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Principal Facts and Density Estimates for Borehole Gravity Stations in Three Water Wells Located in Dixie and Paradise Valleys, Nevada

by

S. L. Robbins[1], D. E. Prudic[2], D. H. Schaefer[2], and F. G. Clutsom[1]

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[1]U.S. Geological Survey, Box 25046, MS 921, Denver Federal Center, Denver, [2]Colorado, 80225
[2]U.S. Geological Survey, Carson City, Nevada

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TABLE OF CONTENTS

ILLUSTRATIONS

TABLES

Principal Facts and Density Estimates for Borehole Gravity Stations in Three Water Wells Located in Dixie and Paradise Valleys, Nevada

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INTRODUCTION

Borehole gravity surveys were conducted in three water wells in June 1982, by the U.S. Geological Survey (USGS) using La Coste and Romberg slim-hole borehole gravity meter (BHGM) BH-6. Well Dixie Valley 24-37-10DDCD is located in Dixie Valley, Churchill County, Nevada, and wells Wash O'Neil 2AA and Winn Farms 23BDA are located in Paradise Valley, Humboldt County, Nevada (fig. 1).

BHGMs are primarily density logging tools having a large radius of investigation compared to conventional logging tools and are not significantly affected by casing, borehole rugosity, or other near-borehole conditions. Therefore, a BHGM survey provides a unique and independent measurement of in-situ bulk density which, when integrated with data from conventional logs and (or) cores, can provide a better understanding of the physical properties of subsurface rocks in areas of "simple" geology, or the structure (remote sensing) when there are density changes horizontally away from the well. Robbins (1980) contains a complete listing of references pertaining to borehole gravimetry.

The primary objective of these surveys was to obtain density information about the alluvial material in these basins for use in: (1) porosity determinations in hydrologic studies, and (2) aiding in the interpretations of surface gravity surveys.

This report contains the principal facts obtained during the surveys (tables 1, 2, and 3) and estimates of in-situ bulk densities from these data (tables 4, 5, and 6). Also included are reduced sections of the gamma-ray logs with the BHGM station locations indicated (figs. 5, 6, and 7) and summaries of the lithology encountered within each well (tables 7, 8, and 9).

Tucci and others (1982, 1983), in Arizona, conducted six BHGM surveys with similar objectives. The only other published BHGM surveys that have been carried out in alluvial basins were conducted at the Nevada Test Site, Nye County, Nevada. The data have been released in the following reports: Healey (1970), Hearst and McKague (1976), Schmoker and Kososki (1978), Kososki and others (1978), Robbins and others (1982), and Robbins and Clutsom (1983).

BOREHOLE DATA

Tables 1, 2, and 3 present the principal facts for the gravity stations occupied during the BHGM surveys. The column headings for these tables are explained in the following list:

Reading #: The order in which the borehole gravity stations were read.

Depth: Depth of station in feet and meters. Datum is the ground elevation at the well.

Time: Coordinated Universal Time (CUT) of the mean of each set of gravity slope readings (beam velocities).

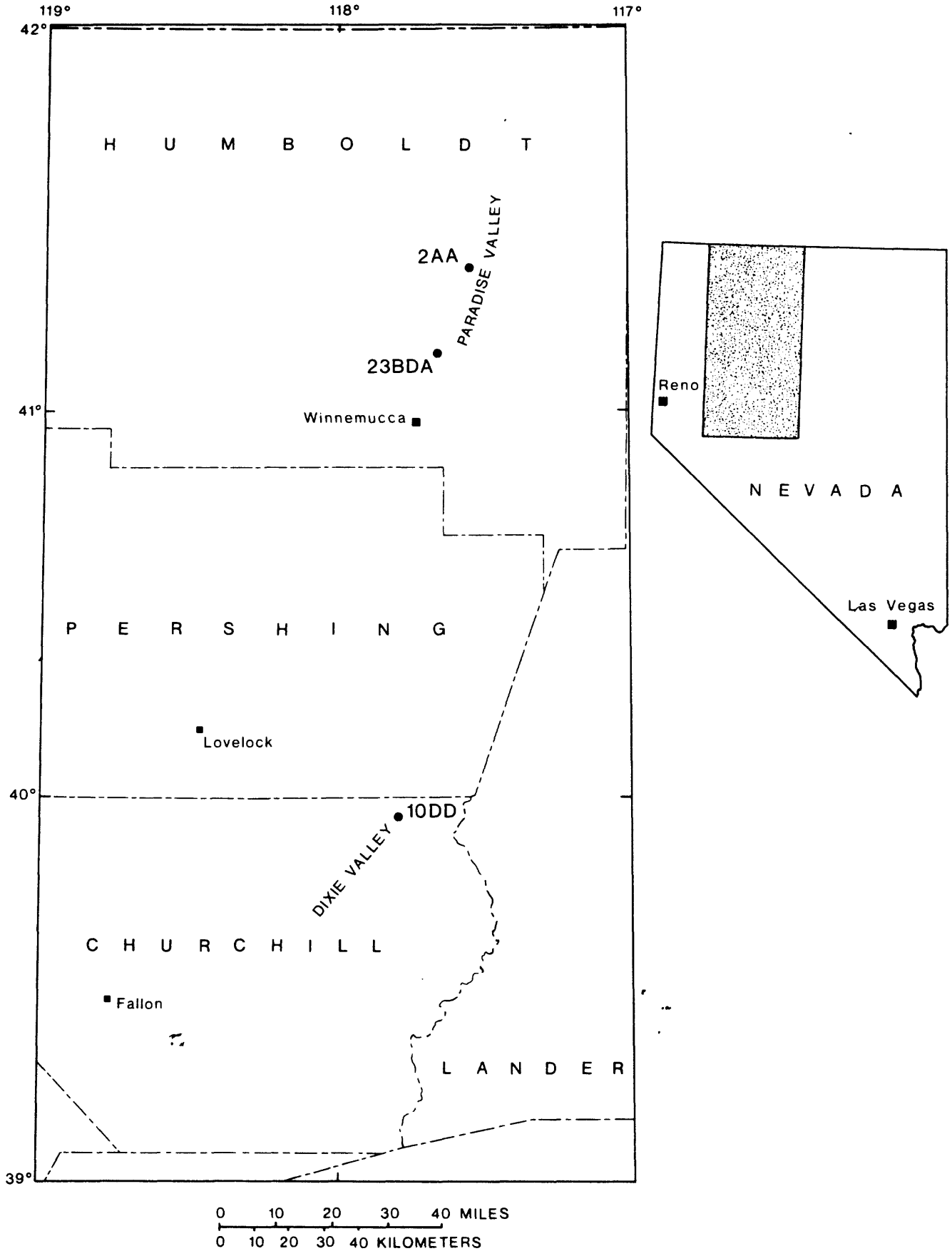


Figure 1.—Index map showing locations of wells logged with borehole gravity meter.

Meter readings: Counter reading of the BHGM in scale divisions at the station's calculated null position (no corrections have been made).

Tide corr.: Theoretical correction for earth tides in milligals (Darroll Wood, 1968, written commun.).

Drift corr.: Correction for instrument drift in milligals derived from station reoccupations. Figures 2, 3, and 4 show the curves used.

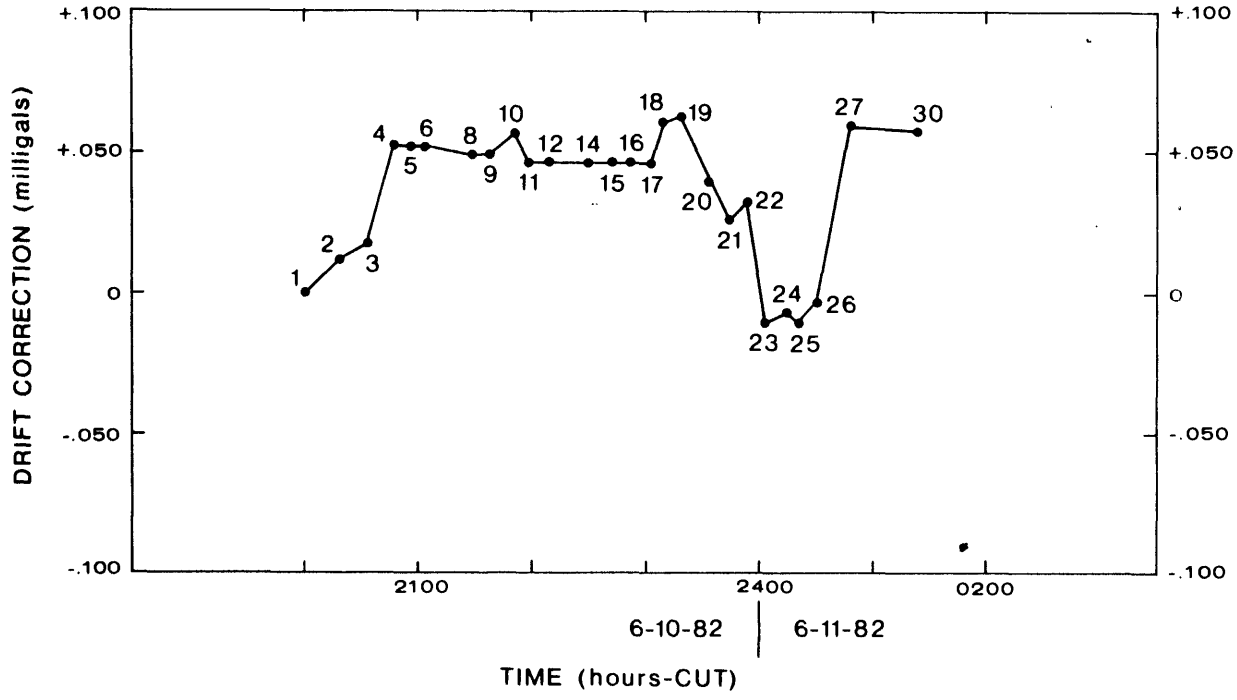
Terr. corr.: Terrain correction in milligals, calculated for a density of 2.2 g/cm^3 for all compartments out to a distance of 94,488 ft (28,800 m). This corresponds to zone L of Hayford-Bowie's terrain correction method (Swick, 1942; Beyer and Corbato, 1972).

Corr. gravity: Observed gravity in milligals, referenced to an arbitrary base. The value in this column is arrived at by first multiplying the meter reading by the "X Factor" number for the appropriate counter interval, and adding the product to the "Base Value" in the following table, and then adding in the tide, drift, and terrain effects.

Counter Interval	X Factor	Base Value
1300-1349.999	0.86487	1123.944
1350-1399.999	0.86496	1167.188
1400-1449.999	0.86508	1210.436

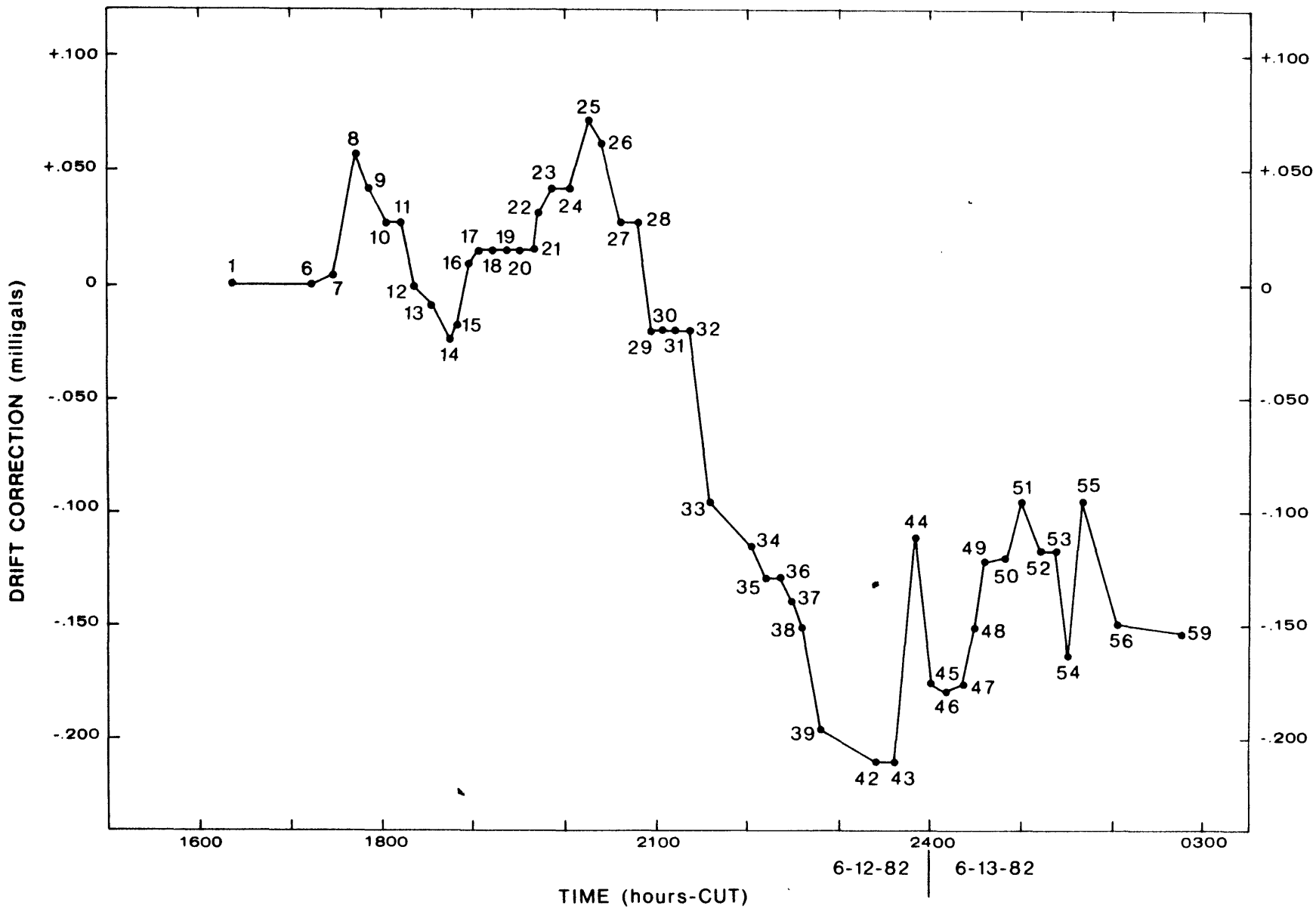
Error: This value, in microgals, is the estimated error caused by the rounding off of the various reduction corrections (that is, tide, drift, etc.) and by determination of the null position from the slope readings (beam velocities).

Prior to conducting the BHGM surveys, a gamma-ray log was run in each well for stratigraphic control and wireline depth correlations. Reduced sections of these logs are reproduced in figures 5, 6, and 7.



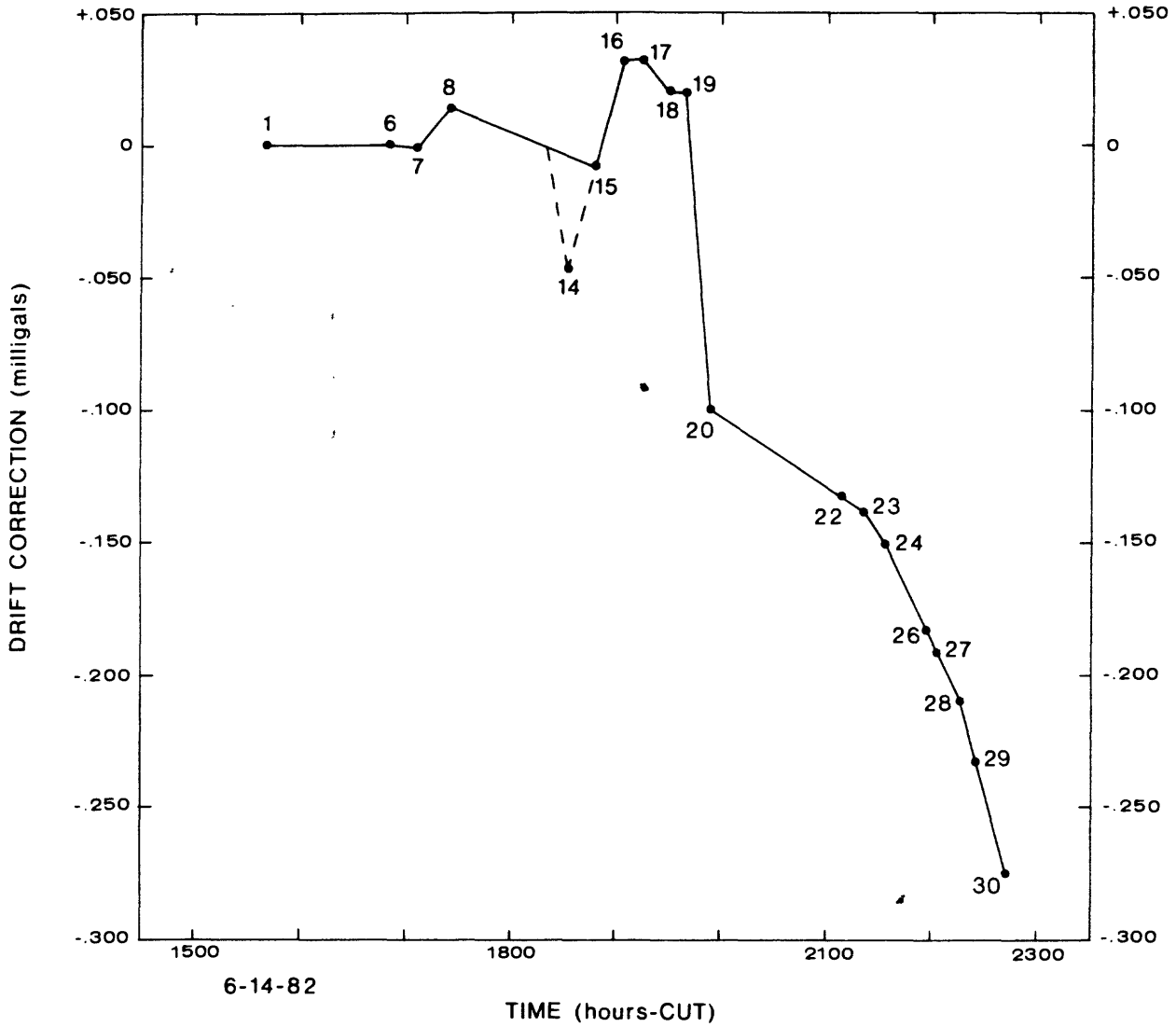
- **Drift correction used at particular reading when more than one reading was made at that depth (numbers refer to reading numbers in table 1).**

Figure 2.—Drift correction curve for BH-6 in well Dixie Valley 1ODD; lat 39°57′24" N., long 117°47′44" W., Dixie Valley, Churchill County, Nevada.



- Drift correction used at particular reading when more than one reading was made at that depth (numbers refer to reading numbers in table 2).

Figure 3.—Drift correction curve for BH-6 in well Wash O'Neil 2AA; lat 41°22'48" N., long 117°32'35" W., Paradise Valley, Humboldt County, Nevada.



- Drift correction used at particular reading when more than one reading was made at that depth (numbers refer to reading numbers in table 3).

Figure 4.—Drift correction curve for BH-6 in well Winn Farms 23BDA; lat 41°09'35" N., long 117°40'09" W., Paradise Valley, Humboldt County, Nevada.

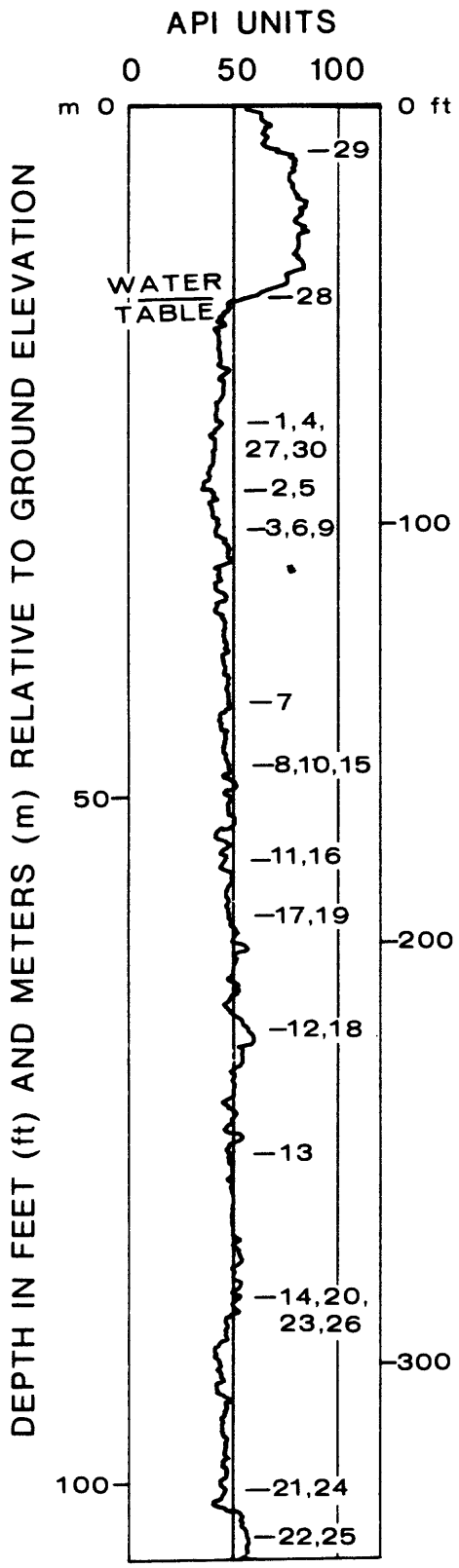


Figure 5.—Gamma-ray intensity log, in API units, from well Dixie Valley 1ODD; lat 39°57′24" N., long 117°47′44" W., Dixie Valley, Churchill County, Nevada, (numbers refer to BHGM reading numbers in table 1).

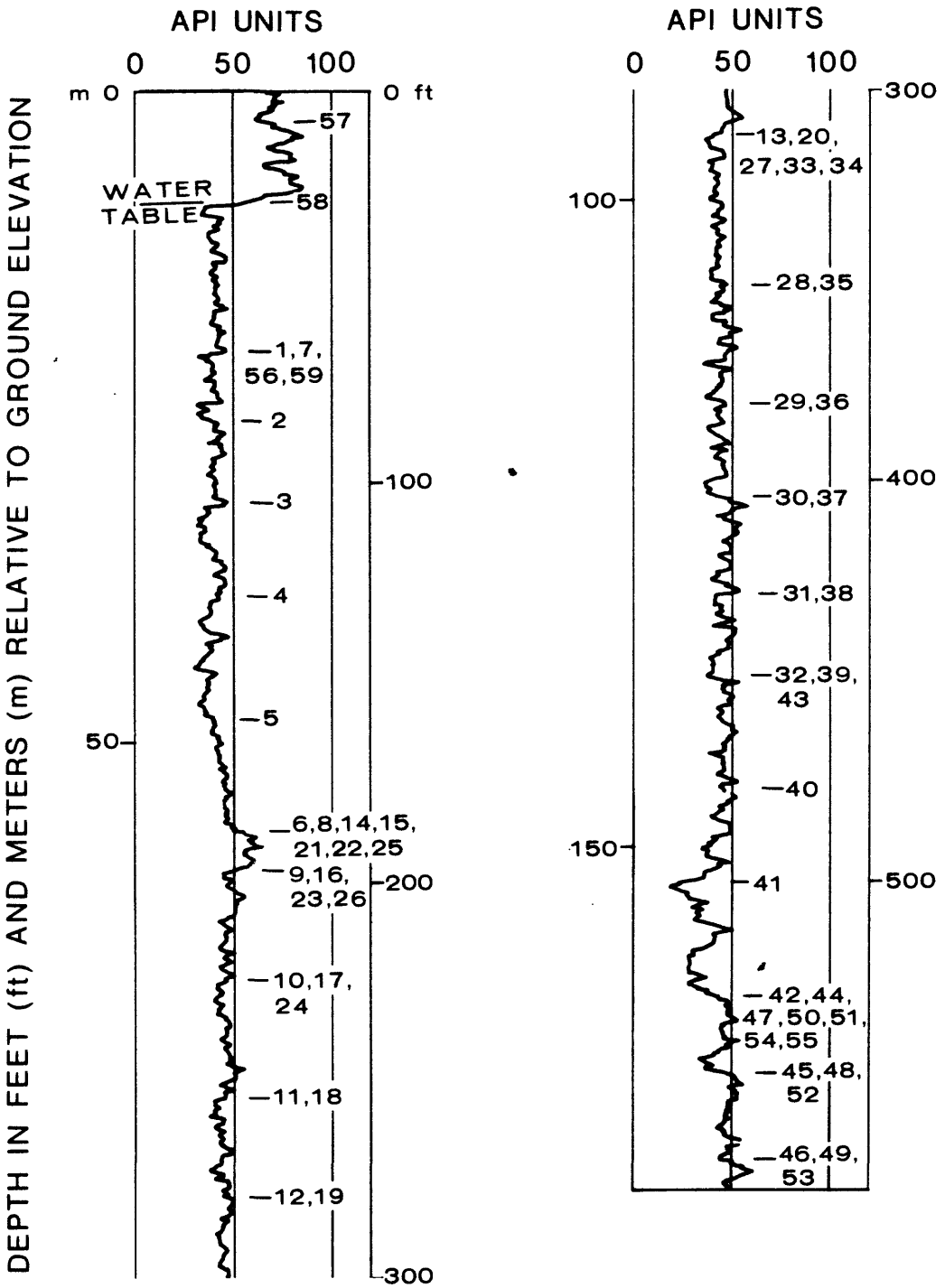


Figure 6.—Gamma-ray intensity log, in API units, from well Wash O'Neil 2AA; lat 41°22'46" N., long 117°32'35" W., Paradise Valley, Humboldt County, Nevada (numbers refer to BHGM reading numbers in table 2).

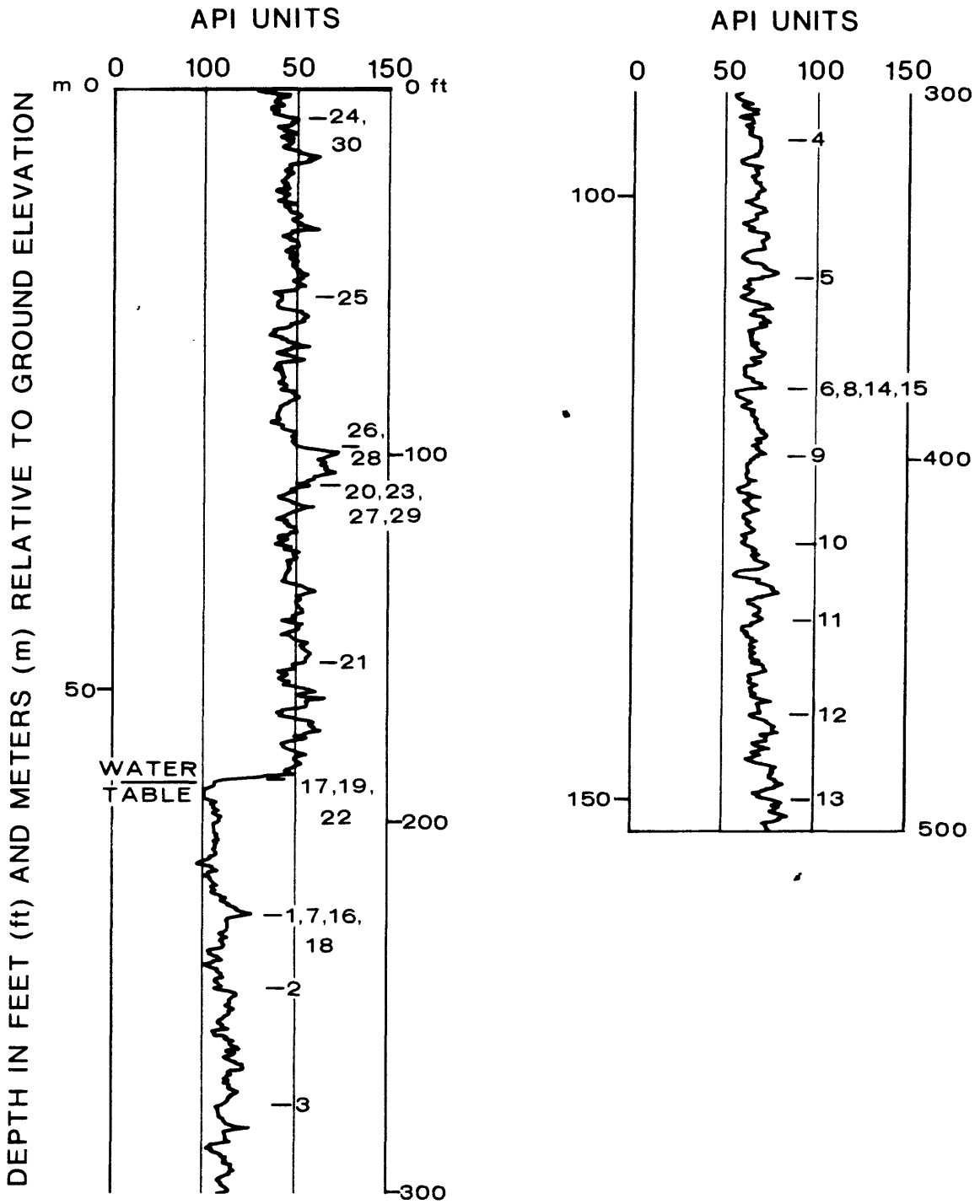


Figure 7.—Gamma-ray intensity log, in API units, from well Winn Farms 23BDA; lat 41°09'35" N., long 117°40'09" W., Paradise Valley, Humboldt County, Nevada (numbers refer to BHGM reading numbers in table 3).

Table 1.--Principal Facts for Well Dixie Valley 24-37-10DDCD, Dixie Valley, Churchill County, Nev.

[Located at lat 39° 57' 24" N., long 117° 47' 44" W.; ground elevation 3,472 ft (1,058 m)]

Logged 6-10-82

Reading #	Depth ft	Depth (m)	Time CUT	Meter readings S.D.	Tide corr. mgal	Drift corr. mgal	Terrain corr. mgal	Corr. gravity mgal	Error ±G μ gal
1	75.7	23.07	2000	1317.186	+.082	0.000	+.754	1139.644	±2.5
2	91.5	27.89	2019	1317.901	+.091	+.012	+.767	1140.296	±5
3	100.5	30.63	2034	1318.278	+.098	+.017	+.775	1140.642	±6
4	75.7	23.07	2048	1317.102	+.103	+.052	+.754	1139.644	±2.5
5	91.5	27.89	2058	1317.836	+.107	+.052	+.767	1140.296	±4
6	100.5	30.63	2107	1318.225	+.109	+.052	+.775	1140.642	±4
7	141.5	43.13	2117	1320.125	+.111	+.050	+.809	1142.320	±4
8	156.5	47.70	2129	1320.816	+.114	+.049	+.823	1142.933	±4
9	100.5	30.63	2138	1318.221	+.115	+.049	+.775	1140.642	±3
10	156.5	47.70	2151	1320.804	+.117	+.056	+.823	1142.933	±2.5
11	179.5	54.71	2159	1321.838	+.117	+.046	+.842	1143.836	±2.5
12	219.5	66.90	2208	1323.574	+.117	+.046	+.877	1145.372	±4
13	249.5	76.05	2219	1324.907	+.117	+.046	+.903	1146.551	±3
14	283.5	86.41	2230	1326.397	+.117	+.046	+.933	1147.870	±3
15	156.5	47.70	2243	1320.818	+.115	+.046	+.823	1142.933	±3.5
16	179.5	54.71	2252	1321.842	+.114	+.046	+.842	1143.836	±4
17	192.5	58.67	2303	1322.458	+.111	+.046	+.853	1144.377	±3
18	219.5	66.90	2310	1323.567	+.109	+.060	+.877	1145.372	±3
19	192.5	58.67	2319	1322.445	+.106	+.062	+.853	1144.377	±3.5
20	283.5	86.41	2334	1326.423	+.101	+.040	+.933	1147.870	±3
21	329.5	100.43	2344	1328.441	+.097	+.026	+.972	1149.637	±2.5
22	340.5	103.78	2354	1328.961	+.093	+.032	+.982	1150.099	±2
23	283.5	86.41	0004	1326.494	+.089	-.010	+.933	1147.870	±4
24	329.5	100.43	0014	1328.494	+.084	-.007	+.972	1149.637	±3
25	340.5	103.78	0021	1329.024	+.081	-.010	+.982	1150.099	±2
26	283.5	86.41	0030	1326.502	+.076	-.004	+.933	1147.870	±5
27	75.7	23.07	0047	1317.137	+.067	+.058	+.754	1139.644	±3
28	45.6	13.90	0102	1315.720	+.058	+.058	+.729	1138.385	±3.5
29	10.6	3.23	0112	1313.939	+.052	+.057	+.700	1136.808	±5
30	75.7	23.07	0123	1317.163	+.045	+.057	+.754	1139.644	±5

Table 2.--Principal Facts for Well Wash O'Neil 2AA,
Paradise Valley, Humboldt County, Nev.
[Located at lat 41° 22' 48" N., long 117° 32' 35" W.;
ground elevation 4420 ft (1347 m)]

Logged 6-12-82

Reading #	Depth ft	Depth (m)	Time CUT	Meter readings S.D.	Tide corr. mgal	Drift corr. mgal	Terrain corr. mgal	Corr. gravity mgal	Error ±G μgal
1	65.4	19.93	1621	1404.177	-.042	0.000	.526	1214.532	±3.5
2	82.8	25.24	1635	1404.966	-.040	0.000	.539	1215.230	±3
3	104.8	31.94	1643	1405.937	-.039	0.000	.555	1216.087	±2.5
4	128.8	39.26	1653	1407.061	-.037	0.000	.572	1217.078	±2.5
5	157.8	48.10	1701	1408.343	-.036	0.000	.592	1218.208	±3
6	186.8	56.94	1714	1409.645	-.034	0.000	.613	1219.358	±2.5
7	65.4	19.93	1728	1404.158	-.030	+.004	.526	1214.532	±2
8	186.8	56.94	1743	1409.571	-.027	+.057	.613	1219.358	±2.5
9	196.8	59.98	1751	1410.009	-.025	+.042	.620	1219.731	±4
10	224.8	68.52	1803	1411.234	-.021	+.027	.639	1220.798	±3
11	253.8	77.36	1812	1412.600	-.018	+.027	.660	1222.004	±3
12	278.8	84.98	1821	1413.861	-.015	-.001	.678	1223.088	±3
13	310.8	94.73	1833	1415.486	-.011	-.009	.701	1224.513	±2.5
14	186.8	56.94	1844	1409.642	-.007	-.024	.613	1219.358	±5
15	186.8	56.94	1849	1409.633	-.005	-.018	.613	1219.358	±3
16	196.8	59.98	1857	1410.021	-.002	+.009	.620	1219.731	±3.5
17	224.8	68.52	1904	1411.223	0.000	+.015	.639	1220.798	±2.5
18	253.8	77.36	1912	1412.590	+.003	+.015	.660	1222.004	±3
19	278.8	84.98	1920	1413.818	+.006	+.015	.678	1223.088	±2.5
20	310.8	94.73	1929	1415.434	+.010	+.015	.701	1224.513	±2
21	186.8	56.94	1939	1409.573	+.014	+.015	.613	1219.358	±5
22	186.8	56.94	1942	1409.553	+.015	+.031	.613	1219.358	±5
23	196.8	59.98	1951	1409.959	+.019	+.042	.620	1219.731	±4
24	224.8	68.52	2002	1411.165	+.023	+.042	.639	1220.798	±5
25	186.8	56.94	2015	1409.489	+.029	+.072	.613	1219.358	±3
26	196.8	59.98	2024	1409.919	+.033	+.062	.620	1219.731	±4
27	310.8	94.73	2036	1415.389	+.037	+.027	.701	1224.513	±3
28	348.9	106.34	2047	1417.273	+.041	+.027	.728	1226.174	±4
29	378.9	115.49	2047	1418.742	+.045	-.020	.750	1227.423	±4
30	403.9	123.11	2104	1419.982	+.048	-.020	.767	1228.516	±3
31	428.9	130.73	2111	1421.233	+.051	-.020	.785	1229.619	±2.5
32	449.9	137.13	2122	1422.220	+.054	-.020	.801	1230.492	±4
33	310.8	94.73	2135	1415.506	+.058	-.095	.701	1224.513	±5
34	310.8	94.73	2203	1415.520	+.066	-.115	.701	1224.513	±5
35	348.9	106.34	2213	1417.421	+.069	-.129	.728	1226.174	±4
36	378.9	115.49	2220	1418.839	+.070	-.129	.750	1227.423	±4
37	403.9	123.11	2229	1420.092	+.072	-.139	.767	1228.516	±2.5
38	428.9	130.73	2236	1421.359	+.073	-.151	.785	1229.619	±3.5
39	449.9	137.13	2248	1422.399	+.075	-.196	.801	1230.492	±3.5
40	476.0	145.08	2258	1423.632	+.076	-.200	.819	1231.574	±2.5
41	501.0	152.70	2312	1424.829	+.077	-.205	.837	1232.623	±3
42	531.1	161.88	2325	1426.197	+.078	-.210	.859	1233.825	±3.5
43	449.9	137.13	2337	1422.412	+.078	-.210	.801	1230.492	±6
44	531.1	161.88	2350	1426.083	+.078	-.111	.859	1233.825	±3
45	551.1	167.98	2400	1427.055	+.077	-.176	.873	1234.614	±2.5
46	573.1	174.68	0010	1428.072	+.076	-.179	.889	1235.506	±3
47	531.1	161.88	0021	1426.163	+.074	-.176	.859	1233.825	±5
48	551.1	167.98	0029	1427.031	+.073	-.151	.873	1234.614	±3.5
49	573.1	174.68	0036	1428.011	+.072	-.122	.889	1235.506	±4
50	531.1	161.88	0050	1426.104	+.069	-.120	.859	1233.825	±3
51	531.1	161.88	0100	1426.078	+.066	-.095	.859	1233.825	±2.5
52	551.1	167.98	0113	1427.004	+.062	-.117	.873	1234.614	±4
53	573.1	174.68	0122	1428.019	+.060	-.117	.889	1235.506	±3
54	531.1	161.88	0130	1426.168	+.057	-.163	.859	1233.825	±3
55	531.1	161.88	0140	1426.094	+.053	-.095	.859	1233.825	±3
56	65.4	19.93	0203	1404.248	+.045	-.149	.526	1214.532	±2.5
57	7.8	2.38	0223	1401.518	+.036	-.151	.485	1212.118	±5
58	27.9	8.50	0234	1402.561	+.031	-.152	.500	1213.029	±3.5
59	65.4	19.93	0245	1404.275	+.026	-.153	.526	1214.532	±3

Table 3.—Principal Facts for Well Winn Farms 23BDA, Paradise Valley, Humboldt County, Nev.

[Located at lat 41° 09' 35" N., long 117° 40' 09" W.; ground elevation 4438 ft (1353 m)]

Logged 6-14-82

Reading #	Depth ft	Depth (m)	Time CUT	Meter readings S.D.	Tide corr. mgal	Drift corr. mgal	Terrain corr. mgal	Corr. gravity mgal	Error ±G μgal
1	224.8	68.52	1542	1395.776	-.001	0.000	.530	1207.310	±2.5
2	244.8	74.62	1601	1396.645	-.002	0.000	.544	1208.075	±3
3	274.8	83.76	1613	1397.930	-.002	0.000	.563	1209.206	±3
4	311.8	95.04	1623	1399.503	-.003	0.000	.587	1210.589	±3
5	349.8	106.62	1634	1401.103	-.004	0.000	.610	1211.995	±4
6	379.8	115.76	1651	1402.369	-.005	0.000	.628	1213.107	±4
7	224.8	68.52	1706	1395.784	-.007	-.001	.530	1207.310	±7
8	379.8	115.76	1725	1402.357	-.009	+.014	.628	1213.107	±4
9	398.8	121.55	1736	1403.175	-.010	+.011	.638	1213.821	±2.5
10	422.8	128.87	1748	1404.194	-.011	+.008	.653	1214.713	±3
11	443.8	135.27	1759	1405.077	-.012	+.004	.664	1215.483	±3
12	468.8	142.89	1810	1406.148	-.013	+.002	.679	1216.422	±3
13	491.8	149.90	1819	1407.109	-.014	-.001	.691	1217.261	±3
14	379.8	115.76	1832	1402.434	-.015	-.047	.628	1213.107	±4
15	379.8	115.76	1848	1402.391	-.016	-.008	.628	1213.107	±4
16	224.8	68.52	1904	1395.756	-.016	+.032	.530	1207.310	±2.5
17	187.7	57.21	1915	1394.110	-.016	+.032	.503	1205.859	±4.5
18	224.8	68.52	1929	1395.770	-.016	+.020	.530	1207.310	±4
19	187.7	57.21	1939	1394.124	-.016	+.020	.503	1205.859	±3
20	107.7	32.83	1955	1390.020	-.016	-.100	.440	1202.127	±3
21	155.7	47.46	2058	1392.805	-.010	-.128	.479	1204.553	±3.5
22	187.7	57.21	2110	1394.291	-.008	-.133	.503	1205.859	±5
23	107.7	32.83	2121	1390.053	-.006	-.138	.440	1202.127	±4
24	7.7	2.35	2134	1384.643	-.003	-.150	.347	1197.346	±3
25	55.7	16.98	2146	1387.233	-.001	-.167	.394	1199.618	±3
26	97.7	29.78	2157	1389.558	+.001	-.183	.432	1201.653	±3.5
27	107.7	32.83	2204	1390.104	+.003	-.191	.440	1202.127	±2.5
28	97.7	29.78	2216	1389.585	+.005	-.210	.432	1201.653	±3
29	107.7	32.83	2223	1390.147	+.007	-.233	.440	1202.127	±4
30	7.7	2.35	2243	1384.770	+.011	-.274	.347	1197.346	±3.5

BHGM INTERPRETATIVE SUMMARY

References to fundamentals of borehole gravity logging, data interpretation, and relationships between subsurface gravity measurements and mass distribution in the Earth can be found in Robbins (1980). In the absence of complicating factors (assuming near-horizontal beds), the in-situ bulk density (in g/cm^3) between two points in a borehole is given by:

$$\rho_B = \frac{F - \frac{\Delta G}{\Delta Z}}{0.02556} \qquad (1)$$

where F is the free-air gradient of gravity in mgal/ft (Robbins, 1981), and $\frac{\Delta G}{\Delta Z}$ is the measured gradient of gravity between the two stations on a vertical line underground in mgal/ft.

Tables 4, 5, and 6 present the calculated bulk densities, and the column headings are explained in the following list:

Station depth: Depth in well (ft) at which BHGM was read one or more times. The points are in descending order relative to the ground surface at the well.

Interval (ΔZ): Vertical distance between the two adjacent station points in the well. Values are given in both feet and meters.

ΔG: Gravity difference between the two adjacent stations in the well in milligals.

ρ(.09406): In-situ bulk density (in g/cm^3) as determined by equation (1) using the "normal" value of 0.09406 for F. This assumed value can vary from area to area and is probably too high when used for wells located within alluvium-filled basins. Therefore, caution should be exercised in using these densities. If F is on the high side, then the computed densities will have a DC shift on the high side. However, density differences between intervals (contrast) will not be affected. Efforts at a later date will be made to determine the correct value of F.

Error: The first value listed is the sum of the estimated errors (error column, tables 1, 2, and 3) of the two adjacent stations in microgals. The second value is the equivalent error in g/cm^3. The values in this column do <u>not</u> include any error that would be associated with unknowns in the drift curves. Schmoker (1978) found the accuracy of most measurements between two points to be about $\pm$10 microgals. The mean errors for the data in this report are about $\pm$6 microgals; for the data in Robbins and others (1982), the mean error is again about $\pm$6 microgals; and for the data in Robbins and Clutsom (1983), the mean is about $\pm$6.5 microgals; thus suggesting that 4 microgals for drift and depth uncertainties be added to the values in this column for a total error.

Tables 7, 8, and 9 contain lithology summaries and unit depths for each well.

Table 4.--Density Estimates for Well Dixie Valley 24-37-10DDCD, Dixie Valley, Churchill County, Nev.

[Located at lat 39° 57' 24" N., long 117° 47' 44" W.; ground elevation 3472 ft (1058 m)]

Station Depth	Interval (ΔZ) (ft)	(m)	ΔG mgal	ρ(g/cm³) for F= .09406 mgal/ft	Error ±G(μgal)	Error ±ρ(g/cm³)
10.6						
	35.0	10.67	1.577	1.917	±8.5	±.010
45.6						
	30.1	9.17	1.259	2.044	±6.5	±.008
75.7						
	15.8	4.82	0.652	2.065	±6.5	±.016
91.5						
	9.0	2.74	0.346	2.176	±7	±.030
100.5						
	41.0	12.50	1.678	2.079	±7	±.007
141.5						
	15.0	4.57	0.613	2.081	±6.5	±.017
156.5						
	23.0	7.01	0.903	2.144	±5	±.009
179.5						
	13.0	3.96	0.541	2.052	±5.5	±.017
192.5						
	27.0	8.23	0.995	2.238	±6	±.009
219.5						
	30.0	9.14	1.179	2.142	±6	±.008
249.5						
	34.0	10.36	1.319	2.162	±6	±.007
283.5						
	46.0	14.02	1.767	2.177	±5.5	±.005
329.5						
	11.0	3.35	0.462	2.037	±4.5	±.016
340.5						

Table 5.--Density Estimates for Well Wash O'Neal 2AA, Paradise Valley, Humboldt County, Nev.

[Located at lat 41° 32' 48" N., long 117° 32' 35" W.; ground elevation 4420 ft (1347 m)]

Station Depth	Interval (ΔZ) (ft)	Interval (ΔZ) (m)	ΔG mgal	ρ(g/cm³) for F= .09406 mgal/ft	Error ±G(μgal)	Error ±ρ(g/cm³)
7.8						
	20.1	6.13	0.911	1.907	±8.5	±.017
27.9						
	37.5	11.43	1.503	2.112	±6.5	±.007
65.4						
	17.4	5.30	0.698	2.111	±6.5	±.014
82.8						
	22.0	6.71	0.857	2.156	±5.5	±.009
104.8						
	24.0	7.32	0.991	2.064	±5	±.008
128.8						
	29.0	8.84	1.130	2.155	±5.5	±.007
157.8						
	29.0	8.84	1.150	2.129	±5.5	±.007
186.8						
	10.0	3.05	0.373	2.221	±5.5	±.022
196.8						
	28.0	8.53	1.067	2.189	±6	±.008
224.8						
	29.0	8.84	1.206	2.053	±5.5	±.007
253.8						
	25.0	7.62	1.084	1.984	±5.5	±.009
278.8						
	32.0	9.75	1.425	1.938	±4.5	±.006
310.8						
	38.1	11.61	1.661	1.974	±6	±.006
348.9						
	30.0	9.14	1.249	2.051	±8	±.010
378.9						
	25.0	7.62	1.093	1.969	±6.5	±.010
403.9						
	25.0	7.62	1.103	1.954	±5	±.008
428.9						
	21.0	6.40	0.873	2.054	±6	±.012
449.9						
	26.1	7.96	1.082	2.058	±6	±.009
476.0						
	25.0	7.62	1.049	2.038	±5.5	±.009
501.0						
	30.1	9.17	1.202	2.118	±6.5	±.009
531.1						
	20.0	6.10	0.789	2.137	±5	±.010
551.1						
	22.0	6.71	0.892	2.094	±5.5	±.010
573.1						

Table 6.--Density Estimates for Well Winn Farms 23BDA, Paradise Valley, Humboldt County, Nev.

[Located at lat 41° 09' 35" N., long 117° 40' 09" W.; ground elevation 4,438 ft (1,353 m)]

Station Depth	Interval (ΔZ) (ft)	Interval (ΔZ) (m)	ΔG mgal	ρ(g/cm^3) for F= .09406 mgal/ft	Error ±G(μgal)	Error ±ρ(g/cm^3)
7.7						
	48.0	14.63	2.272	1.828	±6	±.005
55.7						
	42.0	12.80	2.035	1.784	±6	±.006
97.7						
	10.0	3.05	0.474	1.826	±5.5	±.022
107.7						
	48.0	14.63	2.426	1.703	±6	±.005
155.7						
	32.0	9.75	1.306	2.083	±6.5	±.008
187.7						
	37.1	11.31	1.451	2.150	±5.5	±.006
224.8						
	20.0	6.10	0.765	2.183	±5.5	±.011
244.8						
	30.0	9.14	1.131	2.205	±6	±.007
274.8						
	37.0	11.28	1.383	2.218	±6	±.007
311.8						
	38.0	11.58	1.406	2.232	±7	±.007
349.8						
	30.0	9.14	1.112	2.230	±8	±.011
379.8						
	19.0	5.79	0.714	2.210	±6.5	±.013
398.8						
	24.0	7.32	0.892	2.226	±5.5	±.009
422.8						
	21.0	6.40	0.770	2.245	±6	±.011
443.8						
	25.0	7.62	0.939	2.210	±6	±.009
468.8						
	23.0	7.01	0.839	2.253	±6	±.010
491.8						

Table 7.--Lithologic section and depths in well Dixie Valley 24-37-10DDCD
(From driller's report)
[W.T. = approximate depth to water table]
[T.D. = bottom of BHGM survey]

Lithologic units	Unit depths
	(Surface)
Topsoil	9 ft (2.7 m)
Sand and gravel	46 ft (14.0 m) W.T.
	52 ft (15.8 m)
Brown clay	76 ft (23.2 m)
Sand and gravel	88 ft (26.8 m)
Brown clay	96 ft (29.3 m)
Sand and gravel	102 ft (31.1 m)
Brown sandy clay and clay	140 ft (42.7 m)
Sand and gravel	156 ft (47.6 m)
Sandy clay and brown clay	180 ft (54.9 m)
Sand and gravel	192 ft (58.5 m)
Brown sandy clay and soft clay	220 ft (67.1 m)
Sand and gravel	341 ft (103.9 m) T.D.

Table 8.--Lithologic section and depths in well Wash O'Neal 2AA
(From driller's report)
[W.T. = approximate depth to water table]
[T.D. = bottom of BHGM survey]

Lithologic units	Unit depths
	(Surface)
Top soil	17 ft (5.2 m)
	28 ft (8.5 m) W.T.
Brown clay	77 ft (23.5 m)
Sand and gravel	97 ft (29.6 m)
Brown clay	107 ft (32.6 m)
Sand and gravel	127 ft (38.7 m)
Clay mixed with gravel	227 ft (69.2 m)
Brown clay	237 ft (72.2 m)
Brown clay, sand, and gravel	257 ft (78.3 m)
Brown clay	277 ft (84.4 m)
Sand and gravel	287 ft (87.5 m)
Brown clay	337 ft (102.7 m)
Clay mixed with gravel	
	573 ft (174.7 m) T. D.

Table 9.--Lithologic section and depths in well Winn Farms 23BDA
(From driller's report)
[W.T. = approximate depth to water table]
[T.D. = bottom of BHGM survey]

Lithologic units	Unit depths
	(Surface)
Top soil	10 ft (3.0 m)
Brown clay, hard	13 ft (3.9 m)
Multicolored sand with some brown clay	115 ft (35.1 m)
Multicolored sand and fine gravel	153 ft (46.6 m)
Brown clay with lenses of multicolored sand	188 ft (57.3 m) W.T.
Screened intervals: (ft) 247-252, 255-280, 344-349, 354-369, 384-389, 425-440, 467-477, 480-495 are probably next to lenses of sand within the clay interval.	
	492 ft (150.0 m) T.D.

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