

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Principal facts for gravity stations in the Dos Cabezas  
Mountains, Cochise County, Arizona

by

G. A. Abrams, C. K. Moss, and T. A. Schutter

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## Table of Contents

Introduction.....	1
Data Collection.....	1
Elevation Control.....	1
Data Reduction.....	1
Location Map, Figure 1.....	2
Location of Gravity Stations, Figure 2.....	2
Table 1	
Principal Facts of Gravity Data.....	4
Bouguer Gravity Data.....	5
References Cited.....	7
Appendix A	
Gravity Base Station Description.....	8

## INTRODUCTION

A gravity survey was made in the Dos Cabezas Mountains and vicinity (fig. 1) in May, 1984. The data were obtained as part of a cooperative program of the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (USBM). The purpose of this program is to study the mineral resource potential of Federal land areas.

## DATA COLLECTION

Gravity observations were made using LaCoste and Romberg gravity meters G-551 and G-24. The gravity stations were referenced to the U.S. Department of Defense (DOD) base at Cochise County Airport, Arizona (Appendix A). Gravity loops were started and closed daily by making repeat observations at a secondary base in Wilcox. Access to survey area was by secondary roads and jeep trails.

## ELEVATION CONTROL

The survey area is bound by latitudes  $32^{\circ}10'$  -  $32^{\circ}18'N$  and longitudes  $109^{\circ}27'$  -  $109^{\circ}40'W$ . Station elevations were obtained from benchmarks, spot elevations and section corners on 1:24,000 scale USGS topographic maps. The elevation uncertainty is one-half the contour interval; thus on a map with 40-ft contour intervals, the maximum Bouguer and free-air correction would be 1.2 mgals.

## DATA REDUCTION

Computer programs existing on the USGS Branch of Geophysics Digital Equipment Corporation VAX 11-750 computer system were used to obtain principal facts and terrain-corrected gravity values. A program written by M. Webring

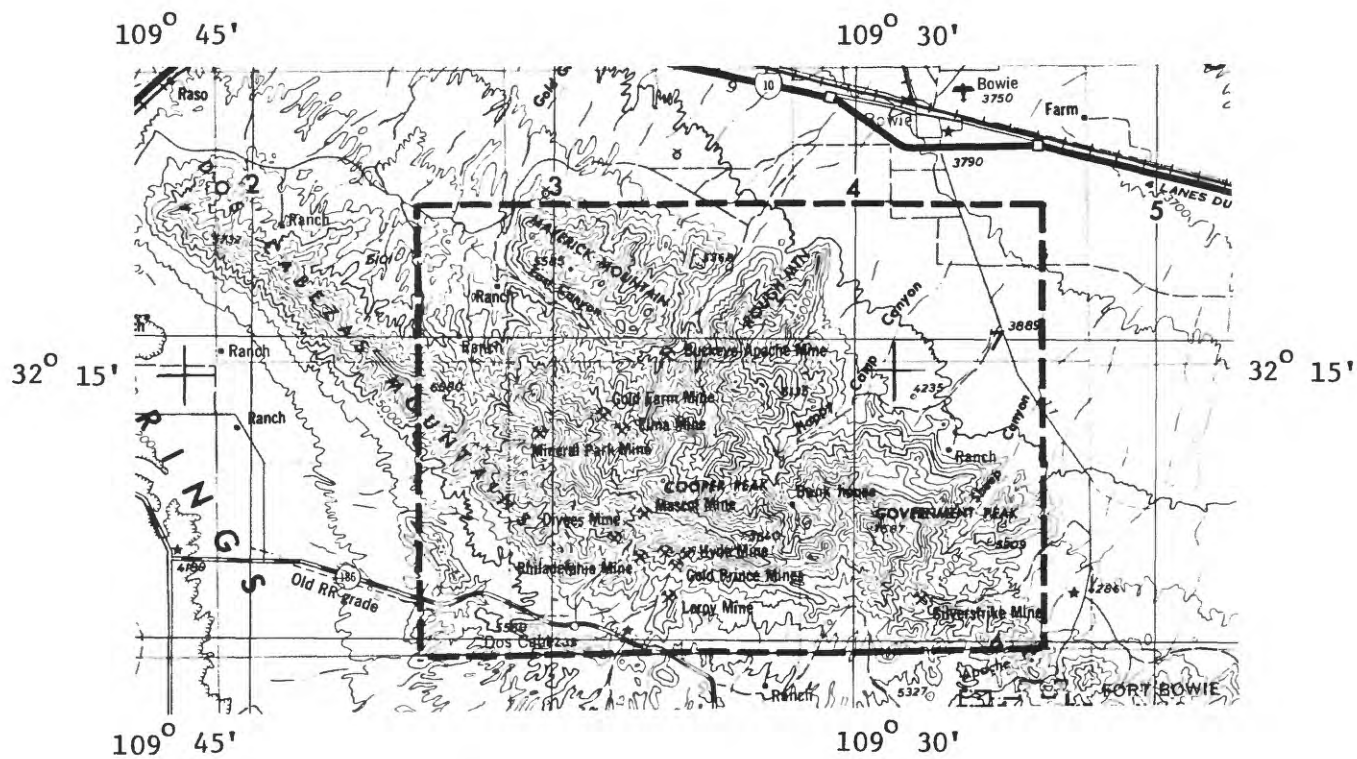


Figure 1. Location Map

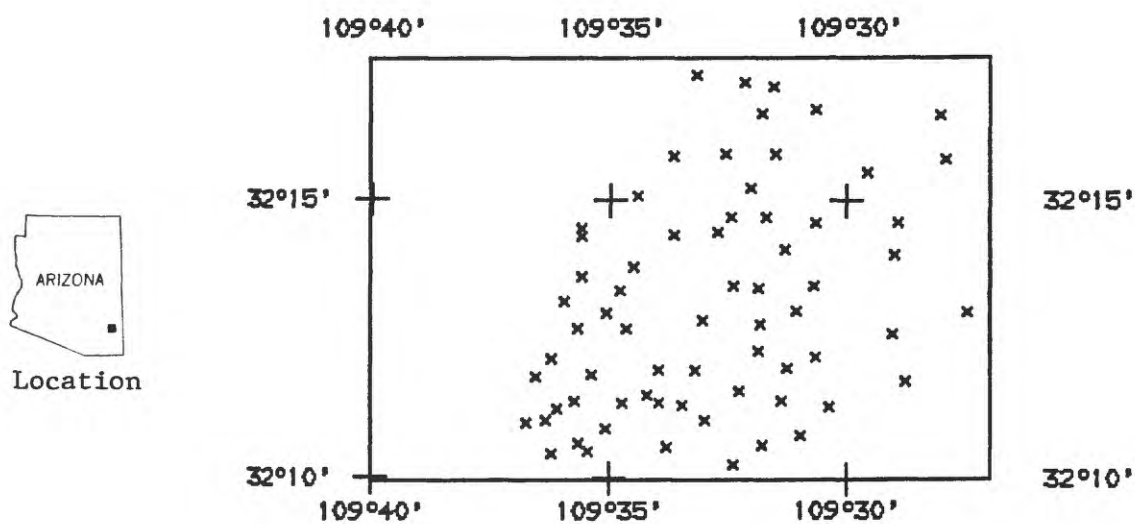
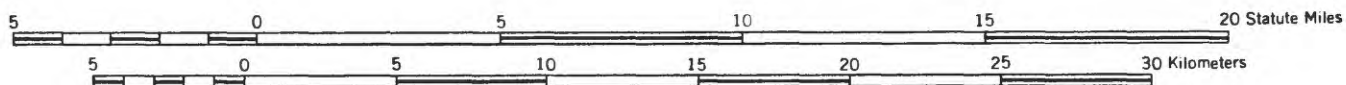


Figure 2. Location of Gravity Stations

and R. Wahl (USGS, unpub. program, 1984) was used to reduce gravity meter readings to observed gravity values by calculating and correcting for earth-tide and linear meter drift. The theoretical gravity value was calculated using the 1967 formula of the Geodetic Reference System (International Association of Geodesy, 1971). Terrain corrections were computed using a program by R. H. Godson (USGS, unpub. program, 1978) correcting for the gravity effects of terrain from each station to a radius of 166.7 km using the method of Plouff (1977). Godson's program also calculates earth curvature corrections and complete (terrain corrected) Bouguer gravity anomaly values. These computed terrain corrections use mean elevation digital data on a 15-second grid for corrections from 0 to 5 km, 1-minute terrain data for corrections from 5 to 21 km, and 3-minute terrain data for corrections from 21 to 166.7 km. A density of  $2.67 \text{ g/cm}^3$  was used to calculate terrain corrections, giving one complete Bouguer gravity anomaly value per station. The second complete Bouguer gravity anomaly value was calculated by using a factor of  $\frac{2.45 \text{ g/cm}^3}{2.67 \text{ g/cm}^3}$ . The corrections and gravity anomaly values are listed in Table 1.

Table 1: Principal Facts of Gravity Data

Explanation of headings

Identification

proj	Not used
sta-id	Gravity station identification number.

Locations

latitude	North latitude in degrees, decimal minutes.
longitude	West longitude in degrees, decimal minutes.
ele	Station elevation in feet.
st	Not used.

Gravity

observed	Observed gravity in milligals.
theoretical	Theoretical gravity in milligals.

Corrections

Terrain	Terrain correction, 166.7 km radius, in milligals.
Bouguer	Simple Bouguer slab correction in milligals.
curv	Curvature correction in milligals.
special	Not used.

Anomalies

free-air	Free-air anomaly in milligals.
complete-Bouguer	Complete Bouguer anomaly in milligals for designated densities $d_1$ and $d_2$ .
spec fields	Not used.

STATION IDENTIFICATION proj sta-id	L O C A T I O N S			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	ELE (in ft)	ST OBSERVED	THEORETICAL	TERRAIN BOUGUER CURV (d1=2.67)	SPECIAL	FREE AIR	COMPLETE-BOUGUER d1=2.67 d2=2.45
:103	32 13.17	-109 35.94	7121.00	978923.43	979501.34	10.49 -242.88 -1.51	0.00	91.65	-142.25 -122.97
:104	32 10.45	-109 36.21	5148.00	979043.57	979497.65	1.71 -175.58 -1.43	0.00	30.04	-145.26 -130.81
:105	32 10.60	-109 35.64	5292.00	979035.44	979497.85	1.97 -180.49 -1.44	0.00	35.24	-144.72 -129.89
:106	32 10.91	-109 35.07	5436.00	979027.63	979498.27	2.67 -185.41 -1.46	0.00	40.55	-143.64 -128.46
:107	32 11.35	-109 34.72	5641.00	979015.38	979498.88	3.75 -192.40 -1.47	0.00	46.97	-143.15 -127.48
:108	32 11.49	-109 34.20	5819.00	979004.10	979499.06	4.80 -198.47 -1.49	0.00	52.24	-142.92 -126.84
:109	32 10.49	-109 35.44	5294.00	979034.69	979497.70	1.98 -180.56 -1.44	0.00	34.83	-145.20 -130.36
:110	32 10.57	-109 33.80	5372.00	979030.23	979497.81	2.38 -183.22 -1.45	0.00	37.59	-144.70 -129.68
:112	32 13.63	-109 35.60	6423.00	978969.91	979501.97	6.42 -219.07 -1.51	0.00	71.90	-142.26 -124.61
:113	32 14.33	-109 35.59	6049.00	978991.97	979502.92	6.13 -206.31 -1.50	0.00	67.86	-143.82 -127.20
:114	32 14.47	-109 35.58	5905.00	979001.34	979503.11	5.14 -201.40 -1.49	0.00	63.61	-144.24 -127.95
:201	32 10.99	-109 36.74	5223.00	979040.41	979498.38	2.36 -178.14 -1.44	0.00	33.19	-144.02 -129.42
:202	32 12.96	-109 35.07	7780.00	978871.67	979501.06	21.96 -265.35 -1.49	0.00	102.11	-142.77 -122.59
:203	32 12.69	-109 35.67	6971.00	978930.27	979500.70	10.60 -237.76 -1.52	0.00	85.06	-143.63 -124.78
:204	32 11.85	-109 35.35	6329.00	978970.73	979499.55	7.50 -215.86 -1.51	0.00	66.30	-143.57 -126.28
:205	32 11.38	-109 35.73	5906.00	978997.72	979498.91	4.85 -201.44 -1.49	0.00	54.18	-143.90 -127.58
:206	32 11.25	-109 36.07	5898.00	978996.61	979498.73	6.33 -201.16 -1.49	0.00	62.50	-143.83 -127.65
:207	32 11.04	-109 35.35	5502.00	979022.23	979498.45	2.80 -187.66 -1.46	0.00	41.17	-145.15 -129.80
:208	32 12.12	-109 36.22	6192.00	978981.09	979499.92	6.22 -211.19 -1.50	0.00	63.43	-143.05 -126.04
:209	32 11.81	-109 36.56	6144.00	978980.90	979499.50	7.43 -209.55 -1.50	0.00	69.14	-144.48 -127.71
:210	32 13.45	-109 32.38	4809.00	979064.13	979501.73	5.07 -164.02 -1.39	0.00	14.65	-145.69 -132.48
:211	32 14.13	-109 31.29	4483.00	979084.63	979502.65	3.77 -152.90 -1.34	0.00	3.59	-146.89 -134.49
:212	32 14.61	-109 30.65	4293.00	979096.97	979503.30	2.42 -146.42 -1.31	0.00	-2.59	-147.90 -135.93
:213	32 14.59	-109 28.93	4028.00	979111.64	979503.27	1.38 -137.38 -1.26	0.00	-12.81	-150.08 -138.77
:214	32 17.03	-109 31.56	4853.00	979058.67	979506.59	10.13 -165.52 -1.39	0.00	8.47	-148.32 -135.40
:215	32 16.57	-109 31.82	5135.00	979042.88	979505.96	11.07 -175.14 -1.43	0.00	19.82	-145.68 -132.04
:216	32 15.84	-109 32.57	6063.00	978982.15	979504.97	14.35 -206.79 -1.50	0.00	47.31	-146.63 -130.65
:217	32 14.43	-109 32.73	6275.00	978970.50	979503.05	13.00 -214.02 -1.51	0.00	67.50	-145.03 -128.34
:218	32 14.71	-109 32.45	6109.00	978982.44	979503.44	10.79 -208.36 -1.50	0.00	63.45	-145.62 -129.21
:219	32 15.23	-109 32.03	5330.00	979032.69	979504.14	6.38 -181.79 -1.45	0.00	29.78	-147.08 -132.61
:220	32 14.70	-109 31.69	5331.00	979031.49	979503.42	7.21 -181.83 -1.45	0.00	29.39	-146.67 -132.16
:221	32 14.39	-109 33.66	5903.00	978999.90	979503.00	4.79 -201.33 -1.49	0.00	51.99	-146.05 -129.73
:222	32 13.80	-109 34.50	7292.00	978901.15	979502.20	20.92 -248.71 -1.51	0.00	84.58	-144.71 -125.82
:223	32 13.36	-109 34.78	7069.00	978926.47	979501.60	11.25 -241.10 -1.51	0.00	89.55	-141.82 -122.75
:224	32 12.68	-109 34.63	7950.00	978853.80	979500.68	29.79 -271.15 -1.47	0.00	100.59	-142.24 -122.24
:225	32 11.95	-109 33.18	7502.00	978884.97	979499.69	23.36 -265.87 -1.50	0.00	90.66	-143.36 -124.07
:226	32 11.56	-109 32.25	6562.00	978953.07	979499.16	8.94 -223.81 -1.52	0.00	70.95	-145.44 -127.61
:227	32 12.20	-109 30.64	7580.00	978872.61	979500.02	33.63 -258.53 -1.50	0.00	85.29	-141.11 -122.45

dos cabezas mt. ariz  
arizona gravity

BOUGUER GRAVITY DATA

STATION IDENTIFICATION proj sta-id	L O C A T I O N S		ST OBSERVED	G R A V I T Y THEORETICAL	C O R R E C T I O N S		FREE AIR	A N O M A L I E S			
	LATITUDE deg min	LONGITUDE deg min			TERRAIN BOUGUER CURV (d1=2.67)	SPECIAL		COMPLETE-BOUGUER d1=2.67 d2=2.45 FIELDS			
:228	32 11.92	-109 33.96	6481.00	978961.92	979499.65	6.86	-221.05	-1.51	71.69	-144.01	-126.24
:229	32 12.82	-109 33.05	5716.00	979009.76	979500.87	6.35	-194.96	-1.48	46.40	-143.68	-128.02
:230	32 12.76	-109 31.82	6017.00	978989.88	979500.79	6.82	-205.22	-1.50	54.90	-145.00	-128.53
:231	32 13.42	-109 31.85	5441.00	979022.55	979501.69	6.34	-185.58	-1.46	32.52	-148.17	-133.28
:232	32 13.01	-109 31.05	6413.00	978956.64	979501.13	14.67	-218.73	-1.51	58.54	-147.03	-130.09
:233	32 13.45	-109 30.71	5610.00	979011.70	979501.73	7.37	-191.34	-1.47	37.53	-147.91	-132.64
:234	32 12.28	-109 31.86	6292.00	978967.85	979500.13	11.53	-214.60	-1.51	59.37	-145.21	-128.35
:235	32 11.97	-109 31.24	6355.00	978969.43	979499.71	6.36	-216.75	-1.51	67.30	-144.61	-127.15
:236	32 11.41	-109 31.36	6271.00	978973.23	979498.95	6.01	-213.89	-1.51	63.95	-145.43	-128.18
:237	32 10.61	-109 31.76	5944.00	978990.09	979497.87	6.36	-202.73	-1.49	51.17	-146.69	-130.39
:238	32 11.04	-109 32.99	5990.00	978991.62	979498.45	5.14	-204.30	-1.50	56.43	-144.22	-127.69
:239	32 11.33	-109 33.46	6224.00	978976.06	979498.84	6.15	-212.28	-1.51	62.48	-145.16	-128.05
:240	32 11.35	-109 33.95	6109.00	978984.96	979498.88	5.28	-208.36	-1.50	60.54	-144.04	-127.18
:242	32 15.08	-109 34.42	5674.00	979010.63	979503.94	8.92	-193.52	-1.48	40.26	-145.82	-130.49
:243	32 15.81	-109 33.66	5341.00	979031.76	979504.93	6.61	-182.17	-1.45	29.09	-147.91	-133.33
:244	32 14.02	-109 28.99	4434.00	979084.12	979502.50	4.07	-151.23	-1.33	-1.39	-149.88	-137.64
:245	32 13.00	-109 27.47	4503.00	979079.02	979501.12	3.23	-153.58	-1.34	1.39	-150.31	-137.81
:247	32 12.62	-109 29.03	5996.00	978980.18	979500.59	14.35	-204.51	-1.50	43.42	-148.23	-132.44
:248	32 11.76	-109 28.73	5062.00	979048.36	979499.43	3.95	-172.65	-1.42	24.97	-145.15	-131.13
:249	32 11.31	-109 30.36	6500.00	978955.72	979498.82	10.65	-221.70	-1.51	68.10	-144.46	-126.94
:250	32 10.78	-109 30.95	5716.00	979007.27	979498.10	3.08	-194.96	-1.48	46.69	-146.67	-130.74
:251	32 17.24	-109 33.19	4155.00	979108.80	979506.88	2.00	-141.72	-1.29	-7.31	-148.32	-136.70
:252	32 17.11	-109 32.15	4041.00	979116.75	979506.70	2.30	-137.83	-1.27	-9.90	-146.69	-135.42
:253	32 15.84	-109 31.52	4277.00	979100.49	979504.97	3.33	-145.88	-1.31	-2.24	-146.09	-134.24
:254	32 16.62	-109 30.66	3994.00	979116.98	979506.03	1.09	-136.22	-1.26	-13.43	-149.82	-138.58
:255	32 15.51	-109 29.57	4048.00	979112.99	979504.52	1.02	-138.07	-1.27	-10.83	-149.14	-137.74
:256	32 16.55	-109 28.04	3848.00	979122.53	979505.94	0.37	-131.24	-1.23	-21.51	-153.61	-142.73
:257	32 15.76	-109 27.92	3896.00	979117.80	979504.87	0.49	-132.88	-1.24	-20.66	-154.29	-143.28
:258	32 10.25	-109 32.36	5304.00	979032.46	979497.38	1.94	-180.90	-1.44	33.86	-146.54	-131.68



#### REFERENCES CITED

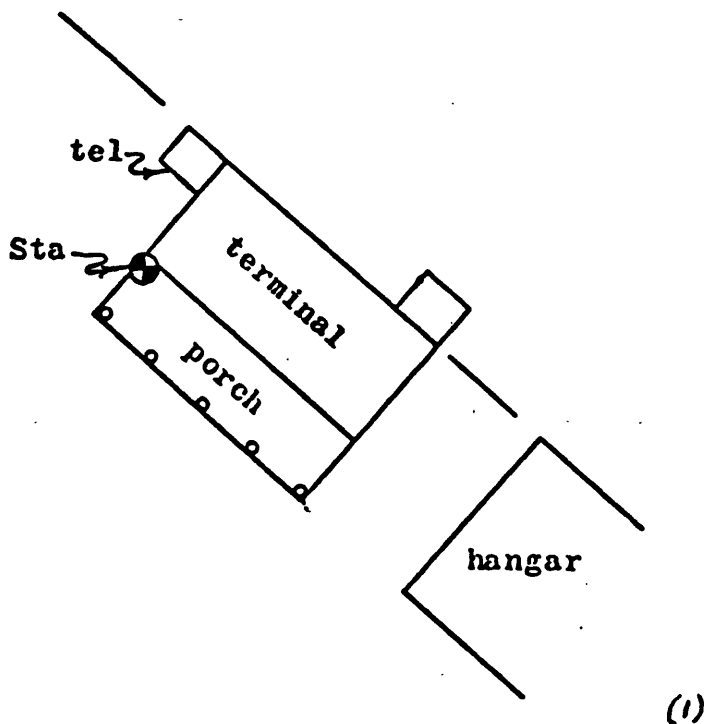
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# GRAVITY BASE STATION

LATITUDE		32° 14.57'N	(1)	STATION DESIGNATION	
LONGITUDE		109° 53.53'W	(1)		
ELEVATION		1275.0	METERS (1)		
REFERENCE CODE NUMBERS				COUNTRY/STATE	
ACIC 3193-1				USA/ARIZONA	
				ADOPTED GRAVITY VALUE	
				g = 979 083.11 mgals	
				ESTIMATED ACCURACY	
				DATE	
				MONTH/YEAR	
				/71	
				± 0.1 mgals	

## DESCRIPTION AND/OR SKETCH

Station site is located at Cochise County Airport, on NW corner of terminal porch (1)



## REFERENCE SOURCE

(1) 03035