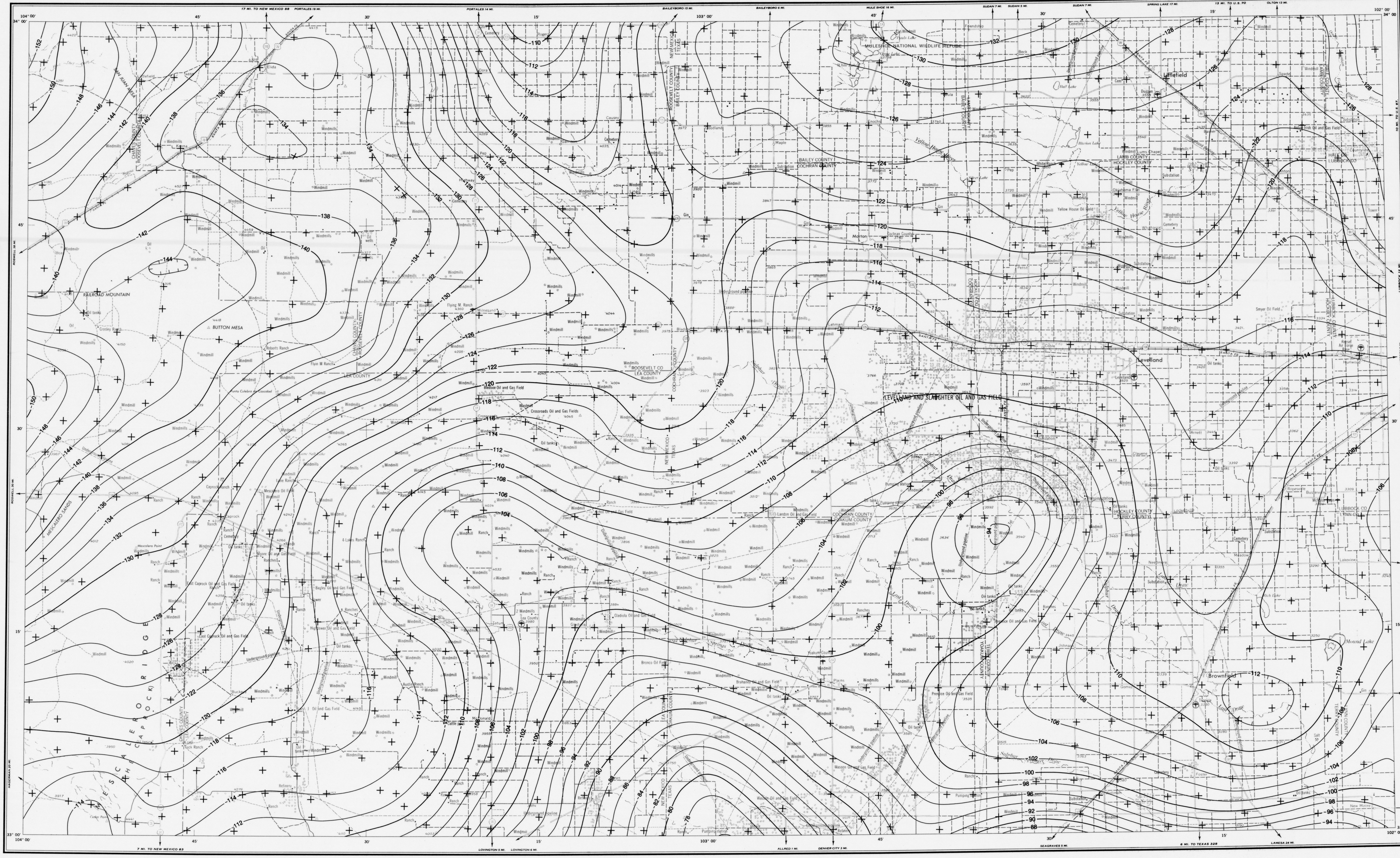
THE UNIVERSITY OF TEXAS AT AUSTIN
BUREAU OF ECONOMIC GEOLOGY
W. L. FISHER, DIRECTOR

Without the contributions of Mr. Hart Brown and D. H. Shurbet and his students at Texas Tech University this map would not have been possible.

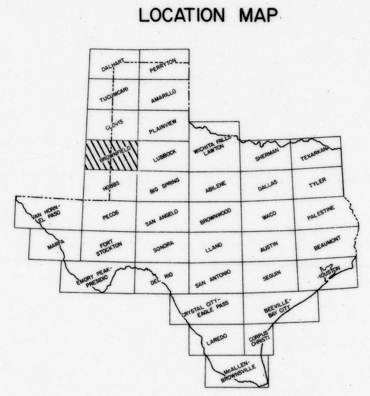


Prepared by the Army Map Service (AJGN), Corps of Engineers, U. S. Army, Washington, D. C. Compiled in 1954 by photogrammetric methods. Horizontal and vertical control by USGS and USC&GS. Aerial photography 1953-54. Photography field annotated 1954.

10,000-meter Universal Transverse Mercator grid ticks, zone 13

+ = approximate location of station points

LOCATION MAP



REFERENCES

Briggs, I. C., 1974, Machine contouring using minimum curvature: Geophysics, v. 39, p. 39-48.
Hammer, S., 1939, Terrain corrections for gravimeter stations: Geophysics, v. 4, p. 184-194.
Morelli, C., 1976, Modern standards for gravity surveys: Geophysics, v. 41, p. 1051.
Plouff, D., 1977, Preliminary documentation for a FORTRAN program to compute gravity terrain corrections based on topography digitized on a geographic grid: U.S. Geological Survey, Open-File Report 77-535, 45 p.
Sampson, R. J., 1978, Surface II graphics system: Kansas Geological Survey, 240 p.

Major Sources of Data for the Brownfield Sheet
Defense Mapping Agency; The University of Texas at Dallas; The University of Texas at El Paso; Texas Tech University; Mr. Hart Brown; Shurbet, D. H., 1966, Gravity field and isostatic equilibrium of the Llano Estacado of Texas and New Mexico: Geol. Soc. Am. Bull., v. 77, p. 213-222.

Scale 1:250,000

5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometers
5 0 5 10 15 Nautical Miles

Cartography by John T. Ames under the supervision of R. L. Dillon.

TRANSVERSE MERCATOR PROJECTION

1986 MAGNETIC DECLINATION FOR CENTER OF THIS SHEET IS 9°27′ EAST. MEAN ANNUAL CHANGE IS 4′33″ WESTWARD.

CONTOUR INTERVAL = 2 MILLIGALS

BOUGUER GRAVITY ATLAS OF TEXAS, BROWNFIELD SHEET

Compiled by: G. R. Keller and C. L. V. Aiken
Assisted by: M. R. Voight and Wayne Basden

1986

TEXAS GRAVITY DATA BASE AND REDUCTION PARAMETERS

The data base of gravity readings that made the Texas gravity mapping project possible is the result of the efforts of many individuals and groups; ultimately it will contain more than 50,000 readings. Major sources of data for each sheet are indicated in the explanation. However, a particular note of thanks is due to Mr. and Mrs. Hart Brown because the regional data they so generously provided are the foundation of this project. Without these data, the mapping and compilation required would have been impossible.

Data in the Texas gravity data base are carefully edited and maintained in a standard format and are tied to a common gravity datum (IGSN-71; Morelli, 1976). Sea level was used as an elevation datum, and a density of 2.67 g/cm^3 was used in the Bouguer correction. For stations west of 103° W longitude, outer-zone terrain corrections were calculated for zones extending from 0.89 km to 167 km from each station (Hammer, 1939). These calculations employed a terrain correction program written by Plouff (1977) and a set of averaged elevations on a grid interval of 30 seconds of latitude and longitude.

Thus, the data base is internally consistent, and the resulting maps all tie together at common boundaries. These maps were constructed by gridding the data using the minimum curvature technique (Briggs, 1974) and were contoured by using a modified version of the Surface II graphics system (Sampson, 1978).

All gravity data were reduced to Bouguer anomaly values using the following formulas:

$$BA = G_{OBS} - G_{TH} + C_{FA} + (C_{BOUG} + C_{TER} + C_{CURV})\rho'$$

where

BA = Bouguer anomaly

ρ' = Ratio of reduction density to the standard value of 2.67 g/cm^3

G_{OBS} = Observed gravity, in milligals, relative to the IGSN-71 gravity datum (Morelli, 1976)

G_{TH} = Theoretical gravity on the surface (sea level) of the 1967 reference spheroid.
$= 978031.843 + \sigma (15727.66 + \sigma (-15762.337 + \sigma (6083.534 + \sigma (-1089.748 + \sigma (69.43)))))$, $\sigma = 0.0001\,\phi^2$, ϕ = latitude in degrees (International Association of Geodesy, 1967; see Morelli, 1976)

C_{FA} = Free air correction for the elevation of the station relative to sea level.
$= h (0.30877 + \sigma (-0.0013398 + \sigma (0.0013553 + \sigma (-0.0005329 + \sigma (0.0000911)))) - h (0.072 \times 10^{-6}))$,
h = elevation of station in meters

C_{BOUG} = Bouguer correction for rock mass positioned between the station and sea level. Correction is calculated from the formula for the attraction of an infinite horizontal slab of thickness h and density ρ to obtain the equation $C_{BOUG} = -0.119h$

C_{CURV} = Curvature correction, a modification of the Bouguer slab approximation that corrects for the curvature of the Earth's surface.
$= -h (1.4639108 \times 10^{-3} + h (-3.532715 \times 10^{-7} + h (4.449648 \times 10^{14})))$

C_{TER} = Correction for local topography