBSERVED GRAVITY 980,022.49 mgals
NEAREST TOWN West Yellowstone		LONGITUDE 111°27.38'		LATITUDE 44°49.62'
ELEVATION 1888 m 6195 ft		TOPOGRAPHIC MAP(S) Hebgen Dam 15 min		
DATE	OBSERVER	METER	REFERENCE STATION	REFERENCE VALUE
9-20-81	Hassemer	G-2	Cameron	980,100.65 mgals
9-21-81	Hassemer	G-2	AQOB1	979,991.46 mgals
9-21-81	Hassemer	G-2	BQOB1	980,202.05 mgals

DESCRIPTION/SKETCH

Base is read on the ground at south side of a 4x4" concrete highway R/W (right of way) marker along the north side of U.S. highway 287. The marker is at a fence corner 1.6 miles east of the junction of State route 87 and U.S. 287.

