

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Principal Facts for 382 Gravity Stations  
in Lassen Volcanic National Park and Vicinity, California

by

Robert C. Jachens<sup>1</sup>, D. Randell Spydell<sup>2</sup>, and Richard W. Saltus<sup>2</sup>

Open-File Report 83-584

This report is preliminary and has not been reviewed  
for conformity with U.S. Geological Survey editorial standards.  
Any use of trade names is for descriptive purposes only  
and does not imply endorsement by the USGS.

1. U. S. Geological Survey, Menlo Park, California 94025
2. U. S. Geological Survey, Denver, Colorado 80225

## Contents

	Page
Introduction	1
Data collection	1
Data reduction	2
References	3

## Tables

1. Gravimeter calibration correction factors	1
--	---

## Appendices

1. Principal facts for gravity data	4
2. Base station description	12

## Introduction

This report contains the principal facts for 382 gravity stations (Appendix 1) measured in Lassen Volcanic National Park, California and the surrounding area during the summers of 1980 and 1981. Gravity stations are most closely spaced near Lassen Peak, the approximate center of the survey area, and become more widely spaced toward the perimeter the survey area. This survey covers a roughly rectangular area bounded on the north and south by lat.  $40^{\circ} 37'N$ . and lat.  $40^{\circ} 20'N$ ., respectively, and on the east and west by long.  $121^{\circ} 25'W$ . and long.  $121^{\circ} 38'W$ ., respectively.

## Data Collection

All gravity measurements were made relative to base station 1p001 (Appendix 2), which is located approximately 9 km northwest of Lassen Peak and approximately 1 km northwest of Manzanita Lake. The observed gravity at this station [979726.80 mGal on the IGSN 71 datum (Morelli, 1974)] was determined by 8 one-way ties to base station ML8 (Robbins and others, 1976) which yielded an uncertainty of  $\pm 0.007$  mGal (1 computed standard error) (Jachens and others, 1983). The observed gravity at ML8 given by Robbins and others (1976) was converted to the IGSN 71 datum by subtracting 14.4 mGal, as recommended in their report (Robbins and others, 1976, p. 11).

All gravity measurements were made along closed circuits with the LaCoste and Romberg gravimeters given in table 1.

Table 1--Gravimeter calibration correction factors

<u>Gravimeter</u>	<u>Correction Factor</u>
D26	1.00100
G8	1.00061
G192	1.00041
G248	1.00047
G550	1.00055

Calibration correction factors for each of these gravimeters (table 1) are based on measurements over the U.S. Geological Survey's Mt. Hamilton Calibration Range (Barnes and others, 1969). Tide corrections were applied to all measurements according to the formulation of Longman (1959) with an assumed compliance factor of 1.160 and a linear or parabolic daily drift correction was applied to all data; a linear drift was assumed for those days during which the base station was occupied twice and a parabolic drift assumed for days with three or more base station occupations. Most of the sites were measured only once with a single gravimeter but a few were measured repeatedly and an analysis of these repeat measurements suggests that the relative gravity values at these stations have uncertainties of approximately 0.025 mGal (1 $\sigma$ ).

All measurement sites were located on 1:24,000 scale aerial photographs by identifying individual trees, bushes, rocks or other features and by measuring distances and azimuths with respect to them. These photographic locations probably are accurate horizontally to within approximately 3 m. The aerial photographs also served as the basis for elevation control at each measurement site. Site elevations were determined by photogrammetric techniques and are characterized by an approximate 1-1.5 m random scatter from site to site and a possible long-wavelength bias of approximately 3 m (W. C. Albee, personnel

commun., 1981). The possible long-wavelength bias results from the separation between surveyed elevation points used to control the photogrammetric models. These points were separated by roughly 3 km near the center of the survey area and about 5 km near the edges of the area.

Altimeter measurements also were made at each site to provide a check on the photogrammetry elevations and also to act as a source for elevations at sites where the areal photographs were of poor quality or where sites had been mislocated in the field. Elevations at about 10 sites were obtained from the altimetry data.

### Data Reduction

The observed gravity data were reduced to complete Bouguer anomalies based on the Geodetic Reference System 1967 (International Association of Geodesy, 1971) for theoretical gravity and the standard reduction formulas given by Oliver and others (1980). Terrain corrections for all topography within 166.7 km of each measurement site were applied to all measurements based on a combination of manual and computer based calculations. Local terrain corrections (0-68 m) were estimated in the field or from detailed notes taken in the field. For all stations of the "lp" and "lpg" series (Appendix 1) terrain corrections for the cylindrical zone from 68 m to 1280 m were calculated by computer using a computer program written by Plouff (1977) and a digital terrain model composed of elevations averaged over 0.25 x 0.25 minute, 1 x 1 minute, and 3 x 3 minute compartments. All of these corrections that were greater than 2 mGal and most that were greater than 1 mGal were recomputed manually. In addition, corrections in this zone for all stations within roughly 6 km of Lassen Peak were computed manually, regardless of the magnitude of the computer correction. All stations for which terrain corrections in the zone 0-1280 m were calculated manually are identified by a "z" on the last column in Appendix 1. Stations identified by a "y" in the last column in Appendix 1 have terrain corrections computed manually out to a distance of 590 m. At all stations, terrain corrections for zones beyond those covered by the manual calculations were calculated by computer.

Complete Bouguer anomalies were calculated for a standard reduction density of  $2.67 \text{ g/cm}^3$  and for a reduction density of  $2.30 \text{ g/cm}^3$  (Appendix 1) which is probably more representative of the densities of the near-surface rocks in this region. Uncertainties in the complete Bouguer anomalies are difficult to assess, particularly those associated with the terrain corrections. However, consideration of the uncertainties associated with the observed gravities and elevations, combined with the results of limited tests on the reproducibility of terrain corrections in this area, indicates that random errors in most complete Bouguer anomalies reported here probably are less than 1 mGal. In addition a somewhat subjective analysis of the smoothness of the contours on a gravity map based on a reduction density of  $2.30 \text{ g/cm}^3$  and contoured at a 1 mGal interval suggests that much of the data set is internally consistent at the 0.5 mGal level.

### References

- Barnes, D. F., Oliver, H. W., and Robbins, S. L., 1969, Standardization of gravimeter calibrations in the U.S. Geological Survey: American Geophysical Union Transactions (Eos), v. 50, p. 526-527.
- International Association of Geodesy, 1971, Geodetic reference system 1967: International Association of Geodesy Special Publication no. 3, 116 p.
- Jachens, R. C., Dzurisin, Daniel, Elder, W. P., and Saltus, R. W., 1983, Precision gravity networks at Lassen Peak and Mount Shasta, California: U.S. Geological Survey Open-File Report 83-192, 20 p., 2 maps, scale 1:62,500.
- Longman, I. M., 1959, Formulas for the tidal acceleration of gravity: Journal of Geophysical Research, v. 64, p. 2351-2355.
- Morelli, C. (Ed.), 1974, The international gravity standardization net 1971: International Association of Geodesy Special Publication no. 4, 194 p.
- Oliver, H. W., Robbins, S. L., and Chapman, R. L., 1980, Gravity measurements, reductions, and conversion formulas to IGSN 71 and GRS 67 in Oliver, H. W., (Ed.), Interpretation of the gravity map of California and its continental margin: California Division of Mines and Geology Bulletin 205, p. 47-52.
- Plouff, Donald, 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, 45 p.
- Robbins, S. L., Oliver, H. W., and Sikora, R. F., 1976, Principal facts, accuracies, sources, base station descriptions and plots for 1,794 gravity stations on the Susanville 1 degree x 2 degree quadrangle, California: U.S. Department of Commerce National Technical Information Service PB-254-061, 75 p.

## Appendix 1

Principal facts for 382 gravity stations in Lassen Volcanic National Park and vicinity. Each line contains the following information:

STA--Observation site designator

LATITUDE--Latitude of observation site, in degrees and minutes

LONGITUDE--Longitude of observation site, in degrees and minutes

ELEV--Elevation of observation site, in feet

OBS GRAV--Observed gravity at site, in milligals

FAA--Free-air anomaly, in milligals

SBA1--Simple Bouguer anomaly with reduction density of  $2.67 \text{ g/cm}^3$ , in milligals

INTC--Terrain correction computed manually for inner zones, with density of  $2.67 \text{ g/cm}^3$ , in milligals. Symbol in last column indicates outter radius of manual correction--blank-0.068 km, y-0.590 km, z-1.280 km.

TOTC--Total terrain correction to radius of 166.7 km, with density of  $2.67 \text{ g/cm}^3$ , in milligals

CBA1--Complete Bouguer anomaly, with reduction density of  $2.67 \text{ g/cm}^3$ , in milligals

CBA2--Complete Bouguer anomaly, with reduction density of  $2.30 \text{ g/cm}^3$ , in milligals

STA	LATITUDE		LONGITUDE		ELEV	OBS GRAV	FAA	SBA1	INTC	TOTC	CBA1	CBA2
	DEG	MIN	DEG	MIN	FEET	MGAL	MGAL	MGAL	MGAL	MGAL	MGAL	MGAL
1p001	40	32.51	121	34.57	5741.0	979726.80	49.25	-146.56	0.16	3.69	-144.35	-117.52
1p002	40	32.16	121	33.50	5903.0	979709.45	47.65	-153.68	0.17	4.15	-151.02	-123.49 z
1p003	40	31.96	121	33.25	6047.0	979699.10	51.13	-155.11	0.43	4.61	-152.00	-123.85 z
1p004	40	32.08	121	32.99	6051.0	979696.91	49.14	-157.24	0.67	4.92	-153.82	-125.69 z
1p005	40	32.14	121	32.57	6186.0	979686.22	51.04	-159.94	0.73	5.16	-156.29	-127.56 z
1p006	40	31.94	121	31.87	6741.0	979645.91	63.19	-166.73	2.33	7.75	-160.49	-129.50 z
1p007	40	31.65	121	31.88	6953.0	979629.98	67.61	-169.53	3.98	10.05	-161.00	-129.32 z
1p008	40	31.54	121	31.88	7063.0	979621.61	69.74	-171.16	4.29	10.79	-161.89	-129.79 z
1p009	40	31.15	121	31.97	6852.0	979636.13	65.01	-168.69	3.35	9.29	-160.91	-129.61 z
1p010	40	31.02	121	32.46	6533.0	979660.32	59.42	-163.40	0.47	6.21	-158.71	-128.48 z
1p011	40	31.20	121	32.63	6470.0	979665.32	58.23	-162.44	0.75	6.15	-157.80	-127.87 z
1p012	40	31.45	121	32.72	6381.0	979672.79	56.96	-160.67	0.77	5.82	-156.36	-126.80 z
1p013	40	31.65	121	32.85	6320.0	979677.91	56.06	-159.50	0.72	5.42	-155.59	-126.26 z
1p014	40	32.75	121	38.52	4750.0	979804.11	33.07	-128.94	2.09	5.01	-125.31	-103.36
1p015	40	32.21	121	36.60	5174.0	979769.87	39.48	-136.99	0.24	3.59	-134.83	-110.68
1p016	40	32.43	121	35.88	5399.0	979753.19	43.62	-140.53	0.33	3.65	-138.33	-113.11
1p017	40	32.47	121	35.00	5637.0	979735.65	48.39	-143.87	0.16	3.62	-141.73	-115.38
1p018	40	32.27	121	34.19	5852.0	979717.07	50.31	-149.28	0.07	3.75	-147.02	-119.67 z
1p019	40	32.33	121	32.83	6085.0	979694.96	50.01	-157.53	0.48	4.57	-154.46	-126.13 z
1p020	40	32.68	121	32.38	6146.0	979689.63	49.90	-159.73	0.34	4.32	-156.91	-128.25 z
1p021	40	33.15	121	32.23	6112.0	979691.69	48.05	-160.41	0.40	4.07	-157.84	-129.31 z
1p022	40	33.50	121	31.84	5981.0	979700.23	43.77	-160.23	0.54	4.04	-157.68	-129.77 z
1p023	40	34.09	121	31.73	5759.0	979715.76	37.55	-158.87	0.47	3.57	-156.78	-129.85 z
1p024	40	33.80	121	31.23	5610.0	979722.59	30.81	-160.53	0.46	3.86	-158.14	-131.95 z
1p026	40	33.10	121	30.17	5877.0	979700.16	34.52	-165.93	0.87	4.76	-162.66	-135.33 z
1p027	40	32.83	121	29.64	6061.0	979686.56	38.61	-168.11	1.22	5.01	-164.60	-136.44 z
1p028	40	32.10	121	29.37	6149.0	979679.02	40.43	-169.29	0.72	5.25	-165.55	-137.00 z
1p029	40	31.70	121	29.04	6209.0	979672.47	40.11	-171.66	1.66	6.40	-166.77	-138.10 z
1p030	40	31.29	121	28.43	6351.0	979662.79	44.39	-172.23	1.33	5.72	-168.02	-138.58 z
1p031	40	30.87	121	27.84	6454.0	979655.54	47.44	-172.69	0.14	4.35	-169.85	-139.74 z
1p032	40	30.59	121	27.60	6487.0	979653.60	49.02	-172.23	0.54	4.74	-169.01	-138.79 z
1p033	40	30.38	121	27.14	6547.0	979649.84	51.21	-172.09	0.27	4.20	-169.40	-138.83 z
1p034	40	30.17	121	26.93	6523.0	979650.86	50.29	-172.19	0.81	4.80	-168.91	-138.53 z
1p035	40	30.08	121	26.52	6576.0	979646.87	51.41	-172.88	0.35	4.13	-170.26	-139.55 z
1p036	40	29.97	121	26.00	6639.0	979644.11	54.73	-171.70	0.11	3.73	-169.49	-138.42 z
1p037	40	29.89	121	25.60	6650.0	979643.73	55.51	-171.30	0.20	3.72	-169.10	-137.97 z
1p038	40	29.57	121	25.44	6693.0	979640.87	57.16	-171.12	0.17	3.72	-168.91	-137.58 z
1p039	40	29.23	121	25.44	6802.0	979631.90	58.94	-173.06	0.23	3.92	-170.65	-138.84 z
1p040	40	28.79	121	25.75	6972.0	979621.28	64.95	-172.84	0.93	5.19	-169.17	-136.72 z
1p041	40	28.40	121	25.92	7121.0	979610.73	68.99	-173.89	1.18	6.05	-169.35	-136.32 z
1p042	40	28.11	121	26.27	7206.0	979605.29	71.96	-173.81	1.69	6.89	-168.44	-135.12 z
1p043	40	27.84	121	26.78	7291.0	979601.55	76.61	-172.07	1.81	7.29	-166.29	-132.63 z
1p044	40	27.64	121	27.37	7291.0	979604.62	79.97	-168.70	1.24	6.70	-163.51	-129.77 z
1p045	40	27.58	121	27.98	7315.0	979603.41	81.12	-168.38	0.42	6.10	-163.78	-129.85 z
1p046	40	27.81	121	28.58	7450.0	979594.14	84.19	-169.91	0.94	7.31	-164.10	-129.70 z
1p047	40	27.89	121	27.88	7734.0	979573.03	89.64	-174.14	2.37	9.43	-166.20	-130.75 z
1p048	40	28.19	121	28.35	7894.0	979563.69	94.88	-174.36	1.73	9.60	-166.24	-130.05 z
1p049	40	28.58	121	28.60	8046.0	979553.74	98.64	-175.79	0.50	9.41	-167.84	-130.92 z
1p050	40	28.72	121	28.55	7869.0	979563.02	91.08	-177.31	0.97	9.02	-169.77	-133.62 z
1p051	40	29.02	121	28.58	7711.0	979575.75	88.52	-174.48	0.79	8.46	-167.51	-132.03 z
1p052	40	29.53	121	27.89	7022.0	979618.98	66.25	-173.25	0.78	6.21	-168.55	-136.01 z
1p053	40	29.26	121	27.95	7051.0	979616.89	67.29	-173.20	1.99	7.71	-167.01	-134.54 z
1p054	40	29.69	121	28.00	6923.0	979624.92	62.65	-173.47	1.17	6.62	-168.37	-136.35 z
1p055	40	30.14	121	27.97	6474.0	979653.97	48.84	-171.97	1.22	6.62	-166.87	-136.98 z
1p056	40	30.51	121	27.86	6423.0	979658.32	47.84	-171.23	0.69	5.40	-167.34	-137.52 z
1p057	40	28.72	121	28.33	7707.0	979576.68	89.52	-173.35	1.17	8.40	-166.44	-130.97 z
1p058	40	28.83	121	27.92	7601.0	979582.53	85.24	-174.00	0.82	7.50	-168.00	-132.91 z
1p059	40	28.64	121	27.36	7346.0	979597.75	76.79	-173.76	2.32	7.83	-167.44	-133.60 z

lp060	40	28.77	121	26.93	7398.0	979592.57	76.30	-176.02	2.50	8.22	-169.31	-135.27	z
lp061	40	29.00	121	26.27	7076.0	979614.11	67.24	-174.10	1.45	5.99	-169.62	-136.80	z
lp062	40	30.85	121	27.33	6311.0	979664.31	42.80	-172.44	0.51	4.50	-169.45	-140.04	
lp063	40	31.09	121	27.34	6289.0	979665.78	41.85	-172.65	0.66	4.52	-169.64	-140.33	
lp064	40	31.35	121	27.28	6272.0	979667.46	41.54	-172.38	1.00	4.67	-169.21	-140.01	
lp065	40	31.74	121	27.03	6253.0	979670.83	42.54	-170.73	1.21	4.63	-167.60	-138.48	
lp066	40	32.08	121	26.94	6252.0	979672.38	43.50	-169.74	0.38	3.66	-167.59	-138.34	
lp067	40	32.35	121	26.84	6182.0	979677.43	41.57	-169.28	0.18	3.40	-167.39	-138.43	
lp068	40	32.50	121	26.62	6170.0	979679.37	42.15	-168.29	0.14	3.27	-166.52	-137.61	
lp069	40	32.74	121	26.50	6159.0	979680.98	42.38	-167.69	0.24	3.27	-165.92	-137.06	
lp070	40	30.73	121	34.78	6786.0	979653.39	76.70	-154.75	1.01	7.63	-148.64	-117.41	
lp071	40	30.63	121	34.13	6789.0	979650.44	74.17	-157.38	0.75	6.83	-152.07	-120.71	
lp072	40	30.22	121	34.27	6954.0	979640.09	79.94	-157.24	0.39	7.15	-151.60	-119.52	
lp073	40	30.17	121	35.13	6701.0	979657.75	73.90	-154.65	0.44	6.72	-149.45	-118.49	
lp074	40	29.96	121	35.77	6443.0	979679.77	71.99	-147.76	0.59	6.38	-142.89	-113.11	
lp075	40	30.11	121	36.32	6285.0	979692.26	69.41	-144.95	1.24	6.95	-139.51	-110.56	
lp076	40	29.57	121	35.92	6071.0	979704.76	62.60	-144.46	1.13	6.16	-139.80	-111.75	
lp077	40	29.56	121	36.63	5760.0	979726.32	54.95	-141.50	0.66	5.38	-137.61	-110.92	
lp078	40	29.40	121	37.12	5506.0	979744.60	49.60	-138.19	0.92	5.47	-134.19	-108.72	
lp079	40	29.66	121	37.82	5247.0	979764.34	44.61	-134.35	0.27	4.25	-131.53	-107.12	
lp080	40	30.07	121	37.16	5538.0	979743.66	50.67	-138.21	0.75	4.94	-134.74	-109.04	
lp081	40	30.71	121	37.11	5612.0	979740.10	53.11	-138.30	0.57	4.63	-135.14	-109.05	
lp082	40	31.14	121	36.97	5421.0	979752.68	47.10	-137.79	0.43	4.13	-135.12	-109.87	
lp083	40	31.66	121	36.68	5371.0	979756.16	45.11	-138.08	0.28	3.75	-135.78	-110.71	
lp084	40	31.74	121	36.02	5423.0	979749.91	43.63	-141.33	0.48	4.21	-138.58	-113.33	
lp085	40	32.01	121	35.64	5486.0	979745.13	44.37	-142.74	0.65	4.27	-139.93	-114.40	
lp086	40	29.15	121	32.41	8464.0	979525.42	108.74	-179.95	8.13	22.13	-159.24	-122.11	z
lp087	40	29.26	121	32.57	8649.0	979512.15	112.68	-182.31	10.81	27.61	-156.11	-118.86	z
lp088	40	29.39	121	32.89	8440.0	979530.33	111.03	-176.83	3.64	19.35	-158.91	-121.50	z
lp089	40	29.46	121	33.37	8148.0	979553.30	106.46	-171.44	2.27	16.07	-156.83	-120.34	z
lp090	40	29.68	121	33.65	7885.0	979572.12	100.25	-168.69	2.25	14.25	-155.92	-120.42	z
lp091	40	30.15	121	30.06	8526.0	979516.61	104.26	-186.54	2.99	17.43	-170.53	-132.45	z
lp092	40	30.08	121	29.75	8228.0	979538.12	97.88	-182.76	2.89	14.69	-169.52	-132.46	z
lp093	40	30.20	121	29.28	7563.0	979583.46	80.56	-177.39	2.02	10.10	-168.78	-134.23	z
lp094	40	30.49	121	28.91	7215.0	979605.92	69.90	-176.19	1.50	7.91	-169.79	-136.57	z
lp095	40	30.61	121	28.78	7093.0	979613.74	66.07	-175.85	1.23	7.09	-170.27	-137.52	z
lp096	40	30.85	121	28.26	6499.0	979653.20	49.36	-172.30	0.52	5.16	-168.65	-138.44	z
lp097	40	31.61	121	33.62	5932.0	979704.07	45.81	-156.51	0.38	4.85	-153.15	-125.58	z
lp098	40	28.49	121	28.98	8134.0	979547.59	100.89	-176.54	0.84	10.26	-167.74	-130.51	z
lp099	40	30.19	121	30.35	8400.0	979526.99	102.75	-183.75	2.59	15.81	-169.38	-131.67	z
lp100	40	30.39	121	30.51	8191.0	979542.01	97.83	-181.54	1.96	13.77	-169.23	-132.22	z
lp101	40	30.71	121	30.26	7628.0	979581.01	83.46	-176.71	1.32	9.67	-168.53	-133.61	z
lp102	40	31.02	121	30.06	7390.0	979596.44	76.07	-175.99	1.59	8.93	-168.56	-134.66	z
lp103	40	31.39	121	30.17	7091.0	979616.84	67.80	-174.04	1.68	7.97	-167.59	-134.97	z
lp104	40	31.53	121	29.93	6918.0	979627.51	62.03	-173.93	1.12	6.84	-168.60	-136.64	z
lp105	40	31.05	121	31.02	8422.0	979521.73	98.28	-188.97	5.06	21.29	-169.11	-132.06	z
lp106	40	31.28	121	31.32	7935.0	979560.14	90.58	-180.05	2.71	14.56	-166.97	-131.28	z
lp107	40	31.81	121	31.33	8179.0	979535.77	88.37	-190.60	8.67	24.65	-167.40	-131.96	z
lp108	40	30.67	121	30.89	8033.0	979552.34	92.90	-181.08	2.47	13.53	-169.02	-132.72	z
lp111	40	30.68	121	26.70	6495.0	979654.11	50.15	-171.38	0.22	3.79	-169.10	-138.72	
lp112	40	31.12	121	26.33	6528.0	979651.48	49.97	-172.68	0.40	3.73	-170.47	-139.92	
lp113	40	31.28	121	25.87	6795.0	979635.30	58.63	-173.13	0.61	4.21	-170.43	-138.69	
lp114	40	31.37	121	24.84	7040.0	979619.75	65.97	-174.14	0.30	4.39	-171.27	-138.39	
lp115	40	33.11	121	24.81	6330.0	979668.42	45.33	-170.56	0.32	3.17	-168.90	-139.22	
lp116	40	32.75	121	27.28	6209.0	979677.97	44.05	-167.72	0.36	3.52	-165.71	-136.64	
lp117	40	31.64	121	28.21	7215.0	979603.60	65.86	-180.22	4.07	10.43	-171.30	-138.44	z
lp118	40	31.32	121	27.61	6427.0	979657.61	46.30	-172.90	0.52	4.17	-170.25	-140.24	
lp119	40	30.58	121	31.64	7038.0	979622.97	70.18	-169.87	2.11	8.92	-162.46	-130.22	z
lp120	40	30.42	121	32.03	6731.0	979644.79	63.39	-166.19	0.99	7.94	-159.76	-128.84	z
lp121	40	30.72	121	32.02	6663.0	979650.05	61.81	-165.44	1.21	7.68	-159.28	-128.64	z



lp122	40	31.09	121	32.28	6572.0	979655.60	58.26	-165.89	1.31	7.10	-160.30	-130.02	z
lp123	40	32.27	121	30.68	7198.0	979611.49	71.22	-174.28	2.23	9.78	-166.02	-133.14	z
lp124	40	32.55	121	30.91	7166.0	979614.27	70.57	-173.84	2.57	10.40	-164.95	-132.31	z
lp125	40	32.38	121	31.32	6822.0	979641.11	65.34	-167.34	1.11	6.80	-162.06	-130.54	z
lp126	40	32.52	121	31.63	6721.0	979649.45	63.99	-165.25	1.08	6.40	-160.36	-129.27	z
lp128	40	27.95	121	30.80	8185.0	979550.98	109.87	-169.29	1.62	11.66	-159.09	-121.81	z
lp129	40	27.44	121	30.10	8200.0	979545.71	106.77	-172.91	1.49	11.99	-162.37	-125.07	z
lp130	40	27.45	121	30.05	8161.0	979548.41	105.80	-172.55	1.64	11.82	-162.19	-125.05	z
lp131	40	27.08	121	29.77	7963.0	979558.70	98.03	-173.56	3.20	12.30	-162.73	-126.60	z
lp132	40	27.31	121	29.31	7642.0	979579.56	88.39	-172.25	2.84	9.91	-163.84	-128.89	z
lp133	40	26.49	121	29.83	7199.0	979612.27	80.70	-164.84	0.62	6.64	-159.71	-126.39	z
lp134	40	26.62	121	30.22	7082.0	979620.49	77.73	-163.81	1.42	7.47	-157.86	-125.21	z
lp135	40	26.47	121	30.67	6509.0	979656.06	59.68	-162.32	3.40	10.02	-153.81	-124.23	z
lp136	40	26.18	121	31.29	6432.0	979664.88	61.70	-157.68	1.75	8.04	-151.15	-121.65	z
lp137	40	28.33	121	29.46	8336.0	979535.22	107.73	-176.59	0.80	11.48	-166.55	-128.54	z
lp138	40	28.46	121	30.25	8452.0	979528.35	111.56	-176.71	1.42	12.88	-165.26	-126.89	z
lp139	40	27.99	121	30.27	8277.0	979542.24	109.72	-172.59	1.06	11.53	-162.50	-124.78	z
lp140	40	27.82	121	31.50	7872.0	979576.40	106.08	-162.41	1.99	10.62	-153.27	-117.33	z
lp141	40	27.46	121	31.57	7652.0	979591.81	101.36	-159.63	1.59	9.52	-151.60	-116.55	z
lp142	40	27.16	121	31.27	7440.0	979603.79	93.86	-159.89	1.77	9.09	-152.31	-118.19	z
lp143	40	26.68	121	31.55	7144.0	979622.29	85.27	-158.40	1.86	8.38	-151.53	-118.72	z
lp144	40	26.89	121	31.91	6979.0	979635.47	82.63	-155.41	2.20	9.10	-147.82	-115.89	z
lp145	40	26.64	121	32.09	6867.0	979641.42	78.43	-155.78	3.10	9.94	-147.36	-116.07	z
lp146	40	25.00	121	31.87	6531.0	979662.64	70.51	-152.24	1.42	6.56	-147.19	-117.02	z
lp147	40	28.39	121	29.80	8458.0	979528.16	112.05	-176.43	1.13	12.67	-165.19	-126.77	z
lp149	40	27.84	121	31.82	8157.0	979558.01	114.43	-163.78	2.19	12.49	-152.75	-115.72	z
lp150	40	28.47	121	32.26	7830.0	979579.03	103.80	-163.26	1.65	10.47	-154.27	-118.51	z
lp151	40	28.55	121	31.67	8268.0	979546.50	112.30	-169.70	2.16	13.11	-158.03	-120.57	z
lp152	40	28.84	121	32.02	7887.0	979572.99	102.56	-166.44	1.91	11.16	-156.76	-120.82	z
lp153	40	29.24	121	32.02	7499.0	979596.65	89.17	-166.60	2.22	10.48	-157.62	-123.42	z
lp154	40	29.81	121	32.06	6916.0	979631.65	68.54	-167.34	4.21	11.93	-156.93	-125.69	z
lp155	40	30.46	121	32.43	6657.0	979651.67	63.26	-163.79	0.70	7.14	-158.17	-127.48	z
lp156	40	28.70	121	30.53	8752.0	979504.68	115.72	-182.79	3.74	17.62	-166.56	-127.44	z
lp157	40	29.12	121	30.93	8949.0	979488.88	117.80	-187.42	6.28	22.95	-165.84	-126.53	z
lp158	40	29.56	121	30.94	8990.0	979483.73	115.81	-190.80	7.22	25.43	-166.73	-127.58	z
lp159	40	29.81	121	30.90	8586.0	979513.24	107.04	-185.81	6.24	20.64	-166.58	-128.66	z
lp160	40	30.32	121	30.82	7808.0	979569.14	89.08	-177.22	2.68	12.06	-166.65	-131.21	z
lp161	40	30.39	121	31.25	7238.0	979606.13	72.42	-174.45	3.16	10.70	-165.26	-132.32	z
lp162	40	35.32	121	31.90	5313.0	979749.64	27.68	-153.53	0.12	2.53	-152.44	-127.48	z
lp163	40	34.94	121	31.41	5325.0	979745.51	25.25	-156.37	0.30	2.90	-154.92	-129.95	z
lp164	40	34.49	121	31.17	5368.0	979740.47	24.92	-158.17	0.52	3.44	-156.18	-131.08	z
lp165	40	34.14	121	30.73	5446.0	979735.16	27.47	-158.28	0.18	3.32	-156.42	-130.94	z
lp166	40	33.94	121	30.17	5582.0	979722.83	28.21	-162.18	0.23	3.33	-160.32	-134.19	z
lp167	40	33.42	121	29.72	5789.0	979705.41	31.02	-166.42	0.41	3.81	-164.10	-137.06	z
lp168	40	33.67	121	29.02	6142.0	979686.08	44.49	-165.00	0.37	3.79	-162.71	-134.00	z
lp169	40	33.10	121	28.96	6299.0	979674.14	48.15	-166.69	0.38	3.99	-164.21	-134.78	z
lp170	40	32.82	121	28.54	6377.0	979668.91	50.67	-166.83	0.19	3.83	-164.51	-134.69	z
lp171	40	33.58	121	28.52	6139.0	979686.21	44.47	-164.91	0.26	3.53	-162.88	-134.15	z
lp172	40	33.10	121	28.21	6198.0	979680.45	44.98	-166.42	0.64	3.91	-164.01	-135.05	z
lp173	40	26.94	121	32.12	6981.0	979636.95	84.22	-153.88	2.37	9.47	-145.92	-114.03	z
lp174	40	27.26	121	32.31	7408.0	979611.42	98.34	-154.33	2.83	10.23	-145.60	-111.80	z
lp175	40	27.41	121	32.83	7983.0	979573.31	114.03	-158.25	1.34	11.24	-148.48	-112.10	z
lp176	40	27.55	121	33.13	8304.0	979548.42	119.09	-164.14	2.13	14.95	-150.63	-113.25	z
lp177	40	27.80	121	33.27	7856.0	979580.09	108.30	-159.65	3.72	13.30	-147.83	-112.34	z
lp178	40	27.77	121	33.69	7259.0	979618.83	90.99	-156.60	4.52	12.06	-146.05	-113.20	z
lp179	40	27.79	121	34.05	6936.0	979640.76	82.54	-154.03	3.55	10.87	-144.68	-113.19	z
lp180	40	27.53	121	34.26	7003.0	979637.24	85.70	-153.15	1.95	9.48	-145.18	-113.19	z
lp181	40	27.80	121	34.32	6785.0	979650.61	78.18	-153.23	2.59	9.80	-144.95	-114.03	z
lp182	40	28.11	121	34.45	6509.0	979668.19	69.37	-152.64	4.37	11.31	-142.84	-113.43	z
lp183	40	28.56	121	35.12	6272.0	979686.19	64.42	-149.49	2.44	8.44	-142.56	-113.88	z

lp184	40	28.70	121	35.42	6263.0	979688.76	65.94	-147.67	1.63	7.26	-141.92	-113.11	z
lp185	40	26.26	121	30.12	7206.0	979612.51	81.93	-163.84	1.46	7.62	-157.73	-124.52	z
lp186	40	26.04	121	30.30	7334.0	979604.87	86.65	-163.49	2.58	9.51	-155.49	-121.94	z
lp187	40	25.81	121	30.42	7585.0	979586.17	91.88	-166.83	3.03	12.11	-156.21	-121.83	z
lp188	40	25.49	121	30.46	7288.0	979607.09	85.37	-163.20	4.27	11.98	-152.73	-119.73	z
lp189	40	25.18	121	30.12	7260.0	979608.57	84.68	-162.94	3.69	11.73	-152.72	-119.82	z
lp190	40	24.99	121	29.60	6689.0	979646.35	69.09	-159.05	2.05	7.18	-153.39	-122.56	z
lp191	40	25.32	121	29.21	6877.0	979635.21	75.12	-159.43	0.99	6.21	-154.74	-122.89	z
lp192	40	25.75	121	29.22	7033.0	979625.17	79.10	-160.77	1.71	7.11	-155.18	-122.71	z
lp193	40	26.09	121	29.27	7046.0	979623.50	78.15	-162.17	1.18	6.57	-157.12	-124.51	z
lp200	40	32.96	121	34.67	5741.0	979725.47	47.25	-148.56	0.56	3.90	-146.14	-119.34	
lp201	40	33.41	121	34.62	5861.0	979717.63	50.02	-149.88	1.01	4.25	-147.12	-119.80	
lp202	40	33.75	121	34.47	5925.0	979713.29	51.19	-150.90	0.76	3.97	-148.42	-120.76	
lp203	40	34.26	121	34.30	5853.0	979719.07	49.44	-150.19	0.67	3.72	-147.95	-120.60	
lp204	40	34.63	121	33.91	5706.0	979728.50	44.51	-150.11	0.31	3.20	-148.39	-121.66	
lp205	40	34.99	121	33.31	5571.0	979735.77	38.56	-151.45	0.12	2.77	-150.15	-124.00	
lp206	40	35.42	121	32.43	5422.0	979745.58	33.72	-151.21	0.03	2.37	-150.30	-124.80	
lp207	40	35.89	121	31.97	5268.0	979755.08	28.04	-151.63	0.15	2.33	-150.74	-125.97	
lp208	40	36.09	121	31.71	5186.0	979758.99	23.95	-152.93	0.13	2.30	-152.06	-127.67	
lp209	40	36.54	121	31.04	5133.0	979761.00	20.31	-154.76	0.09	2.15	-154.04	-129.88	
lp210	40	36.83	121	30.30	5059.0	979766.54	18.46	-154.09	0.04	2.03	-153.47	-129.65	
lp211	40	37.38	121	28.80	4895.0	979775.70	11.39	-155.56	0.07	1.98	-154.98	-131.93	
lp212	40	37.02	121	29.80	5029.0	979767.41	16.23	-155.29	0.04	1.98	-154.73	-131.04	
lp220	40	22.02	121	32.05	5738.0	979720.85	58.64	-137.07	0.67	4.06	-134.49	-107.72	z
lp221	40	22.44	121	31.88	5864.0	979712.35	61.36	-138.65	1.59	5.23	-134.91	-107.71	z
lp222	40	22.72	121	31.60	5964.0	979704.34	62.33	-141.09	1.92	5.83	-136.75	-109.16	z
lp223	40	23.11	121	31.43	6100.0	979694.02	64.21	-143.84	2.24	6.43	-138.91	-110.76	z
lp224	40	23.50	121	31.42	6211.0	979684.81	64.85	-146.99	2.98	7.41	-141.08	-112.55	z
lp225	40	23.88	121	31.39	6319.9	979677.57	67.27	-148.28	2.91	7.60	-142.19	-113.16	z
lp226	40	24.21	121	31.64	6406.0	979674.02	71.33	-147.16	0.67	5.58	-143.09	-113.38	z
lp227	40	24.59	121	31.73	6465.0	979667.84	70.13	-150.37	0.88	5.86	-146.03	-116.07	z
lp228	40	24.87	121	31.88	6493.0	979664.89	69.39	-152.07	1.54	6.61	-146.97	-116.99	z
lp229	40	25.06	121	31.83	6522.0	979662.98	69.92	-152.52	1.55	6.69	-147.35	-117.24	z
lp230	40	25.29	121	31.93	6544.0	979660.88	69.55	-153.65	1.83	7.16	-148.00	-117.85	z
lp231	40	25.44	121	31.99	6576.0	979658.38	69.83	-154.46	2.54	8.02	-147.95	-117.77	z
lp232	40	25.70	121	31.96	6609.0	979656.67	70.84	-154.58	2.24	7.97	-148.12	-117.78	z
lp233	40	25.92	121	32.13	6655.0	979654.85	73.01	-153.97	2.44	8.55	-146.94	-116.46	z
lp234	40	26.13	121	31.97	6709.0	979651.50	74.42	-154.40	1.11	7.28	-148.64	-117.73	z
lp235	40	26.23	121	32.02	6739.0	979650.34	75.95	-153.90	1.31	7.66	-147.76	-116.76	z
lp250	40	25.72	121	37.76	5748.0	979729.60	62.82	-133.22	1.20	5.91	-128.79	-102.24	
lp251	40	25.51	121	38.12	5892.0	979722.50	69.57	-131.39	1.15	6.02	-126.86	-99.64	
lp252	40	25.30	121	37.46	5966.0	979714.82	69.15	-134.33	0.53	5.43	-130.39	-102.74	
lp253	40	24.95	121	37.04	6056.0	979707.71	71.02	-135.53	1.14	6.11	-130.92	-102.93	
lp254	40	24.50	121	37.05	6005.0	979710.48	69.67	-135.14	1.18	5.98	-130.65	-102.89	
lp255	40	24.04	121	37.18	5968.0	979714.63	71.03	-132.52	0.52	5.14	-128.87	-101.17	
lp256	40	24.30	121	37.52	5901.0	979720.96	70.67	-130.59	0.23	4.79	-127.29	-99.86	
lp257	40	24.81	121	38.07	5705.0	979736.05	66.58	-128.00	0.58	4.95	-124.53	-98.04	
lp258	40	23.68	121	36.85	5963.0	979715.56	72.03	-131.35	0.88	5.45	-127.40	-99.76	
lp259	40	23.35	121	36.43	5969.0	979714.33	71.85	-131.74	1.45	5.96	-127.27	-99.68	
lp260	40	23.14	121	35.96	6112.0	979704.52	75.79	-132.67	0.77	5.44	-128.73	-100.39	
lp261	40	22.80	121	35.80	6248.0	979695.19	79.74	-133.36	1.16	6.32	-128.54	-99.68	
lp262	40	23.38	121	35.60	6403.0	979683.04	81.30	-137.09	0.80	6.17	-132.43	-102.81	
lp263	40	23.80	121	35.74	6688.0	979664.10	88.52	-139.59	0.44	6.88	-134.23	-103.36	
lp264	40	24.03	121	35.36	6806.0	979654.14	89.30	-142.83	0.43	7.06	-137.29	-105.89	
lp265	40	24.36	121	35.78	6941.0	979645.39	92.74	-143.99	0.34	7.76	-137.75	-105.81	
lp266	40	24.61	121	36.13	6918.0	979647.41	92.23	-143.72	0.51	8.04	-137.19	-105.40	
lp267	40	24.48	121	35.49	7014.0	979640.16	94.20	-145.03	0.33	7.81	-138.73	-106.45	
lp268	40	24.60	121	35.21	7111.0	979632.76	95.73	-146.81	0.35	8.07	-140.25	-107.55	
lp269	40	23.16	121	35.38	6161.0	979698.64	74.49	-135.65	1.95	6.62	-130.53	-102.12	
lp270	40	23.19	121	34.93	6102.0	979702.84	73.10	-135.02	1.74	6.29	-130.23	-102.06	

lp271	40	23.55	121	34.51	6069.0	979702.50	69.12	-137.88	1.44	6.04	-133.34	-105.28
lp272	40	23.21	121	34.60	6005.0	979709.37	70.48	-134.34	0.62	5.02	-130.81	-102.92
lp273	40	22.76	121	34.79	5911.0	979716.85	69.80	-131.81	1.07	5.30	-128.00	-100.59
lp274	40	22.40	121	34.55	5898.0	979717.51	69.77	-131.40	1.01	5.18	-127.71	-100.34
lp300	40	33.96	121	28.63	6089.0	979690.01	43.00	-164.67	0.40	3.71	-162.46	-133.99
lp301	40	34.04	121	28.25	5988.0	979695.17	38.56	-165.67	1.02	4.10	-163.07	-135.13
lp302	40	33.59	121	27.69	5838.0	979702.72	32.68	-166.44	0.59	3.71	-164.21	-136.93
lp303	40	33.45	121	27.36	6138.0	979684.12	42.48	-166.87	0.58	3.65	-164.72	-136.01
lp304	40	34.86	121	29.83	5373.0	979737.40	21.77	-161.49	0.11	2.68	-160.26	-135.04
lp305	40	27.76	121	31.03	7684.0	979585.02	97.13	-164.95	3.36	11.38	-155.06	-120.11 z
lp306	40	27.45	121	30.95	7310.0	979608.57	86.00	-163.32	3.89	11.19	-153.64	-120.43 z
lp307	40	27.26	121	30.86	7169.0	979616.98	81.45	-163.07	3.56	10.51	-154.07	-121.43 z
lp308	40	27.11	121	30.98	6978.0	979629.19	75.92	-162.07	2.69	9.61	-153.98	-122.12 z
lp309	40	26.80	121	30.91	6846.0	979637.21	72.01	-161.49	2.63	9.12	-153.89	-122.58 z
lp310	40	29.82	121	29.67	8195.0	979540.19	97.23	-182.27	3.77	14.84	-168.89	-132.01 z
lp311	40	29.75	121	29.34	7923.0	979558.80	90.39	-179.84	3.50	13.06	-168.25	-132.41 z
lp312	40	29.96	121	28.87	7367.0	979596.72	75.76	-175.50	1.30	8.49	-168.52	-134.67 z
lp313	40	30.43	121	28.46	6901.0	979626.93	61.49	-173.88	1.26	6.63	-168.77	-136.86 z
lp701	40	27.49	121	27.04	7193.0	979611.42	77.80	-167.54	0.32	5.60	-163.45	-130.02 z
lp702	40	27.23	121	26.40	7187.0	979608.97	75.16	-169.96	1.55	6.99	-164.48	-131.27 z
lp703	40	26.88	121	26.28	7016.0	979619.08	69.73	-169.57	2.12	6.96	-164.12	-131.72 z
lp704	40	26.98	121	26.64	7185.0	979610.06	76.44	-168.62	1.94	7.32	-162.81	-129.65 z
lp705	40	27.14	121	27.00	7175.0	979612.70	77.91	-166.81	0.22	5.47	-162.85	-129.49 z
lp706	40	26.82	121	27.12	7028.0	979621.29	73.16	-166.55	1.20	6.02	-162.04	-129.45 z
lp707	40	26.70	121	26.92	6904.0	979628.43	68.82	-166.65	1.54	6.07	-162.10	-130.10 z
lp708	40	26.70	121	26.59	6537.0	979648.87	54.78	-168.18	3.08	7.29	-162.41	-132.31 z
lp709	40	26.60	121	26.22	6296.0	979665.48	48.90	-165.84	2.33	6.48	-160.87	-131.80 z
lp710	40	26.47	121	25.83	6011.0	979683.81	40.63	-164.38	2.35	6.75	-159.13	-131.45 z
lp711	40	26.66	121	24.74	5740.0	979699.85	30.92	-164.85	1.75	5.90	-160.43	-133.91 z
lp712	40	26.58	121	24.25	5677.0	979704.55	29.81	-163.81	1.84	5.76	-159.53	-133.29 z
lp714	40	28.70	121	35.42	6259.0	979688.84	65.65	-147.83	1.63	7.26	-142.07	-113.29 z
lp715	40	28.67	121	35.85	6281.0	979689.01	67.93	-146.30	0.56	6.10	-141.71	-112.66 z
lp716	40	28.96	121	35.84	6221.0	979693.00	65.85	-146.33	0.56	5.90	-141.94	-113.14 z
lp717	40	28.76	121	35.59	6226.0	979691.45	65.07	-147.28	1.56	7.06	-141.73	-113.07 z
lp718	40	29.17	121	36.23	6260.0	979691.73	67.93	-145.57	1.11	6.57	-140.51	-111.63 z
lp719	40	29.39	121	35.49	6145.0	979697.64	62.71	-146.88	1.40	6.68	-141.70	-113.38 z
lp720	40	29.21	121	35.03	6230.0	979688.98	62.31	-150.18	1.82	7.58	-144.11	-115.50 z
lp721	40	29.02	121	34.22	6360.0	979675.81	61.63	-155.29	5.29	12.10	-144.70	-116.10 z
lp722	40	29.11	121	34.65	6289.0	979683.63	62.65	-151.85	2.68	8.92	-144.44	-115.74 z
lp723	40	29.37	121	34.95	6205.0	979690.05	60.78	-150.85	2.06	7.86	-144.50	-116.05 z
lp724	40	31.14	121	34.69	6502.0	979672.46	68.47	-153.30	0.56	6.02	-148.79	-118.68 z
lp725	40	30.77	121	33.93	6604.0	979661.53	67.67	-157.57	1.48	6.91	-152.17	-121.71 z
lp726	40	30.70	121	33.42	6408.0	979672.69	60.52	-158.04	0.80	6.29	-153.26	-123.64 z
lp727	40	31.09	121	36.49	5741.0	979729.84	54.41	-141.40	1.00	5.14	-137.74	-111.11 z
lp728	40	30.70	121	36.18	6001.0	979710.79	60.37	-144.30	1.12	5.83	-139.97	-112.21 z
lp729	40	31.33	121	35.95	5749.0	979726.92	51.88	-144.20	0.80	4.87	-140.81	-114.10 z
lp730	40	27.22	121	27.78	7160.0	979613.34	77.02	-167.19	0.74	6.03	-162.67	-129.46 z
lp731	40	27.04	121	28.02	7559.0	979589.37	90.80	-167.02	0.57	7.16	-161.35	-126.41 z
lp732	40	26.67	121	27.48	7544.0	979587.48	88.06	-169.24	1.72	8.73	-162.01	-127.36 z
lp733	40	26.37	121	27.92	7452.0	979595.10	87.48	-166.69	1.59	8.18	-160.01	-125.72 z
lp734	40	26.63	121	28.37	7469.0	979595.31	88.90	-165.85	1.21	7.60	-159.75	-125.29 z
lp735	40	27.31	121	28.68	7400.0	979599.14	85.23	-167.16	0.29	6.46	-162.20	-127.92 z
lp736	40	27.64	121	28.38	7363.0	979601.42	83.55	-167.58	0.43	6.49	-162.60	-128.49 z
lp737	40	29.43	121	25.88	6791.0	979633.34	59.05	-172.57	0.21	4.00	-170.08	-138.33 z
lp739	40	23.45	121	37.19	5908.0	979720.16	71.80	-129.70	0.46	4.91	-126.28	-98.83 z
lp740	40	25.96	121	26.22	7126.0	979612.39	74.75	-168.30	2.40	8.01	-161.80	-129.02 z
lp741	40	28.25	121	27.99	8494.0	979516.88	104.36	-185.35	4.69	17.66	-169.11	-131.22 z
lp742	40	25.63	121	30.05	8158.0	979540.67	100.48	-177.77	5.79	21.26	-157.96	-122.15 z
lp743	40	27.67	121	29.83	8753.0	979502.64	115.31	-183.23	5.36	20.58	-164.04	-125.33 z
lp744	40	22.86	121	37.13	6036.0	979713.09	77.64	-128.23	1.41	6.14	-123.59	-95.70 z

lp745	40	22.66	121	36.57	6130.0	979706.26	79.93	-129.14	0.91	5.84	-124.81	-96.43
lp746	40	22.33	121	36.89	6549.0	979678.73	92.27	-131.09	0.90	8.82	-123.79	-93.85
lp747	40	22.69	121	37.59	6160.0	979705.08	81.53	-128.57	0.66	6.09	-123.99	-95.51
lp748	40	22.29	121	37.63	6122.0	979708.22	81.69	-127.11	0.97	6.67	-121.94	-93.72
lp749	40	21.75	121	38.12	6003.0	979716.30	79.39	-125.35	3.28	9.47	-117.38	-90.11 z
lp750	40	21.60	121	37.40	5694.0	979736.18	70.46	-123.75	4.96	9.58	-115.64	-89.85 z
lp751	40	21.58	121	36.93	5503.0	979749.75	66.11	-121.58	4.23	8.32	-114.72	-89.67 z
lp752	40	21.41	121	36.27	5272.0	979767.48	62.38	-117.43	1.07	4.99	-113.88	-89.45
lp753	40	20.93	121	37.22	4826.0	979798.09	51.79	-112.81	0.49	4.70	-109.50	-87.15
lp754	40	21.98	121	33.76	5122.0	979767.16	47.12	-127.58	0.95	4.83	-124.17	-100.44
lp755	40	22.52	121	33.61	5327.0	979750.56	48.98	-132.71	1.86	5.97	-128.18	-103.63
lp756	40	22.92	121	33.23	5495.0	979738.65	52.26	-135.16	1.87	6.08	-130.54	-105.21 z
lp757	40	22.39	121	34.22	5806.0	979722.59	66.22	-131.80	1.44	5.31	-127.98	-101.07
lp758	40	22.76	121	33.86	5717.0	979725.55	60.26	-134.73	1.68	5.49	-130.72	-104.25 z
lp759	40	23.15	121	33.51	5881.0	979712.66	62.21	-138.37	3.37	7.39	-132.47	-105.49 z
lp760	40	23.38	121	32.98	5999.0	979705.31	65.60	-139.00	0.71	4.79	-135.71	-107.81
lp761	40	23.44	121	32.46	6203.0	979690.40	69.77	-141.79	0.51	4.79	-138.51	-109.65
lp762	40	23.51	121	31.85	6208.0	979688.86	68.60	-143.14	0.51	4.94	-139.70	-110.84
lp763	40	35.14	121	33.92	5642.0	979733.64	42.87	-149.56	0.36	2.93	-148.10	-121.64
lp764	40	35.21	121	34.44	5618.0	979732.98	39.86	-151.76	0.13	2.68	-150.55	-124.16
lp765	40	35.49	121	35.31	5688.0	979734.07	47.10	-146.90	0.22	2.77	-145.60	-118.90
lp766	40	35.43	121	35.88	5722.0	979731.45	47.77	-147.39	0.26	2.88	-145.99	-119.14
lp767	40	35.42	121	36.29	5753.0	979729.47	48.72	-147.50	0.19	2.88	-146.10	-119.11
lp768	40	35.83	121	36.43	5704.0	979734.32	48.35	-146.20	0.50	3.10	-144.57	-117.84
lp769	40	36.25	121	36.77	5721.0	979733.42	48.43	-146.70	0.52	3.15	-145.03	-118.22
lp770	40	36.62	121	37.18	5762.0	979731.19	49.49	-147.03	0.63	3.36	-145.16	-118.18
lp771	40	35.02	121	36.53	5772.0	979728.85	50.48	-146.39	0.55	3.39	-144.48	-117.46
lp772	40	34.65	121	37.01	5655.0	979739.24	50.43	-142.45	0.58	3.45	-140.47	-114.02
lp773	40	34.33	121	37.44	5468.0	979752.60	46.69	-139.81	0.38	3.23	-138.04	-112.44
lp774	40	33.95	121	37.36	5420.0	979757.35	47.49	-137.37	0.13	2.98	-135.84	-110.44
lp775	40	21.05	121	26.29	5552.0	979720.68	42.43	-146.93	0.77	2.87	-145.53	-119.48
lp776	40	21.10	121	27.04	5768.0	979707.38	49.36	-147.37	1.01	3.64	-145.21	-118.25
lp777	40	21.22	121	27.50	5705.0	979712.63	48.51	-146.07	0.95	3.51	-144.04	-117.36
lp778	40	21.29	121	28.05	5744.0	979710.87	50.31	-145.60	0.89	3.74	-143.35	-116.51
lp779	40	21.54	121	28.40	5850.0	979704.62	53.65	-145.88	0.87	4.12	-143.25	-115.96
lp780	40	29.20	121	30.35	10378.0	979371.49	134.52	-219.45	10.47	50.63	-169.92	-127.73 z
lp781	40	29.42	121	30.42	10285.0	979379.19	133.15	-217.64	9.08	48.14	-170.62	-128.53 z
lp783	40	28.87	121	30.16	9434.0	979451.32	126.17	-195.60	5.73	27.83	-169.05	-128.14 z
lp784	40	28.75	121	29.97	8943.0	979491.47	120.38	-184.64	2.87	18.67	-167.34	-127.47 z
lp785	40	28.96	121	38.00	5285.0	979763.72	48.60	-131.65	0.32	4.51	-128.59	-104.03
lp786	40	28.32	121	37.69	5476.0	979750.60	54.39	-132.38	0.63	5.48	-128.36	-103.03
lp787	40	28.85	121	37.12	5726.0	979731.23	57.73	-137.57	0.86	5.75	-133.30	-106.83
lp788	40	28.15	121	37.24	5995.0	979713.00	65.82	-138.65	2.22	7.79	-132.36	-104.90 z
lp789	40	28.57	121	36.59	6279.0	979691.57	70.45	-143.71	0.84	6.75	-138.46	-109.51
lp790	40	27.87	121	37.94	5568.0	979745.36	58.47	-131.44	0.62	5.48	-127.43	-101.67
lp791	40	27.31	121	38.06	5610.0	979742.83	60.72	-130.63	0.41	5.28	-126.82	-100.83
lp792	40	26.67	121	38.09	5573.0	979743.00	58.36	-131.72	0.51	5.22	-127.96	-102.14
lpg03b	40	29.33	121	29.97	9812.5	979414.42	124.14	-210.54	11.52	41.01	-170.75	-129.88 z
lpg06	40	31.79	121	31.08	8387.0	979517.73	89.89	-196.17	9.86	28.28	-169.33	-133.40 z
sh03	40	27.65	121	27.57	7280.0	979605.01	79.32	-168.98	0.35	6.60	-163.89	-130.19 y
sh04	40	27.19	121	25.55	6838.0	979629.03	62.50	-170.73	0.63	5.52	-166.73	-134.96 y
sh06	40	25.89	121	25.56	6482.0	979654.83	56.77	-164.31	0.13	4.08	-161.74	-131.46 y
sh08	40	26.50	121	27.16	7360.0	979598.79	82.33	-168.70	1.30	8.17	-162.04	-128.17 y
sh09	40	27.20	121	27.84	7140.0	979613.65	75.48	-168.04	1.30	6.97	-162.59	-129.60 y
sh10	40	21.19	121	28.36	6266.0	979670.78	59.43	-154.28	2.85	10.70	-145.09	-116.75 y
sh11	40	22.28	121	27.91	5997.0	979695.89	57.64	-146.90	0.64	4.28	-144.12	-116.16 y
sh12	40	23.92	121	27.99	6184.0	979674.33	51.20	-159.72	0.39	3.87	-157.35	-128.45 y
sh13	40	24.19	121	27.83	6279.0	979668.65	54.05	-160.11	0.23	3.78	-157.84	-128.47 y
sh15	40	24.78	121	27.57	6490.0	979656.36	60.71	-160.64	0.05	3.91	-158.25	-127.91 y
sh16	40	25.47	121	28.31	6977.0	979625.37	74.46	-163.51	1.69	7.17	-157.86	-125.66 y

sh18	40	23.75	121	26.38	5970.0	979691.20	48.24	-155.39	0.17	3.17	-153.71	-125.73	y
sh19	40	22.86	121	25.08	5681.0	979710.03	41.21	-152.55	0.11	2.72	-151.30	-124.63	y
sh20	40	26.35	121	33.53	8392.0	979539.04	119.77	-166.46	1.28	17.56	-150.34	-112.91	y
sh21	40	26.85	121	33.90	8931.0	979494.25	124.87	-179.74	3.94	29.64	-151.47	-113.18	y
sh22	40	26.74	121	33.51	9235.0	979462.86	122.19	-192.79	16.95	43.32	-150.79	-112.96	z
sh23	40	26.97	121	33.21	8577.0	979525.67	122.86	-169.68	3.24	21.15	-149.95	-112.14	y
sh24	40	27.27	121	33.16	8659.0	979518.89	123.34	-172.00	4.09	23.00	-150.41	-112.47	y
sh25	40	27.85	121	32.62	9087.0	979477.97	121.75	-188.19	10.46	36.35	-153.18	-115.08	y
sh26	40	28.09	121	31.94	8886.0	979495.32	119.86	-183.22	10.82	30.89	-153.70	-115.79	y
sh27	40	28.41	121	31.28	8965.0	979492.76	124.23	-181.54	1.74	20.69	-162.21	-122.52	y
sh28	40	26.26	121	37.90	5513.0	979744.96	55.31	-132.73	0.94	6.25	-127.94	-102.55	y
sh29	40	26.18	121	35.59	6596.0	979666.42	78.66	-146.31	1.02	8.48	-139.35	-109.14	y
sh31	40	25.49	121	35.02	7244.0	979622.04	96.18	-150.89	0.89	9.08	-143.32	-110.13	y
sh32	40	25.59	121	35.77	7171.0	979628.81	95.95	-148.63	2.87	12.35	-137.80	-105.40	y
sh34	40	26.94	121	37.07	6134.0	979701.57	69.24	-139.97	0.77	7.25	-134.22	-106.03	y
sh35	40	27.42	121	28.94	7402.0	979597.08	83.19	-169.27	0.38	7.41	-163.37	-129.20	y
sh36	40	26.81	121	29.38	7224.0	979611.28	81.59	-164.80	0.20	6.77	-159.55	-126.13	y
sh38	40	26.35	121	29.61	7526.0	979587.54	86.89	-169.80	3.29	11.00	-160.30	-126.04	y
sh40	40	24.21	121	28.82	6531.0	979655.62	64.67	-158.08	0.71	5.53	-154.07	-123.76	y
sh43	40	27.55	121	36.01	7555.0	979600.01	100.30	-157.37	2.28	16.28	-142.59	-108.93	y
sh44	40	26.97	121	34.78	8198.0	979551.26	112.83	-166.78	4.00	20.61	-147.62	-111.53	y
sh45	40	27.07	121	36.13	6829.0	979652.69	85.49	-147.43	0.41	8.32	-140.63	-109.29	y
sh49	40	26.95	121	31.37	7977.0	979558.43	99.27	-172.80	8.15	20.90	-153.37	-118.36	y
sh50	40	28.03	121	31.03	8089.0	979558.29	108.04	-167.85	0.88	11.28	-158.03	-121.16	y

## Appendix 2

Station lp001 is at U.S. Coast and Geodetic Survey benchmark "Fl96 1934", located approximately 9 km northwest of the summit of Lassen Peak and approximately 1 km northwest of Manzanita Lake. Benchmark is set in a large boulder at the northeast edge of an abandoned unpaved road. Reading site is at high point of boulder containing the benchmark and is marked by three shallow depressions in the rock positioned such that they will accommodate the legs of a standard LaCoste and Romberg baseplate.

An alternate reading site is over National Park Service benchmark "ML-27 1978" located 24 m 164° from benchmark "Fl96 1934". The observed gravity at the alternate reading site is  $-0.136 \pm 0.003$  mGal relative to lp001.