GL02204

MICROGEOPHYSICS CORPORATION

TUSCARORA, NEVADA

GRAVITY SURVEY

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1.0.0 INTRODUCTION

In August and September, 1979, MicroGeophysics Corporation performed a gravity survey in and around the Independence Valley just north of Tuscarora, Nevada (Figure 1.1). The gravity survey of 1 square mile station density has as elevation controls, USGS benchmarks, topographic elevations, and where neither existed, vertical control was achieved by barometric altimetry.

Gravity surveys are of particular importance when used as a tool to distinguish structure. The Tuscarora survey area is a complex intermixture of Basin and Range taphrogenic activity that has been partially inundated by basaltic flows and ash flow deposits. The data collected near Tuscarora indicates that the graben containing the Independence Valley is considerably larger than its surface manifestations. In addition to the extended valley structure obtained from the data an anomalous high occurred trending west-northwest through the Sulphur Hot Springs area.

LOCATION AND INDEX MAP

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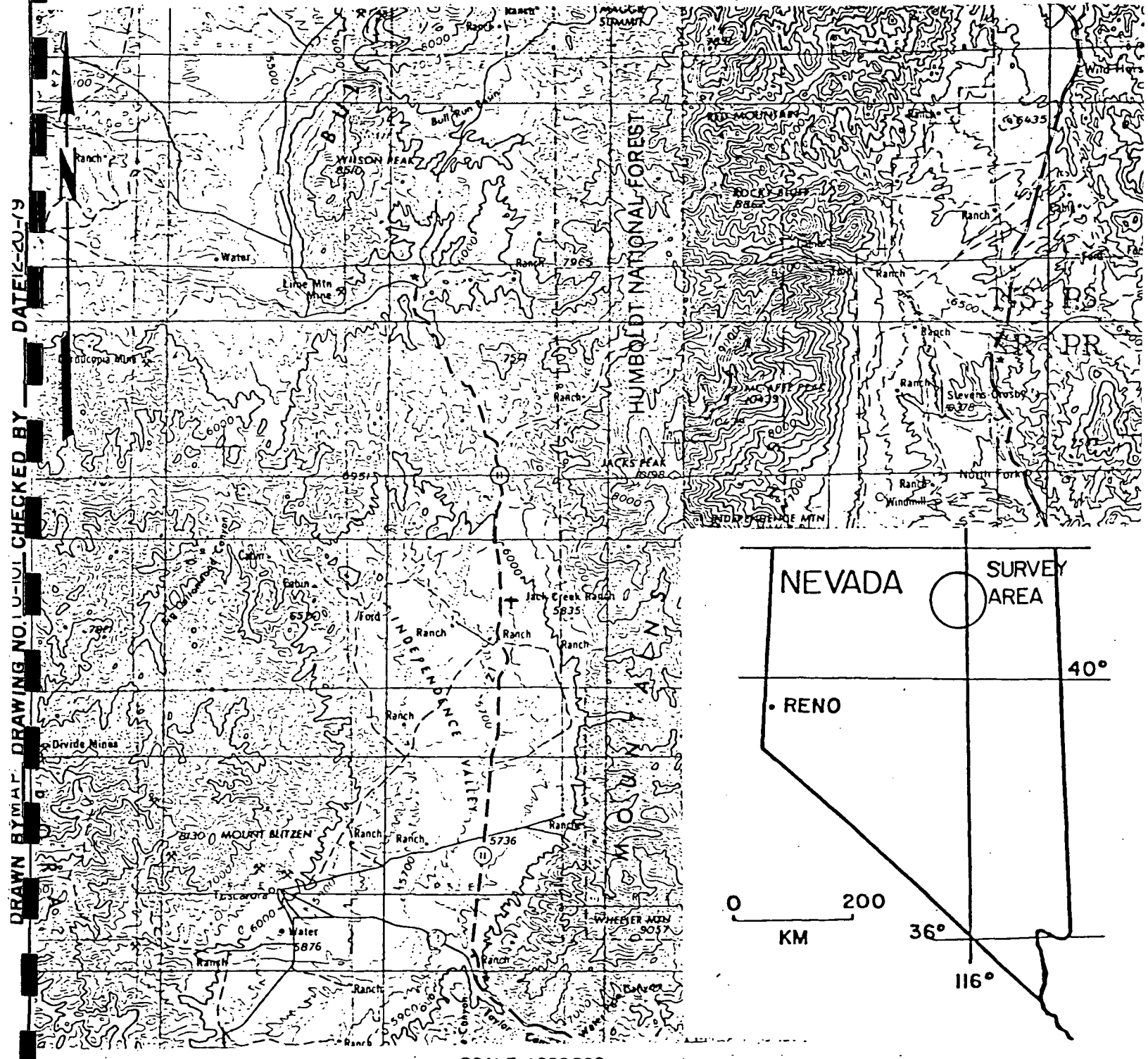

2.0.0 FIELD PROCEDURE AND INSTRUMENTATION

2.1.0 Gravimetry

The gravity measurements taken in the Tuscarora area were made with a LaCoste-Romberg Model G gravimeter number G-470. All readings were taken within a series of closed loops. Closure times for the loops were between 4 and 12 hours. With the uncertainty inherent from the type of vertical control used at Tuscarora, closure times short enough to eliminate earth-tides were not necessary.

Survey locations were chosen along roads at USGS spot elevation and benchmarks. Station spacings were approximately 1 per square mile. Where roads were not available the instrument was backpacked. Vertical control at these stations were USGS spot elevations.

Where spot elevations or benchmarks did not exist in sufficient density barometric leveling was used to achieve vertical control.

2.2.0 Altimetry

Altimetry at Tuscarora was performed using an American Paulins System Micro Surveying Altimeter model M-2 in conjunction with a Micro Surveying Barograph model SMB5.

In operation, the micro baragraph is placed at a suitable base station with a known elevation. This is selected on basis of spatial and vertical proximity to the area to be surveyed. The

micro surveying altimeter was set at the base value then transported to the desired stations in a cooler on ice. By keeping the altimeter at a constant temperature errors due to inexact thermal compensation are eliminated. In past surveys this thermal error has been found to be the largest error source.

The micro baragraph records variations in atmospheric pressure at the base station. This information was later used to correct for drift of the altimeter measurements around the loop. Loop closures were kept to a minimum. Generally closure times were under one and one-half hours except where backpacking of the instrument was necessary.

All altimeter stations along existing roads were performed in three parts. First the gravity readings were made. Then the altimetry was performed in two loops. Each station was enclosed to two identical loops run in opposite directions. This method required more time than taking altimetry measurement along with gravity readings, but minimized the time between altimeter base occupations.

Where backpacking to locations without vertical control the altimeter was carried along with the gravimeter. As with the road work, the altimeter was carried on ice. The drastic decrease in productivity inherent to backpacking limited the number of altimetry occupations to one per station.

3.0.0 INTERPRETATION

Observed gravity readings were made throughout the survey area by ties to the International Gravity Network, 1971, at Elko, Nevada. The free-air and Bouguer anomalies (Table 3.1) were calculated using the Geodetic Reference System, 1967. Exact determination of the Bouguer density was not made in this area. An assumed value of 2.67 g/cc was used for this survey area. Table 3.1 lists the observed and theoretical gravity, free-air and Bouguer anomalies (simple), latitude, longitude and elevation for each station. Table 3.2 lists the simple Bouguer anomaly, terrain corrections for the Hammer Zones D-M and the complete Bouguer anomaly. These values were used to generate the complete Bouguer anomaly map (Plate 1).

Plate 2 is a smoothed complete Bouguer anomaly map. The only difference is that several single point anomalies have been removed along with their effect on the neighboring contours. The contour interval has also been decreased from 5 mgal (Plate 1) to 2.5 mgal (Plate 2).

Several points of interest appear on Plate 2. Possibly the single most impressive feature is the Jack Creek fault on the eastern boundary of the Independence Valley. The Independence Valley appears to deepen to the north with maximum valley fill in the vicinity of the Spanish Ranch. To the west, a boundary fault parallel to Jack Creek fracture, defines the western valley margin. A fault system trending roughly N70W and superimposed

on the gravity high near Sulphur Hot Springs and the major east-west off-set on the Jack Creek fault bounds the valley to the north.

An extension of the Independence Valley lies to the north and west of the exposed valley. Surface rocks in this area are Snake River basalts that have inundated the valley. This valley is bound to the east by the Jack Creek fault and to the west by a parallel fault system. An east-west fault bounds the valley to the north. The deepest portion of the valley lies directly north of the Spanish Ranch (Plate 2).

Two gravity highs appear in the area. The most interesting one lies in the central portion of the map near Sulphur Hot Springs. This area approximates the locus of the west-northwest, east-southeast trending northern boundary fault for Independence Valley. A speculative explanation for this high could be either a basalt dike or shallow linear intrusive occurring along the fracture or a density increase from silification along the fracture, or, most likely, a combination of both.

A second gravity high is located to the north of Mt. Blitzen. This area is covered by an extensive layer of welded and non-welded silicic ash flow tuffs.

Comparison of the gravity from this study (Plate 2) and the P-wave delay depth to interface (Plate 5.3, Tuscarora Seismicity prepared for AMAX, 1978) shows a great similarity in gross

structure between the two methods. The Hypocenter map (Plate 4.1, Tuscarora Seismicity) showed activity during the 11 day monitoring period along the Jack Creek fault and the west-northwest, east-southeast trend to the north of Independence Valley.

4.0.0 CONCLUSIONS AND RECOMMENDATIONS

The gravity method as employed near Tuscarora, Nevada produced very good results as to the structure of the Independence Valley and its northern continuation. The gravity high near Sulphur Hot Springs is of importance owing to its proximity to the Hot Springs locations and the offset in the Jack Creek Fault.

Any further work in the Tuscarora area should be primarily centered around the Sulphur Hot Springs Gravity Anomaly. A much more precise definition of the structure and the relation it has to the Jack Creek Fault off-set could be achieved by a pseudo-grid spacing of approximately one station per half-mile over this structural area.

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
BC1	979750.18	980307.37	-6.36	-206.10	41.423	116.290	5858.0
BC1	979750.16	980307.37	-6.38	-206.11	41.423	116.290	5858.0
BC2	979776.43	980313.00	-23.99	-209.85	41.485	116.248	5451.0
BASE	979739.85	980309.37	-18.79	-218.49	41.446	116.101	5857.0
BC2	979776.45	980313.00	-23.97	-209.83	41.485	116.267	5451.0
BC2	979776.49	980313.00	-23.93	-209.79	41.485	116.248	5451.0
BC1	979750.12	980307.37	-6.42	-206.16	41.423	116.290	5858.0
BC2	979776.44	980313.00	-23.98	-209.84	41.485	116.248	5451.0
001	979670.85	980305.88	30.94	-210.56	41.406	116.294	7083.0
002	979659.15	980304.69	35.84	-211.26	41.393	116.260	7247.0
003	979755.54	980308.31	-8.43	-205.81	41.434	116.286	5789.0
003	979755.60	980308.31	-8.37	-205.75	41.434	116.286	5789.0
004	979761.31	980309.25	-9.99	-205.05	41.444	116.278	5721.0
004	979761.35	980309.25	-9.95	-205.01	41.444	116.278	5721.0
005	979765.43	980309.75	-12.10	-205.08	41.449	116.269	5660.0
005	979765.45	980309.75	-12.07	-205.06	41.449	116.269	5660.0
006	979769.34	980310.56	-17.74	-207.55	41.458	116.255	5567.0
006	979769.37	980310.56	-17.71	-207.52	41.458	116.255	5567.0
007	979772.50	980311.38	-19.72	-207.96	41.468	116.253	5521.0
007	979772.54	980311.38	-19.68	-207.92	41.468	116.253	5521.0
008	979776.40	980311.81	-20.67	-207.31	41.473	116.226	5474.0
009	979773.17	980310.75	-21.62	-208.71	41.460	116.221	5487.0
010	979770.94	980310.06	-21.56	-209.23	41.453	116.214	5504.0
011	979767.72	980308.81	-20.99	-209.58	41.439	116.188	5531.0
012	979752.34	980308.44	-17.39	-212.73	41.435	116.170	5729.0
012	979752.24	980308.44	-17.49	-212.82	41.435	116.170	5729.0
013	979675.39	980303.44	32.75	-206.88	41.379	116.238	7028.0
014	979661.39	980307.37	27.22	-216.91	41.423	116.268	7160.0
015	979691.85	980308.69	11.82	-216.15	41.437	116.242	6686.0
016	979674.19	980305.19	32.34	-208.21	41.399	116.248	7055.0
017	979702.09	980307.62	12.03	-211.91	41.426	116.226	6568.0
018	979697.66	980308.19	7.60	-216.55	41.432	116.212	6574.0
019	979713.44	980308.69	1.73	-214.74	41.438	116.215	6349.0
020	979709.84	980305.88	14.95	-206.60	41.407	116.216	6498.0
021	979692.03	980306.25	18.76	-210.77	41.411	116.231	6732.0
022	979666.14	980304.50	42.17	-204.62	41.390	116.243	7238.0
023	979741.70	980302.37	-22.90	-217.90	41.367	116.106	5719.0
024	979742.58	980303.69	-22.68	-217.91	41.381	116.101	5726.0
025	979743.32	980304.50	-19.94	-216.19	41.391	116.101	5756.0
026	979743.87	980305.50	-18.97	-215.74	41.403	116.101	5771.0

Table 3.1

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
027	979742.65	980307.19	-20.66	-217.87	41.421	116.103	5784.0
028	979739.36	980308.12	-20.75	-219.46	41.432	116.101	5828.0
029	979682.99	980303.06	32.45	-204.18	41.375	116.225	6940.0
030	979698.96	980305.06	17.57	-208.59	41.397	116.212	6633.0
031	979748.93	980302.62	-23.36	-215.66	41.370	116.152	5640.0
032	979752.34	980303.56	-21.06	-213.30	41.381	116.168	5638.0
033	979728.14	980304.00	-3.69	-211.16	41.385	116.183	6085.0
034	979755.00	980304.69	-23.30	-214.17	41.393	116.172	5598.0
035	979761.44	980306.00	-18.73	-209.39	41.407	116.179	5592.0
036	979735.74	980307.37	-6.33	-211.31	41.423	116.192	6012.0
037	979763.74	980307.19	-20.25	-209.96	41.420	116.179	5564.0
038	979738.02	980309.25	-7.33	-211.81	41.444	116.165	5997.0
039	979771.41	980319.50	-14.28	-207.84	41.559	116.205	5677.0
040	979761.88	980322.00	-6.47	-207.23	41.586	116.214	5888.0
041	979761.97	980321.62	-6.57	-207.12	41.583	116.214	5882.0
042	979790.50	980323.00	-15.60	-203.03	41.598	116.264	5497.0
043	979796.18	980323.37	-10.01	-197.54	41.602	116.274	5500.0
044	979766.52	980322.00	-16.03	-211.63	41.586	116.226	5737.0
045	979763.65	980320.56	-11.43	-209.23	41.570	116.213	5801.0
046	979707.12	980322.00	23.92	-207.73	41.586	116.183	6794.0
047	979781.36	980319.06	-12.81	-203.13	41.554	116.192	5582.0
048	979776.99	980319.50	-13.30	-205.19	41.559	116.173	5628.0
049	979775.40	980320.13	-13.07	-205.85	41.565	116.166	5654.0
050	979772.76	980318.56	-9.92	-204.23	41.549	116.147	5699.0
051	979777.02	980319.50	-26.05	-213.31	41.558	116.234	5492.0
052	979778.42	980320.25	-20.61	-209.60	41.566	116.251	5543.0
053	979787.18	980319.87	-15.98	-203.34	41.563	116.270	5495.0
054	979776.69	980321.06	3.26	-195.31	41.575	116.293	5824.0
055	979765.25	980319.19	10.62	-194.09	41.554	116.284	6004.0
056	979782.71	980319.62	1.69	-193.61	41.560	116.296	5728.0
057	979696.35	980316.50	36.23	-201.79	41.525	116.283	6981.0
058	979739.47	980315.56	23.52	-193.91	41.514	116.279	6377.0
059	979745.66	980314.62	16.64	-195.71	41.504	116.281	6228.0
060	979736.36	980314.19	7.88	-204.50	41.499	116.264	6229.0
061	979719.54	980316.00	24.58	-200.62	41.519	116.267	6605.0
062	979720.17	980314.87	9.32	-209.71	41.507	116.259	6424.0
063	979717.74	980316.75	26.54	-200.30	41.528	116.269	6653.0
064	979739.15	980317.75	10.49	-203.12	41.539	116.271	6265.0
065	979725.87	980318.13	24.65	-199.05	41.543	116.282	6561.0
066	979742.52	980308.44	-26.55	-222.12	41.435	116.131	5736.0

Table 3.1

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
067	979747.35	980309.25	-23.57	-218.77	41.444	116.148	5725.0
068	979756.81	980312.31	-11.25	-208.60	41.478	116.145	5788.0
069	979720.26	980313.25	2.01	-213.75	41.488	116.156	6328.0
070	979748.78	980313.00	-9.81	-210.84	41.486	116.166	5896.0
071	979724.00	980311.25	-6.15	-216.86	41.466	116.116	6180.0
072	979743.26	980312.06	-8.19	-211.47	41.475	116.131	5962.0
073	979754.77	980311.38	-15.83	-211.91	41.468	116.151	5751.0
074	979754.25	980310.06	-20.02	-214.30	41.453	116.154	5698.0
075	979748.95	980309.37	0.19	-203.09	41.445	116.194	5962.0
076	979694.05	980311.81	15.31	-214.26	41.472	116.197	6733.0
077	979681.57	980313.31	21.62	-215.31	41.489	116.187	6949.0
078	979698.54	980313.25	20.15	-210.07	41.488	116.195	6752.0
079	979761.68	980313.81	-23.29	-215.05	41.495	116.235	5624.0
080	979750.46	980315.81	-16.77	-215.69	41.517	116.222	5834.0
081	979759.25	980317.88	-22.36	-216.81	41.540	116.222	5703.0
082	979764.96	980318.37	-19.88	-213.34	41.546	116.211	5674.0
083	979729.19	980314.06	-4.81	-215.14	41.497	116.244	6169.0
084	979719.91	980313.69	-0.27	-215.49	41.493	116.221	6312.0
085	979701.13	980314.87	12.28	-214.73	41.506	116.206	6658.0
086	979682.01	980316.00	16.94	-219.11	41.520	116.187	6923.0
087	979706.76	980317.56	12.11	-213.77	41.536	116.179	6625.0
088	979690.15	980317.06	12.36	-219.46	41.531	116.154	6799.0
089	979690.50	980315.69	8.82	-221.09	41.516	116.143	6743.0
090	979695.06	980314.87	7.71	-219.84	41.507	116.128	6674.0
091	979704.49	980313.44	2.32	-219.34	41.491	116.115	6501.0
092	979713.95	980312.87	-0.44	-217.46	41.485	116.118	6365.0
093	979639.19	980317.56	30.63	-226.49	41.536	116.101	7541.0
094	979680.84	980318.00	49.95	-199.22	41.542	116.051	7308.0
095	979687.28	980319.19	37.16	-205.47	41.555	116.071	7116.0
096	979675.05	980319.62	50.14	-201.79	41.560	116.052	7389.0
097	979650.36	980320.94	55.80	-207.62	41.574	116.068	7726.0
098	979638.76	980320.81	61.06	-208.44	41.573	116.055	7904.0
099	979639.12	980321.88	71.25	-202.20	41.585	116.006	8020.0
100	979690.72	980318.56	48.08	-197.03	41.549	116.011	7189.0
101	979699.04	980317.75	45.28	-195.51	41.539	116.021	7062.0
102	979705.48	980317.75	40.15	-196.44	41.539	116.033	6939.0
103	979717.57	980317.44	32.16	-197.03	41.535	116.044	6722.0
104	979719.99	980316.62	29.76	-197.39	41.526	116.047	6662.0
105	979766.64	980322.06	-6.84	-205.76	41.587	116.139	5834.0
106	979772.44	980320.56	-10.08	-205.17	41.570	116.144	5722.0

Table 3.1

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
107	979762.37	980318.94	-9.78	-208.05	41.553	116.143	5815.0
108	979751.28	980318.13	-10.28	-212.09	41.544	116.134	5919.0
109	979732.20	980317.06	-5.55	-215.62	41.531	116.127	6161.0
110	979715.43	980316.50	4.56	-215.06	41.525	116.116	6441.0
111	979723.45	980315.00	-0.86	-215.05	41.508	116.109	6282.0
112	979735.15	980314.25	0.21	-209.85	41.500	116.101	6161.0
113	979736.66	980314.87	9.83	-203.40	41.507	116.093	6254.0
114	979732.84	980315.06	17.29	-200.10	41.509	116.073	6376.0
115	979643.71	980314.25	58.66	-205.79	41.500	116.054	7756.0
116	979724.50	980315.44	21.92	-200.31	41.513	116.059	6518.0
117	979655.91	980316.62	65.58	-197.82	41.526	116.030	7725.0
118	979474.45	980313.00	120.08	-227.63	41.486	116.006	10198.0
119	979511.61	980313.31	114.47	-217.83	41.490	116.016	9746.0
120	979549.83	980310.31	86.08	-220.95	41.456	116.031	9005.0
121	979577.65	980310.06	77.88	-215.99	41.453	116.039	8619.0
122	979750.70	980322.19	2.94	-205.35	41.589	116.093	6109.0
123	979756.29	980320.56	0.85	-204.07	41.570	116.091	6010.0
124	979761.73	980320.69	-5.03	-205.89	41.572	116.106	5891.0
125	979768.99	980320.94	-8.26	-205.40	41.574	116.119	5782.0
126	979771.28	980320.69	-9.11	-205.02	41.571	116.131	5746.0
127	979748.73	980321.25	1.99	-206.33	41.578	116.135	6110.0
128	979593.87	980309.25	77.15	-210.28	41.444	116.025	8430.0
129	979616.49	980308.56	68.24	-207.49	41.436	116.032	8087.0
130	9/9665.23	980308.69	50.42	-201.21	41.438	116.043	7380.0
131	979695.43	980307.87	42.43	-195.05	41.429	116.021	6965.0
132	979700.50	980307.50	34.81	-197.93	41.425	116.036	6826.0
133	979709.70	980306.94	26.53	-199.66	41.419	116.047	6634.0
134	979724.55	980307.37	16.78	-200.64	41.424	116.054	6377.0
135	979562.92	980312.19	87.90	-215.73	41.477	116.028	8905.0
136	979643.98	980311.81	-15.87	-252.29	41.472	116.058	6934.0
137	979721.03	980311.50	20.42	-201.10	41.469	116.069	6497.0
138	979686.69	980313.31	34.45	-205.27	41.490	116.080	7031.0
139	979713.52	980312.62	24.38	-201.71	41.482	116.081	6631.0
140	979735.22	980311.81	14.28	-199.98	41.473	116.081	6284.0
141	979738.96	980311.69	1.51	-206.71	41.471	116.093	6107.0
142	979679.74	980306.25	41.89	-200.49	41.410	116.042	7109.0
143	979665.68	980305.31	53.77	-197.68	41.400	116.013	7375.0
144	979652.18	980306.12	56.47	-201.16	41.408	116.022	7556.0
145	979682.33	980305.44	38.35	-201.52	41.401	116.041	7035.0
146	9/9707.06	980304.62	29.68	-197.77	41.391	116.046	6671.0

Table 3.1

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
147	979737.35	980305.75	13.08	-197.77	41.405	116.053	6184.0
148	979745.50	980306.12	3.93	-200.78	41.409	116.061	6004.0
149	979745.56	980304.81	-9.55	-208.87	41.394	116.068	5846.0
150	979744.65	980305.50	-4.84	-206.45	41.402	116.071	5913.0
151	979743.19	980306.44	-8.19	-209.45	41.413	116.075	5903.0
152	979741.57	980306.81	-13.84	-213.78	41.416	116.087	5864.0
153	979736.02	980309.00	-15.66	-217.75	41.441	116.089	5927.0
154	979735.84	980309.00	-7.95	-212.90	41.442	116.084	6011.0
155	979731.08	980309.00	1.58	-208.55	41.442	116.075	6163.0
156	979720.21	980309.13	14.55	-204.28	41.442	116.066	6418.0
157	979738.27	980308.44	-16.61	-217.33	41.435	116.091	5887.0
158	979740.76	980307.87	-18.54	-217.46	41.428	116.093	5834.0
159	979738.83	980307.50	-14.55	-215.47	41.424	116.084	5893.0
160	979739.16	980307.19	-9.02	-211.72	41.420	116.074	5945.0
161	979746.67	980303.69	-6.93	-206.39	41.382	116.064	5850.0
162	979744.19	980303.81	-10.01	-209.30	41.383	116.073	5845.0
163	979742 35	980303.81	-14.58	-212.88	41.383	116.083	5816.0
164	979743.42	980303.88	-15.08	-212.83	41.385	116.083	5800.0
165	979741.30	980303.31	-17.57	-214.98	41.377	116.089	5790.0
166	979740.36	980302.75	-19.82	-216.56	41.371	116.099	5770.0
167	979742.92	980305.06	-10.18	-210.32	41.397	116.082	5870.0
168	979742.59	980304.38	-14.06	-212.67	41.389	116.088	5825.0
169	979735.79	980310.44	-2.86	-210.20	41.457	116.091	6081.0
170	979737.84	980310.56	-14.18	-216.71	41.459	116.104	5940.0
171	979738.36	980311.38	-4.33	-210.54	41.468	116.104	6048.0
172	979741.05	980311.94	-1.45	-207.93	41.474	116.100	6056.0
173	979740.13	980312.87	1.21	-206.92	41.484	116.100	6104.0
174	979736.16	980313.56	-0.25	-209.53	41.492	116.101	6138.0
175	979744.73	980307.19	-25.53	-220.22	41.420	116.113	5710.0
176	979742.66	980308.00	-26.73	-222.03	41.430	116.123	5728.0
177	979740.36	980308.81	-27.12	-223.41	41.439	116.118	5757.0
178	979738.41	980309.50	-25.24	-223.17	41.447	116.111	5805.0
179	979738.31	980309.50	-25.43	-223.32	41.447	116.126	5804.0
180	979748.31	980308.56	-25.86	-219.63	41.437	116.147	5683.0
181	979714.76	980308.81	13.64	-206.72	41.440	116.069	6463.0
182	979668.91	980308.94	42 95	-204.73	41.440	116.052	7264.0
183	979631.57	980310.06	56.17	-210.26	41.453	116.053	7814.0
184	979745.93	980306.44	-23.77	-218.39	41.413	116.114	5708.0
185	979747.42	980305.75	-24.32	-217.95	41.405	116.124	5679.0
186	979746.68	980305.31	-23.87	-217.77	41.400	116.108	5687.0

Table 3.1

STATION ID	STATION GRAV.	THEOR. GRAV.	FREE AIR ANOM.	BOUGUER ANOM.	LAT.	LONG.	ELEV.
187	979748.82	980305.19	-24.70	-217.48	41.399	116.138	5654.0
188	979750.25	980305.50	-26.22	-218.05	41.402	116.150	5626.0
189	979748.00	980305.19	-24.02	-217.35	41.399	116.130	5670.0
190	979745.81	980304.50	-24.02	-217.89	41.391	116.121	5686.0
191	979746.32	980307.62	-25.98	-220.08	41.426	116.125	5693.0
192	979753.28	980307.50	-23.12	-215.69	41.424	116.152	5648.0
193	979749.64	980304.00	-23.64	-216.08	41.385	116.145	5644.0
194	979750.01	980304.62	-25.12	-217.11	41.392	116.151	5631.0
195	979744.82	980303.69	-20.63	-215.79	41.382	116.118	5724.0
301	979769.74	980319.37	-12.25	-207.11	41.557	116.248	5715.0
302	979751.89	980316.62	-2.44	-206.33	41.527	116.250	5980.0
303	979780.24	980319.31	-15.78	-205.52	41.556	116.251	5565.0
304	979707.76	980316.25	31.44	-200.62	41.522	116.076	6806.0
305	979677.91	980317.31	45.07	-203.15	41.534	116.073	7280.0
306	979705.77	980316.50	21.87	-207.53	41.524	116.149	6728.0
307	979742.31	980319.50	-0.70	-209.74	41.559	116.115	6131.0
308	979729.20	980319.31	11.10	-206.91	41.556	116.096	6394.0
309	979738.68	980314.50	-7.89	-213.83	41.503	116.162	6040.0
310	979728.05	980315.81	0.10	-213.07	41.517	116.157	6252.0
311	979670.81	980311.25	34.54	-210.24	41.467	116.042	7179.0
312	979727.68	980311.94	-2.97	-213.75	41.474	116.179	6182.0
313	979743.70	980311.13	-9.83	-212.02	41.465	116.185	5930.0
314	979751.36	980310.75	-17.86	-214.22	41.461	116.168	5759.0

Table 3.1

STA	ELEV	SBA	ZONES D-H	ZONES I-J	ZONES K-M	KME	KMN	CBA	NUMB
BC1	5858.	-206.11	4.9	1.0	0.2	18.51	23.54	-200.0	0
BC2	5451.	-209.85	0.6	0.5	0.3	22.00	30.39	-208.5	10
BASE	5857.	-218.49	0.1	0.6	0.3	34.33	26.00	-217.5	20
001	7083.	-210.56	4.6	0.4	0.2	18.20	21.66	-205.4	30
002	7247.	-211.26	2.2	0.8	0.3	20.99	20.18	-208.0	40
003	5789.	-205.75	3.2	0.8	0.2	18.82	24.70	-201.6	50
004	5721.	-205.01	2.8	0.6	0.2	19.52	25.86	-201.3	60
005	5660.	-205.06	3.6	0.6	0.2	20.30	26.39	-200.7	70
006	5567.	-207.52	2.3	0.5	0.2	21.44	27.39	-204.5	80
007	5521.	-207.92	1.3	0.5	0.2	21.60	28.45	-205.9	90
008	5474.	-207.31	1.1	0.5	0.3	23.82	28.98	-205.4	100
009	5487.	-208.71	1.0	0.5	0.3	24.25	27.64	-207.0	110
010	5504.	-209.23	1.2	0.5	0.3	24.85	26.77	-207.3	120
011	5531.	-209.58	0.6	0.3	0.3	27.02	25.26	-208.4	130
012	5729.	-212.82	0.2	0.1	0.2	28.55	24.80	-212.3	140
013	7028.	-206.88	0.7	0.7	0.2	22.82	18.66	-205.3	150
014	7160.	-216.91	5.3	1.0	0.2	20.36	23.51	-210.4	160
015	6686.	-216.15	3.6	0.6	0.1	22.52	25.05	-211.8	170
016	7055.	-208.21	1.4	0.7	0.2	22.02	20.84	-205.9	180
017	6568.	-211.91	1.6	0.5	0.1	23.85	23.81	-209.8	190
018	6574.	-216.55	4.3	0.6	0.1	25.03	24.52	-211.6	200
019	6349.	-214.74	2.1	0.3	0.1	24.79	25.18	-212.2	210
020	6498.	-206.60	2.1	0.4	0.1	24.74	21.69	-204.0	220
021	6732.	-210.77	2.3	0.6	0.1	23.47	22.14	-207.7	230
022	7238.	-204.62	2.7	1.0	0.2	22.40	19.87	-200.7	240
023	5719.	-217.90	0.0	0.3	0.3	33.92	17.33	-217.3	250
024	5726.	-217.91	0.0	0.3	0.3	34.31	18.84	-217.4	260
025	5756.	-216.19	0.0	0.2	0.3	34.28	19.92	-215.7	270
026	5771.	-215.74	0.0	0.3	0.3	34.29	21.26	-215.2	280
027	5784.	-217.87	0.0	0.3	0.3	34.10	23.28	-217.2	290
028	5828.	-219.46	0.0	0.4	0.3	34.33	24.44	-218.7	300
029	6940.	-204.18	1.8	0.8	0.2	23.98	18.15	-201.4	310
030	6633.	-208.59	2.9	0.6	0.1	25.04	20.66	-205.0	320
031	5640.	-215.66	0.0	0.2	0.2	30.01	17.67	-215.2	330
032	5638.	-213.30	0.1	0.3	0.2	28.74	18.83	-212.7	340
033	6085.	-211.16	2.0	0.3	0.1	27.46	19.32	-208.8	350
034	5598.	-214.17	0.2	0.3	0.2	28.41	20.21	-213.4	360
035	5592.	-209.39	0.2	0.3	0.2	27.83	21.74	-208.7	370
036	6012.	-211.31	1.7	0.2	0.1	26.67	23.51	-209.3	380
037	5564.	-209.96	0.1	0.3	0.3	27.79	23.20	-209.3	390
038	5997.	-211.81	1.2	0.1	0.2	28.94	25.86	-210.4	400
039	5677.	-207.84	0.7	0.3	0.2	25.59	38.54	-206.6	410
040	5888.	-207.23	1.4	0.3	0.1	24.83	41.54	-205.4	420
041	5882.	-207.12	1.2	0.3	0.1	24.87	41.17	-205.5	430
042	5497.	-203.03	0.1	0.2	0.1	20.68	42.83	-202.7	440
043	5500.	-197.54	0.0	0.2	0.1	19.86	43.30	-197.3	450
044	5737.	-211.63	0.5	0.4	0.1	23.90	41.56	-210.7	460
045	5801.	-209.23	0.7	0.3	0.1	24.95	39.79	-208.1	470
046	6794.	-207.73	5.1	0.9	0.1	27.44	41.59	-201.6	480
047	5582	-203.13	1.7	0.5	0.2	26.72	37.97	-200.7	490
048	5628.	-205.19	1.3	0.5	0.3	28.26	38.50	-203.1	500
049	5654.	-205.85	0.6	0.5	0.3	28.84	39.24	-204.5	510
050	5699.	-204.23	5.6	0.5	0.4	30.43	37.43	-197.8	520
051	5492.	-213.31	0.4	0.4	0.2	23.22	38.47	-212.4	530
052	5543.	-209.60	0.2	0.3	0.1	21.78	39.37	-209.0	540
053	5495.	-203.34	0.3	0.3	0.1	20.20	38.97	-202.7	550
054	5824.	-195.31	1.8	0.1	0.0	18.24	40.37	-193.3	560
055	6004.	-194.09	1.0	0.2	0.0	19.04	38.02	-192.9	570
056	5728.	-193.61	0.4	0.2	0.1	18.01	38.63	-192.9	580
057	6981.	-201.79	6.7	1.7	0.1	19.09	34.77	-193.3	590

Table 3.2

STA	ELEV	SBA	ZONES D-H	ZONES I-J	ZONES K-M	KME	KMN	CBA	NUMB
058	6377.	-193.91	2.9	0.3	0.0	19.41	33.56	-190.6	600
059	6228.	-195.71	4.1	0.2	0.1	19.30	32.52	-191.4	610
060	6229.	-204.50	3.2	0.1	0.1	20.67	31.92	-201.1	620
061	6605.	-200.62	3.0	0.7	0.1	20.42	34.18	-196.8	630
062	6424.	-209.71	3.0	0.3	0.1	21.10	32.81	-206.3	640
063	6653.	-200.30	3.3	0.9	0.1	20.26	35.11	-196.1	650
064	6265.	-203.12	1.4	0.3	0.0	20.07	36.38	-201.4	660
065	6561.	-199.05	3.4	0.8	0.1	19.22	36.73	-194.8	670
066	5736.	-222.12	0.0	0.2	0.3	31.77	24.81	-221.7	680
067	5725.	-218.77	0.0	0.1	0.3	30.40	25.82	-218.3	690
068	5788.	-208.60	2.0	0.3	0.3	30.59	29.56	-206.0	700
069	6328.	-213.75	4.5	0.2	0.2	29.72	30.73	-208.9	710
070	5896.	-210.84	1.1	0.2	0.3	28.89	30.47	-209.3	720
071	6180.	-216.86	0.9	0.3	0.2	33.07	28.22	-215.4	730
072	5962.	-211.47	0.1	0.3	0.3	31.77	29.25	-210.8	740
073	5751.	-211.91	0.1	0.3	0.3	30.11	28.48	-211.2	750
074	5698.	-214.30	0.1	0.2	0.3	29.85	26.85	-213.7	760
075	5962.	-203.09	1.1	0.1	0.1	26.51	25.95	-201.7	770
076	6733.	-214.26	4.8	0.9	0.1	26.31	28.95	-208.5	780
077	6949.	-215.31	5.5	1.2	0.2	27.15	30.83	-208.4	790
078	6752.	-210.07	2.4	0.8	0.1	26.46	30.75	-206.7	800
079	5624.	-215.05	1.1	0.3	0.2	23.10	31.52	-213.5	810
080	5834.	-215.69	1.1	0.1	0.1	24.21	33.92	-214.3	820
081	5703.	-216.81	0.4	0.3	0.1	24.17	36.46	-216.0	830
082	5674.	-213.34	0.6	0.3	0.2	25.09	37.10	-212.3	840
083	6169.	-215.14	3.6	0.1	0.1	22.34	31.70	-211.4	850
084	6312.	-215.49	3.1	0.2	0.1	24.32	31.30	-212.1	860
085	6658.	-214.73	2.9	0.6	0.1	25.54	32.73	-211.1	870
086	6923.	-219.11	3.8	1.0	0.2	27.09	34.21	-214.1	880
087	6625.	-213.77	1.2	0.4	0.2	27.79	36.01	-212.0	890
088	6799.	-219.46	2.4	0.5	0.2	29.89	35.49	-216.4	900
089	6743.	-221.09	2.4	0.4	0.2	30.82	33.77	-218.1	910
090	6674.	-219.84	2.1	0.3	0.2	32.06	32.81	-217.2	920
091	6501.	-219.34	1.5	0.3	0.3	33.14	31.05	-217.2	930
092	6365.	-217.46	1.0	0.3	0.3	32.89	30.31	-215.9	940
093	7541.	-226.49	7.2	1.7	0.3	34.34	36.04	-217.3	950
094	7308.	-199.22	3.7	0.9	0.2	38.46	36.65	-194.4	960
095	7116.	-205.47	3.8	0.7	0.2	36.80	38.07	-200.8	970
096	7389.	-201.79	5.3	0.8	0.2	38.43	38.63	-195.5	980
097	7726.	-207.62	7.4	1.7	0.3	37.09	40.18	-198.2	990
098	7904.	-208.44	8.4	1.8	0.3	38.12	40.06	-197.9	1000
099	8020.	-202.20	4.4	0.9	0.9	42.23	41.40	-196.1	1010
100	7189.	-197.03	3.6	1.5	0.4	41.87	37.43	-191.6	1020
101	7062.	-195.51	3.4	1.9	0.3	40.97	36.40	-189.9	1030
102	6939.	-196.44	1.8	1.8	0.3	40.01	36.30	-192.6	1040
103	6722.	-197.03	2.1	1.9	0.1	39.11	35.88	-193.0	1050
104	6662.	-197.39	2.8	2.1	0.1	38.86	34.95	-192.4	1060
105	5834.	-205.76	0.3	0.4	0.3	31.16	41.64	-204.8	1070
106	5722.	-205.17	0.3	0.5	0.3	30.72	39.74	-204.0	1080
107	5815.	-208.05	1.8	0.4	0.3	30.79	37.84	-205.5	1090
108	5919.	-212.09	2.7	0.3	0.4	31.59	36.85	-208.7	1100
109	6161.	-215.62	1.6	0.2	0.3	32.11	35.49	-213.5	1110
110	6441.	-215.06	0.2	0.2	0.3	33.09	34.75	-214.3	1120
111	6282.	-215.05	0.1	0.4	0.3	33.62	32.94	-214.2	1130
112	6161.	-209.85	1.0	0.7	0.3	34.33	32.04	-207.8	1140
113	6254.	-203.40	0.9	0.8	0.3	34.99	32.76	-201.4	1150
114	6376.	-200.10	2.7	1.5	0.2	36.69	32.98	-195.7	1160
115	7756.	-205.79	4.6	1.6	0.4	38.27	32.05	-199.2	1170
116	6518.	-200.31	4.1	1.9	0.1	37.82	33.50	-194.1	1180
117	7725.	-197.82	2.8	1.3	0.7	40.23	34.88	-193.0	1190
118	10198.	-227.63	15.3	8.3	6.2	42 26	30.51	-197.8	1200
119	9746.	-217.83	8.4	6.2	4.4	41.39	30.91	-198.9	1210

STA	ELEV	SBA	ZONES D-H	ZONES I-J	ZONES K-M	KME	KMN	CBA	NUMB
120	9005.	-220.95	15.7	5.0	2.7	40.17	27.18	-197.6	1220
121	8619.	-215.99	12.9	4.1	0.8	39.46	26.87	-198.2	1230
122	6109.	-205.35	2.3	0.5	0.3	34.94	41.85	-202.2	1240
123	6010.	-204.07	3.0	0.7	0.4	35.11	39.81	-199.9	1250
124	5891.	-205.89	0.5	0.7	0.5	33.88	40.00	-204.3	1260
125	5782.	-205.40	0.2	0.6	0.4	32.85	40.23	-204.1	1270
126	5746.	-205.02	0.4	0.6	0.4	31.80	39.92	-203.7	1280
127	6110.	-206.33	1.7	0.2	0.3	31.45	40.66	-204.3	1290
128	8430.	-210.28	15.5	2.8	1.8	40.68	25.82	-190.1	1300
129	8087.	-207.49	13.0	2.4	1.2	40.05	24.94	-190.9	1310
130	7380.	-201.21	2.8	1.3	0.2	39.14	25.13	-196.8	1320
131	6965.	-195.05	1.7	0.9	0.4	40.97	24.12	-192.0	1330
132	6826.	-197.93	1.8	0.9	0.1	39.72	23.68	-195.1	1340
133	6634.	-199.66	1.0	0.8	0.1	38.83	23.01	-197.8	1350
134	6377.	-200.64	1.1	0.9	0.1	38.24	23.59	-198.6	1360
135	8905.	-215.73	14.0	3.5	2.5	40.41	29.49	-195.8	1370
136	6934.	-252.29	1.9	1.4	0.1	37.91	28.96	-248.8	1380
137	6497.	-201.10	1.4	1.4	0.1	37.01	28.62	-198.2	1390
138	7031.	-205.27	3.1	1.0	0.2	36.10	30.91	-201.0	1400
139	6631.	-201.71	1.1	1.0	0.2	35.95	30.04	-199.5	1410
140	6284.	-199.98	0.6	1.3	0.2	36.02	29.04	-198.0	1420
141	6107.	-206.71	0.3	0.9	0.2	34.97	28.83	-205.3	1430
142	7109.	-200.49	3.1	0.9	0.1	39.27	22.06	-196.4	1440
143	7375.	-197.68	5.2	0.7	0.7	41.63	20.98	-191.2	1450
144	7556.	-201.16	5.9	1.1	0.8	40.89	21.88	-193.4	1460
145	7035.	-201.52	4.2	0.8	0.1	39.35	21.06	-196.4	1470
146	6671.	-197.77	3.1	0.6	0.1	38.90	20.00	-194.0	1480
147	6184.	-197.77	2.8	0.8	0.1	38.35	21.48	-194.1	1490
148	6004.	-200.78	1.2	0.9	0.2	37.69	21.96	-198.5	1500
149	5846.	-208.87	0.4	0.8	0.2	37.11	20.34	-207.4	1510
150	5913.	-206.45	0.2	0.7	0.2	36.79	21.22	-205.3	1520
151	5903.	-209.45	0.2	0.7	0.2	36.50	22.37	-208.3	1530
152	5864.	-213.78	0.0	0.5	0.2	35.45	22.74	-213.0	1540
153	5927.	-217.75	0.2	0.8	0.2	35.31	25.49	-216.5	1550
154	6011.	-212.90	0.4	0.9	0.2	35.76	25.58	-211.4	1560
155	6163.	-208.55	0.8	1.0	0.1	36.47	25.55	-206.5	1570
156	6418.	-204.28	1.7	1.1	0.1	37.27	25.65	-201.4	1580
157	5887.	-217.33	0.1	0.7	0.2	35.18	24.88	-216.3	1590
158	5834.	-217.46	0.1	0.6	0.3	35.00	24.10	-216.5	1600
159	5893.	-215.47	0.1	0.7	0.2	35.71	23.60	-214.5	1610
160	5945.	-211.72	0.2	0.8	0.2	36.53	23.20	-210.5	1620
161	5850.	-206.39	1.3	0.9	0.2	37.38	18.92	-204.0	1630
162	5845.	-209.30	0.3	0.7	0.2	36.63	19.10	-208.0	1640
163	5816.	-212.88	0.1	0.5	0.3	35.81	19.05	-212.0	1650
164	5800.	-212.83	0.1	0.5	0.3	35.79	19.26	-212.0	1660
165	5790.	-214.98	0.0	0.5	0.3	35.32	18.44	-214.2	1670
166	5770.	-216.56	0.0	0.3	0.2	34.49	17.73	-216.0	1680
167	5870.	-210.32	0.1	0.5	0.2	35.90	20.60	-209.5	1690
168	5825.	-212.67	0.1	0.4	0.2	35.44	19.71	-211.9	1700
169	6081.	-210.20	0.3	0.9	0.2	35.16	27.29	-208.8	1710
170	5940.	-216.71	0.1	0.6	0.3	34.05	27.48	-215.7	1720
171	6048.	-210.54	0.1	0.6	0.2	34.07	28.46	-209.5	1730
172	6056.	-207.93	0.2	0.8	0.3	34.36	29.14	-206.7	1740
173	6104.	-206.92	0.5	0.8	0.3	34.41	30.28	-205.3	1750

Table 3.2

STA	ELEV	SBA	ZONES D-H	ZONES I-J	ZONES K-M	KME	KMN	CBA	NUMB
174	6138.	-209.53	0.8	0.8	0.3	34.33	31.10	-207.7	1760
175	5710.	-220.22	0.0	0.2	0.3	33.28	23.22	-219.7	1770
176	5728.	-222.03	0.0	0.2	0.3	32.48	24.25	-221.5	1780
177	5757.	-223.41	0.0	0.3	0.3	32.86	25.26	-222.8	1790
178	5805.	-223.17	0.1	0.5	0.3	33.51	26.15	-222.3	1800
179	5804.	-223.32	0.0	0.2	0.3	32.25	26.15	-222.8	1810
180	5683.	-219.63	0.0	0.1	0.3	30.45	25.00	-219.2	1820
181	6463.	-206.72	1.7	0.9	0.1	36.95	25.33	-204.0	1830
182	7264.	-204.73	5.1	1.3	0.2	38.41	25.41	-198.2	1840
183	7814.	-210.26	7.5	2.3	0.4	38.35	26.81	-200.1	1850
184	5708.	-218.39	0.0	0.2	0.3	33.26	22.37	-217.9	1860
185	5679.	-217.95	0.0	0.1	0.3	32.36	21.53	-217.6	1870
186	5687.	-217.77	0.1	0.2	0.3	33.71	20.95	-217.2	1880
187	5654.	-217.48	0.0	0.1	0.3	31.22	20.80	-217.1	1890
188	5626.	-218.05	0.0	0.1	0.3	30.22	21.21	-217.7	1900
189	5670.	-217.35	0.0	0.1	0.3	31.91	20.82	-217.0	1910
190	5686.	-217.89	0.0	0.1	0.3	32.62	19.95	-217.5	1920
191	5693.	-220.08	0.0	0.2	0.3	32.30	23.85	-219.6	1930
192	5648.	-215.69	0.0	0.1	0.3	30.05	23.65	-215.3	1940
193	5644.	-216.08	0.0	0.1	0.3	30.66	19.29	-215.7	1950
194	5631.	-217.11	0.0	0.1	0.3	30.16	20.02	-216.7	1960
195	5724.	-215.79	0.0	0.1	0.3	32.89	18.91	-215.4	1970
301	5715.	-207.11	0.4	0.2	0.1	21.99	38.33	-206.5	1980
302	5980.	-206.33	0.2	0.1	0.1	21.86	34.98	-205.9	1990
303	5565.	-205.52	0.1	0.3	0.1	21.74	38.23	-205.0	2000
304	6806.	-200.62	1.7	0.8	0.2	36.43	34.48	-197.9	2010
305	7280.	-203.15	4.1	0.9	0.2	36.64	35.77	-197.9	2020
306	6728.	-207.53	1.9	0.4	0.2	30.26	34.72	-205.0	2030
307	6131.	-209.74	0.8	0.3	0.3	33.12	38.50	-208.3	2040
308	6394.	-206.91	0.9	0.4	0.3	34.70	38.23	-205.3	2050
309	6040.	-213.83	1.4	0.1	0.2	29.18	32.31	-212.0	2060
310	6252.	-213.07	0.2	0.1	0.2	29.61	33.95	-212.5	2070
311	7179.	-210.24	7.7	1.4	0.2	39.23	28.32	-201.0	2080
312	6182.	-213.75	0.6	0.1	0.2	27.83	29.09	-212.9	2090
313	5930.	-212.02	0.4	0.1	0.2	27.31	28.11	-211.4	2100
314	5759.	-214.22	0.2	0.2	0.2	28.71	27.71	-213.6	2110

Table 3,2