DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

DENSITY AND MAGNETIC SUSCEPTIBILITY MEASUREMENTS OF ROCKS IN THE WICHITA UPLIFT AND SLICK HILLS, SOUTHWESTERN OKLAHOMA

by

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PURPOSE AND LOCATION OF STUDY

This report on magnetic susceptibilities and densities determined from rocks within the Wichita uplift and the Slick Hills in southwestern Oklahoma was motivated by a need for a representative set of data to be used in modelling and interpretation of ground and aeromagnetic data (Jones-Cecil, 1990; Jones-Cecil, in press) and gravity data (Robbins and others, 1989; Jones-Cecil and Robbins, in press). The Wichita uplift provides an ideal setting for geophysical studies because many of the highly magnetic and some of the high density source rocks are exposed at the surface. Nevertheless, caution must still be used in extrapolating surface measurements to subsurface bodies because of the effects of surface and near surface weathering and alteration, particularly in using these density measurements to model deeper source rocks.

Previously published magnetic susceptibility and density data from this area are limited in scope, details of location, and sampling and testing procedures (Chase and others, 1956; Ku and others, 1967). This study provides: 1) susceptibility data from *in situ* readings representative of most of the exposed igneous rock types in the Wichita uplift; 2) susceptibility and density measurements from hand samples of most of the exposed igneous rock types in the Wichita uplift; 3) a limited set of susceptibility and density data from the Cambrian, Ordovician and Permian sedimentary rocks exposed in the Slick Hills, north of the Meers fault, and 4) density and susceptibility measurements from core samples on loan from the Oklahoma Geological Survey. The core samples are from holes drilled by the Oklahoma Geological Survey adjacent to the Meers fault (see map locations A and B, fig. 1). The cores encountered altered gabbroic(?) and altered dioritic rocks (Kenneth Luza, oral comm., 1990; Donley S. Collins, written comm., 1991) between depths of 200 feet (61.0 m) and 230 feet (70.1 m) in hole MF-4 (map location A, fig. 1). In hole MF-2 (map location B, fig. 1) there was altered rhyolitic rock between depths of 194 feet (59.1 m) and 200 feet (61.0 m). Knowledge of susceptibilities and densities of these cores is important because the gabbroic/dioritic rock from well hole MF-4 occurs where magnetic and gravity anomalies are observed near the fault. A highly magnetic dike-like body has previously been interpreted from aeromagnetic data immediately south of the Meers fault (Purucker, 1986), and further defined by interpretation of ground magnetic profiles (Jones-Cecil, 1990). A one milligal positive gravity anomaly was observed immediately south of the Meers fault from detailed gravity profiling (Robbins and others, 1989). Having direct susceptibility and density measurements of the igneous cores from these holes is important in order to formulate more realistic models of the dike-like body.

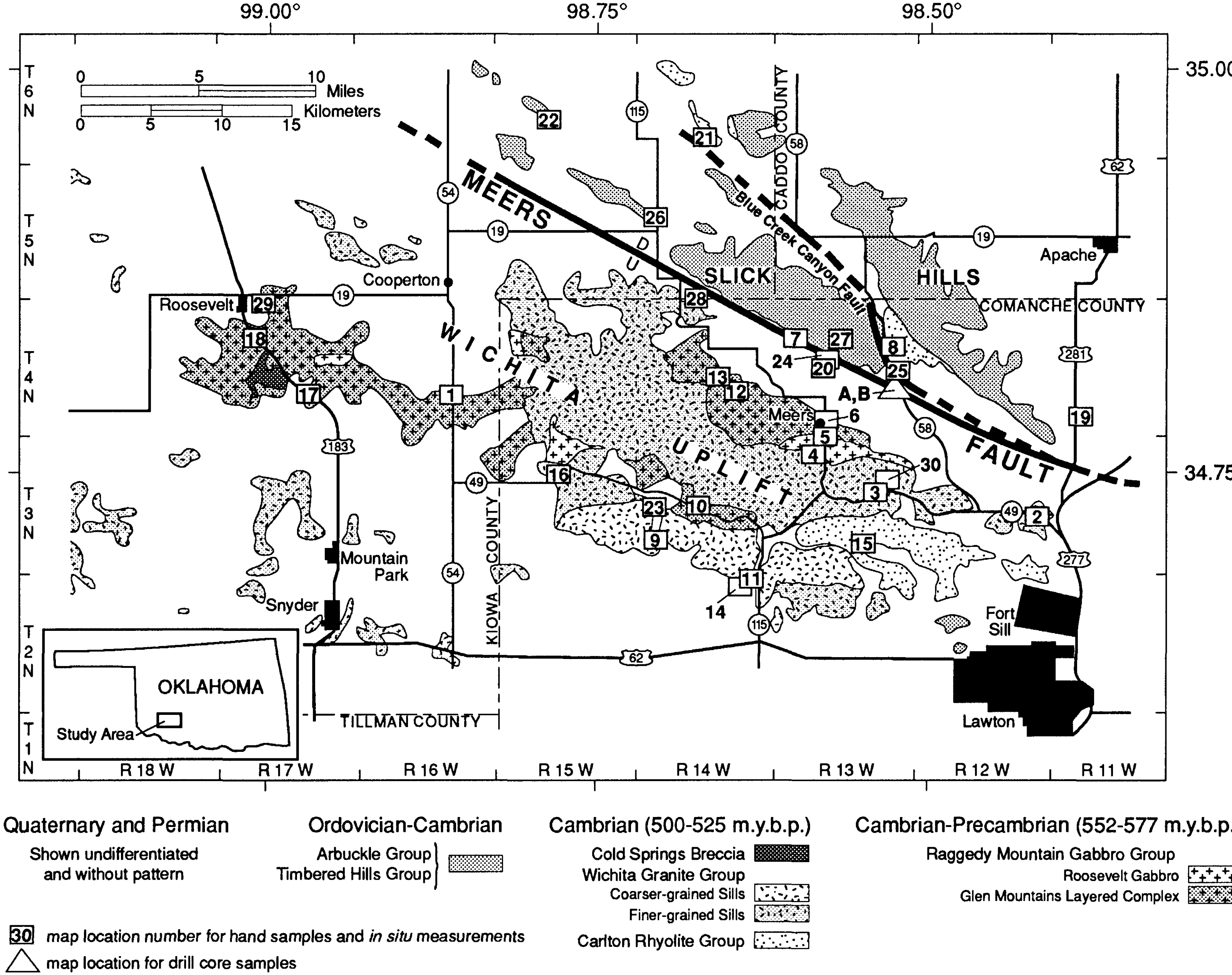

FIGURE 1. -- Location map of study area in southwestern Oklahoma (see Table 1 for further detail of locations). Location of Blue Creek Canyon fault after Harlton (1951), and the remaining geology after Powell and others (1980). Quanah Granite included in coarser-grained sills; Saddle Mountain and Mount Scott Granite included in finer-grained sills.

TABLE 1.--Localities and rock types for magnetic susceptibility and density measurements (see location map Figure 1). Rock types for Raggedy Mountain Gabbro Group were primarily determined from figure 1 of Powell (1986), for Wichita Granite Group from figure 1 of Gilbert and Myers (1986), and the remaining from Havens (1977).

[1] M. Jones-Cecil hand samples of May 1987
[2] T. Crone/M. Jones-Cecil hand samples of March-May 1988
[3] T. Crone (*in situ* measurements 1-8)/M. Jones-Cecil (*in situ* measurements 9-18) of March-May 1988
[4] L. A. Bradley hand samples of October 1989

Map Location Number	Sample Number	Location	Rock Description	Remarks
1	1[3]	lat. 34.7988° N., long. 98.8615° W. SE1/4 NE1/4 sec. 27, T 4 N., R 16 W. West edge N 1/2 sec. 26, T 4 N., R 16 W.	Glen Mountains Layered Complex (N zone); gabbro	Roadcut along east side State Highway 54, outcrops west side Highway 54.
2	2[3]	lat. 34.7221° N., long. 98.4195° W. NW1/4 NW1/4 sec. 24, T 3 N., R 12 W.	Mount Scott Granite Formation; granite	Roadcut on State Highway 49 approximately 1.6 km west of I-44 exit, flank of Craig Hill.
3	3[3]	lat. 34.7373° N., long. 98.5386° W. NE1/4 NW1/4 sec. 14, T 3 N., R 13 W.	Mount Scott Granite Formation; granite	Roadcuts on south flank of Mount Scott.
4	4[3]	lat. 34.7594° N., long. 98.5810° W. NE1/4 SE1/4 sec. 5, T 3 N., R 13 W.	Roosevelt Gabbro (Mount Sheridan Gabbro Member); gabbro	Approximately 100 m south of north boundary of Wichita Mountains National Wildlife Refuge, same location as sample 12[4].
5	5[2,3]	lat. 34.7714° N., long. 98.5795° W. West edge SW1/4 sec. 33, T 4 N., R 13 W.	Roosevelt Gabbro (Mount Sheridan Gabbro Member); gabbro	Outcrops along State Highway 115 south side of Medicine Creek, same location as sample 7[4].
6	6[3]	lat. 34.7827° N., long. 98.5783° W. NW1/4 NW1/4 sec. 33, T 4 N., R 13 W.	Glen Mountains Layered Complex (unassigned); gabbro	50 m east of Meers store, south side of road, rock sheared and altered.
7	7a[3]	lat. 34.8331° N., long. 98.6003° W. NE1/4 SE1/4 sec. 7, T 4 N., R 13 W.	Post Oak Conglomerate (limestone facies)	Bedrock along stream channel.
25	7b[3]	lat. 34.8102° N., long. 98.5250° W. NW1/4 NW1/4 sec. 24, T 4 N., R 13 W.	Fort Sill/Honey Creek Formation; ss/ls/dol	Roadcut of Highway 58, same location as sample G[1].
8	8[3]	lat. 34.8228° N., long. 98.5277° W. NE1/4 NE1/4 sec. 14, T 4 N., R 13 W.	Carlton Rhyolite Group; rhyolite	Roadcut of Highway 58 across from Kimball Ranch entrance, same location as sample 6[4] and H[1].
9	9[3]	lat. 34.7060° N., long. 98.7061° W. SE1/4 NE1/4 sec. 30, T 3 N., R 14 W.	Quanah Granite Formation; granite	Outcrop on east flank of Bat Cave Mountain, 0.5 km SSE of sample 8[4].
10	10[2,3]	lat. 34.7270° N., long. 98.6727° W. SW1/4 SE1/4 sec. 16, T 3 N., R 14 W.	Glen Mountains Layered Complex (unassigned); gabbro	Outcrop on east side of dirt road along Panther Creek about 300 m north of Highway 49, 0.5 km ENE of sample 11[4].

11	11[2,3]	lat. 34.6808° N., long. 98.6318° W. NW1/4 NW1/4 sec. 1, T 2 N., R 14 W.	Quanah Granite Formation; granite	Outcrop immediately southwest of Wichita Mountains National Wildlife Refuge boundary, finer grained than other Quanah Granite Formation localities.
12	12[3]	lat. 34.7992° N., long. 98.6491° W. West edge SW1/4 sec. 23, T 4 N., R 14 W.	Glen Mountains Layered Complex (unassigned); gabbro	Outcrop about 100 m north of Medicine Creek, strong mineral alignment.
12	12[3](dike)	do.	Mafic	do.
13	13[2,3]	lat. 34.8097° N., long. 98.6586° W. NE1/4 NW1/4 sec. 22, T 4 N., R 14 W.	Glen Mountains Layered Complex (unassigned); gabbro	Outcrop in field.
13	13[2,3](dike)	do.	Mafic	do.
14	14[3]	lat. 34.6782° N., long. 98.6420° W. E1/2 NW1/4 sec. 2, T 2 N., R 14 W.	Quanah Granite Formation; granite	Outcrop on southeast flank of Quanah Mountain within Fort Sill Military Reservation, six readings from float.
14	14[3](dike)	do.	Plagioclase-rich zone	do.
15	15[2,3]	lat. 34.7051° N., long. 98.5474° W. SE1/4 NE1/4 sec. 27, T 3 N., R 13 W.	Carlton Rhyolite Group; rhyolite	Outcrop on southeast flank of Thompson Hill.
16	16[3]	lat. 34.7498° N., long. 98.7804° W. SW1/4 NE1/4 sec. 9, T 3 N., R 15 W.	Roosevelt Gabbro (Sandy Creek Gabbro Member); gabbro	Outcrop southeast of Highway 49, same location as sample 10[4].
17	17[2,3]	lat. 34.7965° N., long. 98.9674 W. NE1/4 NE1/4 sec. 27, T 4 N., R 17 W.	Glen Mountains Layered Complex (L zone); gabbro	Mostly float, same location as sample 5[4].
18	18[3]	lat. 34.8316° N., long. 99.0147° W. NW1/4 SW1/4 sec. 8, T 4 N., R 17 W.	Glen Mountains Layered Complex (M zone); anorthosite/gabbro	Outcrop east of Highway 183, same location as sample 4[4].
19	A[1]	lat. 34.7857° N., long. 98.3863° W. SW1/4 SW1/4 sec. 29, T 4 N., R 11 W.	Hennessey Shale Group; shale/sandstone	Tan sandstone from roadcut east side of Highway 281, north of Porter Hill, south of Rock Creek.
20	B[1]	lat. 34.8130° N., long. 98.5798° W. NW1/4 NW1/4 sec. 21, T 4 N., R 13 W.	Post Oak Conglomerate (limestone facies)	Float containing small cobbles.
21	C[1]	lat. 34.9572° N., long. 98.6725° W. SW1/4 SW1/4 sec. 27, T 6 N., R 14 W.	Carlton Rhyolite Group; rhyolite	Float at base of Bally Mountain, same location as sample 2[4].
22	D[1]	lat. 34.9713° N., long. 98.7900° W. NE1/4 NW1/4 sec. 28, T 6 N., R 15 W.	Viola Limestone and Bromide Formation; limestone	Samples from outcrop north of road.
23	E[1]	lat. 34.7269° N., long. 98.7054° W. SE1/4 SE1/4 sec. 18, T 3 N., R 14 W.	Mount Scott Granite Formation (?); granite	At road intersection of Indiahoma Road and road to French Lake, same location as sample 9[4].
24	F[1]	lat. 34.8180° N., long. 98.5772° W. W1/2 sec. 16, T 4 N., R 13 W.	Post Oak Conglomerate (limestone facies)	Float.
25	G[1]	lat. 34.8102°N., long. 98.5277°W. NW1/4 NW1/4 sec. 24, T 4 N., R 13 W.	Lower part of Arbuckle/ Timbered Hills Group; ls/dol	Samples taken at intervals along roadcut on east side of Highway 58, same location as sample 7b[3].

8	H[1]	lat. 34.8229° N., long. 98.5277° W. NE1/4 NE1/4 sec. 14, T 4 N., R 13 W.	Carlton Rhyolite Group; rhyolite	Roadcut of Highway 58 across from Kimball Ranch entrance, same location as sample 6[4] and 8[3].
8	I[1]	lat. 34.8229° N., long. 98.5277° W. NE1/4 NE1/4 sec. 14, T 4 N., R 13 W.	Lower part of Arbuckle/ Timbered Hills Group; ls/dol	Samples immediately south of site H.
26	J[1]	lat. 34.9083° N., long. 98.7078° W. SE1/4 NE1/4 sec. 18, T 5 N., R 14 W.	West Spring Creek/ Kindblade Formation; dol/ls	Samples from outcrop west of Highway 115.
27	K[1]	lat. 34.8316° N., long. 98.5660° W. E1/2 sec. 9, T 4 N., R 13 W.	Cool Creek/McKenzie Hill Formation; limestone	Samples from float and outcrop.
28	1[4]	lat. 34.8579° N., long. 98.6800° W. SW1/4 SE1/4 sec. 33, T 5 N., R 14 W.	Saddle Mountain Granite Formation; granite	Samples from outcrop east of Highway 115.
21	2[4]	lat. 34.9572° N., long. 98.6725° W. SW1/4 SW1/4 sec. 27, T 6 N., R 14 W.	Carlton Rhyolite Group; rhyolite	Samples from Bally Mountain, same location as sample C[1].
29	3[4]	lat. 34.8554° N., long. 99.0052° W. N1/2 NE1/4 sec. 5, T 4 N., R 17 W.	Glen Mountain Layered Complex (M Zone); anorthosite/gabbro	Samples from outcrop north side of Highway 19.
18	4[4]	lat. 34.8316° N., long. 99.0147° W. NW1/4 SW1/4 sec. 8, T 4 N., R 17 W.	Glen Mountain Layered Complex (M Zone); anorthosite/gabbro	Outcrop east of Highway 183, same location as sample 18[3].
17	5[4]	lat. 34.7965° N., long. 98.9674 W. NE1/4 NE1/4 sec. 27, T 4 N., R 17 W.	Glen Mountain Layered Complex (L Zone); gabbro	Outcrop east of Highway 183, same location as sample 17[3,2].
8	6[4]	lat. 34.8229° N., long. 98.5277° W. NE1/4 NE1/4 sec. 14, T 4 N., R 13 W.	Carlton Rhyolite Group; rhyolite	Roadcut of Highway 58 across from Kimball Ranch entrance, same location as sample 8[3] and H[1].
5	7[4]	lat. 34.7714° N., long. 98.5795° W. West edge SW1/4 sec. 33, T 4 N., R 13 W.	Roosevelt Gabbro (Mount Sheridan Gabbro Member); gabbro	Outcrops along State Highway 115 south side of Medicine Creek, same location as 5[2,3].
5	7a[4] (dike)	do.		do.
9	8[4]	lat. 34.7100° N., long. 98.7083° W. NW1/4 NE1/4 sec. 30, T 3 N., R 14 W.	Quanah Granite Formation; granite	Outcrop on east flank of Bat Cave Mountain, 0.5 km NNW of sample 9[3].
23	9[4]	lat. 34.7255° N., long. 98.7054° W. SE1/4 SE1/4 sec. 18, T 3 N., R 14 W.	Mount Scott Granite(?); granite	At road intersection of Indiahoma Road and road to French Lake, same location as sample E[1].
16	10[4]	lat. 34.7498° N., long. 98.7804° W. SW1/4 NE1/4 sec. 9, T 3 N., R 15 W.	Roosevelt Gabbro (Sandy Creek Gabbro Member); gabbro	Outcrop southeast of Highway 49, same location as sample 16[3].
10	11[4]	lat. 34.7253° N., long. 98.6783° W. SE1/4 SW1/4 sec. 16, T 3 N., R 14 W.	Glen Mountain Layered Complex (unassigned); gabbro	Boulder turnoff to Dog Run Trail at Wichita Mountains National Wildlife Refuge, 0.5 km WSW of sample 10[2,3].
4	12[4]	lat. 34.7594° N., long. 98.5810° W. NE1/4 SE1/4 sec. 5, T 3 N., R 13 W.	Roosevelt Gabbro (Mount Sheridan Gabbro Member); gabbro	Approximately 100 m south of north boundary of Wichita Mountains National Wildlife Refuge, same location as sample 4[3].
4	12a[4] (dike)	do.		do.

30	13[4]	lat. 34.7440° N., long. 98.5315° W. E1/2 sec. 11, T 3 N., R 13 W.	Mount Scott Granite Formation; granite	Samples were taken from several locations along side of road up Mount Scott.
A	MF-4	lat. 34.799° N., long. 98.523° W. SW1/4 SW1/4 sec. 24, T 4 N., R 13 W.	conglomerate, gabbro? (highly altered), diorite (altered)	Drill site MF-4 is ~122 m (400 feet) south of drill site MF-2, core is from 170-230 feet (depth).
B	MF-2	lat. 34.800° N., long. 98.523° W. SW1/4 SW1/4 sec. 24, T 4 N., R 13 W.	sedimentary rock, rhyolite (altered)	Drill site MF-2 is ~122 m (400 feet) north of drill site MF-4, core is from 190-200 feet (depth).

METHODS OF MEASUREMENT

Magnetic Susceptibility Measurements

Magnetic susceptibility was measured using two different instruments. A Geoinstruments JH-8 hand-held magnetic susceptibility meter was used to make measurements on outcrops in the field and to measure hand samples that were brought back to the office. Table 2 denotes which measurements were taken in the field (*in situ*) and which measurements were made on hand samples brought back for testing. A Sapphire Instruments SI-2 magnetic susceptibility and anisotropy instrument was used to measure the susceptibility of the cores from drill holes MF-4 and MF-2, located approximately 61 m (200 feet) south and 61 m (200 feet) north of the Meers fault respectively. In addition, the susceptibility of the cores was also measured using the Geoinstruments JH-8 hand-held meter to compare results from the two different instruments (see Table 4 and fig. 2). Refer to Figure 1 and Table 2 for the locations of hand samples, *in situ* measurements, and drill core sites.

In situ measurements were made by taking a number of measurements over an approximate 0.4-km by 0.4-km (1/4-mi by 1/4-mi) area of an individual outcrop (or less if the outcrop was less than this size). All metallic material such as watches and belt buckles were removed from the instrument operator. Each measurement was made after zeroing the instrument at the appropriate scale setting (using as low a scale setting as possible while keeping the reading on scale) and then placing the meter on the outcrop and moving and rotating the meter until a maximum value was obtained. Measurements on hand samples were made in the office away from metallic furniture and after removing metallic objects from the operator. Because the JH-8 susceptibility meter assumes a volume of a half-space, a correction factor should be incorporated for small samples. For fist-sized samples, Geoinstruments recommends multiplying the measurements by a factor of 2.0. However, comparing the susceptibility determined from hand samples taken from the same location as *in situ* measurements indicates that a correction factor of 1.5 is more appropriate for methor used and the rock types encountered in this study. Note, that this correction factor of 1.5 is not the result of a designed experiment, but rather the result of a comparison of a few overlapping field and hand sample localities. Inhomogeneity of the rocks measured makes such a comparison prone to some error, though the effect of inhomogeneity was minimized by using average values whenever possible. Table 2 gives the readings, corrected by a factor of 1.5 for hand samples, and Table 4 summarizes these measured susceptibilities by rock type. Figure 3 presents histograms of susceptibilities for igneous hand samples and *in situ* measurements.

Magnetic susceptibility of the core samples was measured for each piece of core that was at least 15 cm (6 inches) in length or greater (the coil is 5 cm (1.97 inches) long). Each sample was measured with at least 2.54 cm (1 inch) extending beyond each end of the coil. The procedure for making a measurement involved: 1) making a measurement without any sample in the coil (i.e., measuring air); 2) placing the core in the holder, inserting it into the coil and making a measurement; 3) marking a spot adjacent to the coil, removing the sample and measuring air again; 4) reinserting the sample to the marked spot and repeating the measurement; and 5) finally measuring air again. The mean of the two core readings was then calculated from values corrected for coil inductance drift during the measurement process. Because the mean susceptibility reading of the SI-2 meter is given as a cgs susceptibility for the test volume, it was necessary to correct for the volume of the 5.08 cm (2 inch) diameter core in a 5 cm (1.97 inches) long coil by dividing the reading by the test volume of 101 cm^3. Next, the cgs susceptibilities were converted to SI susceptibilities by multiplying each reading by 4π. For comparison, each piece of core was also measured with the Geoinstruments JH-8 hand-held susceptibility meter by taking a maximum reading from the center section of the core. Table 3 lists susceptibilities in SI units determined from the Sapphire Instruments SI-2 susceptibility and anisotropy meter. In addition, susceptibility measurements determined using the hand-held JH-8 meter, uncorrected for volume, are shown for comparison purposes. The susceptibility measurements for both instruments are given in Table 4.

A comparison of the magnetic susceptibility values for the drill cores obtained by using the two instruments show: 1) a correction factor for sample size for the JH-8 hand-held susceptibility meter is needed and; 2) a slightly non-linear relationship between the two readings is suggested. By dividing the SI-2 meter readings by the JH-8 meter readings, an empirical correction factor of 1.8±0.5 is obtained for these 5.08 cm (2.0 inch) diameter cores. This is slightly less than the 2.0 correction factor recommended by Geoinstruments for a 4.7 cm (1.7 inch) diameter core. However, plotting the two readings against each other (fig. 2a) and plotting the individual correction factors against the SI-2 readings suggests that the correction factor changes slightly with the magnitude of the susceptibility. This possible change is small enough that using a mixture of SI-2 meter readings and corrected JH-8 meter readings for the cores in magnetic modelling should pose no real problems. A discrepancy between the remaining JH-8 meter readings and the SI-2 meter readings might exist due to the process described above of maximizing the JH-8 meter reading about the central axis of the meter (the point of maximum sensitivity of the meter is 2.25 cm (0.89 inches) off center on the base of the meter) and over a small area of core, outcrop, or hand sample. This maximizing procedure was not described in the Geoinstruments JH-8 meter manual. The close agreement (within 0.5) of the size correction factors recommended by Geoinstruments and those obtained empirically in this study (with fist-sized hand samples and drill cores) would imply that this possible discrepancy is minimal.

The rock types for the Oklahoma Geological Survey cores have been tentatively assigned on the basis of physical description (Kenneth Luza, oral comm., 1990) and examination of nine thin sections taken at intervals from the cores (Donley S. Collins, written comm., 1991), see Tables 3, 5, 7, and 10. The conglomerate from core MF-4 contains clasts of rhyolite and granite. Below the conglomerate, the interval from 200 feet (61.0 m) to 206.42 feet (62.9 m) in core MF-4, contains highly altered, possibly weathered, gabbro or intermediate rock. As is reflected in the magnetic susceptibility and density measurements (see Tables 3 and 7), the lower part of this interval is transitional to the underlying less altered diorite. North of the Meers fault, core MF-2 consists of sedimentary rock, including conglomerates with rhyolite clasts as well as either a large rhyolite clast or a very thin interbedded rhyolite, overlying altered rhyolite. Table 5 is a summary of the susceptibilities for the cores by rock type as measured with the SI-2 meter and histograms of the data are shown in Figure 4.

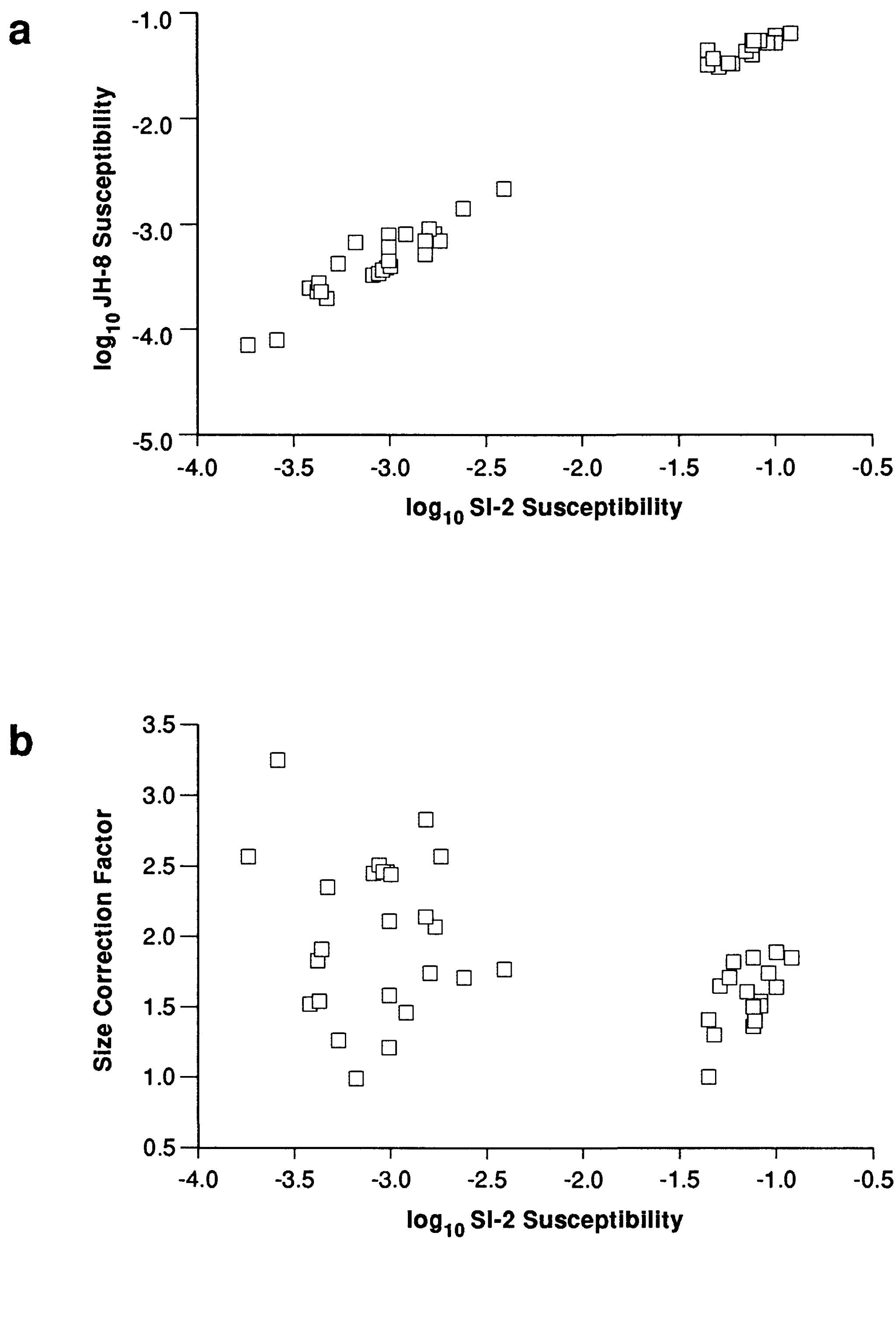

FIGURE 2. -- Comparison of SI-2 and JH-8 magnetic susceptibility meters. (**a**) Log-log plot of SI-2 meter magnetic susceptibility readings versus JH-8 meter susceptibility readings. Note slight decrease in slope as magnitude of readings increase; (**b**) Semilog plot of SI-2 meter readings versus individual correction factors (SI-2 meter readings divided by JH-8 meter readings). A correlation coefficient of -0.439 and a negative slope when calculating a regression equation suggest a slightly non-linear relationship between the two types of readings.

Bulk Density Measurements

Both dry and saturated bulk density measurements were made on hand samples from the field. Some of the hand samples were from the same locations as the *in situ* magnetic susceptibility field tests; locations with both hand and *in situ* samples can be determined by comparing the map location numbers in Table 6 with the map location numbers in Table 2. Dry but not saturated bulk density measurements were performed on the cores from drill sites MF-2 and MF-4 due to the high clay content and high degree of shearing which resulted in partial to complete disintegration of samples if saturated (see Table 3). In preparation for the bulk density tests, all samples were carefully washed and air-dried to eliminate any foreign or loose material. An electronic Sartonius digital scale with 2 decimal place precision was used to determine all weights for the calculations.

The hand samples were saturated by submersing them in de-aired tap water inside a desiccator. A vacuum pump was attached to the desiccator and vacuum pumping was repeated periodically throughout the 24 hour saturation period to eliminate as much air as possible in the samples. De-aired tap water was adequate because the density change of water at room temperature and the distillation effects are negligible for the precision required in the saturation process. The density value used for water is $\frac{1.00\ g}{cm^3}$ which was rounded from $\frac{0.997\ g}{cm^3}$ at 25° C (Edgar Ethington, oral comm., 1990). After completion of the saturation process, the samples were suspended and weighed in tap water minus the tare weight. This weight, divided by the density of water $\frac{1.00\ g}{cm^3}$, determined the saturated volume (V_s). The samples were then surface-dried and weighed to determine the saturated weight (W_s). The saturated bulk density (D_{sb}) was then calculated using the standard equation:

$$D_{sb} = \frac{W_s}{V_s}$$

The saturated bulk densities for the hand samples are listed in Table 6 and summarized by rock type in Table 8.

Dry bulk density was calculated after the saturated bulk density measurement in case any part of the sample was lost in the saturation or submersion process. Samples were air-dried for a minimum of 48 hours and weighed (W_d), then suspended and weighed in tap water minus tare weight; this weight, divided by the density of water, determined the dry volume (V_d). The dry bulk density (D_{db}) was calculated using the standard equation:

$$D_{db} = \frac{W_d}{V_d}$$

The dry bulk densities for the hand samples are shown in Table 6 and summarized by rock type in Table 9. The dry bulk densities for the core samples are shown in Table 7 and summarized by rock type in Table 10; the histograms are in figure 5.

TABLE 2.--Magnetic susceptibility for hand samples and *in situ* measurements. Rock types for Wichita Granite Group were primarily determined from figure 1 of Gilbert and Myers (1986), for Raggedy Mountain Gabbro Group from figure 1 of Powell (1986), and the remaining from Havens (1977). The probable ages of the Wichita Granite Group and the Carlton Rhyolite Group were from Ham and others (1964), the ages for the Roosevelt Gabbro Group from Bowring and Hoppe (1982), and the Glen Mountain Layered Complex from Lambert and others (1988). A size correction factor of 1.5 has been applied for hand samples only. In magnetic susceptibility notation, E precedes base ten exponent. For a summary of the data contained in this table refer to Table 4; for histograms see figure 3.

Map Location Number	Sample Number	Rock Description	Sample Type	Magnetic Susceptibility (SI) JH-8 hand-held meter
Permian				
Hennessey Group				
19	A.a[1]	shale and sandstone	hand	**3.0 E-05**
19	A.b[1]	do.	hand	**3.0 E-05**
19	A.c[1]	do.	hand	**3.0 E-05**
19	A.d[1]	do.	hand	**3.0 E-05**
19	A.e[1]	do.	hand	**3.0 E-05**
20	B.a[1]	Post Oak Cgl.* (limestone facies)	hand	**3.0 E-05**
24	F.a[1]	do.	hand	**<3.0 E-05**
24	F.b[1]	do.	hand	**<3.0 E-05**
7	7a.a[3]	do.	in situ	**<2.0 E-05**
7	7a.b[3]	do.	in situ	**<2.0 E-05**
7	7a.c[3]	do.	in situ	**<2.0 E-05**
7	7a.d[3]	do.	in situ	**<2.0 E-05**
7	7a.e[3]	do.	in situ	**<2.0 E-05**
7	7a.f[3]	do.	in situ	**<2.0 E-05**
7	7a.g[3]	do.	in situ	**<2.0 E-05**
7	7a.h[3]	do.	in situ	**<2.0 E-05**
7	7a.i[3]	do.	in situ	**<2.0 E-05**
7	7a.j[3]	do.	in situ	**<2.0 E-05**
7	7a.k[3]	do.	in situ	**<2.0 E-05**
7	7a.l[3]	do.	in situ	**<2.0 E-05**
7	7a.m[3]	do.	in situ	**<2.0 E-05**
7	7a.n[3]	do.	in situ	**<2.0 E-05**
Ordovician and Cambrian				
Simpson Group				
22	D.a[1]	Viola Ls & Bromide Fm. (limestone)	hand	**<3.0 E-05**
22	D.b[1]	do.	hand	**<3.0 E-05**
Arbuckle Group				
26	J.a[1]	West Springs Creek/Kindblade Fm. (dolomite/limestone)	hand	**<3.0 E-05**
26	J.b[1]	do.	hand	**<3.0 E-05**
27	K.a[1]	Cool Creek./McKenzie Hill Fm. (limestone)	hand	**<3.0 E-05**
27	K.b[1]	do.	hand	**<3.0 E-05**
27	K.c[1]	do.	hand	**<3.0 E-05**
27	K.d[1]	do.	hand	**<3.0 E-05**
27	K.e[1]	do.	hand	**<3.0 E-05**
Lower Arbuckle/Timbered Hills Group				
8	I.a[1]	Fort Sill Fm. (limestone/dolomite)	hand	**7.5 E-05**

8	I.b[1]	do.	hand	7.5 E-05
8	I.c[1]	do.	hand	7.5 E-05
25	G.a[1]	Fort Sill/Honey Creek Fm. (sandstone/limestone/dolomite)	hand	7.5 E-05
25	G.b[1]	do.	hand	<3.0 E-05
25	G.c[1]	do.	hand	<3.0 E-05
25	G.d[1]	do.	hand	~3.0 E-05
25	7b.a[3]	do.	in situ	<2.0 E-05
25	7b.b[3]	do.	in situ	<2.0 E-05
25	7b.c[3]	do.	in situ	<2.0 E-05
25	7b.d[3]	do.	in situ	<2.0 E-05
25	7b.e[3]	do.	in situ	<2.0 E-05
25	7b.f[3]	do.	in situ	<2.0 E-05
25	7b.g[3]	do.	in situ	<2.0 E-05
25	7b.h[3]	do.	in situ	<2.0 E-05
Cambrian				
Wichita Granite Group (525 ± 25 m.y.)				
9	8.1[4]	Quanah Granite Fm. (granite)	hand	7.8 E-04
9	8.2[4]	do.	hand	6.8 E-04
9	8.3[4]	do.	hand	6.3 E-04
9	9.a[3]	do.	in situ	2.5 E-04
9	9.b[3]	do.	in situ	1.0 E-04
9	9.c[3]	do.	in situ	1.0 E-04
9	9.d[3]	do.	in situ	1.0 E-04
9	9.e[3]	do.	in situ	1.0 E-04
9	9.f[3]	do.	in situ	1.0 E-04
9	9.g[3]	do.	in situ	5.0 E-05
9	9.h[3]	do.	in situ	1.0 E-04
9	9.i[3]	do.	in situ	1.0 E-04
9	9.j[3]	do.	in situ	2.0 E-04
9	9.k[3]	do.	in situ	1.0 E-04
9	9.l[3]	do.	in situ	5.0 E-05
11	11[2]	do.	hand	8.3 E-04
11	11.a[3]	do.	in situ	3.0 E-04
11	11.b[3]	do.	in situ	3.5 E-04
11	11.c[3]	do.	in situ	9.2 E-04
11	11.d[3]	do.	in situ	1.5 E-03
11	11.e[3]	do.	in situ	1.5 E-03
11	11.f[3]	do.	in situ	2.0 E-03
11	11.g[3]	do.	in situ	4.0 E-04
11	11.h[3]	do.	in situ	1.5 E-03
11	11.i[3]	do.	in situ	2.3 E-03
11	11.j[3]	do.	in situ	3.0 E-04
11	11.k[3]	do.	in situ	1.3 E-03
11	11.l[3]	do.	in situ	1.5 E-03
11	11.m[3]	do.	in situ	7.0 E-04
14	14.a[3]	do.	in situ	5.2 E-04
14	14.b[3]	do.	in situ	3.5 E-03
14	14.c[3]	do.	in situ	2.8 E-03
14	14.d[3]	do.	in situ	3.2 E-03
14	14.e[3]	do.	in situ	2.5 E-03
14	14.f[3]	do.	in situ	3.5 E-04
14	14.g[3]	do.	in situ	5.4 E-04
14	14.h[3]	do.	in situ	5.5 E-04

14	14.i[3]	do.	in situ	5.5 E-04
14	14.j[3]	do.	in situ	4.0 E-04
14	14.k[3]	do.	in situ	5.0 E-04
14	14.l[3]	do.	in situ	5.3 E-04
14	14.m[3]	do.	in situ	9.3 E-04
14	14.n[3]	do.	in situ	6.5 E-04
14	14[3]	do. (dike)	in situ	1.5 E-04
28	1.1[4]	Saddle Mountain. Granite Fm. (granite)	hand	1.7 E-02
28	1.2[4]	do.	hand	4.7 E-03
28	1.3[4]	do.	hand	2.0 E-03
23	E.a[1]	Mount Scott Granite Fm. (granite)	hand	6.0 E-03
23	9.1[4]	do.	hand	1.2 E-02
23	9.2[4]	do.	hand	9.9 E-04
23	9.3[4]	do.	hand	8.7 E-03
23	9.4[4]	do.	hand	4.1 E-03
30	13.1[4]	do.	hand	4.5 E-02
30	13.2[4]	do.	hand	3.2 E-02
30	13.3[4]	do.	hand	1.1 E-03
30	13.4[4]	do.	hand	2.7 E-02
30	13.5[4]	do.	hand	2.3 E-02
2	2.a[3]	do.	in situ	1.6 E-02
2	2.b[3]	do.	in situ	4.1 E-02
2	2.c[3]	do.	in situ	1.5 E-02
2	2.d[3]	do.	in situ	1.5 E-02
2	2.e[3]	do.	in situ	5.2 E-03
2	2.f[3]	do.	in situ	1.2 E-02
2	2.g[3]	do.	in situ	3.9 E-02
2	2.h[3]	do.	in situ	4.0 E-02
2	2.i[3]	do.	in situ	4.2 E-02
2	2.j[3]	do.	in situ	1.9 E-02
3	3.a[3]	do.	in situ	1.0 E-03
3	3.b[3]	do.	in situ	9.0 E-04
3	3.c[3]	do.	in situ	2.8 E-03
3	3.d[3]	do.	in situ	2.0 E-03
3	3.e[3]	do.	in situ	4.5 E-03
3	3.f[3]	do.	in situ	3.6 E-03
3	3.g[3]	do.	in situ	1.2 E-03
3	3.h[3]	do.	in situ	1.5 E-02
3	3.i[3]	do.	in situ	8.1 E-03
3	3.j[3]	do.	in situ	4.1 E-03
3	3.k[3]	do.	in situ	1.7 E-03
3	3.l[3]	do.	in situ	6.1 E-03
Cambrian				
Carlton Rhyolite Group (525 ± 25 m.y.)				
21	C.a[1]	at Bally Mountain (rhyolite)	hand	1.3 E-02
21	C.b[1]	do.	hand	1.3 E-02
21	2.1[4]	do.	hand	1.3 E-02
21	2.2[4]	do.	hand	1.0 E-02
21	2.3[4]	do.	hand	1.4 E-02
21	2.4[4]	do.	hand	5.9 E-03
8	H.a[1]	at Blue Creek Canyon (rhyolite)	hand	1.5 E-03
8	H.b[1]	do.	hand	2.3 E-03
8	6.1[4]	do.	hand	3.0 E-03
8	6.2[4]	do.	hand	3.3 E-03

8	6.3[4]	do.	hand	1.3 E-03
8	8.a[3]	do.	in situ	3.1 E-03
8	8.b[3]	do.	in situ	2.1 E-03
8	8.c[3]	do.	in situ	2.6 E-03
8	8.d[3]	do.	in situ	2.0 E-03
8	8.e[3]	do.	in situ	2.9 E-03
8	8.f[3]	do.	in situ	3.9 E-03
8	8.g[3]	do.	in situ	4.1 E-03
8	8.h[3]	do.	in situ	3.3 E-03
8	8.i[3]	do.	in situ	2.4 E-03
8	8.j[3]	do.	in situ	2.0 E-03
8	8.k[3]	do.	in situ	2.9 E-03
8	8.l[3]	do.	in situ	2.8 E-03
8	8.m[3]	do.	in situ	2.4 E-03
8	8.n[3]	do.	in situ	2.4 E-03
8	8.o[3]	do.	in situ	2.0 E-03
8	8.p[3]	do.	in situ	1.9 E-03
8	8.q[3]	do.	in situ	3.6 E-03
8	8.r[3]	do.	in situ	4.4 E-03
8	8.s[3]	do.	in situ	4.6 E-03
8	8.t[3]	do.	in situ	2.2 E-03
8	8.u[3]	do.	in situ	2.3 E-03
8	8.v[3]	do.	in situ	4.0 E-03
15	15[2]	at Thompson Hill (rhyolite)	hand	6.0 E-03
15	15.a[3]	do.	in situ	9.5 E-03
15	15.b[3]	do.	in situ	1.0 E-02
15	15.c[3]	do.	in situ	1.5 E-02
15	15.d[3]	do.	in situ	3.4 E-03
15	15.e[3]	do.	in situ	3.0 E-03
15	15.f[3]	do.	in situ	4.0 E-03
15	15.g[3]	do.	in situ	5.0 E-04
15	15.h[3]	do.	in situ	1.5 E-02
15	15.i[3]	do.	in situ	2.0 E-02
15	15.j[3]	do.	in situ	5.0 E-03
15	15.k[3]	do.	in situ	3.0 E-03
15	15.l[3]	do.	in situ	3.0 E-03
15	15.m[3]	do.	in situ	2.5 E-03
15	15.n[3]	do.	in situ	1.5 E-02
15	15.o[3]	do.	in situ	4.2 E-03
15	15.p[3]	do.	in situ	5.0 E-03
15	15.q[3]	do.	in situ	4.5 E-03
15	15.r[3]	do.	in situ	3.0 E-03
15	15.s[3]	do.	in situ	7.5 E-03
15	15.t[3]	do.	in situ	4.0 E-03
Cambrian				
Raggedy Mountain Group				
Roosevelt Gabbro Formation (552 ± 7 m.y.)				
16	10.1[4]	Sandy Creek Gabbro Mbr. (gabbro)	hand	3.0 E-02
16	10.2[4]	do.	hand	3.0 E-02
16	10.3[4]	do.	hand	3.5 E-02
16	10.4[4]	do.	hand	2.7 E-02
16	10.5[4]	do.	hand	3.6 E-02
16	10.6[4]	do.	hand	2.7 E-02
16	10.7[4]	do.	hand	2.6 E-02

16	10.8[4]	do.	hand	4.5 E-02
16	16.a[3]	do.	in situ	2.5 E-02
16	16.b[3]	do.	in situ	3.2 E-02
16	16.c[3]	do.	in situ	2.4 E-02
16	16.d[3]	do.	in situ	3.2 E-02
16	16.e[3]	do.	in situ	2.0 E-02
16	16.f[3]	do.	in situ	2.7 E-02
16	16.g[3]	do.	in situ	3.0 E-02
16	16.h[3]	do.	in situ	2.5 E-02
16	16.i[3]	do.	in situ	2.3 E-02
16	16.j[3]	do.	in situ	2.5 E-02
16	16.k[3]	do.	in situ	2.5 E-02
16	16.l[3]	do.	in situ	3.5 E-02
4	12.1[4]	Mt. Sheridan Gabbro Mbr. (gabbro)	hand	8.1 E-02
4	12.2[4]	do.	hand	1.1 E-01
4	12.3[4]	do.	hand	7.4 E-02
4	4.a[3]	do.	in situ	3.6 E-02
4	4.b[3]	do.	in situ	3.8 E-02
4	4.c[3]	do.	in situ	8.9 E-02
4	4.d[3]	do.	in situ	6.0 E-02
4	4.e[3]	do.	in situ	9.7 E-02
4	4.f[3]	do.	in situ	8.2 E-02
4	4.g[3]	do.	in situ	7.6 E-02
4	4.h[3]	do.	in situ	9.4 E-02
4	4.i[3]	do.	in situ	5.9 E-02
4	4.j[3]	do.	in situ	9.3 E-02
4	4.k[3]	do.	in situ	7.5 E-02
4	4.l[3]	do.	in situ	8.0 E-02
5	5.1[2]	do.	hand	9.0 E-02
5	5.2[2]	do.	hand	1.8 E-01
5	5.a[3]	do.	in situ	2.0 E-01
5	5.b[3]	do.	in situ	1.4 E-01
5	5.c[3]	do.	in situ	8.1 E-02
5	5.d[3]	do.	in situ	1.6 E-01
5	5.e[3]	do.	in situ	2.2 E-01
5	5.f[3]	do.	in situ	6.2 E-02
5	7.1[4]	do.	hand	9.8 E-02
5	7.2[4]	do.	hand	1.0 E-01
5	7.3[4]	do.	hand	1.2 E-01
5	7.4[4]	do.	hand	8.3 E-02
5	7.5[4]	do.	hand	8.4 E-02
4	12a.1[4]	do. (dike)	hand	1.4 E-02
4	12a.2[4]	do. (dike)	hand	1.3 E-02
4	12a.3[4]	do. (dike)	hand	9.2 E-03
5	7a.1[4]	do. (dike)	hand	5.7 E-02
5	7a.2[4]	do. (dike)	hand	8.1 E-03
5	7a.3[4]	do. (dike)	hand	1.3 E-02
Glen Mountain Layered Complex Formation (577 ± 165 m.y.)				
1	1.a[3]	N Zone Mbr. (gabbro)	in situ	1.3 E-02
1	1.b[3]	do.	in situ	5.9 E-02
1	1.c[3]	do.	in situ	1.8 E-02
1	1.d[3]	do.	in situ	1.6 E-02
1	1.e[3]	do.	in situ	5.0 E-03
1	1.f[3]	do.	in situ	2.0 E-02

1	1.g[3]	do.	in situ	1.0 E-02
1	1.h[3]	do.	in situ	1.4 E-02
1	1.i[3]	do.	in situ	1.0 E-02
1	1.j[3]	do.	in situ	1.8 E-02
1	1.k[3]	do.	in situ	1.1 E-01
1	1.l[3]	do.	in situ	1.0 E-02
1	1.m[3]	do.	in situ	9.0 E-03
1	1.n[3]	do.	in situ	4.8 E-02
1	1.o[3]	do.	in situ	2.0 E-02
1	1.p[3]	do.	in situ	1.4 E-01
1	1.q[3]	do.	in situ	3.3 E-02
1	1.r[3]	do.	in situ	3.2 E-02
1	1.s[3]	do.	in situ	1.8 E-02
1	1.t[3]	do.	in situ	1.5 E-02
29	3.1[4]	M Zone Mbr. (anorthosite/gabbro)	hand	6.6 E-03
29	3.2[4]	do.	hand	8.0 E-03
29	3.3[4]	do.	hand	5.7 E-02
29	3.4[4]	do.	hand	8.1 E-03
18	4.1[4]	do.	hand	6.5 E-04
18	4.2[4]	do.	hand	2.6 E-03
18	4.3[4]	do.	hand	1.1 E-03
18	4.4[4]	do.	hand	8.1 E-04
18	4.5[4]	do.	hand	2.3 E-03
18	18.a[3]	do.	in situ	3.0 E-03
18	18.b[3]	do.	in situ	2.0 E-03
18	18.c[3]	do.	in situ	4.0 E-03
18	18.d[3]	do.	in situ	2.0 E-03
18	18.e[3]	do.	in situ	3.0 E-03
18	18.f[3]	do.	in situ	1.5 E-03
18	18.g[3]	do.	in situ	2.2 E-03
18	18.h[3]	do.	in situ	6.5 E-03
18	18.i[3]	do.	in situ	6.5 E-03
18	18.j[3]	do.	in situ	4.0 E-03
18	18.k[3]	do.	in situ	2.0 E-03
18	18.l[3]	do.	in situ	1.0 E-03
18	18.m[3]	do.	in situ	1.5 E-03
17	5.1[4]	L Zone Mbr. (gabbro)	hand	6.8 E-04
17	5.2[4]	do.	hand	6.5 E-04
17	5.3[4]	do.	hand	5.7 E-04
17	5.4[4]	do.	hand	7.7 E-04
17	5.5[4]	do.	hand	9.5 E-04
17	5.6[4]	do.	hand	6.3 E-04
17	17[2]	do.	hand	2.3 E-03
17	17.a[3]	do.	in situ	1.5 E-03
17	17.b[3]	do.	in situ	2.5 E-03
17	17.c[3]	do.	in situ	2.5 E-03
17	17.d[3]	do.	in situ	2.3 E-03
17	17.e[3]	do.	in situ	1.0 E-03
17	17.f[3]	do.	in situ	2.0 E-03
17	17.g[3]	do.	in situ	8.0 E-04
17	17.h[3]	do.	in situ	1.5 E-02
17	17.i[3]	do.	in situ	6.0 E-04
17	17.j[3]	do.	in situ	1.2 E-03
17	17.k[3]	do.	in situ	1.2 E-03

17	17.l[3]	do.	in situ	1.5 E-03
6	6.a[3]	unassigned mbr. (gabbro)	in situ	1.4 E-01
6	6.b[3]	do.	in situ	4.7 E-02
6	6.c[3]	do.	in situ	1.4 E-01
6	6.d[3]	do.	in situ	6.9 E-02
10	10[2]	do.	hand	6.0 E-02
10	11.1[4]	do.	hand	4.8 E-03
10	11.2[4]	do.	hand	6.5 E-03
10	11.3[4]	do.	hand	6.9 E-03
10	11.4[4]	do.	hand	5.0 E-03
10	10.a[3]	do.	in situ	2.5 E-02
10	10.b[3]	do.	in situ	2.3 E-02
10	10.c[3]	do.	in situ	4.0 E-02
10	10.d[3]	do.	in situ	1.0 E-02
10	10.e[3]	do.	in situ	2.5 E-02
10	10.f[3]	do.	in situ	3.0 E-02
10	10.g[3]	do.	in situ	4.0 E-02
10	10.h[3]	do.	in situ	1.2 E-02
10	10.i[3]	do.	in situ	2.2 E-02
10	10.j[3]	do.	in situ	2.0 E-02
10	10.k[3]	do.	in situ	2.3 E-02
10	10.l[3]	do.	in situ	2.5 E-02
12	12.a[3]	do.	in situ	4.0 E-02
12	12.b[3]	do.	in situ	5.8 E-02
12	12.c[3]	do.	in situ	2.8 E-02
12	12.d[3]	do.	in situ	7.0 E-02
12	12.e[3]	do.	in situ	2.5 E-02
12	12.f[3]	do.	in situ	3.0 E-02
12	12.g[3]	do.	in situ	5.0 E-02
12	12.h[3]	do.	in situ	1.9 E-02
12	12.i[3]	do.	in situ	2.7 E-02
12	12.j[3]	do.	in situ	2.2 E-02
12	12.k[3]	do.	in situ	1.8 E-02
13	13[2]	do.	hand	5.3 E-02
13	13.a[3]	do.	in situ	3.0 E-02
13	13.b[3]	do.	in situ	4.5 E-02
13	13.c[3]	do.	in situ	4.5 E-02
13	13.d[3]	do.	in situ	3.5 E-02
13	13.e[3]	do.	in situ	4.8 E-02
13	13.f[3]	do.	in situ	6.5 E-02
13	13.g[3]	do.	in situ	4.0 E-02
13	13.h[3]	do.	in situ	5.7 E-02
13	13.i[3]	do.	in situ	2.3 E-02
13	13.j[3]	do.	in situ	4.7 E-02
13	13.k[3]	do.	in situ	5.9 E-02
12	12[3]	do. (dike)	in situ	2.0 E-02
13	13[3]	do. (dike)	in situ	2.5 E-02

* equivalent of the Hennessey Shale

[1] M. Jones-Cecil hand samples of May 1987

[2] T. Crone/M. Jones-Cecil hand samples of March-May 1988

[3] T. Crone (*in situ* measurements 1-8)/M. Jones-Cecil (*in situ* measurements 9-18) of March-May 1988

[4] L. A. Bradley hand samples of October 1989

TABLE 3.--Magnetic susceptibility for core samples. Some material from MF-4 170-190' was lost due to partial disintegration during the drilling process, therefore, the depths given are assumed to be evenly distributed within the 20 foot interval of MF-4 170-190'. In magnetic susceptibility notation, E precedes base ten exponent. For a summary of the magnetic susceptibility (SI-2 bridge meter) data see Table 5; for histograms see figure 4.

Map Location Number	Sample Number	Core Hole Number	Depth (feet)	Rock Type	Magnetic Susceptibility (SI) SI-2 bridge meter	Magnetic Susceptibility (SI) JH-8 hand-held meter
A	14	MF-4 170-190'	170.50-171.00	conglomerate	–	–
A	15a	do.	172.00-172.50	do.	9.8 E-04	6.2 E-04
A	15b	do.	172.50-173.00	do.	do.	do
A	16	do.	173.66-174.00	do.	–	–
A	17a	do.	174.00-174.66	do.	9.7 E-04	8.0 E-04
A	17b	do.	174.66-175.50	do.	do.	do
A	18	do.	175.50-176.16	do.	–	–
A	19	do.	176.16-177.00	do.	5.4 E-04	4.3 E-04
A	20	do.	177.50-178.00	do.	2.4 E-03	1.4 E-03
A	21	do.	178.00-178.34	do.	–	–
A	22	do.	178.50-178.84	do.	–	–
A	23	do.	178.84-180.00	do.	4.4 E-04	2.3 E-04
A	24	do.	181.00-181.34	do.	–	–
A	25	do.	183.00-183.34	do.	4.3 E-04	2.8 E-04
A	26	do.	184.16-184.50	do.	1.5 E-03	7.0 E-04
A	27a	do.	185.00-185.50	do.	9.7 E-04	4.6 E-04
A	27b	do.	185.50-186.00	do.	do.	do
A	28	do.	186.50-187.16	do.	4.2 E-04	2.3 E-04
A	29a	do.	187.84-188.50	do.	1.2 E-03	8.2 E-04
A	29b	do.	188.50-189.00	do.	do.	do
A	30	MF-4 200-210'	200.00-200.17	gabbro ? (highly altered)	–	–
A	31	do.	200.33-200.83	do.	1.6 E-03	9.2 E-04
A	32	do.	201.00-201.25	do.	–	–
A	33	do.	201.42-202.00	do.	2.4 E-03	1.4 E-03
A	34a	do.	202.33-202.50	do.	1.5 E-03	5.3 E-04
A	34b	do.	202.50-202.75	do.	do.	do
A	35	do.	203.00-203.17	do.	–	–
A	36	do.	203.25-203.33	do.	–	–
A	37a	do.	203.33-203.50	do.	1.8 E-03	7.0 E-04
A	37b	do.	203.50-203.83	do.	do.	do
A	38	do.	204.00-204.25	do.	–	–
A	39	do.	204.25-204.50	do.	–	–
A	40	do.	204.50-204.83	do.	1.7 E-03	8.2 E-04
A	41	do.	204.92-205.50	do.	3.9 E-03	2.2 E-03
A	42	do.	205.50-205.92	do.	7.7 E-02	5.5 E-02
A	43	do.	206.00-206.42	do.	–	–
A	44	do.	206.50-206.92	diorite (altered)	4.8 E-02	3.7 E-02
A	45	do.	207.00-207.33	do.	4.5 E-02	3.2 E-02
A	46	do.	207.33-207.92	do.	7.5 E-02	5.0 E-02
A	47	do.	208.00-208.42	do.	–	–
A	48	do.	208.42-208.75	do.	–	–
A	49	do.	208.75-209.08	do.	7.5 E-02	5.5 E-02

A	50	do.	209.33-209.75	do.	**7.1 E-02**	**4.4 E-02**
A	51	MF-4 220-230'	220.00-220.58	do.	**7.6 E-02**	**4.1 E-02**
A	52	do.	220.58-221.33	do.	**8.3 E-02**	**5.5 E-02**
A	53a	do.	221.33-221.58	do.	**9.2 E-02**	**5.3 E-02**
A	53b	do.	221.58-222.00	do.	do.	do
A	54	do.	222.17-222.67	do.	**1.0 E-01**	**5.3 E-02**
A	55	do.	222.67-223.00	do.	–	–
A	56	do.	223.00-223.58	do.	**1.0 E-01**	**6.1 E-02**
A	57	do.	224.33-224.83	do.	**5.8 E-02**	**3.4 E-02**
A	58a	do.	224.83-225.25	do.	**6.0 E-02**	**3.3 E-02**
A	58b	do.	225.25-225.50	do.	do.	do
A	59	do.	225.50-225.92	do.	–	–
A	60	do.	226.00-226.42	do.	–	–
A	61	do.	227.00-227.67	do.	**5.1 E-02**	**3.1 E-02**
A	62	do.	227.67-228.00	do.	**4.5 E-02**	**4.5 E-02**
A	63	do.	228.00-228.33	do.	–	–
A	64	do.	228.50.228.92	do.	**8.3 E-02**	**5.4 E-02**
A	65	do.	228.92-229.25	do.	–	–
A	66	do.	229.42-230.00	sedimentary rock	**1.2 E-01**	**6.5 E-02**
B	67	MF-2 190-200'	190.33-199.58	do.	–	–
B	68	do.	190.58-190.75	do.	–	–
B	69	do.	190.75-191.33	do.	**3.8 E-04**	**2.5 E-04**
B	70	do.	191.33-191.67	do.	**2.6 E-04**	**8.0 E-05**
B	71	do.	192.00-192.50	do.	**6.6 E-04**	**6.7 E-04**
B	72a	do.	192.50-192.92	do.	**4.7 E-04**	**2.0 E-04**
B	72b	do.	192.75-193.00	do.	do.	do
B	73a	do.	193.00-193.33	do.	**1.8 E-04**	**7.0 E-05**
B	73b	do.	193.33-193.50	do.	do.	do
B	74	do.	194.00-194.25	rhyolite (altered)	–	–
B	75a	do.	194.67-194.83	do.	**1.0 E-03**	**4.1 E-04**
B	75b	do.	195.00-195.33	do.	do.	do
B	76a	do.	196.25-196.42	do.	**9.1 E-04**	**3.7 E-04**
B	76b	do.	196.42-196.75	do.	do.	do
B	77	do.	196.92-197.25	do.	**8.8 E-04**	**3.5 E-04**
B	78a	do.	198.50-198.67	do.	**9.6 E-04**	**3.9 E-04**
B	78b	do.	198.67-199.08	do.	do.	do
B	79	do.	199.17-199.75	do.	**8.1 E-04**	**3.3 E-04**

TABLE 4.--Summary of magnetic susceptibility for hand samples and *in situ* measurements. Summary was compiled by rock type from data in Table 2. Dike material was not included in the summary. Rock types for Wichita Granite Group were primarily determined from figure 1 of Gilbert and Myers (1986), for Raggedy Mountain Gabbro Group from figure 1 of Powell (1986), and the remaining from Havens (1977). The probable ages of the Wichita Granite Group and the Carlton Rhyolite Group were from Ham and others (1964), the ages for the Roosevelt Gabbro Group from Bowring and Hoppe (1982), and the Glen Mountain Layered Complex from Lambert and others (1988). A size correction factor of 1.5 has been applied for hand samples only. In magnetic susceptibility notation, E precedes base ten exponent. Histograms of these data are in figure 3.

Rock Description	Number of Samples	Mean (SI)	Median (SI)	Standard Deviation
Permian				
Hennessey Group				
shale and sandstone	5	3.0 E-05	3.0 E-05	0.0
Post Oak Conglomerate* (ls facies)	17	<2.2 E-05	<2.0 E-05	---
Ordovician and Cambrian				
Simpson Group				
Viola Ls & Bromide Fm. (limestone)	2	<3.0 E-05	<3.0 E-05	---
Arbuckle Group				
West Spgs Ck./Kindblade Fm. (dolomite/limestone)	2	<3.0 E-05	<3.0 E-05	---
Cool Ck./McKenzie Hill Fm. (limestone)	5	<3.0 E-05	<3.0 E-05	---
Lower Arbuckle/Timbered Hills Group				
Fort Sill Fm. (limestone/dolomite)	3	7.5 E-05	7.5 E-05	0.0
Fort Sill/Honey Creek Fm. (sandstone/limestone/dolomite)	12	<2.7 E-05	<2.0 E-05	---
Cambrian				
Wichita Granite Group (525 ± 25 m.y.)				
Quanah Granite Fm. (granite)	43	8.5 E-04	5.4 E-04	8.9 E-04
Saddle Mountain Granite Fm. (granite)	3	7.9 E-03	2.0 E-03	8.0 E-03
Mount Scott Granite Fm. (granite)	32	1.4 E-02	8.4 E-03	1.4 E-02
Cambrian				
Carlton Rhyolite Group (525 ± 25 m.y.) (rhyolite)	54	5.3 E-03	3.4 E-03	4.5 E-03
Cambrian				
Raggedy Mountain Group				
Roosevelt Gabbro Formation (552 ± 7 m.y.)				
Sandy Creek Gabbro Mbr. (gabbro)	20	2.9 E-02	2.7 E-02	5.7 E-03
Mt. Sheridan Gabbro Mbr. (gabbro)	28	9.9 E-02	8.7 E-02	4.4 E-02
Glen Mountain Layered Complex Formation (577 ± 165 m.y.)				
N Zone Mbr. (gabbro)	20	3.1 E-02	1.8 E-02	3.5 E-02
M Zone Mbr. (anorthosite/gabbro)	22	5.7 E-03	2.5 E-03	1.2 E-02
L Zone Mbr. (gabbro)	19	2.0 E-03	1.2 E-03	3.2 E-03
unassigned mbr. (gabbro)	44	3.9 E-02	3.0 E-02	2.8 E-02

* equivalent of the Hennessey Shale

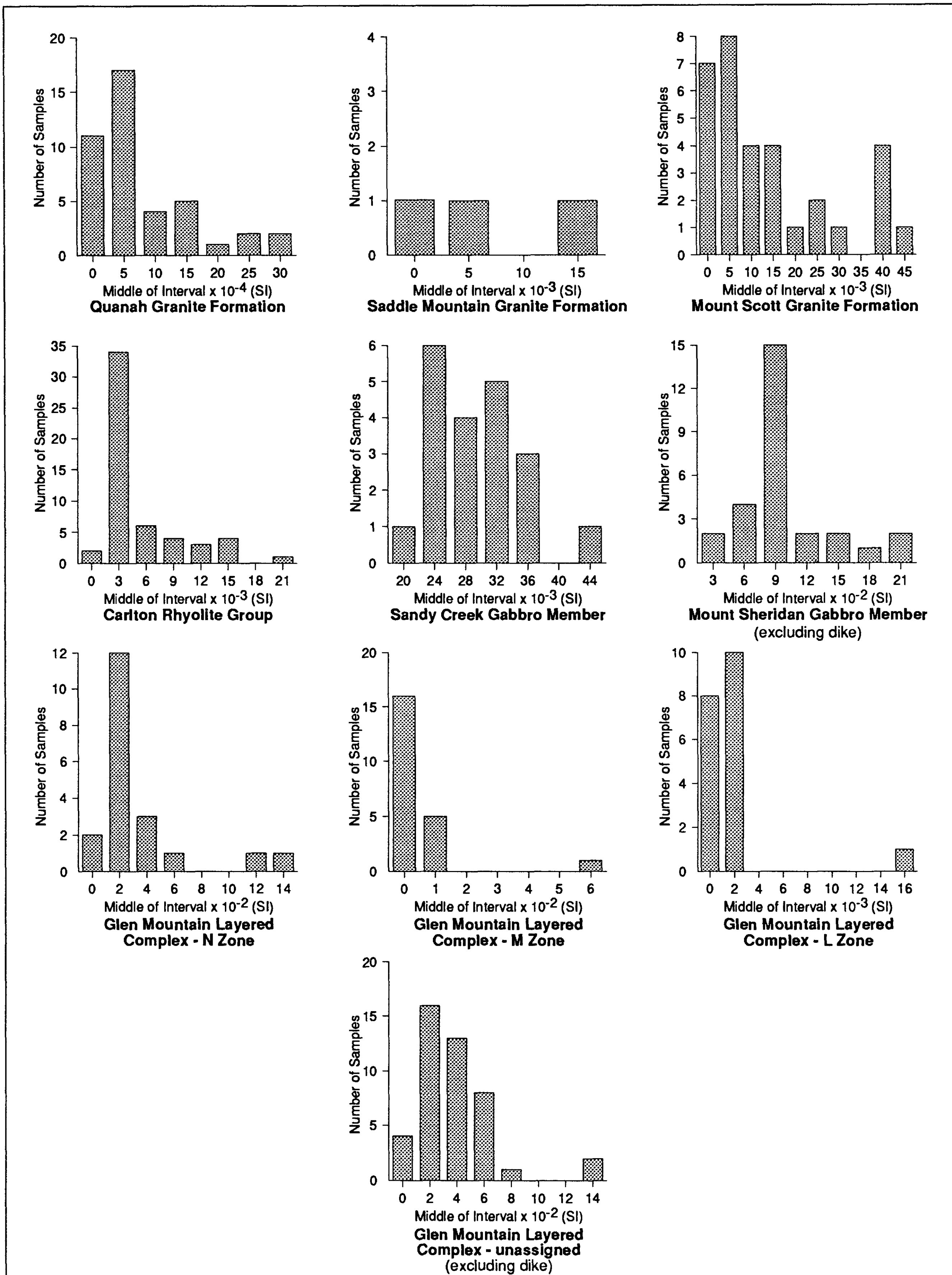

FIGURE 3. -- Histograms of magnetic susceptibility for hand samples and *in situ* measurements. Compiled by rock type from Table 2.

TABLE 5.--Summary of magnetic susceptibility for core samples. Summary was compiled from SI-2 bridge meter data in Table 3. In magnetic susceptibility notation, E precedes base ten exponent. Histograms of these data are in figure 4.

Core Hole Number	Rock Description	Number of Samples	Mean (SI)	Median (SI)	Standard Deviation
MF-4 170.00-190.00'	conglomerate	10	9.9 E-04	9.7 E-04	6.2 E-04
MF-4 200.00-206.42'	gabbro ? (highly altered)	7	1.3 E-02	1.8 E-03	2.8 E-02
MF-4 206.50-210.00', MF-4 220.00-230.00'	diorite (altered)	16	7.4 E-02	7.3 E-02	2.2 E-02
MF-2 190.00-193.50'	sedimentary rock	5	3.9 E-04	3.8 E-04	1.9 E-04
MF-2 194.00-200.00'	rhyolite (altered)	5	9.1 E-04	9.1 E-04	7.3 E-05

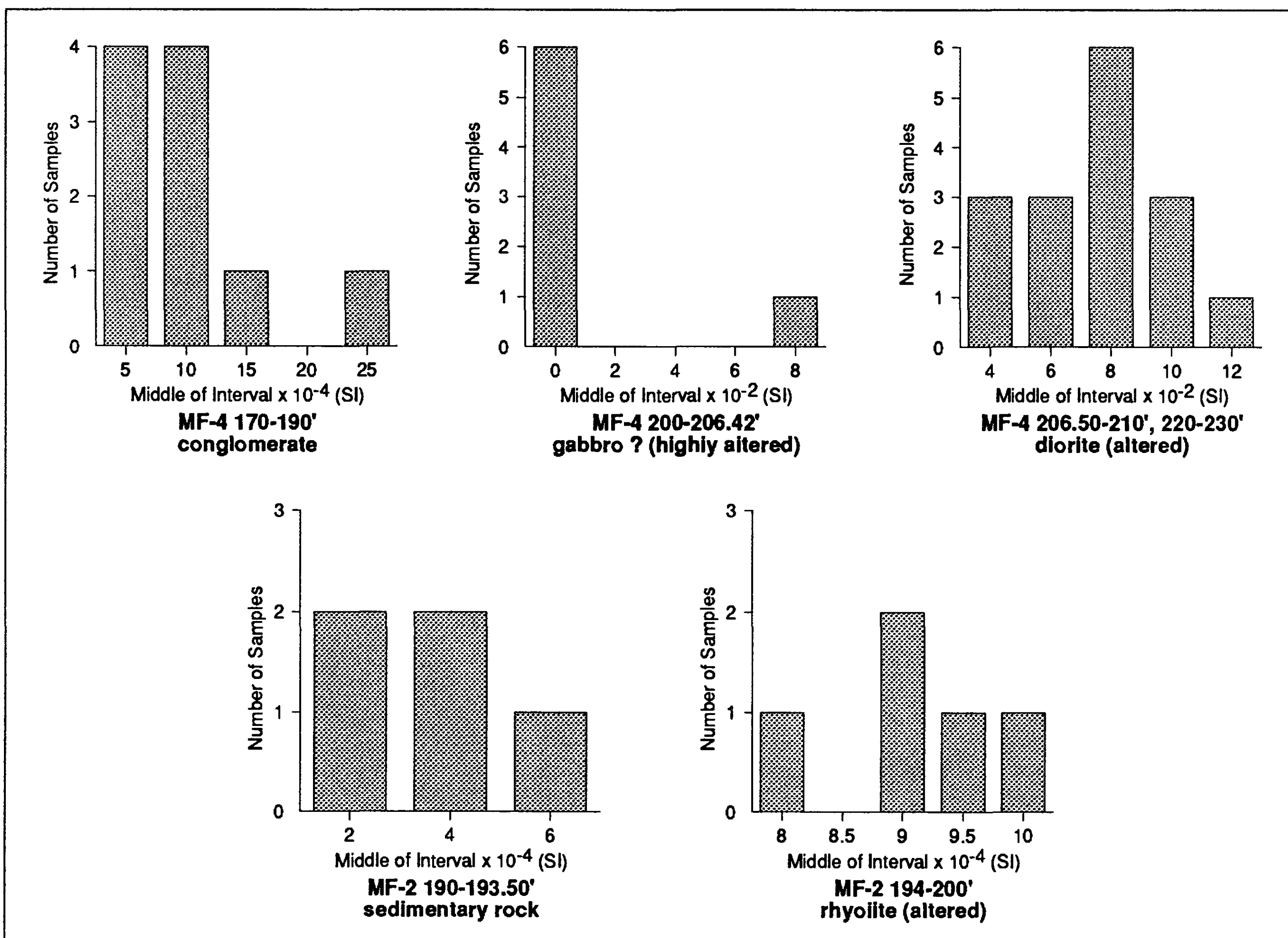

FIGURE 4. -- Histograms of magnetic susceptibility for core samples. Compiled by rock type from Table 3.

TABLE 6.--Saturated and dry bulk density for igneous hand samples. Rock types for Wichita Granite Group were primarily determined from figure 1 of Gilbert and Myers (1986), for Raggedy Mountain Gabbro Group from figure 1 of Powell (1986), and the remaining from Havens (1977). The probable ages of the Wichita Granite Group and the Carlton Rhyolite Group were from Ham and others (1964), the ages for the Roosevelt Gabbro Group from Bowring and Hoppe (1982), and the Glen Mountain Layered Complex from Lambert and others (1988). For a summary of the saturated bulk density data contained in this table see Table 8. For dry bulk density summary see Table 9.

Map Location Number	Sample Number	Rock Description	Sample Type	Saturated volume in H_2O - tare (V_s) (cm³)	Saturated surface dried wt (W_s) (g)	Saturated bulk density (W_s/V_s) (g/cm3)	Wet volume in H_2O - tare (V_d) (cm³)	Dry weight (W_d) (g)	Dry bulk density (W_d/V_d) (g/cm3)
Cambrian									
Wichita Granite Group (525 ± 25 m.y.)									
28	1.1[4]	Saddle Mountain Granite Fm. (granite)	hand	281.67	751.71	**2.67**	283.34	749.47	**2.65**
28	1.2[4]	do.	hand	126.28	333.65	**2.64**	126.00	332.38	**2.64**
28	1.3[4]	do.	hand	160.42	422.04	**2.63**	159.99	419.56	**2.62**
23	9.1[4]	Mount Scott Granite Fm. (granite)	hand	171.77	449.84	**2.62**	170.30	447.78	**2.63**
23	9.2[4]	do.	hand	235.21	603.45	**2.57**	232.74	597.38	**2.57**
23	9.3[4]	do.	hand	308.58	803.99	**2.61**	302.72	796.85	**2.63**
23	9.4[4]	do.	hand	383.28	979.95	**2.56**	377.07	962.34	**2.55**
30	13.1[4]	do.	hand	259.11	680.54	**2.63**	258.85	677.12	**2.65**
30	13.2[4]	do.	hand	180.04	478.20	**2.66**	180.05	476.66	**2.65**
30	13.3[4]	do.	hand	72.21	191.89	**2.66**	72.12	191.44	**2.65**
30	13.4[4]	do.	hand	95.04	250.82	**2.64**	93.95	250.23	**2.66**
30	13.5[4]	do.	hand	367.85	975.61	**2.65**	367.19	973.98	**2.65**
Cambrian									
Carlton Rhyolite Group (525 ± 25 m.y.)									
21	2.1[4]	at Bally Mountain (rhyolite)	hand	207.83	543.48	**2.62**	207.20	541.30	**2.61**
21	2.2[4]	do.	hand	75.29	196.03	**2.60**	75.11	194.60	**2.59**
21	2.3[4]	do.	hand	202.88	531.30	**2.62**	202.11	528.55	**2.62**
21	2.4[4]	do.	hand	78.84	206.11	**2.61**	78.34	204.66	**2.61**
8	6.1[4]	at Blue Creek Canyon (rhyolite)	hand	73.64	195.45	**2.65**	73.48	194.99	**2.65**
8	6.2[4]	do.	hand	76.99	202.77	**2.63**	76.31	202.16	**2.65**
8	6.3[4]	do.	hand	49.17	129.85	**2.64**	48.98	128.95	**2.63**
Cambrian									
Raggedy Mountain Group									
Roosevelt Gabbro Formation (552 ± 7 m.y.)									
16	10.1[4]	Sandy Creek Gabbro Mbr. (gabbro)	hand	172.36	513.29	**2.98**	171.21	511.26	**2.99**
16	10.2[4]	do.	hand	346.69	1032.96	**2.98**	343.69	1030.94	**3.00**

16	10.3[4]	do.	hand	416.54	1237.17	**2.97**	412.98	1234.06	**2.99**
16	10.4[4]	do.	hand	127.47	381.39	**2.99**	127.02	381.21	**3.00**
16	10.5[4]	do.	hand	313.63	936.81	**2.99**	312.95	934.59	**2.99**
16	10.6[4]	do.	hand	120.17	358.33	**2.98**	120.49	358.42	**2.97**
16	10.7[4]	do.	hand	71.89	214.06	**2.98**	70.39	210.22	**2.99**
16	10.8[4]	do.	hand	335.66	1000.23	**2.98**	335.96	1000.11	**2.98**
4	12.1[4]	Mt. Sheridan Gabbro Mbr. (gabbro)	hand	158.89	470.57	**2.98**	157.36	469.26	**2.98**
4	12.2[4]	do.	hand	442.38	1321.91	**2.99**	440.12	1320.29	**3.00**
4	12.3[4]	do.	hand	326.21	951.71	**2.92**	324.69	950.52	**2.93**
5	7.1[4]	do.	hand	222.10	677.51	**3.05**	223.19	676.86	**3.03**
5	7.2[4]	do.	hand	224.14	673.58	**3.01**	223.01	672.88	**3.02**
5	7.3[4]	do.	hand	138.52	427.03	**3.08**	138.10	426.77	**3.09**
5	7.4[4]	do.	hand	148.10	447.68	**3.02**	148.01	446.96	**3.02**
5	7.5[4]	do.	hand	109.52	333.32	**3.04**	109.07	332.97	**3.05**
4	12a.1[4]	do. (dike)	hand	209.61	589.28	**2.81**	206.79	585.82	**2.83**
4	12a.2[4]	do. (dike)	hand	56.84	150.04	**2.64**	55.74	149.10	**2.67**
4	12a.3[4]	do. (dike)	hand	60.06	160.72	**2.68**	59.31	159.23	**2.68**
5	7a.1[4]	do. (dike)	hand	177.43	496.78	**2.80**	176.85	488.67	**2.76**
5	7a.2[4]	do. (dike)	hand	39.15	106.73	**2.73**	39.01	106.02	**2.72**
5	7a.3[4]	do. (dike)	hand	54.94	149.92	**2.73**	55.46	149.81	**2.70**
Glen Mountain Layered Complex Formation (577 ± 165 m.y.)									
29	3.1[4]	M Zone Mbr. (anorthosite/gabbro)	hand	110.56	300.37	**2.72**	109.86	300.19	**2.73**
29	3.2[4]	do.	hand	129.95	356.75	**2.75**	129.79	356.65	**2.75**
29	3.3[4]	do.	hand	56.87	154.94	**2.72**	56.50	154.87	**2.74**
29	3.4[4]	do.	hand	45.13	121.98	**2.70**	44.68	121.24	**2.71**
18	4.1[4]	do.	hand	33.28	88.93	**2.67**	33.06	88.61	**2.68**
18	4.2[4]	do.	hand	118.30	320.09	**2.71**	119.04	319.26	**2.68**
18	4.3[4]	do.	hand	104.94	282.22	**2.69**	103.62	281.42	**2.72**
18	4.4[4]	do.	hand	126.42	340.30	**2.69**	125.16	339.42	**2.71**
18	4.5[4]	do.	hand	118.28	320.05	**2.71**	117.86	319.54	**2.71**
17	5.1[4]	L Zone Mbr. (gabbro)	hand	100.63	272.13	**2.70**	99.79	271.38	**2.72**
17	5.2[4]	do.	hand	126.97	340.64	**2.68**	124.97	338.68	**2.71**
17	5.3[4]	do.	hand	67.27	181.95	**2.70**	66.75	181.46	**2.72**
17	5.4[4]	do.	hand	52.56	141.33	**2.69**	51.95	140.33	**2.70**
17	5.5[4]	do.	hand	99.31	266.75	**2.69**	98.46	265.05	**2.69**
17	5.6[4]	do.	hand	150.44	403.80	**2.68**	149.16	400.90	**2.69**
10	11.1[4]	unassigned mbr. (gabbro)	hand	47.98	132.37	**2.76**	48.19	132.10	**2.74**
10	11.2[4]	do.	hand	243.79	664.28	**2.72**	241.47	662.73	**2.74**
10	11.3[4]	do.	hand	229.16	628.53	**2.74**	228.03	627.49	**2.75**
10	11.4[4]	do.	hand	114.95	314.80	**2.74**	114.41	314.05	**2.74**

[4] L. A. Bradley hand samples of 10/89

TABLE 7.--Dry bulk density for core samples. Some material from MF-4 170-190' was lost due to partial disintegration during the drilling process, therefore, the depths given are assumed to be evenly distributed within the 20 foot interval of MF-4 170-190'. For a summary of dry bulk density data see Table 10; for histograms see figure 5.

Map Location Number	Sample Number	Core Hole Number	Depth (feet)	Rock Description	Wet volume in H_2O - tare (V_d) (cm³)	Dry weight (W_d) (g)	Dry bulk density (W_d/V_d) (g/cm³)
A	14	MF-4 170-190'	170.50-171.00	conglomerate	125.56	268.68	**2.14**
A	15a	do.	172.00-172.50	do.	151.25	308.01	**2.04**
A	15b	do.	172.50-173.00	do.	108.21	214.60	**1.98**
A	16	do.	173.66-174.00	do.	99.48	216.54	**2.18**
A	17a	do.	174.00-174.66	do.	131.59	286.51	**2.18**
A	17b	do.	174.66-175.50	do.	242.65	533.52	**2.20**
A	18	do.	175.50-176.16	do.	161.48	355.54	**2.20**
A	19	do.	176.16-177.00	do.	224.04	471.41	**2.10**
A	20	do.	177.50-178.00	do.	147.08	312.43	**2.12**
A	21	do.	178.00-178.34	do.	100.80	212.69	**2.11**
A	22	do.	178.50-178.84	do.	123.33	260.31	**2.11**
A	23	do.	178.84-180.00	do.	306.84	633.98	**2.07**
A	24	do.	181.00-181.34	do.	76.85	159.67	**2.08**
A	25	do.	183.00-183.34	do.	119.53	252.28	**2.11**
A	26	do.	184.16-184.50	do.	127.89	255.95	**2.00**
A	27a	do.	185.00-185.50	do.	117.63	251.79	**2.14**
A	27b	do.	185.50-186.00	do.	131.21	270.34	**2.06**
A	28	do.	186.50-187.16	do.	191.43	396.44	**2.07**
A	29a	do.	187.84-188.50	do.	181.29	399.48	**2.20**
A	29b	do.	188.50-189.00	do.	125.64	273.04	**2.17**
A	30	MF-4 200-210'	200.00-200.17	gabbro ? (highly altered)	74.93	176.42	**2.35**
A	31	do.	200.33-200.83	do.	305.20	725.76	**2.38**
A	32	do.	201.00-201.25	do.	131.43	312.87	**2.38**
A	33	do.	201.42-202.00	do.	339.16	800.15	**2.36**
A	34a	do.	202.33-202.50	do.	73.72	178.60	**2.42**
A	34b	do.	202.50-202.75	do.	151.09	354.15	**2.34**
A	35	do.	203.00-203.17	do.	95.36	224.51	**2.35**
A	36	do.	203.25-203.33	do.	73.86	169.55	**2.30**
A	37a	do.	203.33-203.50	do.	64.96	153.44	**2.36**
A	37b	do.	203.50-203.83	do.	177.12	407.59	**2.30**
A	38	do.	204.00-204.25	do.	95.95	225.66	**2.35**
A	39	do.	204.25-204.50	do.	118.18	287.06	**2.43**
A	40	do.	204.50-204.83	do.	223.48	525.14	**2.35**
A	41	do.	204.92-205.50	do.	298.75	745.45	**2.50**
A	42	do.	205.50-205.92	do.	253.20	661.80	**2.61**
A	43	do.	206.00-206.42	do.	221.76	606.04	**2.73**
A	44	do.	206.50-206.92	diorite (altered)	267.79	750.83	**2.80**
A	45	do.	207.00-207.33	do.	217.48	606.31	**2.79**
A	46	do.	207.33-207.92	do.	310.33	872.12	**2.81**
A	47	do.	208.00-208.42	do.	231.86	653.88	**2.82**
A	48	do.	208.42-208.75	do.	201.34	574.08	**2.85**
A	49	do.	208.75-209.08	do.	194.76	570.66	**2.93**
A	50	do.	209.33-209.75	do.	277.14	799.51	**2.88**

A	51	MF-4 220-230'	220.00-220.58	do.	356.98	1011.70	**2.83**
A	52	do.	220.58-221.33	do.	–	–	--[1]
A	53a	do.	221.33-221.58	do.	137.71	392.90	**2.85**
A	53b	do.	221.58-222.00	do.	248.57	716.86	**2.88**
A	54	do.	222.17-222.67	do.	316.50	896.04	**2.83**
A	55	do.	222.67-223.00	do.	237.91	708.46	**2.98**
A	56	do.	223.00-223.58	do.	363.09	1042.90	**2.87**
A	57	do.	224.33-224.83	do.	281.04	811.65	**2.89**
A	58a	do.	224.83-225.25	do.	281.66	830.80	**2.95**
A	58b	do.	225.25-225.50	do.	150.30	446.16	**2.97**
A	59	do.	225.50-225.92	do.	225.30	663.96	**2.95**
A	60	do.	226.00-226.42	do.	190.08	565.77	**2.98**
A	61	do.	227.00-227.67	do.	–	–	--[1]
A	62	do.	227.67-228.00	do.	168.31	477.77	**2.84**
A	63	do.	228.00-228.33	do.	187.16	540.45	**2.89**
A	64	do.	228.50.228.92	do.	224.74	655.94	**2.92**
A	65	do.	228.92-229.25	do.	263.01	761.11	**2.89**
A	66	do.	229.42-230.00	sedimentary rock	–	–	--[2]
B	67	MF-2 190-200'	190.33-199.58	do.	121.42	248.29	**2.04**
B	68	do.	190.58-190.75	do.	83.47	177.05	**2.12**
B	69	do.	190.75-191.33	do.	307.47	647.97	**2.11**
B	70	do.	191.33-191.67	do.	228.63	494.21	**2.16**
B	71	do.	192.00-192.50	do.	255.52	549.15	**2.15**
B	72a	do.	192.50-192.92	do.	147.52	332.92	**2.26**
	do.			do.	147.38	331.72	***2.25**
B	72b	do.	192.75-193.00	do.	108.41	229.68	**2.12**
	do.			do.	109.13	228.18	***2.09**
B	73a	do.	193.00-193.33	do.	188.29	387.92	**2.06**
B	73b	do.	193.33-193.50	do.	109.51	228.33	**2.09**
B	74	do.	194.00-194.25	rhyolite (altered)	117.05	237.25	**2.03**
B	75a	do.	194.67-194.83	do.	122.19	250.10	**2.05**
B	75b	do.	195.00-195.33	do.	232.15	477.24	**2.06**
B	76a	do.	196.25-196.42	do.	167.32	338.67	**2.02**
B	76b	do.	196.42-196.75	do.	152.52	303.76	**1.99**
B	77	do.	196.92-197.25	do.	164.46	323.62	**1.97**
B	78a	do.	198.50-198.67	do.	142.59	285.88	**2.00**
B	78b	do.	198.67-199.08	do.	243.39	484.82	**1.99**
B	79	do.	199.17-199.75	do.	315.52	626.17	**1.98**

[1] density tests were not run due to size of sample.

[2] density test was not run due to friable nature of sample.

* samples rechecked for accuracy - used averaged value for summary Table 10.

TABLE 8.--Summary of saturated bulk density for igneous hand samples. Summary was compiled from data in Table 6. Dike material was not included in the summary. Rock types for Wichita Granite Group were primarily determined from figure 1 of Gilbert and Myers (1986), for Raggedy Mountain Gabbro Group from figure 1 of Powell (1986), and the remaining from Havens (1977). The probable ages of the Wichita Granite Group and the Carlton Rhyolite Group were from Ham and others (1964), the ages for the Roosevelt Gabbro Group from Bowring and Hoppe (1982), and the Glen Mountain Layered Complex from Lambert and others (1988). In standard deviation notation, E precedes base ten exponent.

Rock Description	Number of Samples	Mean (g/cm^3)	Median (g/cm^3)	Standard Deviation
Cambrian				
Wichita Granite Group (525 ± 25 m.y.)				
Saddle Mountain Granite Fm. (granite)	3	2.65	2.64	2.1 E-02
Mount Scott Granite Fm. (granite)	9	2.62	2.63	3.7 E-02
Cambrian				
Carlton Rhyolite Group (525 ± 25 m.y.) (rhyolite)	7	2.62	2.62	1.7 E-02
Cambrian				
Raggedy Mountain Group				
Roosevelt Gabbro Formation (552 ± 7 m.y.)				
Sandy Creek Gabbro Mbr. (gabbro)	8	2.98	2.98	6.4 E-03
Mt. Sheridan Gabbro Mbr. (gabbro)	8	3.01	3.02	4.9 E-02
Glen Mountain Layered Complex Formation (577 ± 165 m.y.)				
M Zone Mbr. (anorthosite/gabbro)	9	2.71	2.71	2.3 E-02
L Zone Mbr. (gabbro)	6	2.69	2.69	8.9 E-03
unassigned mbr. (gabbro)	4	2.74	2.74	1.6 E-02

TABLE 9.--Summary of dry bulk density for igneous hand samples. Summary was compiled from data in Table 6. Dike material was not included in the summary. Rock types for Wichita Granite Group were primarily determined from figure 1 of Gilbert and Myers (1986), for Raggedy Mountain Gabbro Group from figure 1 of Powell (1986), and the remaining from Havens (1977). The probable ages of the Wichita Granite Group and the Carlton Rhyolite Group were from Ham and others (1964), the ages for the Roosevelt Gabbro Group from Bowring and Hoppe (1982), and the Glen Mountain Layered Complex from Lambert and others (1988). In standard deviation notation, E precedes base ten exponent.

Rock Description	Number of Samples	Mean (g/cm^3)	Median (g/cm^3)	Standard Deviation
Cambrian				
Wichita Granite Group (525 ± 25 m.y.)				
Saddle Mountain Granite Fm. (granite)	3	2.64	2.64	1.5 E-02
Mount Scott Granite Fm. (granite)	9	2.63	2.63	3.9 E-02
Cambrian				
Carlton Rhyolite Group (525 ± 25 m.y.) (rhyolite)	7	2.62	2.62	2.2 E-02
Cambrian				
Raggedy Mountain Group				
Roosevelt Gabbro Formation (552 ± 7 m.y.)				
Sandy Creek Gabbro Mbr. (gabbro)	8	2.96	2.99	8.6 E-02
Mt. Sheridan Gabbro Mbr. (gabbro)	8	3.02	3.02	4.8 E-02
Glen Mountain Layered Complex Formation (577 ± 165 m.y.)				
M Zone Mbr. (anorthosite/gabbro)	9	2.71	2.71	2.4 E-02
L Zone Mbr. (gabbro)	6	2.71	2.71	1.4 E-02
unassigned mbr. (gabbro)	4	2.74	2.74	5.0 E-03

TABLE 10.--Summary of dry bulk density for core samples. Summary was compiled from data in Table 7. Histograms of these data are in figure 5. In standard deviation notation, E precedes base ten exponent.

Core Hole Number	Rock Description	Number of Samples	Mean (g/cm3)	Median (g/cm3)	Standard Deviation
MF-4 170.00-190.00'	conglomerate	20	2.11	2.11	6.5 E-02
MF-4 200.00-206.42'	gabbro ?(highly altered)	16	2.41	2.36	1.2 E-01
MF-4 206.50-210.00', 220.00-230.00'	diorite (altered)	22	2.88	2.88	5.9 E-02
MF-2 190.00-193.50'	sedimentary rock	9	2.12	2.11	6.3 E-02
MF-2 194.00-200.00'	rhyolite (altered)	9	2.01	2.00	3.2 E-02

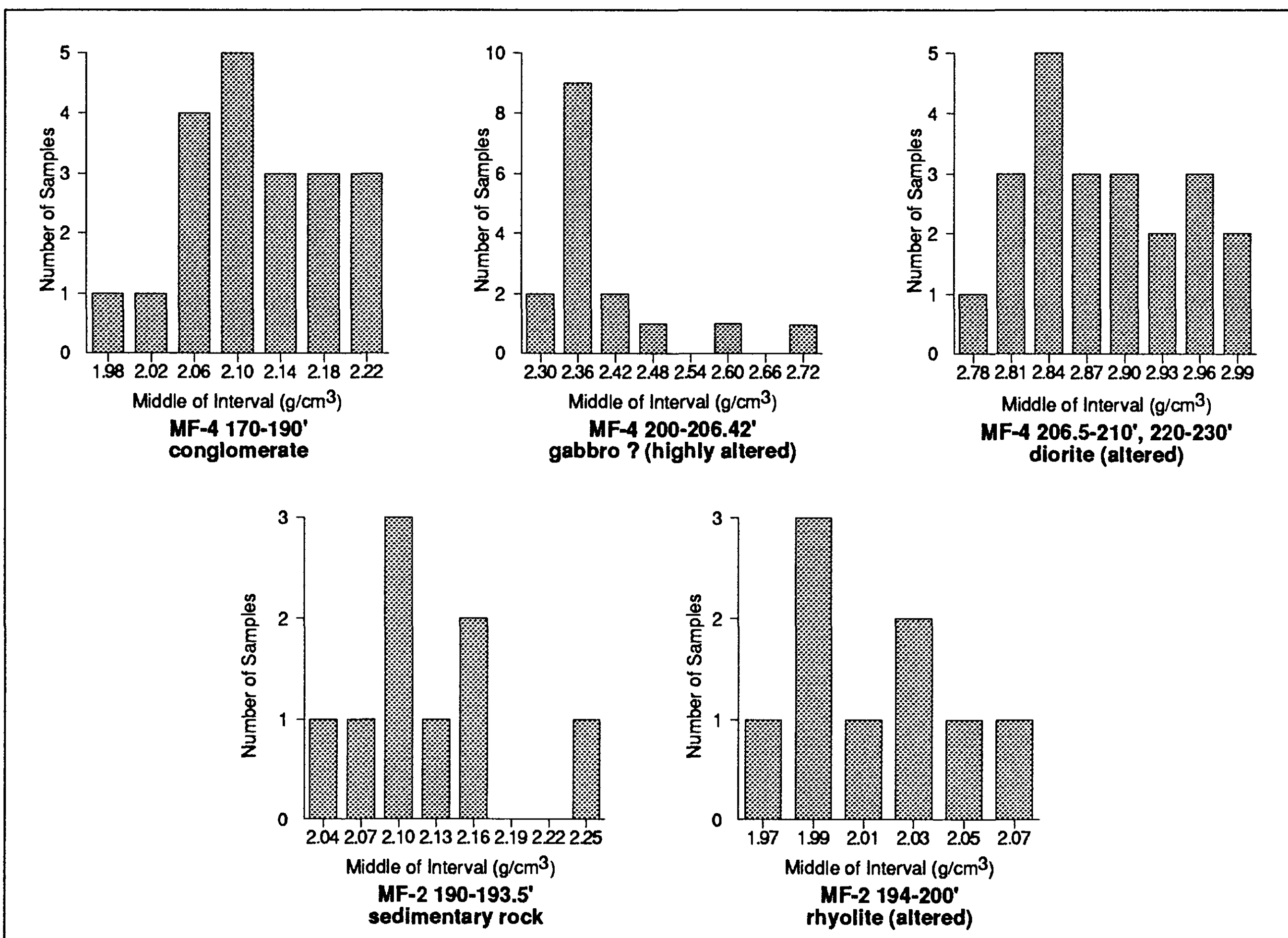

FIGURE 5. -- Histograms of dry bulk density for core samples. Compiled by rock type from Table 7.

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