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NATIONAL URANIUM RESOURCE EVALUATION PROGRAM

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR BROWNSVILLE-McALLEN NTMS QUADRANGLES, TEXAS

Uranium Resource Evaluation Project

September 30, 1980

OPERATED BY
UNION CARBIDE CORPORATION
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

A computer readable magnetic tape containing measurement, analysis, and location data may be purchased from the GJOIS Project, UCC-ND Computer Applications Dept., 4500 North Building, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37830.

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Uranium Resource Evaluation Project

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Oak Ridge, Tennessee

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

(In Back Pocket)

ABSTRACT

Results of a reconnaissance geochemical survey of the Brownsville-McAllen Quadrangles, Texas are reported. Field and laboratory data are presented for 427 groundwater and 171 stream sediment samples. Statistical and areal distributions of uranium and possible uranium-related variables are displayed. Pertinent geologic factors which may be of significance in evaluating the potential for uranium mineralization are briefly discussed.

Groundwater data indicate the most promising area for potential uranium mineralization occurs in the northwestern section of the quadrangles (Jim Hogg, Starr, and Zapata Counties), where waters are derived from the Catahoula Formation. These groundwaters have high concentrations of uranium, uranium associated elements, and low values for specific conductance. Another area with high uranium concentrations is in the southeastern portion of the survey area (Hidalgo, Cameron, and Willacy Counties). Shallow wells <10 m (30 ft) are numerous in this area and high specific conductance values may indicate contamination from extensive fertilization.

Stream sediment data for the survey does not indicate an area favorable for uranium mineralization. Anomalous acid soluble uranium values in the southeastern area (Hidalgo, Cameron, and Willacy Counties) can be attributed to phosphate fertilizer contamination. Four samples in the western part of the area (western Starr County) have anomalously high total uranium values and low acid soluble uranium values, indicating the uranium may be contained in resistate minerals.

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HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR BROWNSVILLE-McALLEN NTMS QUADRANGLES, TEXAS

INTRODUCTION

The National Uranium Resource Evaluation (NURE) Program was established by the U. S. Atomic Energy Commission, now the U. S. Department of Energy (DOE), in the spring of 1973 to assess uranium resources and to identify favorable areas for detailed uranium exploration throughout the United States. The principal objectives of the NURE Program are: (1) to provide a comprehensive in-depth assessment of the nation's uranium resources for national energy planning, and (2) to identify areas favorable for uranium resources. A NURE Program report covering uranium resource assessment in 116 National Topographic Map Series (NTMS) 1° x 2° quadrangles, which contain 100% of the currently estimated uranium resources, is targeted for 1980. The complete resource assessment of the 272 highest-priority quadrangles is scheduled for completion in 1985, and the first comprehensive assessment report of the entire United States is scheduled for completion in 1988. This program, which is being administered by DOE, is expected to increase the activity of commercial exploration for uranium in the United States.

The NURE Program consists of five parts:

1. Hydrogeochemical and Stream Sediment Reconnaissance (HSSR) Program,
2. Aerial Radiometric and Magnetic Survey,
3. Surface Geologic Investigations,
4. Drilling for Geologic Information, and
5. Geophysical Technology Development.

The objective of the HSSR Program is to provide information to be used in accomplishing the overall NURE Program objectives. This is accomplished by a reconnaissance of surface water, groundwater, stream sediment, and lake sediment. The survey is being conducted by three Government-owned laboratories. Union Carbide Corporation, Nuclear Division (UCC-ND), under contract with DOE, is conducting its survey in 154 NTMS 1° x 2° quadrangles which cover approximately 2,500,000 km^2 (1,000,000 mi^2) of the central United States (Figure 1). This area includes most of the states of Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Wisconsin, Michigan, Indiana, Illinois, and Iowa, as well as parts of Arkansas, Missouri, New Mexico, and Ohio. Described herein are the results of the work done by UCC-ND in the Brownsville-McAllen NTMS Quadrangles, Texas.

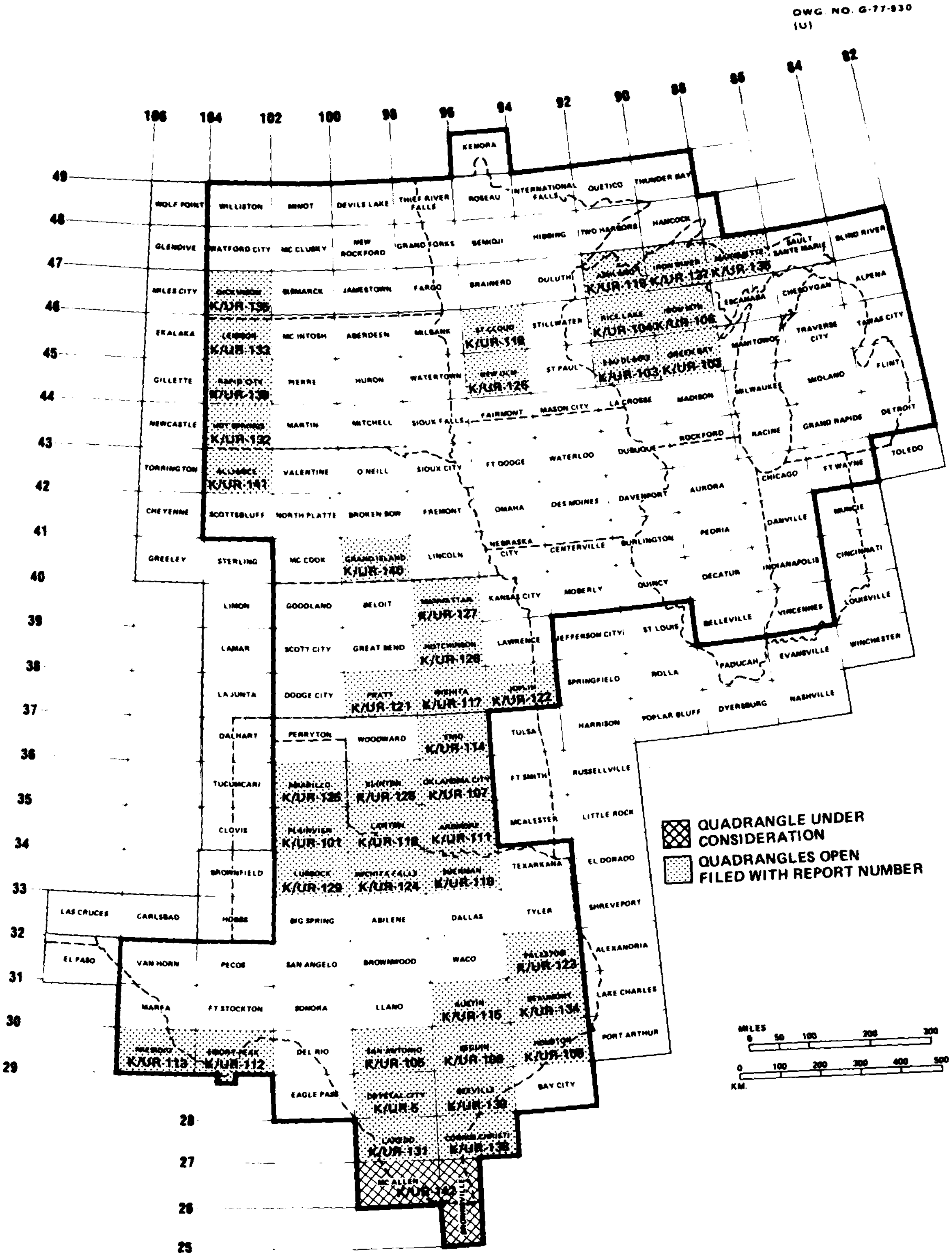

Figure 1

INDEX MAP SHOWING THE ORGDP AREA OF RESPONSIBILITY FOR THE HSSR SURVEY, THE BROWNSVILLE-McALLEN QUADRANGLES, AND QUADRANGLES FOR WHICH BASIC DATA REPORTS HAVE BEEN OPEN FILED

GEOLOGY

LOCATION AND GEOLOGIC SETTING

The Brownsville-McAllen Quadrangles are located in South Texas between lat. 25° and 27° N. and long. 97° and 100° W. They encompases an area of 16,750 km^2 (6,450 mi^2) and include all or parts, of Brooks, Cameron, Hidalgo, Jim Hogg, Kenedy, Starr, Willacy, and Zapata Counties. The location of the study area is outlined on the generalized geologic map of Texas shown in Figure 2. A generalized geologic map of the Brownsville-McAllen Quadrangles, along with a stratigraphic column listing geologic codes used in this report, is presented in Figure 3 and Plate 7.

LITHOLOGY AND ENVIRONMENTS OF DEPOSITION

The Claiborne and Jackson Groups of Tertiary age in the Brownsville-McAllen survey area are represented by trangressive-regressive fluvial, deltaic, and near shore marine depositional environments. Younger Tertiary and Quaternary sediments were deposited by fluvial systems, such as the Oligocene (?) Gueydan fluvial system. Quaternary deposits consist of the Lissie and Beaumont Formations overlain by the later windblown deposits and alluvium.

The oldest exposed formation is the Middle Eocene Laredo Formation exposed in the western part of the survey area. Gardner (1938) recommended the beds formerly called the Cook Mountain Formation in the Rio Grande Embayment be referred to as the Laredo Formation. The Laredo Formation is equivalent to the Sparta Sand and Cook Mountain Formation in eastern and central Texas (Eargle, 1968). The Laredo Formation represents a transgressive-regressive environment consisting of marine clays; thick beds of medium- to fine-grained sand and sandstone, which are varicolored, commonly glauconitic, fossiliferous, and ferruginous with a few thin beds of impure limestone. These sediments were deposited in the gulf basin by a series of small stream complexes which supplied a high-destructive, wave dominated delta system, essentially composed of coastal barrier sands and associated lagoonal muds. A marine trangression developed in late Cook Mountain time resulting in shelf mud deposition (Ricoy and Brown, 1977).

Unconformably overlying the Laredo Formation is the Yegua Formation. The Yegua Formation is composed chiefly of clay, with minor beds of sandstone, some thin beds of concretionary limestone, and limestone lenses rich in oyster shells (Eargle, 1968). Lignite seams are present in the Yegua Formation in both near ground surface (<61 m) and deep basin (>61 m) lagoonal deposits (Kaiser, 1974). The Yegua Formation was deposited during transgressive-regressive environments similar to the Laredo Formation.

14

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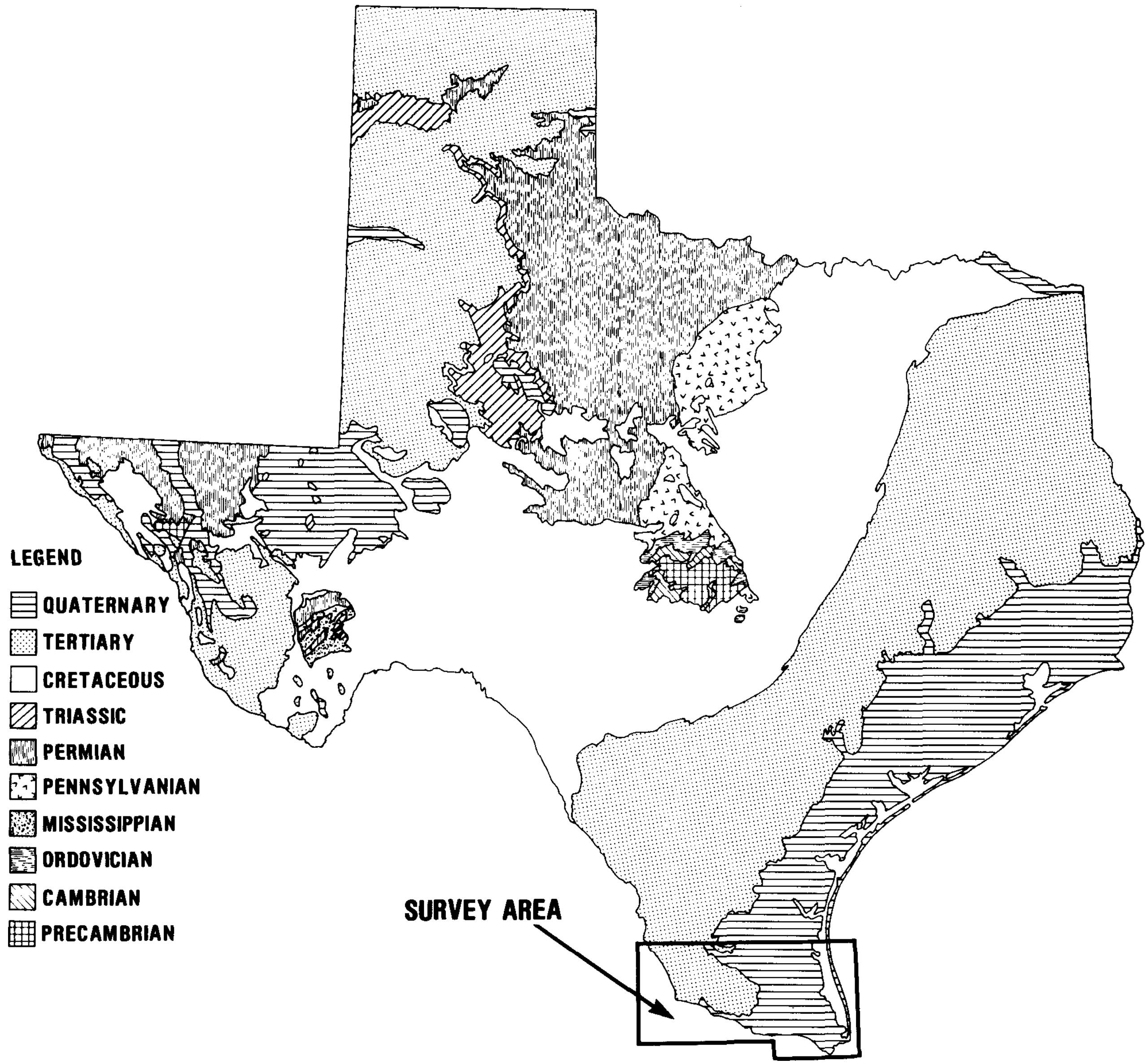

Figure 2

GENERALIZED GEOLOGIC MAP OF TEXAS
(AFTER KING, ET AL, 1974)

STRATIGRAPHIC - HYDROLOGIC COLUMN FOR THE BROWNSVILLE-McALLEN QUADRANGLES

ERA	SYSTEM	SERIES	GEOLOGIC SURFACE CODE	GEOLOGIC MEMBER	PRODUCING HORIZON CODE	AQUIFER NAME	MAXIMUM THICKNESS METERS	FEET
CENOZOIC	QUATERNARY	HOLOCENE	QD	FILL AND SPOIL ALLUVIAL, FLOODPLAIN AND TIDAL FLAT DEPOSITS BARRIER ISLAND DEPOSITS	AQRG	RIO GRANDE* AQUIFER	215	700
			QWBD	WINDBLOWN DEPOSITS				
		PLEISTOCENE	QD	FLUVIATILE TERRACE DEPOSITS				
			QPB	BEAUMONT FORMATION				
			QPLI	LISSIE FORMATION	AQCH	CHICOT AQUIFER	305	1,000
			QPU	UVALDE GRAVEL				
	TERTIARY	PLIOCENE	TPG	GOLIAD FORMATION	AQEV	EVANGELINE AQUIFER	610	2,000
		MIOCENE	TMO	UPPER FLEMING				
				FLEMING FORMATION	AQBK	BURKEVILLE CONFINING SYSTEM	150	500
				LOWER FLEMING OAKVILLE FORMATION	TMO		305	1,000
		OLIGOCENE	TOC	CATAHOULA AND FRIO FORMATIONS (UNDIV.)	TOC		610	2,000
		EOCENE	TEJ	JACKSON GROUP	TEJ		460	1,500
			TECY	YEGUA FORMATION	TECY		305	1,000
			TECL	LAREDO FORMATION	TECL		180	600

*OCCURS 9-45 km (5-28 mi) EITHER SIDE OF RIO GRANDE RIVER.

SOURCES OF GEOLOGY AND HYDROLOGY:

BAKER, E. T., Jr., "STRATIGRAPHIC AND HYDROGEOLOGIC FRAMEWORK OF PART OF THE COASTAL PLAIN OF TEXAS," U.S. GEOLOGIC SURVEY OPEN-FILE REPORT 77-712 (1978).

BARNES, V. E., "GEOLOGIC ATLAS OF TEXAS, McALLEN-BROWNSVILLE SHEET (1976).

QUICK, J. V.; THOMAS, N. G.; BROGDON, L. D.; JONES, C. A.; AND MARTIN, T. S. "URANIUM FAVORABILITY OF LATE EOCENE THROUGH PLIOCENE ROCKS OF THE SOUTH TEXAS COASTAL PLAN," GJBX-7(77).

LEGEND FOR FIGURE 3

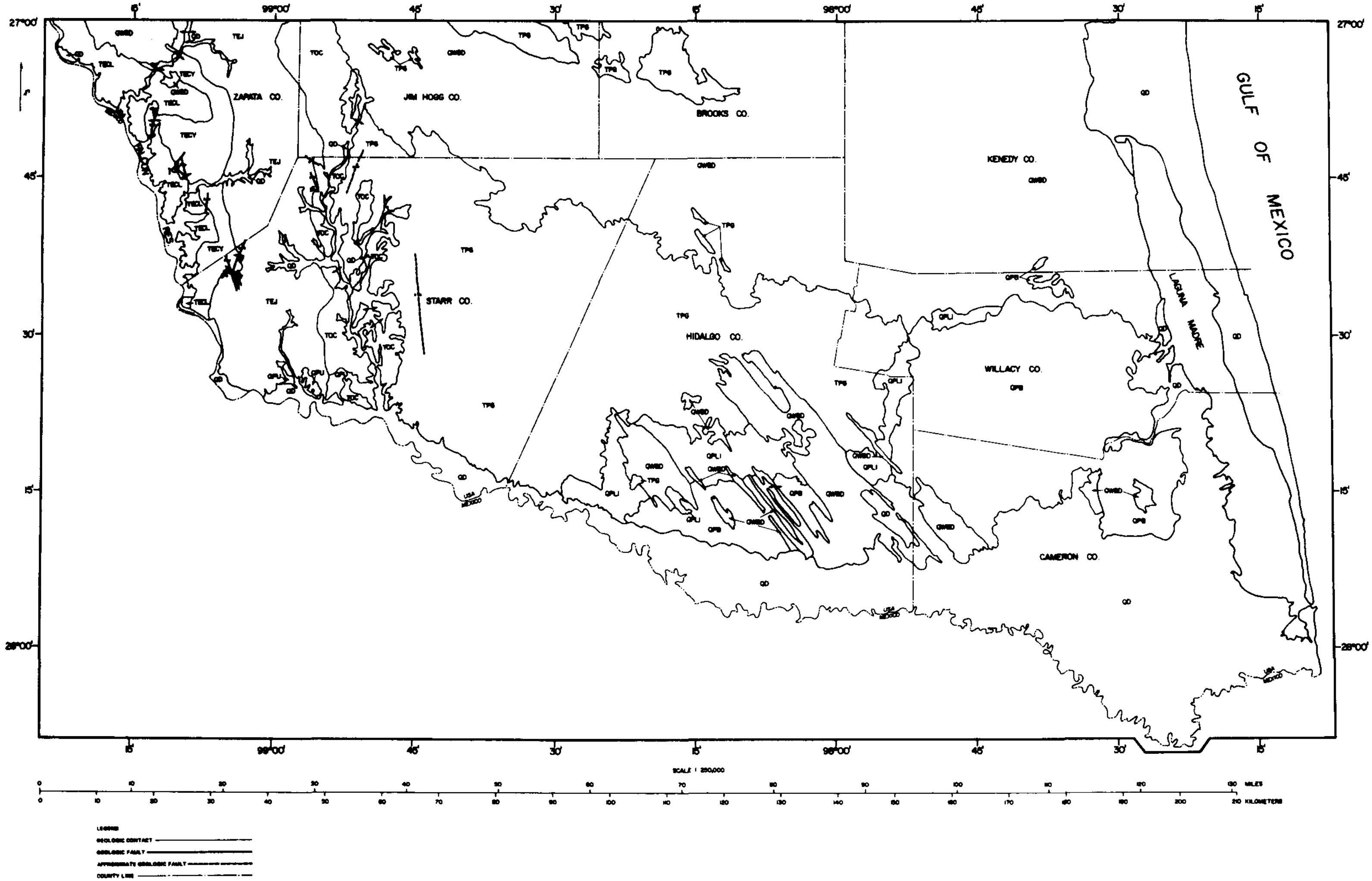

Figure 3

GENERALIZED GEOLOGIC MAP OF THE BROWNSVILLE-McALLEN QUADRANGLES

The Jackson Group represents the last prograding delta system of the Eocene series and conformably overlies the Yegua Formation. The Jackson Group contains white tuff and carbonaceous tuff and clay, tuffaceous sand and sandstone, bentonitic clay, and thin beds of lignite and volcanic ash. The sandstone is fine- to coarse-grained, variable in color from almost white to greenish-gray, or buff, and poorly to very well consolidated. The most characteristic feature of the sandstone is the abundance of silicified wood (Trowbridge, 1932).

The Oligocene (?) Frio Formation lies conformably on the Jackson Group and is unconformably overlain by beds of tuff and volcanic ash of the Catahoula Formation. The Frio Formation is predominantly a massive clay, containing gypsum and thin beds of sand and volcanic ash (Wood, et al, 1963). Although the Frio Formation is mapped undifferentiated from the Catahoula Formation in the survey area (Barnes, 1976), it is mapped as a discrete unit elsewhere in the Texas Gulf Coast. Unconformably overlying the Frio Formation is the Oligocene/Miocene (?) Catahoula Formation, which was deposited by the Gueydan fluvial system. This system is represented by high bedload channel fill, crevasse splay, floodplain, and coastal lake facies (Galloway, 1977). Sand units are interbedded with subordinate amounts of tuff, ash, and silt (Galloway, 1977). A western source is indicated for the sediment by the high percentage of plagioclase feldspar in fluvial sands, together with volcanic ash and volcanic rock fragments.

Uplift along the Balcones Fault during Middle Miocene brought the deposition of the Catahoula Formation to an abrupt end. Later in the Miocene, rejuvenated streams brought clastic material from the Edwards Plateau and the Llano Uplift to form the Miocene Oakville Formation (Eargle, et al, 1975). This formation unconformably overlies the Catahoula Formation. The Oakville Formation consists of massive light-colored sand, interbedded with gray or tan yellow-brown calcareous clay, and silt. It is characterized by layers of reworked Cretaceous fossils and volcanic ash (Wood, et al, 1963). The cross-bedded character of the sands and the sequence of fine to coarse deposits is suggestive of a deltaic environment (Weeks, 1945). It should also be noted that the Oakville Formation is not exposed in the survey area but does occur in the subsurface (Baker, 1978).

Unconformably overlying the Oakville Formation is the Fleming Formation, consisting of yellow to green calcareous to marly clay, with thin lenticular seams of silt, coarse sand and gravel (Shafer, 1974). The Fleming Formation generally has a higher percentage of clay than does the Oakville Formation, but it is so similar lithologically that establishing formational contacts is difficult, particularly in the subsurface (Baker, 1978). Therefore, the Fleming and Oakville Formations are combined in the report as in Barnes (1976).

Unconformably overlying the Oakville Formation, and the Catahoula Formation in some areas, is the Pliocene Goliad Formation. This formation is composed primarily of sand. The sand is whitish gray and in places black chert grains give the formation a "salt and pepper" appearance (wood, et al, 1963). The climate during deposition of the Goliad Formation was semi-arid as indicated by the prevalence of caliche. During this time, channels were formed by streams that deposited sediments originating in western Texas, New Mexico, and perhaps the ancestral Rocky Mountains (Eargle, et al, 1975).

The Uvalde Gravel occurs as isolated masses of sand, gravel, and caliche. It is similar lithologically to the sand and gravel of the Goliad Formation, although the Uvalde Gravel is considered younger (Lonsdale and Day, 1937).

The Lissie Formation lies unconformably on the Goliad Formation and is composed of thick sand beds containing gravel lenses and is interbedded with clay and silt. These sediments are believed to represent coalescing alluvial fans deposited at the mouths of streams which discharged into the sea during the Pleistocene (Deussen, 1914). After the deposition of the Lissie Formation, rejuvenation of major streams caused downcutting through the Lissie Formation into the underlying Oakville Formation.

Largely deltaic interbedded in places with marine and lagoonal beds, the Beaumont Formation was deposited unconformably on the Lissie formation. It is composed of gray, yellow, brown, and pink clays which in many places contain gypsum and calcareous nodules. Sands of similar color are also present (Weeks, 1933).

Qauternary windblown deposits cover large areas, especially in the northern and, to a lesser extent, in the south central portion of the Brownsville-McAllen Quadrangles. These units were deposited by easterly winds, which carried sand from the beaches to the east (Wood, et al, 1963). Most of these deposits are stabilized, but in the central northeast area of the quadrangles, active sand dunes are present (Barnes, 1976).

STRUCTURE

The geologic structure in the survey area is relatively simple. The most prominent feature is a general gulfward dip of the formations at an angle greater than the slope of the land surface. The direction of dip is essentially south-southeast. In vertical sections, geologic formations underlying the region occur as a series of gently dipping truncated wedges that thicken toward the coast, each wedge having a lightly steeper dip than the overlying wedge (Wood, et al, 1963). The wedge structure results from subsidence of the Rio Grande Embayment, a Tertiary depositional basin, which was later elevated to its present position (Lonsdale and Day, 1937).

Faults are common in the survey area, but generally they have little or no surface expression. Most are normal strike faults, seemingly related to the gradual subsidence and tilting of the basement, and the subsequent adjustment of the overlying sediments (Wood, et al, 1963).

HYDROLOGY

Four major aquifers or aquifer systems are present in the Brownsville-McAllen Quadrangles: (1) Jasper aquifer, (2) Evangeline aquifer, (3) Chicot aquifer, and (4) Rio Grande aquifer. Two confining systems are also present in the stratigraphy of the survey area: (1) Catahoula confining system (restricted) separating the underlying units from the Jasper aquifer, and (2) Burkeville confining system (restricted) separating the Jasper aquifer from the Evangeline aquifer. Other water-producing units include the Eocene formations and Quaternary windblown deposits, terrace deposits, and alluvium.

The Catahoula confining system (restricted), as described by Baker (1978), includes the Frio Formation and most of the Catahoula Formation. These formations have a maximum outcrop thickness of 244 m (800 ft) and increase to over 765 m (2,500 ft) in the subsurface (Baker, 1978). They also consist mainly of clays and tuffs, and act as an impermeable layer between the overlying Jasper aquifer and underlying formations. The Upper Catahoula Formation generally contains more sand and produces significant amounts of water used in the area (41 wells). In the following discussion of groundwaters, the term Catahoula Formation is understood to mean this upper sand water-producing section of the Catahoula confining system (restricted).

The Jasper aquifer includes the Oakville Formation and overlying Lower Fleming Formation. The Jasper aquifer ranges in thickness from as little as 30 to 305 m (100 to 1,000 ft) (Baker, 1978). The Oakville Formation is a major producing unit of the Jasper aquifer, and consists of medium- to fine-grained sand, sandstone, bentonitic clay, and small amounts of volcanic ash. The Lower Fleming Formation consists mainly of calcareous clay and generally does not produce significant amounts of water (Shafer, 1974).

The Burkeville confining system, or Fleming Formation as described by Baker (1978), overlies the Jasper aquifer and separates the Jasper aquifer from the Evangeline aquifer. The range in thickness of the Burkeville confining system is from 90 m (300 ft) to 185 m (600 ft) and consists predominantly of silt and clay. Because of its relatively large percentage of silt and clay when compared to the underlying Jasper aquifer and overlying Evangeline Aquifer, the Burkeville confining system functions as a confining unit. No groundwater samples taken in the survey area were determined to be from the Burkeville confining system.

The Evangeline aquifer overlies the Burkeville confining system and includes the Goliad Formation and the upper portion of the Fleming Formation (Baker, 1978). The Evangeline aquifer is typically wedge shaped (thickens gulfward) and has a high sand to clay ratio. The Evangeline aquifer ranges in thickness from 185 m (600 ft) to 305 m (1,000 ft) and is one of the most productive units in the survey area, providing an abundance of fresh to slightly saline water.

The Chicot aquifer overlies the Evangeline aquifer and includes the Quaternary units (Baker, 1978). The aquifer attains a maximum thickness of 305 m (1,000 ft) (Baker, 1978) and is also one of the most productive aquifers in the survey area, producing large amounts of fresh to slightly saline water.

The Rio Grande aquifer consists of terrace, floodplain, and delta alluvium deposits, and also includes portions of the Goliad, Lissie, and Beaumont Formations which underlie the alluvium. This aquifer has a maximum thickness of 215 m (700 ft) and is in hydraulic continuity with the other aquifers in the Rio Grande Basin (Peckham, 1963). The aquifer extends along the Rio Grande from below Falcon Dam in Starr County for 160 km (100 mi) to Brownsville in Cameron County. In southern Starr County and southwestern Hidalgo County, the aquifer is a narrow strip along the Rio Grande, 8 to 16 km (5 to 10 mi) wide. From eastern Hidalgo County it extends northward into Willacy County where it attains its maximum width in Texas, about 45 km (28 mi). The productive area of the aquifer covers about 2,460 km (950 mi^2), most of which lies outside the Rio Grande Basin in Hidalgo, Cameron, and Willacy Counties.

Significant amounts of water are produced from the Lower Tertiary Formations (Jackson Group, Yegua, and Laredo) in the western section of the survey area. Other aquifers are the Quaternary windblown deposits and alluvium.

URANIUM OCCURRENCES

Uranium deposits are found in an area north of the Brownsville-McAllen Quadrangles in Atascosa, Duval, Gonzales, Fayette, Karnes, Live Oak, and Washington Counties. The three stratigraphic units that contain these uranium deposits also occur in the survey area. In ascending order, these rock units are the sands in the Whitsett Formation of the Jackson Group, the Oligocene Catahoula Formation, and the Miocene Oakville Sandstone (Eargle, et al, 1975). The primary source of the uranium is presumed to be the siliceous volcanic tuffs and ashes of the Catahoula Formation and the Jackson Group with a possible alternate or additional source from the granites and pegmatites of the Llano Uplift in central Texas (Quick, et al, 1977). After deposition of the volcanic tuffs and ash, uranium was leached from the deposits and transported by moderately alkaline groundwaters, and precipitated where the groundwater encountered a reducing environment. These uranium-bearing units have not been commercially mined in the Brownsville-McAllen Quadrangles.

Uranium ore in the Jackson Group is found mainly in the sand of the Whitsett Formation. These sands were deposited in a strand plain-barrier bar environment during a regression of the Jackson Sea (Quick, et al, 1977). Ore deposits are found in both oxidized and unoxidized environments. The oxidized ore is concentrated in a small, lenticular or irregular marine-beach sandstone. The main uranium minerals are autunite and tyuyamunite. The unoxidized Jackson Group ore is in ore rolls in the same marine-beach sand facies as the oxidized ore. Most of the unoxidized ore is present within the structural graben between the Falls City and Fishing Faults (Quick, et al, 1977; Eargle, et al, 1975). These faults may provide conduits by which the underlying hydrogen and hydrogen sulfide gas infiltrates the overlying units and subsequently forms a reducing environment (Eargle and Weeks, 1961). Common reduced uranium minerals are uraninite and coffinite.

Uranium deposits in the Catahoula Formation are reduced ore rolls in sandstones deposited along the lateral margins of fluvial channels formed by the Gueydan fluvial system (Quick, et al, 1977; Eargle, et al, 1975). Near surface portions of the Gueydan fluvial system have been widely tested by drilling and the abundance of deposits discovered proves it to be a uranium-rich system containing multiple ore bodies (Galloway, 1977). According to Galloway (1977), total proven reserves are unknown because reserve data are proprietary, but 10^7 lb U_3O_8 is a likely order of magnitude.

Galloway (1977) states that in the Catahoula Formation "uranium was leached from ash in the zone of shallow pedogenic weathering, recharged into regional semiconfined aquifers, and concentrated along mineralization fronts that formed where geochemical gradients within the aquifer abruptly reduced uranium solubility". Subsequently, "changing flow patterns may result in local flow stagnation and reduction of oxidized parts of alteration tongues, or outcrop recession may superimpose a surficial oxidizing environment on the mineralization front". The reduced uranium ore occurs as dessiminated uraninite and coffinite within medium- to fine-grained sands with mudstone lenses, conglomerates, and diagenetic clay. The oxidized ore usually occurs in the form of stable minerals such as autinite (Galloway, 1977).

Uranium ore in the Miocene Oakville Formation lies along the margins of a major fluvial system trending south-southeast parallel to regional dip. The ores, all of them unoxidized, lie north and southwest of the fluvial system (Quick, et al, 1977). The host rocks, fluvial sands with interbedded silts and clays, are floodplain deposits that grade laterally into finer grained deposits. It is believed the circulation of groundwater is restricted in this stratigraphic setting, giving ample opportunity for the precipitation of uranium (Eargle, et al, 1971).

All these deposits are located near fault lines where there is seepage of oil and gas that contain hydrogen sulfide (Eargle and Weeks, 1961).

Thus, abundant materials are provided for creation of a reducing environment in which uranium may be precipitated (Eargle, et al, 1971).

Another stratigraphic unit where uranium is found is the Goliad Formation. This unit is mineralized above the caprock of the Palangana Salt Dome. In situ leaching has been attempted, but little or no uranium has been produced (Eargle, et al, 1975; Quick, et al, 1977).

SAMPLE COLLECTION

CHRONOLOGY OF THE SURVEY

Sampling in the Brownsville-McAllen Quadrangles began in December 1979. All field sampling was performed by UCC-ND personnel. Laboratory analysis, as well as compilation and verification of all field and laboratory data, continued throughout the sampling period. The final field and laboratory data base used to prepare the statistical and areal distribution of uranium and other related variables for this report was completed in April 1980.

FIELD PROCEDURES

A total of 427 groundwater and 171 stream sediment samples were collected within the boundaries of the Brownsville-McAllen Quadrangles. Spring water and well water samples are collectively reported as groundwater. Plates 1 and 4 are overlays at a scale of 1:250,000 showing sample locations for groundwater and stream sediments, respectively. Drainage basins <20 mi^2 are drawn in on Plate 4 to indicate the area represented by the stream sediment samples. Detailed information regarding techniques of sample collection, recording of site data, field equipment, and recording of field measurements may be found in the following reports: "Hydrogeochemical and Stream Sediment Procedures of the Uranium Resource Evaluation Project" (Arendt, et al, December 1979); "Procedures Manual for Groundwater Reconnaissance Sampling" (Uranium Resource Evaluation Project, March 1978); "Procedures Manual for Stream Sediment Reconnaissance Sampling" (Uranium Resource Evaluation Project, May 1978). Field observations were recorded on the field forms shown in Table C-2 and are included in the microfiche in Appendix C.

CONTAMINATION

Precautions were taken to avoid the possibility of collecting contaminated samples. Wells which were affected by chlorination, water-softening, or filtering devices were not sampled if the sample could not be taken before the water passed through such devices. Any well that had not been pumped recently was allowed to run long enough to flush the system, and the fact that it was not used was noted on the field form. Since the possibility for contamination is high in dug wells, these are indicated on the field form. Any wells thought to be contaminated were noted as such on the field form. Wherever possible, sediment samples were collected upstream from road crossings. Visible signs of contamination or the presence of cultivated areas upstream from the sample site were noted on the field form.

Citrus groves are a major industry in the southeastern section of the Brownsville-McAllen Quadrangles. Groundwater and stream sediment contamination may occur from the extensive use of fertilizers. Phosphate fertilizers are known to contain trace amounts of uranium and the uranium can be leached and incorporated in the soil. Also, oil and gas production is a major industry in the quadrangles except the southeastern section. Groundwater contamination may occur from the movement of brine through improperly cased oil wells, oil test wells that are not properly sealed or cased, and the infiltration of oil field brines from surface disposal pits (Holt, 1956; Alexander and White, 1966). Numerous uranium test drill holes which occur in this area, especially in the north central portion of the quadrangles, are also a possible source of contamination, especially those without adequate surface plugs (White, 1972).

CHEMICAL ANALYSIS

All samples collected in the field geology program were returned to the URE Project Laboratory in Oak Ridge, Tennessee for preparation and analysis. The elements determined and the analytical techniques used along with the appropriate detection limits are given in Table 1. These detection limits are considered the best average during normal operation; however, some variables have values reported below these limits. All water samples were received in 250-ml polyethylene bottles and were filtered through 0.45-μm cellulose acetate paper. Stream sediment samples were dried overnight at 85°C and sieved to collect the <150-μm fraction. Part of the sediment sample was dissolved in 10 ml of 1:1 nitric-hydrofluoric acid. The analytical procedures which were used have been described by Cagle (1977) and Arendt, et al (1979). All observed data from all samples are included in the microfiche in Appendix C.

QUALITY CONTROL

MEASUREMENTS CONTROL

The procedures used to analyze URE Project reconnaissance samples require that calibration standards, check samples, and blanks be analyzed along with normal samples to ensure the validity of the reported results. A measurements control program provides information concerning precision and reliability of these measurements. Control samples of two water batches and two sediment batches are submitted anonymously along with routine samples on a daily basis. A statistical summary of results reported on control samples, which were analyzed along with the samples

Table 1

DETECTION LIMITS OF VARIABLES DETERMINED IN WATER AND SEDIMENT SAMPLES

Variable	Method	Detection Limits Sediment (ppm)	Detection Limits Water (ppb)
U-FL	Fluorometry	0.25	0.2
U-MS	Mass Spectrometry-Isotope Dilution	--	0.02
U-NT	Neutron Activation-Delayed Neutron Count	0.02	--
As	Atomic Absorption	0.1	0.5
Se	Atomic Absorption	0.1	0.2
Ag	Plasma Source Emission Spectrometry	2	2
Al	Plasma Source Emission Spectrometry	0.05[a]	10
B	Plasma Source Emission Spectrometry	10	4
Ba	Plasma Source Emission Spectrometry	2	2
Be	Plasma Source Emission Spectrometry	1	1
Ca	Plasma Source Emission Spectrometry	0.05[a]	0.1[b]
Ce	Plasma Source Emission Spectrometry	10	30
Co	Plasma Source Emission Spectrometry	4	2
Cr	Plasma Source Emission Spectrometry	1	4
Cu	Plasma Source Emission Spectrometry	2	2
Fe	Plasma Source Emission Spectrometry	0.05[a]	10
Hf	Plasma Source Emission Spectrometry	15	--
K	Plasma Source Emission Spectrometry	0.05[a]	0.1[b]
La	Plasma Source Emission Spectrometry	2	--
Li	Plasma Source Emission Spectrometry	1	2
Mg	Plasma Source Emission Spectrometry	0.05[a]	0.1[b]
Mn	Plasma Source Emission Spectrometry	4	2
Mo	Plasma Source Emission Spectrometry	4	4
Na	Plasma Source Emission Spectrometry	0.05[a]	0.1[b]
Nb	Plasma Source Emission Spectrometry	4	--
Ni	Plasma Source Emission Spectrometry	2	4
P	Plasma Source Emission Spectrometry	5	40
Pb	Plasma Source Emission Spectrometry	10	--
Sc	Plasma Source Emission Spectrometry	1	1
Si	Plasma Source Emission Spectrometry	--	0.1[b]
Sr	Plasma Source Emission Spectrometry	1	2
Th	Plasma Source Emission Spectrometry	2	--
Ti	Plasma Source Emission Spectrometry	10	2
V	Plasma Source Emission Spectrometry	2	4
Y	Plasma Source Emission Spectrometry	1	1
Zn	Plasma Source Emission Spectrometry	2	4
Zr	Plasma Source Emission Spectrometry	2	2
SO_4	Spectrophotometry	--	5[b]
Cl	Spectrophotometry	--	10[b]

[a] Detection limits expressed in percent.
[b] Detection limits expressed in ppm.

included in this survey, are given in Tables 2 and 3. Results of uranium analysis of water and sediment control samples obtained from the Ames Laboratory as part of the Multilaboratory Analytical Quality Control for the HSSR Program are reported by D'Silva, et al (1980).

PRINCIPAL COMPONENT ERROR ANALYSIS

A principal component analysis of data from groundwater and stream sediment samples was used to produce an ordered list of samples using the eigenvalue statistics as described by Kane, et al (1977), where the most extreme samples were listed first. Additional unusual samples were identified if single-element measurements were outside a three standard deviation confidence interval around the mean. The laboratory and field data from the unusual samples identified by this procedure were reviewed. Ten well water samples (038382, 038387, 038451, 038569, 041913, 042126, 042150, 042152, 042237, and 042324) and eight stream sediment samples (038384, 038567, 038570, 038605, 042110, 042243, 042319, and 042520) which appeared to be the most unusual were submitted for reanalysis. The original results were compared to the results from reanalysis. Of the more than 500 individual analyses that were compared, the only groundwater results which were considered to be in error in the original analysis and thus require corrections were uranium values for Samples 038387 and 041913, arsenic and selenium values for Samples 042150 and 042324, sulfate and chloride values for Samples 038382 and 038451, and multielement values for Samples 038569, 042126, 042237, and 042324. Reanalysis of sediment samples resulted in correcting arsenic and selenium values for Sample 038384, uranium value for Sample 038570, and multielement values for Samples 038567, 038570, 038605, and 042520. This low error rate for the unusual samples indicates a high level of reliability for the laboratory measurements.

GEOCHEMICAL RESULTS

A statistical summary of all geochemical variables determined and the correlation matrices of selected variables for groundwater and stream sediment samples collected in the Brownsville-McAllen Quadrangles are presented in Appendixes A and B, respectively. Symbol plots, log frequency, lognormal probability, percentile plots, and tabular data listings for selected variables are also included. All field and laboratory data for groundwater and stream sediment samples may be found on microfiche in Appendix C. Details of all sampling, analytical, and statistical procedures are discussed in Report K/UR-100 (Arendt, et al, December 1979).

For discussion purposes, the 15th and 85th percentile concentrations are contoured on the symbol plots for all elements in Appendixes A and B, to indicate areas of low and high concentrations. This represents values of approximately one standard deviation below and above the mean for a

Table 2

SUMMARY OF MEASUREMENTS CONTROL RESULTS OBTAINED
WITH GROUNDWATER SAMPLES FROM THE BROWNSVILLE-McALLEN QUADRANGLES

		Batch L-4				Batch H-4			
Element	Method	No. of Samples	Mean (ppb)	Standard Deviation (ppb)	Coefficient of Variation	No. of Samples	Mean (ppb)	Standard Deviation (ppb)	Coefficient of Variation
U	FL[(a)]	17	0.75	0.351	0.47	11	10.87	0.897	0.08
AS	AA[(b)]	20	3.3	1.11	0.33	17	0.6	0.31	0.55
SE	AA	20	1.2	0.31	0.26	17	0.8	0.24	0.29
AL	PS[(c)]	13	92.0	20.2	0.22	18	330.0	25.0	0.08
B	PS	13	1,570.0	62.2	0.04	19	69.0	4.6	0.07
BA	PS	12	140.0	3.3	0.02	19	31.0	1.4	0.05
CA	PS	14	10,000.0	850.0	0.08	18	91,400.0	6,190.0	0.07
CO	PS	14	20.0	4.1	0.20	17	90.0	2.9	0.03
CR	PS	14	93.0	5.6	0.06	18	18.0	1.8	0.10
CU	PS	8	45.0	1.8	0.04	18	202.0	23.3	0.11
FE	PS	13	103.0	7.2	0.07	18	960.0	50.7	0.05
K	PS	14	1,800.0	229.0	0.13	17	19,490.0	937.0	0.05
LI	PS	14	16.0	1.1	0.07	18	100.0	5.6	0.06
MG	PS	14	9,200.0	420.0	0.05	18	67,900.0	2,710.0	0.04
MN	PS	14	20.0	2.3	0.11	16	96.0	4.1	0.04
MO	PS	13	24.0	10.1	0.41	13	11.0	6.3	0.57
NA	PS	14	1,600.0	150.0	0.10	18	43,800.0	2,120.0	0.05
NI	PS	13	195.0	10.7	0.05	18	37.0	6.2	0.16
P	PS	13	90.0	23.8	0.26	17	4,498.0	134.3	0.03
SC	PS	13	63.0	2.8	0.04	17	11.0	0.5	0.05
SI	PS	14	870.0	164.0	0.19	18	7,940.0	371.0	0.05
SR	PS	14	56.29	2.644	0.05	18	5,012.55	170.85	0.03
TI	PS	13	118.0	8.2	0.07	18	38.0	4.4	0.11
V	PS	12	9.0	1.5	0.15	18	41.0	3.5	0.08
Y	PS	14	9.0	1.4	0.14	18	45.0	2.4	0.05
ZN	PS	14	498.0	42.7	0.09	18	45.0	24.3	0.54

[(a)] Fluorometric analysis.
[(b)] Atomic absorption.
[(c)] Plasma source emission spectroscopy.

Table 3

SUMMARY OF MEASUREMENTS CONTROL RESULTS OBTAINED WITH STREAM SEDIMENT SAMPLES FROM THE BROWNSVILLE-McALLEN QUADRANGLES

		Batch Q-1				Batch R-3				Batch S-3			
Element	Method	No. of Samples	Mean (ppm)	Standard Deviation (ppm)	Coefficient of Variation	No. of Samples	Mean (ppm)	Standard Deviation (ppm)	Coefficient of Variation	No. of Samples	Mean (ppm)	Standard Deviation (ppm)	Coefficient of Variation
U	FL[a]	40	0.79	0.268	0.34	37	4.26	0.469	0.11	38	28.52	2.674	0.09
U	NT[b]	39	0.67	0.160	0.24	50	4.91	0.102	0.02	35	26.25	0.797	0.03
AS	AA[c]	17	1.8	0.25	0.14	27	3.6	0.64	0.18	19	26.4	3.11	0.12
SE	AA	12	0.5	0.31	0.57	28	0.2	0.43	2.02	20	1.4	0.62	0.45
AL	PS[d]	36	9,700.0	490.0	0.05	39	34,100.0	2,730.0	0.08	30	48,700.0	3,430.0	0.07
B	PS	38	7.0	3.5	0.46	34	20.0	7.1	0.34	30	61.0	10.3	0.17
BA	PS	38	130.0	14.6	0.11	39	454.0	51.0	0.11	32	314.0	31.1	0.10
BE	PS	37	0.0	0.6	0.94	40	0.0	10.3	10.27	32	2.0	4.0	1.74
CA	PS	38	1,200.0	100.0	0.08	40	3,100.0	300.0	0.10	31	16,900.0	80.0	0.06
CE	PS	37	19.08	3.677	0.19	39	68.82	7.196	0.10	29	55.59	4.968	0.09
CO	PS	38	4.0	2.7	0.59	40	10.0	2.2	0.20	31	33.0	3.1	0.09
CR	PS	38	14.0	2.1	0.14	39	28.0	3.2	0.11	32	65.0	6.6	0.10
CU	PS	35	3.0	0.8	0.22	38	20.0	1.5	0.07	30	69.0	2.9	0.04
FE	PS	37	9,700.0	390.0	0.04	40	18,000.0	1,070.0	0.06	30	40,800.0	2,070.0	0.05
K	PS	37	1,900.0	190.0	0.10	38	9,900.0	930.0	0.09	31	17,200.0	2,000.0	0.12
LI	PS	37	9.0	0.8	0.08	39	23.0	1.8	0.08	32	35.0	3.6	0.10
MG	PS	38	1,100.0	50.0	0.05	39	2,200.0	110.0	0.05	32	5,600.0	260.0	0.05
MN	PS	37	317.0	9.9	0.03	40	1,909.0	87.8	0.05	30	404.0	15.9	0.04
MO	PS	1	0.0	0.0	0.0	40	2.0	0.9	0.41	29	43.0	3.7	0.08
NA	PS	1	0.0	0.0	0.0	40	1,600.0	190.0	0.13	31	1,600.0	220.0	0.14
NB	PS	37	2.0	0.7	0.32	41	8.0	4.3	0.49	33	2.0	1.6	0.58
NI	PS	37	6.0	1.0	0.16	41	20.0	3.1	0.15	30	108.0	6.3	0.06
P	PS	36	70.0	6.0	0.09	35	2,149.0	217.3	0.10	28	1,441.0	83.8	0.06
PB	PS	28	5.0	3.0	0.50	27	38.0	5.6	0.14	28	21.0	3.6	0.16
SC	PS	38	1.0	0.5	0.31	41	5.0	0.8	0.15	32	10.0	0.8	0.08
SR	PS	36	19.17	1.320	0.07	39	55.33	4.054	0.07	32	85.56	6.133	0.07
TH	PS	38	2.0	1.7	0.74	41	8.0	2.8	0.34	33	8.0	2.5	0.30
TI	PS	38	572.0	54.8	0.10	39	3,321.0	369.9	0.11	32	2,123.0	174.9	0.08
V	PS	35	20.0	0.9	0.04	38	55.0	4.4	0.08	30	166.0	6.7	0.04
Y	PS	37	4.0	0.3	0.08	39	20.0	1.7	0.08	30	33.0	1.6	0.05
ZN	PS	36	13.0	2.1	0.16	35	93.0	7.5	0.08	29	185.0	12.0	0.06
ZR	PS	38	30.0	2.9	0.10	38	136.0	10.9	0.08	31	83.0	6.0	0.07
HF	PS	27	2.11	1.577	0.75	27	3.83	2.685	0.70	28	1.95	1.455	0.75
LA	PS	28	20.89	3.023	0.14	27	78.00	15.056	0.19	28	90.61	4.787	0.05

[a] Fluorometric analysis.
[b] Neutron activation delayed neutron count.
[c] Atomic absorption.
[d] Plasma source emission spectroscopy.

normally distributed population. For more careful evaluation of the data presented, concentration levels considered to be anomalous should be determined separately for each geologic unit within the quadrangles.

GEOCHEMICAL DISTRIBUTIONS IN GROUNDWATER

The sample site locations for groundwater samples collected in the Brownsville-McAllen Quadrangles are shown on Plate 1 at a scale of 1:250,000. Symbol plots for uranium and specific conductance are presented at this scale on Plates 2 and 3 and at a scale of 1:1,000,000 in Figures A-1b and A-2b, respectively. A map of the major producing horizons sampled and the samples noted as having hydrogen sulfide odor at the time the samples were collected is presented in Figure 4.

Observed data for the variables uranium, specific conductance, boron, calcium, lithium, magnesium, molybdenum, potassium, sodium, strontium, and pH are listed in Table A-3. The figures in Appendix A present log frequency, lognormal probability, percentile, and areal distribution plots for these variables plus arsenic, chloride, selenium, silicon, titanium, total alkalinity, uranium/specific conductance, vanadium, and zinc. Groundwater data used to generate the tables and figures in Appendix A include all groundwater samples collected in the Brownsville-McAllen Quadrangles.

Uranium

The areal distribution of uranium in groundwater in the Brownsville-McAllen Quadrangles (Plate 2, Figure A-1b) and the percentile plot (Figure A-1a) indicate that most uranium concentrations above 19.26 ppb (85th percentile) occur in two general areas. One is an area where wells produce from the Catahoula Formation in the southwestern corner of Jim Hogg County and northwestern corner of Starr County. The other is a larger northwest-southeast discontinuous trend underlain by Chicot, Evangeline, and Rio Grande aquifers in eastern Hidalgo County, Cameron, and Willacy Counties. The percentile plot (Figure A-1a) indicates the highest values are found in the water from the Catahoula Formation and the Chicot, Evangeline, and Rio Grande aquifers. In the lower Rio Grande Valley high uranium values correspond to citrus groves which are fertilized with ammonium phosphate fertilizer. It is possible that the high uranium values are due to groundwater contamination. Groundwaters with uranium concentrations <0.23 ppb (15th percentile) occur predominantly in the western portion of the quadrangles. Waters in this area are produced from the Jackson Group and the Yegua and Laredo Formations. The percentile plot (Figure A-1a) indicates waters produced from these units have the lowest background values.

The correlation matrix (Table A-2) indicates significant positive correlation with a coefficient of >0.3 for both Pearson and Spearman correlations between uranium and magnesium, strontium, and potassium. There is a high negative correlation between uranium and pH.

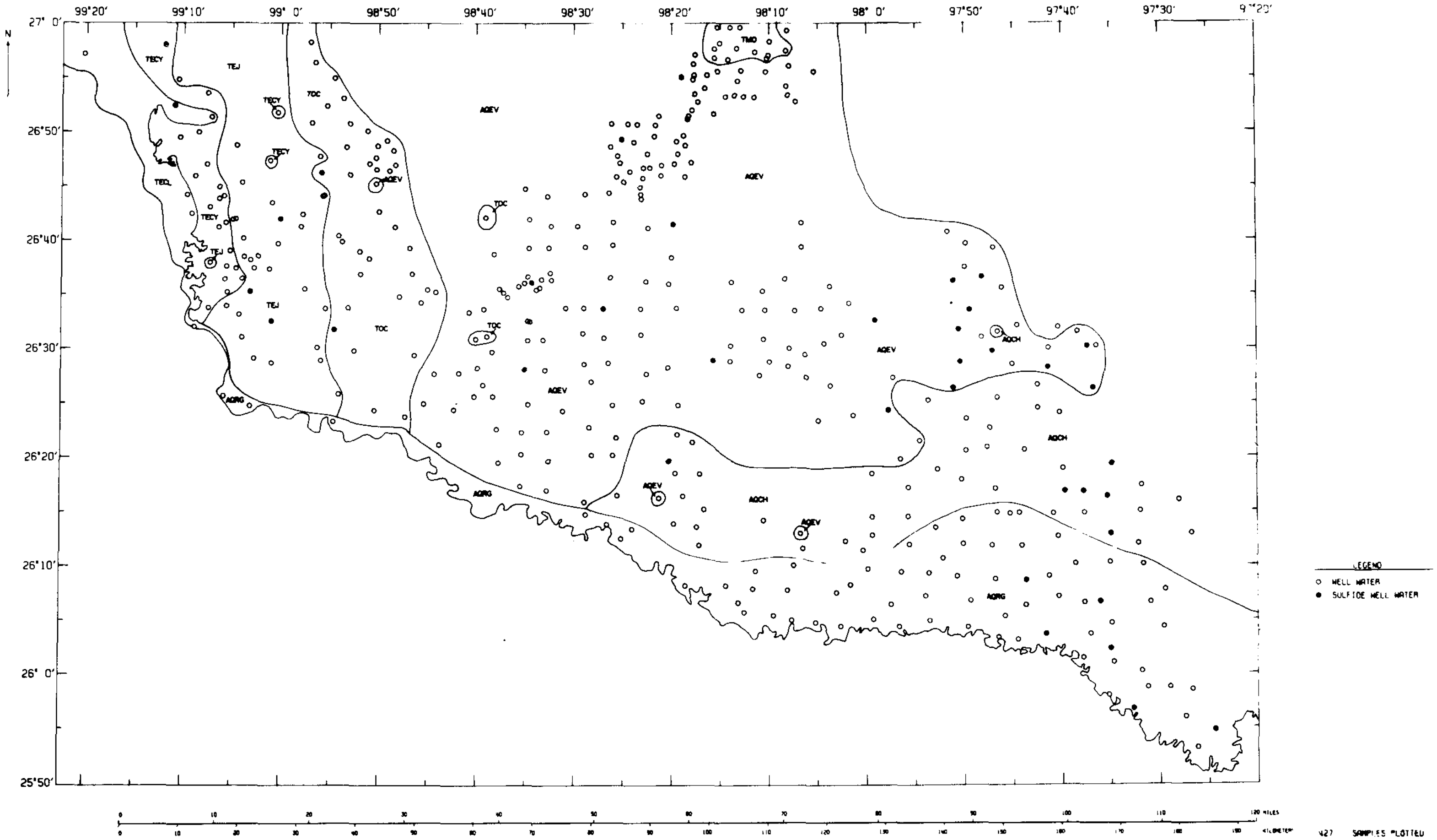

Figure 4

PRODUCING HORIZON MAP OF GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

Specific Conductance

Figure A-2b indicates that most groundwater samples with specific conductance values >6,950 µmhos/cm (85th percentile) occur in the western portions of the quadrangles. Groundwater samples with specific conductance values <1,550 µmhos/cm (15th percentile) are found in the north west. The percentile plot (Figure A-2a) indicates the Jackson Group, and the Catahoula, Yegua, and Laredo Formations have the highest background values when compared with the other aquifers and formations in the quadrangles.

From the areal distribution plot (Figure A-2b) there appears to be a major trend of high specific conductance values in waters from the Catahoula Formation and Jackson Group. High values for boron, chloride, lithium, molybdenum, and sodium are also found in waters collected in this area. High concentrations of these variables may be related to the presence of saline water.

The correlation matrix (Table A-2) indicates a significant positive correlation with a coefficient of >0.3 for both Pearson and Spearman correlations for specific conductance and strontium, sulfate, boron, sodium, lithium, and chloride. A significant negative correlation exists between specific conductance and barium.

Related Variables

In addition to uranium and specific conductance, several variables are useful in delineating possible uranium mineralization. Areal distribution plots indicate that high values for potassium, lithium, sodium, titanium, chloride, and uranium/specific conductance overlap or occur in close association with the trend of high uranium values in water from the Catahoula Formation in the western portion of the quadrangles between lat. 26°40' to 27°00' N. and long. 98°45' to 99°00' W. Groundwater samples with high uranium concentrations from the Catahoula Formation have pH values that range from slightly basic to moderately acidic (6.0-7.3) and total alkalinity values which are low to moderate (<200 ppm). Relatively high values for 1,000·uranium/ specific conductance also occur in these waters. High values of the saline indicators K, Li, Na, Ti, and Cl. are found to be in similar areal distributions to those of high uranium concentrations in the Catahoula Formation. Also uranium/specific conductance is high so the uranium is probably not due simply to high dissolved solids.

Groundwater from the Evangeline, Chicot, and Rio Grande aquifers in the southeastern section of the Brownsville-McAllen Quadrangles is moderately basic to acidic (8.2-5.6) and has alkalinity values of (110 to 620 ppm). Areal distribution plots indicate relatively high concentration of arsenic, magnesium, vanadium, zinc, strontium, 1,000·uranium/ specific conductance, and molybdenum in this area. This area looks very favorable for uranium mineralization. Along with the highest uranium values in the quadrangles, arsenic, vanadium, and molybdenum are also present in high concentrations. However, the stratigraphy of the Beaumont Formation with its high clay content is not a favorable host unit.

Summary of Groundwater Data

The area which appears most promising for uranium mineralization trends north-south in the northwestern section of the quadrangles, where the waters are derived from the Catahoula Formation. Groundwaters from the Catahoula Formation have high concentrations of uranium and low specific conductance values. The wells in the southeastern portion of the quadrangles produce from the Chicot, Evangeline, and Rio Grande aquifers at depths >10 m (30 ft). These also have high concentrations of uranium and uranium associated elements, and high values for specific conductance. But with the extensive use of fertilizers, primarily phosphate fertilizers, and the stratigraphy of the formations may indicate the adsorbtion of the trace elements by the clays of the Beaumont.

GEOCHEMICAL DISTRIBUTIONS IN STREAM SEDIMENT

Sample site locations and the outline of drainage basins from which stream sediment samples were collected in the Brownsville-McAllen Quadrangles are shown on Plate 4 at a scale of 1:250,000. Symbol plots for hot-acid-soluble uranium as determined by fluorometric analysis (U-FL) and thorium are presented in Plates 5 and 6, respectively. The number of stream sediment samples collected from each of the major stratigraphic units in the survey area is presented in Table 4.

Stream sediment data used to produce the correlation matrix and figures in Appendix B compiled from 171 samples collected from basins in the Brownsville-McAllen Quadrangles that average from 5 to 50 km^2 (2 to 20 mi^2) and/or basins greater than 50 km^2. Data for all samples are included in Tables B-1 and B-3 and on microfiche in Appendix C.

Values for soluble uranium (U-FL), total uranium as determined by neutron activation (U-NT), U/UNT, thorium, aluminum, arsenic, calcium, manganese, phosphorus, vanadium, and titanium are listed in Table B-3. The figures in Appendix B present log frequency, lognormal probability, percentile, and areal symbol plots for the above variables plus strontium, iron, lithium, magnesium, niobium, and vanadium.

Uranium

The areal distribution plot (Figure B-1b and Plate 5) and percentile plot (Figure A-1a)for soluble uranium (U-FL) indicates concentrations >2.67 ppm (85th percentile) are associated with the Quaternary units. Several high U-FL concentrations are scattered in the area of the Catahoula Formation and Jackson Group. The correlation matrix (Table B-2) shows a significant positive correlation coefficient >0.68 between U-NT and U-FL. Weaker positive correlations are present with all other variables except potassium and barium.

Table 4

DISTRIBUTION OF SAMPLES BY GEOLOGIC UNIT FROM BROWNSVILLE-MCALLEN QUADRANGLES

Geologic Unit	Geologic Unit Code	No. of Groundwater Samples	No. of Sediment Samples
Alluvium and Fluviatile Terrace Deposits	QD	--	61
Windblown Deposits	QWBD	--	14
Beaumont Formation	QPB	--	17
Lissie Formation	QPLI	--	3
Uvalde Gravel	QPU	--	--
Goliad Formation	TPG	--	29
Fleming and Oakville Formation	TMP	12	--
Rio Grande Aquifer	AQRG	77	--
Chicot Aquifer	AQCH	47	--
Evangeline Aquifer	AQEV	192	--
Catahoula and Frio Formations	TOC	41	15
Jackson Group	TEJ	32	27
Yegua Formation	TECY	21	2
Laredo Formation	TECL	5	3
		427	171

Figure B-2b indicates the majority of U-NT values above the 85th percentile (3.1 ppm) are located in the western and southeastern sections of the quadrangles. The sediments are derived from the Jackson Group and Catahoula Formation in the west and Quaternary units in the southeast. The correlation matrix (Table B-2) shows a strong significant positive correlation, with a coefficient >0.68 for both Pearson and Spearman correlations between U-NT and U-FL, and >0.30 between U-FL and aluminum, arsenic, calcium, chromium, copper, iron, lithium, magnesium, manganese, nickel, niobium, phosphorus, scandium, strontium, vanadium, yttrium, zinc, and zirconium.

Four sediment samples having high U-NT values are located in the western section of the quadrangles (lat. 26°29' to 26°32' N. and long. 99°02' to 99°07' W.) are derived from the Catahoula Formation and Jackson Group. However, a low U-FL/U-NT value (0.30) less than 15th percentile suggests a low proportion of soluable uranium.

Thorium

The areal distribution of thorium (Figure B-4b) indicates that sediments with concentrations above the 85th percentile (3 ppm) are derived mainly from streams draining the Tertiary units in the western portion of the survey area and the Quaternary deposits in the east. The percentile plot (Figure B-4a) shows a limited range of thorium concentrations in the Brownsville-McAllen Quadrangles. The correlation matrix (Table B-2) shows a moderately strong positive correlation (0.35 to 0.50) between thorium and cerium, zirconium, scandium, and yttrium. This suggests a residual or heavy mineral suite as the probable source for thorium in the survey area.

Related Variables

The only major trend in the Brownsville-McAllen Quadrangles appears in the southeastern area (25°50'-26°30'N - 97°20'-98°00'W). The areal distribution plots show high concentrations for aluminum, arsenic, calcium, iron, lithium, magnesium, phosphorous, strontium, and vanadium. These high concentrations indicate that clays in the Beaumont Formation and alluvium, along with the organics, are adsorbing these elements. The extensive use of fertilizers and irrigation is a possible cause for the introduction of these trace elements.

One extremely small area exists in the western section of the survey area. Four stream sediment samples that drain the Jackson Group exhibit anomalous U-NT values. Low U-FL values supplemented with areal distribution plots of yttrium, titanium, and zirconium indicate U-NT in association with heavy and/or resistate minerals.

Summary of Stream Sediment Data

Significant uranium mineralization is not indicated by the stream sediment data from the Brownsville-McAllen Quadrangles. Anomalous U-FL values occur in the southeastern section, but this can be attributed to phosphate fertilizer contamination. High concentrations of aluminum, arsenic, calcium, iron, lithium, magnesium, phosphorous, strontium, and vanadium also occur in this area. Four anomalous U-NT values that are located in the western section of the quadrangles appear to be somewhat more promising. However, low U-FL values and high concentrations of titanium and zirconium indicate that much of the uranium is contained in resistate minerals.

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BIBLIOGRAPHY

1. Alexander, W. H., Jr. and White, E. E., *Groundwater Resources of Atascosa and Frio Counties, Texas,* Texas Water Development Board, Report No. 32 (1966).

2. Arendt, J. W., Butz, T. R., Cagle, G. W., Kane, V. E., and Nichols, C. E., *Hydrogeochemical and Stream Sediment Reconnaissance Procedures of the Uranium Resource Evaluation Project,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-100 (In Press).

3. Baker, E. T., Jr., *Stratigraphic and Hydrogeologic Framework of Part of the Coastal Plain of Texas,* U.S. Geological Survey, Open-File Report 77-712 (1978).

4. Barnes, V. E., *Geologic Atlas of Texas, Laredo Sheet, Julia Gardner Memorial Edition,* Bureau of Economic Geology, The University of Texas, Austin (1976).

5. Cagle, G. W., "The Oak Ridge Analytical Program," *Symposium on Hydrogeochemical and Stream Sediment Reconnaissance for Uranium in the United States, March 16 and 18, 1977,* pp 133-156, United States Energy Research and Development Administration, Grand Junction, Colorado, GJBX-77(77) (October 1977).

6. D'Silva, A. P., Grabau, F., Haas, W. J., Jr., *Multilaboratory Analytical Quality Control Program for the Hydrogeochemical and Stream Sediment Reconnaissance,* Ames Laboratory, Iowa State University, Ames, Iowa, IS-4736 (April 1980) (Available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161).

7. Deussen, A., *Geology and Underground Waters of the Southeastern Part of the Texas Coastal Plain,* U.S. Geological Survey, Water Supply Paper No. 335 (1914).

8. Eargle, D. H., *Nomenclature of Formations of the Claiborne Group, Middle Eocene Coastal Plain of Texas,* U.S. Geological Survey, Bulletin 1251-D (1968).

9. Eargle, D. H., Dickinson, K. A., and Davis, B. O., "South Texas Uranium Deposits," *The American Association of Petroleum Geologists Bulletin,* Vol. 59, No. 5, pp 766-779 (May 1975).

10. Eargle, D. H., Hinds, G. W., Weeks, A. D., *Uranium Geology and Mines, South Texas,* Bureau of Economic Geology, The University of Texas, Austin, Guidebook No. 12 (1971).

11. Eargle, D. H. and Weeks, A. D., *Possible Relation Between Hydrogen Sulfide-Bearing Hydrocarbons in Fault-Line Oil Fields and Uranium Deposits in the Southeast Texas Coastal Plain,* U.S. Geological Survey, Professional Paper 424-D, pp D7-D9 (1961).

12. Galloway, W. E., *Catahoula Formation of the Texas Coastal Plain: Depositional Systems, Composition, Structural Development, Ground-water Flow History, and Uranium Distribution,* Bureau of Economic Geology, The University of Texas, Austin, Report of Investigations No. 87 (1977).

13. Gardner, J. A., "Laredo, A New Name for a Unit of Cook Mountain Age in the Rio Grande Region," *Washington Acad. Sci. Jour.,* Vol. 28, No. 7, pp 297-298 (1938).

14. Hem, J. D., *Study and Interpretation of the Chemical Characteristics of Natural Water,* U.S. Geological Survey, Water Supply Paper 1473, p 155 (1970).

15. Holt, L. R., Jr., *Geology and Groundwater Resources of Medina County, Texas,* U.S. Geological Survey, Bulletin 5601 (1956).

16. Kane, V. E., Baer, T., and Begovich, C. L., *Principal Components Testing for Outliers,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-7 (July 1977). United States Department of Energy, Grand Junction, Colorado [GJBX-71(77)].

17. Kaiser, W. R., *Texas Lignite: Near Surface and Deep Basin Resources,* Bureau of Economic Geology, The University of Texas, Austin, Report of Investigations No. 79 (1974).

18. King, P. B., Beikman, H. M., and Edmonston, G. J., *Geologic Map of the United States,* U.S. Geological Survey (1974).

19. Lonsdale, J. T. and Day, J. R., *Geology and Ground-Water Resources of Webb County, Texas,* U.S. Geological Survey, Water Supply Paper 778 (1937).

20. Peckman, R. C., *Summary of the Groundwater Aquifers in the Rio Grande Basin,* Texas Water Commission, Circular No. 6305 (1963).

21. Quick, J. V., Thomas, N. G., Brogdon, L. D., Jones, C. A., and Martin, T. S., *Uranium Favorability of Late Eocene Through Pliocene Rocks of the South Texas Coastal Plain*, United States Department of Energy, Grand Junction, Colorado [GJBX-7(77)].

22. Ricoy, J. U. and Brown, L. F., Jr., "Depositional Systems in the Sparta Formation (Eocene) Gulf Coast Basin of Texas," *Gulf Coast Association of Geological Societies, Transactions,* Vol. 27, pp 139-153 (1977). Reprinted as Bureau of Economic Geology, The University of Texas, Austin, Geological Circular 77-7.

23. Shafer, G. H., *Ground-Water Resources of Duval County, Texas,* Texas Water Development Board, Report 181 (1974).

24. Trowbridge, A. C., *Tertiary and Quaternary Geology of the Lower Rio Grande Region, Texas,* U. S. Geological Survey, Bulletin 837 (1932).

25. Uranium Resource Evaluation Project, *Procedures Manual for Groundwater Reconnaissance Sampling,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-12 (March 1978). United States Department of Energy, Grand Junction, Colorado [GJBX-62(79)].

26. Uranium Resource Evaluation Project, *Procedures Manual for Stream Sediment Reconnaissance Sampling,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-13 (May 1978). United States Department of Energy, Grand Junction, Colorado [GBJX-84(78)].

27. Weeks, A. W., "Lissie, Reynosa, and Upland Terrace Deposits of Coastal Plain of Texas Between Brazos River and Rio Grande," *The American Association of Petroleum Geologist Bulletin,* Vol. 17, No. 5, pp 453-487 (1933).

28. Weeks, A. W., "Oakville, Cuero, and Goliad Formations of Texas Coastal Plain Between Brazos River and Rio Grande," *The American Association of Petroleum Geologists Bulletin,* Vol. 29, No. 12, pp 1721-1732 (December 1945).

29. White, D. J., *Investigation of Exploratory Test Holes for Uranium in the Flatonia Area, Fayette County, Texas,* Groundwater-Contamination-Investigation Report, Project No. CI-6805, Texas Water Development Board (1972).

30. Wood, L. A., Gabrysch, R. K., and Marvin, R., *Reconnaissance Investigation of the Ground-Water Resources of the Gulf Coast Region, Texas,* Texas Water Commission, Bulletin 6305 (1963).

APPENDIX A

GROUNDWATER

APPENDIX A

GROUNDWATER

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

Table A-1

STATISTICAL SUMMARY FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

ELEMENT	NO. SAMPLES ANALYZED: MEASURABLE VALUES	NO. SAMPLES ANALYZED: BELOW DETECTION LIMIT	DETECTION LIMIT	MINIMUM VALUE	MAXIMUM VALUE	MEAN	MEDIAN	MODE	STANDARD DEVIATION	COEFFICIENT OF VARIATION	LN TRANSFORMATION: MEAN	LN TRANSFORMATION: S. D.	LN TRANSFORMATION: ROBUST MEAN	LN TRANSFORMATION: ROBUST S. D.
U	368	59	<0.20	<0.20	238.50	11.63	4.51	0.46	18.819	1.618	1.55	1.54	1.18	1.90
SP	427			110	21647	4201	3396	1586	3129.1	0.7	8.09	0.75	8.11	0.67
U/SP	427			0.01	81.23	3.41	1.74	0.12	7.470	2.189	-0.17	2.05	-0.11	1.89
U/B	427			0.01	113.91	6.11	3.54	0.28	9.356	1.531	0.46	2.19	0.55	2.00
U/SO	427			0.06	1840.00	78.93	26.39	2.11	202.965	2.572	2.61	2.26	2.65	2.24
AG	191	236	<2	<2	39	8	<2	<2	6.2	0.7	1.54	0.72		
AL	217	210	<10	<10	735	51	<10	<10	85.6	1.7	3.43	0.85		
AS	332	94	<0.5	<0.5	868.0	8.4	2.4	<0.5	47.81	5.72	1.23	1.10	0.72	1.45
B	427			93	17772	2901	1848	357	3129.2	1.1	7.47	1.04	7.47	1.07
BA	427			3	581	39	22	13	60.2	1.5	3.21	0.85	3.16	0.85
BE	37	390	<1	<1	7	2	<1	<1	1.6	0.7	0.56	0.62		
CA	427			1.0	759.7	110.4	80.9	4.4	114.99	1.04	4.16	1.20	4.22	1.32
CO	132	295	<2	<2	35	4	<2	<2	4.9	1.2	1.20	0.57		
CR	49	378	<4	<4	169	8	<4	<4	23.4	2.7	1.71	0.58		
CU	255	172	<2	<2	177	8	<2	<2	14.2	1.7	1.64	0.82		
FE	309	118	<10	<10	329	26	14	15	35.2	1.3	2.98	0.61	2.64	0.64
K	427			0.6	44.6	10.3	8.1	8.0	7.49	0.73	2.06	0.77	2.08	0.79
LI	427			8	775	132	107	43	97.4	0.7	4.64	0.70	4.64	0.65
MG	427			0.2	604.6	35.9	25.6	1.3	47.07	1.31	2.92	1.38	3.00	1.43
MN	361	66	<2	<2	3811	103	9	<2	309.1	3.0	2.95	1.71	2.27	2.24
MO	326	101	<4	<4	296	30	12	<4	36.9	1.2	2.97	0.94	2.48	1.31
NA	426	1	<0.1	<0.1	1053.0	400.4	364.8	221.8	214.19	0.53	5.82	0.64	5.86	0.60
NI	109	318	<4	<4	66	8	<4	<4	10.1	1.2	1.86	0.54		
P	22	405	<40	<40	544	162	<40	<40	134.9	0.8	4.76	0.84		
SC	153	274	<1	<1	14	1	<1	<1	1.8	1.2	0.20	0.48		
SE	287	139	<0.2	<0.2	4.6	0.5	0.3	0.3	0.47	0.95	-0.91	0.57	-1.32	0.78
SI	427			0.6	48.4	14.6	10.1	7.3	10.63	0.73	2.43	0.74	2.45	0.69
SR	427			181	31229	3889	2076	1736	3899.1	1.0	7.86	0.94	7.88	1.02
TI	185	242	<2	<2	33	6	<2	<2	5.3	0.9	1.55	0.71		
V	192	235	<4	<4	325	23	<4	<4	38.6	1.7	2.57	0.95		
Y	142	285	<1	<1	5	1	<1	<1	0.7	0.6	0.09	0.31		
ZN	386	41	<4	<4	4052	178	44	<4	408.0	2.3	4.11	1.39	3.80	1.75
ZR	155	272	<2	<2	26	4	<2	<2	3.4	0.7	1.35	0.54		
T-AK	427			42	1678	320	283	194	179.3	0.6	5.64	0.52	5.64	0.53
M-AK	427			43	1872	317	280	201	181.0	0.6	5.62	0.52	5.63	0.53
P-AK	426			0	137	6	0	0	16.1	2.5				
CL	424	3	<10	<10	8750	872	494	237	1081.4	1.2	6.24	1.04	6.24	1.09
NA/C	427			0.00	6.95	0.92	0.68	0.45	0.953	1.042	-0.41	0.90	-0.41	0.73
PH	427			5.2	9.3	7.3	7.2	7.1	0.64	0.09				
SO4	420	7	<5	<5	3046	399	238	64	468.2	1.2	5.39	1.17	5.39	1.26

NOTE: Refer to Table 1, Page 25 and Table C-1, Page C-4 for concentration units and symbol definitions.

Table A-2

CORRELATION MATRIX FOR GROUNDWATER
OF THE BROWNSVILLE-McALLEN QUADRANGLES

	L-U	L-CA	L-MG	L-SR	L-K	PH	LTAK	L-MN	L-ZN	L-SI	L-V
L-U	1.00 (368)										
L-CA	0.37*** 0.29*** (368)	1.00 (427)									
L-MG	0.47*** 0.41*** (368)	0.88*** 0.88*** (427)	1.00 (427)								
L-SR	0.36*** 0.35*** (368)	0.78*** 0.70*** (427)	0.76*** 0.72*** (427)	1.00 (427)							
L-K	0.35*** 0.36*** (368)	0.62*** 0.51*** (427)	0.63*** 0.58*** (427)	0.50*** 0.46*** (427)	1.00 (427)						
PH	-0.32*** -0.29*** (368)	-0.46*** -0.40*** (427)	-0.42*** -0.44*** (427)	-0.27*** -0.25*** (427)	-0.28*** -0.28*** (427)	1.00 (427)					
LTAK	0.18*** 0.19*** (368)	-0.05 0.03 (427)	0.14*** 0.22*** (427)	-0.02 0.02 (427)	-0.01 0.06 (427)	-0.14*** -0.12** (427)	1.00 (427)				
L-MN	0.03 0.06 (323)	0.37*** 0.34*** (361)	0.38*** 0.37*** (361)	0.26*** 0.26*** (361)	0.02 -0.01 (361)	-0.17*** -0.12** (361)	0.15*** 0.15*** (361)	1.00 (361)			
L-ZN	0.15*** 0.15*** (331)	0.39*** 0.36*** (386)	0.37*** 0.33*** (386)	0.31*** 0.29*** (386)	0.23*** 0.23*** (386)	-0.23*** -0.21*** (386)	-0.00 0.01 (386)	0.19*** 0.22*** (336)	1.00 (386)		
L-SI	0.33*** 0.28*** (368)	0.38*** 0.39*** (427)	0.38*** 0.48*** (427)	0.09* 0.11** (427)	0.22*** 0.28*** (427)	-0.40*** -0.42*** (427)	0.34*** 0.33*** (427)	0.12** 0.13** (361)	0.09* 0.15*** (386)	1.00 (427)	
L-V	0.28*** 0.19*** (188)	-0.10 -0.12* (192)	0.07 -0.01 (192)	-0.07 -0.09 (192)	0.10 0.16** (192)	-0.06 -0.07 (192)	0.33*** 0.28*** (192)	-0.15** -0.13* (169)	-0.09 -0.09 (170)	0.60*** 0.69*** (192)	1.00 (192)
L-AS	0.04 0.03 (289)	0.02 -0.02 (332)	0.03 0.02 (332)	-0.04 -0.05 (332)	0.09 0.05 (332)	0.04 0.04 (332)	-0.02 -0.03 (332)	-0.06 -0.07 (272)	-0.19*** -0.19*** (294)	0.41*** 0.40*** (332)	0.51*** 0.56*** (175)
L-BA	-0.08 -0.12** (368)	-0.05 -0.00 (427)	-0.06 -0.04 (427)	-0.23*** -0.25*** (427)	-0.03 0.00 (427)	-0.16*** -0.17*** (427)	0.03 -0.03 (427)	-0.07 -0.08 (361)	0.03 0.01 (386)	0.14*** 0.15*** (427)	0.05 0.11 (192)
LSO4	0.12** 0.18*** (361)	0.36*** 0.37*** (420)	0.31*** 0.32*** (420)	0.53*** 0.52*** (420)	0.14*** 0.13*** (420)	0.03 0.05 (420)	-0.04 0.02 (420)	0.21*** 0.24*** (356)	0.09* 0.11** (379)	-0.04 -0.05 (420)	-0.00 -0.03 (188)
L-MO	0.22*** 0.23*** (280)	0.05 -0.01 (326)	0.08 0.06 (326)	0.08 0.07 (326)	0.14** 0.14** (320)	0.01 0.02 (326)	0.04 0.08 (326)	0.01 0.01 (274)	-0.14** -0.13** (295)	0.14*** 0.12** (326)	0.10 0.07 (149)
L-B	0.17*** 0.23*** (368)	-0.03 -0.02 (427)	-0.06 -0.01 (427)	0.32*** 0.35*** (427)	0.21*** 0.22*** (427)	0.20*** 0.18*** (427)	0.01 0.01 (427)	-0.17*** -0.10* (361)	-0.01 0.01 (386)	-0.19*** -0.25*** (427)	0.10 0.03 (192)
L-NA	0.15*** 0.23*** (367)	0.08 0.18*** (426)	0.09* 0.18*** (426)	0.42*** 0.47*** (426)	0.25*** 0.27*** (426)	0.09* 0.08* (426)	-0.01 -0.02 (426)	0.02 0.09* (360)	0.01 0.07 (385)	-0.17*** -0.20*** (426)	0.03 -0.02 (192)
L-LI	0.21*** 0.29*** (368)	0.28*** 0.20*** (427)	0.23*** 0.25*** (427)	0.54*** 0.56*** (427)	0.21*** 0.19*** (427)	0.01 0.02 (427)	0.01 0.01 (427)	0.16*** 0.20*** (361)	0.19*** 0.19*** (386)	-0.06 -0.09* (427)	0.05 -0.02 (192)
L-CL	0.17*** 0.21*** (365)	0.32*** 0.36*** (424)	0.21*** 0.28*** (424)	0.53*** 0.56*** (424)	0.36*** 0.39*** (424)	-0.13*** -0.13*** (424)	-0.02 0.02 (424)	-0.01 0.04 (359)	0.09* 0.14*** (383)	-0.12** -0.13*** (424)	-0.00 -0.05 (190)
L-SP	0.08 0.16*** (368)	0.28*** 0.34*** (427)	0.25*** 0.33*** (427)	0.50*** 0.57*** (427)	0.25*** 0.28*** (427)	0.03 0.01 (427)	0.10** 0.11** (427)	0.10* 0.12** (361)	0.05 0.09* (386)	-0.07 -0.11** (427)	0.01 -0.04 (192)
L-CU	0.16** 0.18** (226)	0.27*** 0.30*** (255)	0.19*** 0.21*** (255)	0.18*** 0.24*** (255)	0.16** 0.21*** (255)	-0.13** -0.11* (255)	0.09 0.04 (255)	-0.02 -0.02 (233)	0.31*** 0.23*** (233)	0.10 0.09 (255)	0.08 0.07 (114)
L-NI	0.06 0.03 (99)	0.05 0.01 (109)	0.09 0.01 (109)	0.09 0.00 (109)	0.19** 0.09 (109)	-0.18 -0.16* (109)	0.00 -0.09 (109)	0.05 -0.01 (96)	0.25** 0.16 (97)	0.04 0.09 (109)	0.08 0.15 (62)
L-FE	-0.03 0.04 (273)	-0.18*** 0.20*** (309)	-0.26*** 0.11* (309)	-0.13** 0.20*** (309)	-0.06 0.13** (309)	0.14** 0.01 (309)	0.04 0.01 (309)	0.03 0.10* (270)	-0.03 0.01 (283)	0.00 0.01 (309)	0.07 0.06 (136)
[illegible]	0.23*** [illegible] (107)	0.61*** [illegible] (188)	0.38*** 0.38*** (188)	0.57*** 0.57*** (188)	0.27*** 0.27*** (188)	-0.25*** -0.22*** (188)	-0.01 -0.03 (186)	0.22*** 0.23*** (177)	0.33*** 0.26*** (170)	0.11 0.12* (188)	0.24** 0.38*** (79)

NOTE: (1) Pearson correlation/Spearman correlation/(sample size). If either element has a concentration below the laboratory detection limits, it is omitted from the pairwise computations.
(2) Significance levels: *-10%, **-5%, ***-1%.

	L-AS	L-BA	LSO4	L-MO	L-B	L-NA	L-LI	L-CL	L-SP	L-CU	L-NI	L-FE	L-TI
L-AS	1.00 (332)												
L-BA	-0.10* -0.10* (332)	1.00 (427)											
LSO4	0.03 0.00 (326)	-0.46*** -0.48*** (420)	1.00 (420)										
L-MO	0.21*** 0.18*** (259)	-0.20*** -0.31*** (326)	0.24*** 0.21*** (320)	1.00 (326)									
L-B	0.04 0.01 (332)	-0.39*** -0.43*** (427)	0.48*** 0.50*** (420)	0.29*** 0.28*** (326)	1.00 (427)								
L-NA	-0.03 -0.04 (331)	-0.43*** -0.42*** (426)	0.60*** 0.62*** (419)	0.24*** 0.26*** (325)	0.85*** 0.86*** (426)	1.00 (426)							
L-LI	0.01 -0.01 (332)	-0.40*** -0.43*** (427)	0.66*** 0.68*** (420)	0.17*** 0.15*** (326)	0.71*** 0.70*** (427)	0.83*** 0.86*** (426)	1.00 (427)						
L-CL	-0.08 -0.09* (329)	-0.19*** -0.20*** (424)	0.41*** 0.40*** (419)	0.08 0.08 (324)	0.69*** 0.67*** (424)	0.75*** 0.74*** (423)	0.67*** 0.64*** (424)	1.00 (424)					
L-SP	0.02 -0.02 (332)	-0.33*** -0.39*** (427)	0.51*** 0.58*** (420)	0.17*** 0.19*** (326)	0.64*** 0.68*** (427)	0.69*** 0.77*** (426)	0.65*** 0.73*** (427)	0.66*** 0.74*** (424)	1.00 (427)				
L-CU	-0.04 -0.06 (187)	0.18*** 0.12* (255)	0.15** 0.20*** (251)	-0.13* -0.11 (188)	0.07 0.14** (255)	0.05 0.15** (254)	0.07 0.17*** (255)	0.18*** 0.30*** (253)	0.09 0.20*** (255)	1.00 (255)			
L-NI	0.01 0.12 (94)	0.13 0.17* (109)	0.06 0.02 (108)	0.07 0.06 (86)	-0.04 -0.05 (109)	0.02 -0.00 (109)	-0.04 -0.05 (109)	-0.00 -0.05 (108)	-0.17* -0.17* (109)	0.43*** 0.24** (70)	1.00 (109)		
L-FE	-0.00 0.01 (238)	0.13** 0.07 (309)	0.03 0.15*** (306)	0.13** 0.09 (239)	0.23*** 0.26*** (309)	0.13** 0.18*** (308)	0.09 0.15*** (309)	0.23*** 0.36*** (309)	0.16*** 0.28*** (309)	0.19*** 0.24*** (203)	0.36*** 0.06 (81)	1.00 (309)	
L-TI	-0.09 -0.07 (128)	0.12 0.12 (185)	0.35*** 0.38*** (184)	-0.06 -0.08 (137)	0.22*** 0.23*** (185)	0.28*** 0.34*** (184)	0.35*** 0.36*** (186)	0.49*** 0.53*** (185)	0.16** 0.31*** (185)	0.55*** 0.59*** (166)	0.43*** 0.22 (95)	0.49*** 0.49*** (163)	1.00 (185)

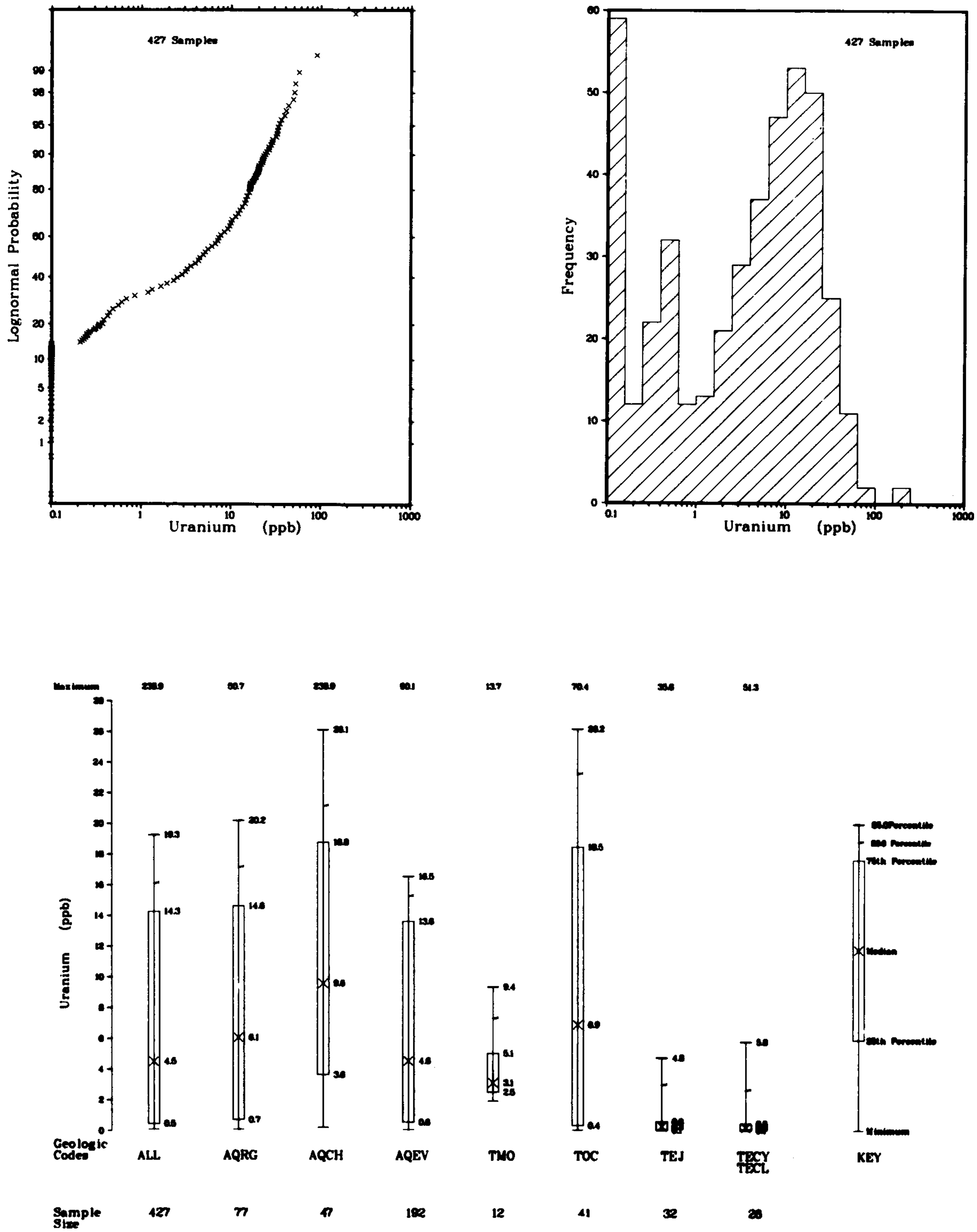


Figure A-1a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR URANIUM (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

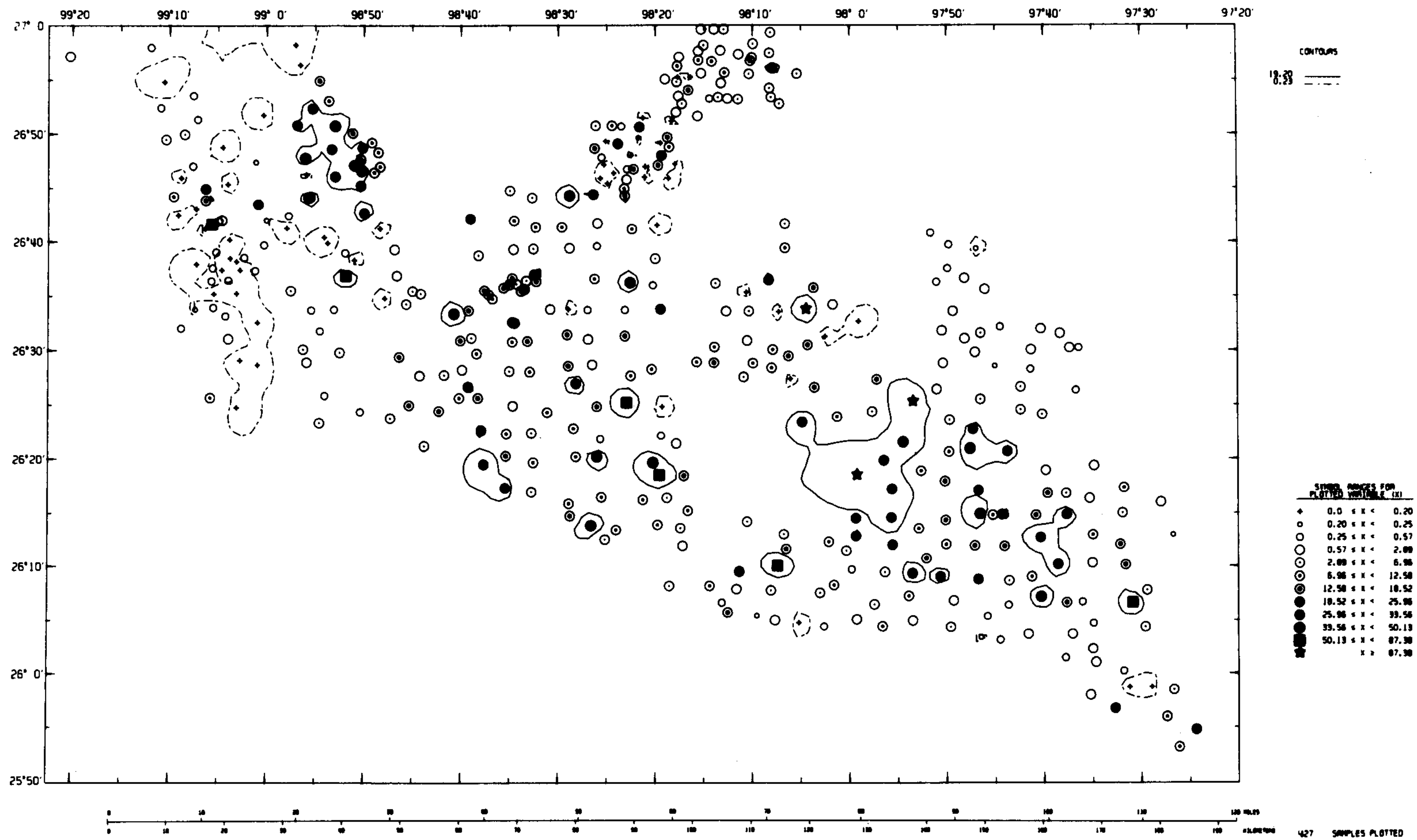


Figure A-1b

GEOCHEMICAL DISTRIBUTION OF URANIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

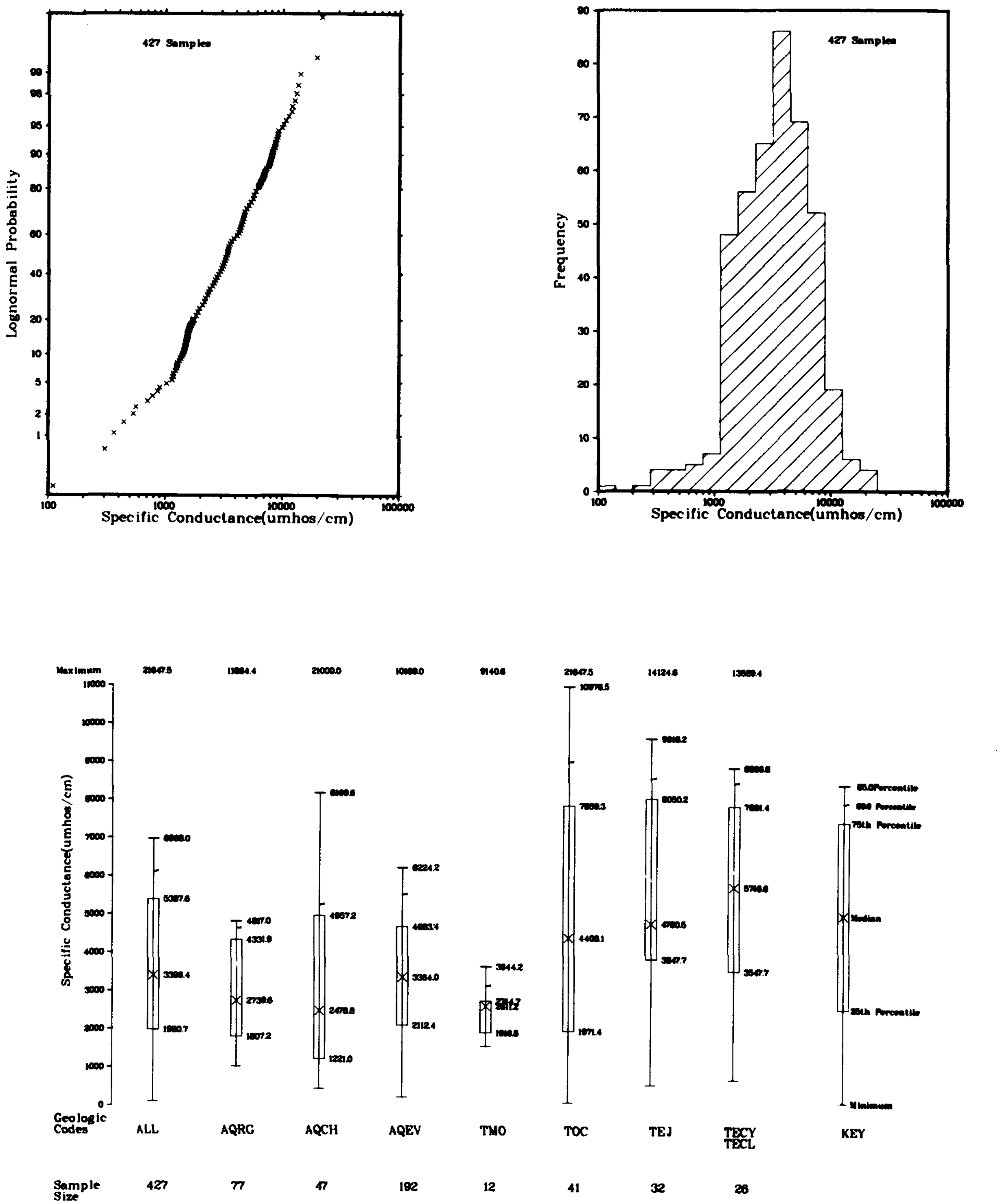


Figure A-2a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SPECIFIC CONDUCTANCE (μMHOS/CM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

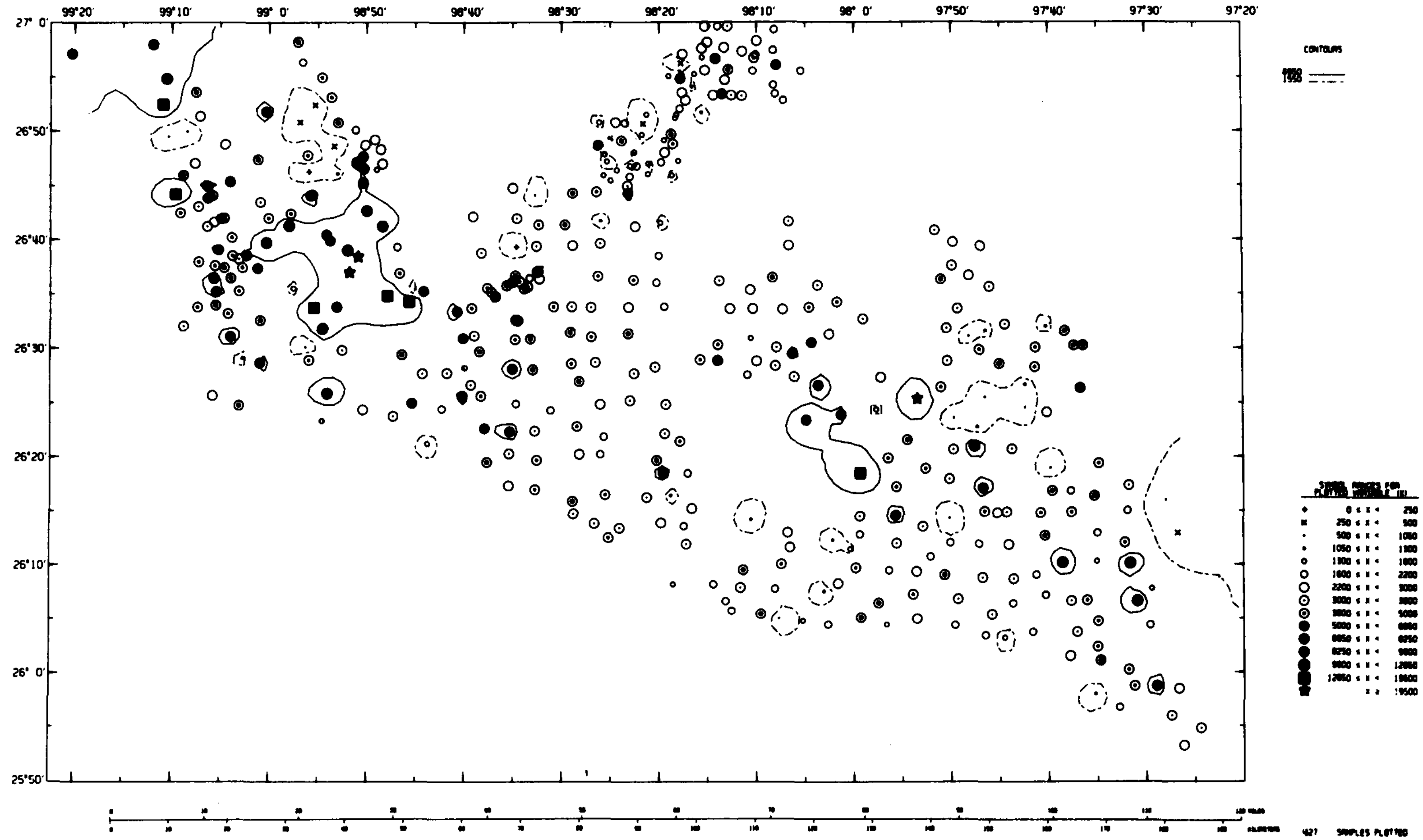


Figure A-2b

GEOCHEMICAL DISTRIBUTION OF SPECIFIC CONDUCTANCE (μMHOS/CM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

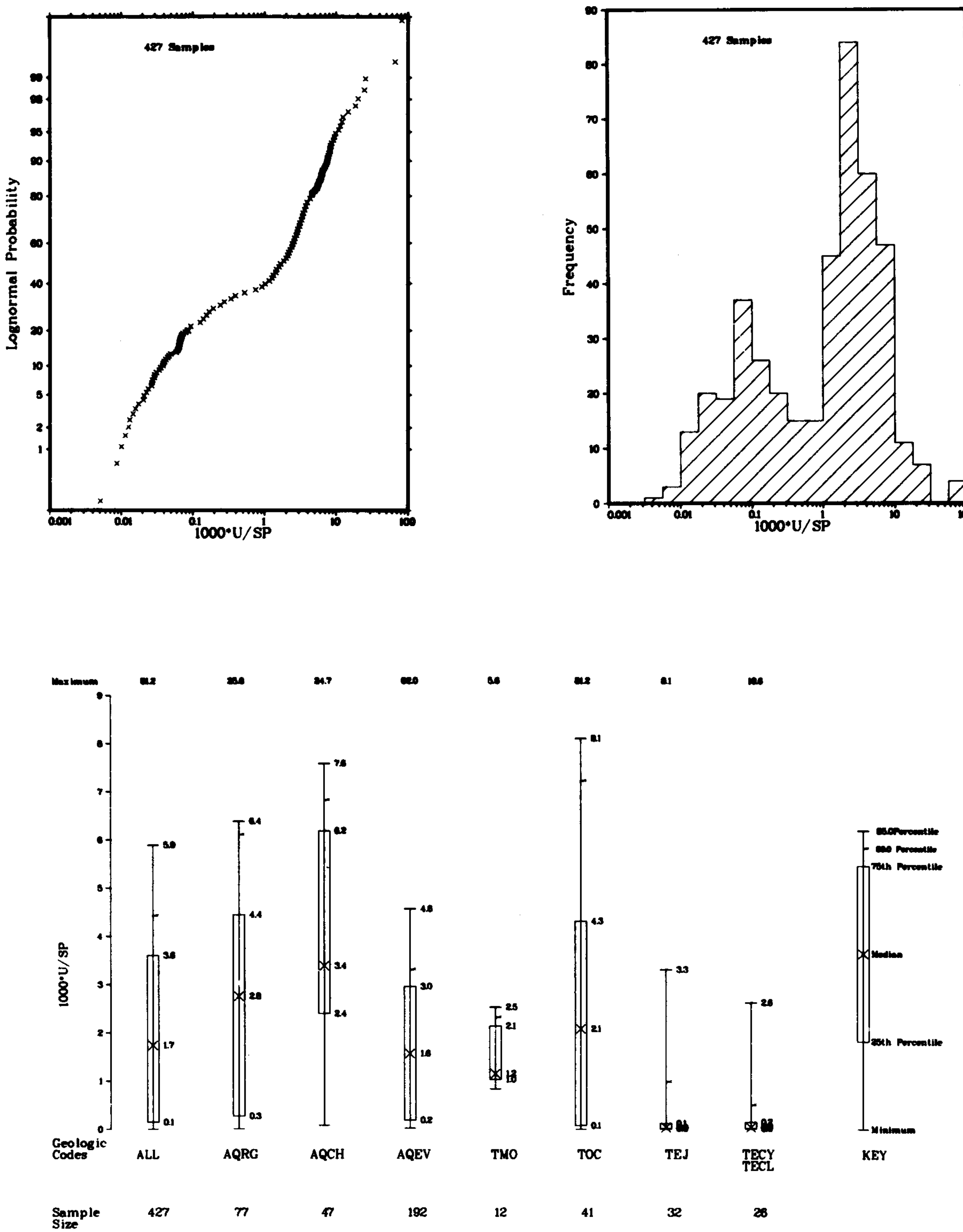


Figure A-3a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR 1,000·URANIUM/SPECIFIC CONDUCTANCE IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLE

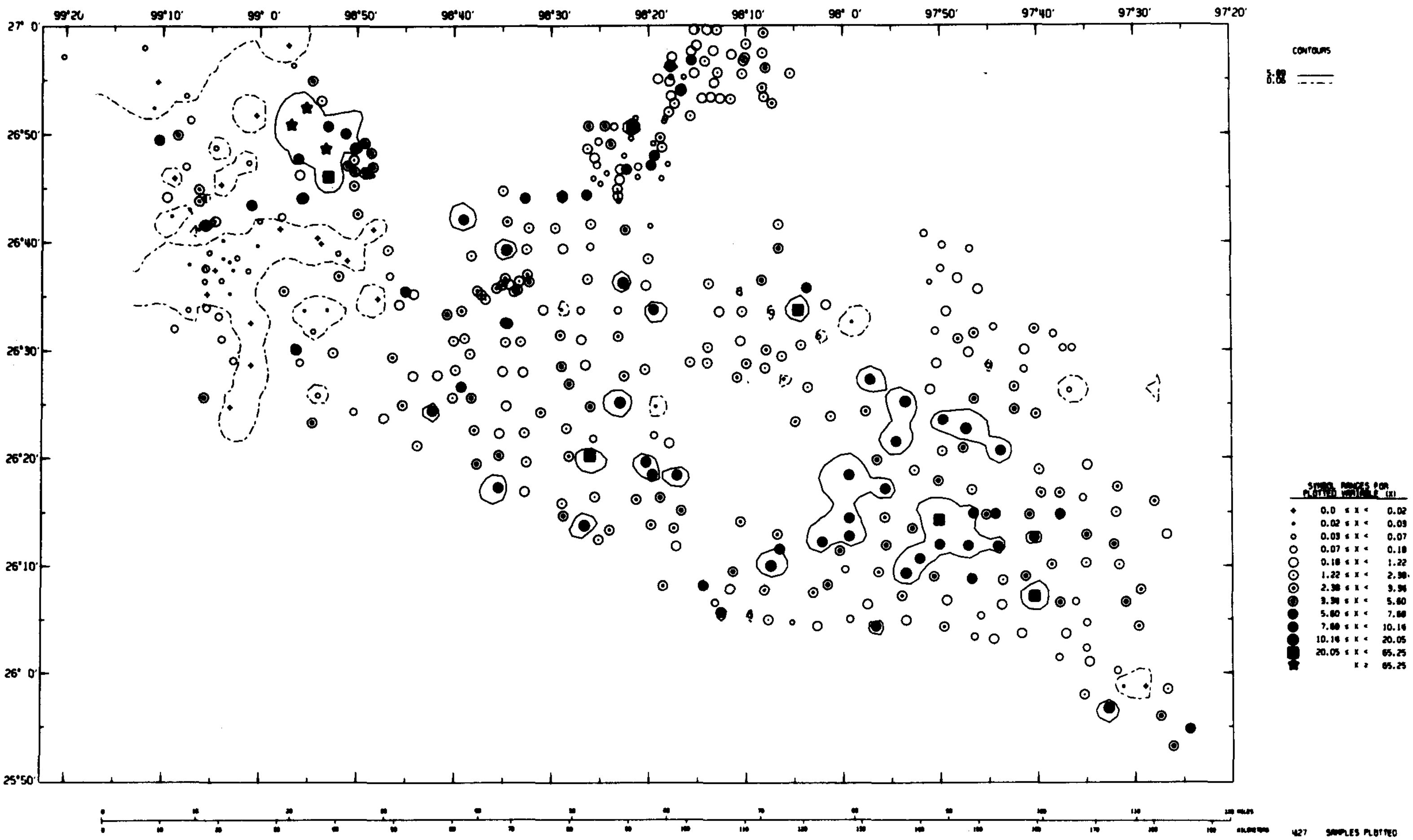


Figure A-3b

GEOCHEMICAL DISTRIBUTION OF 1,000·URANIUM/SPECIFIC CONDUCTANCE IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

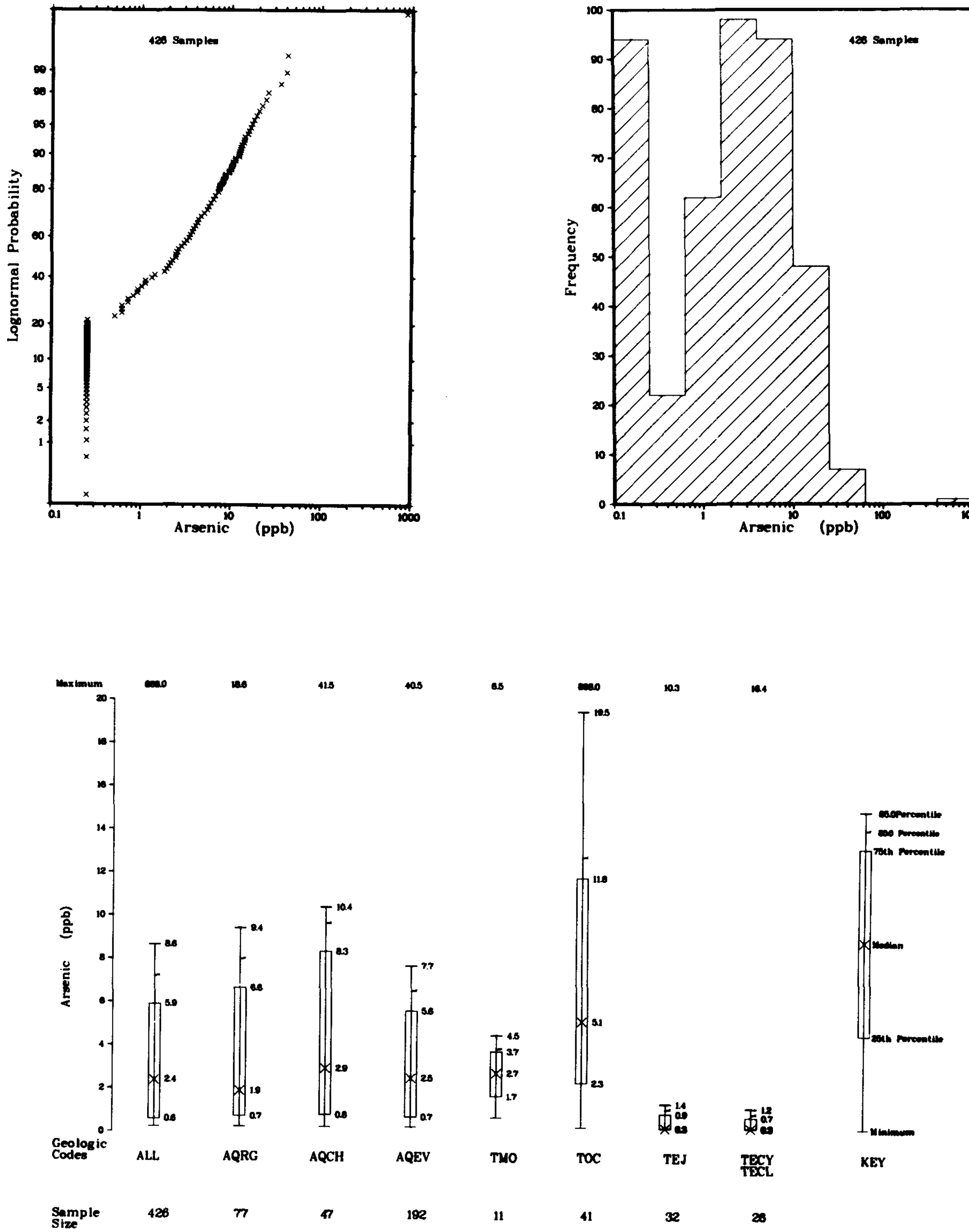


Figure A-4a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ARSENIC (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

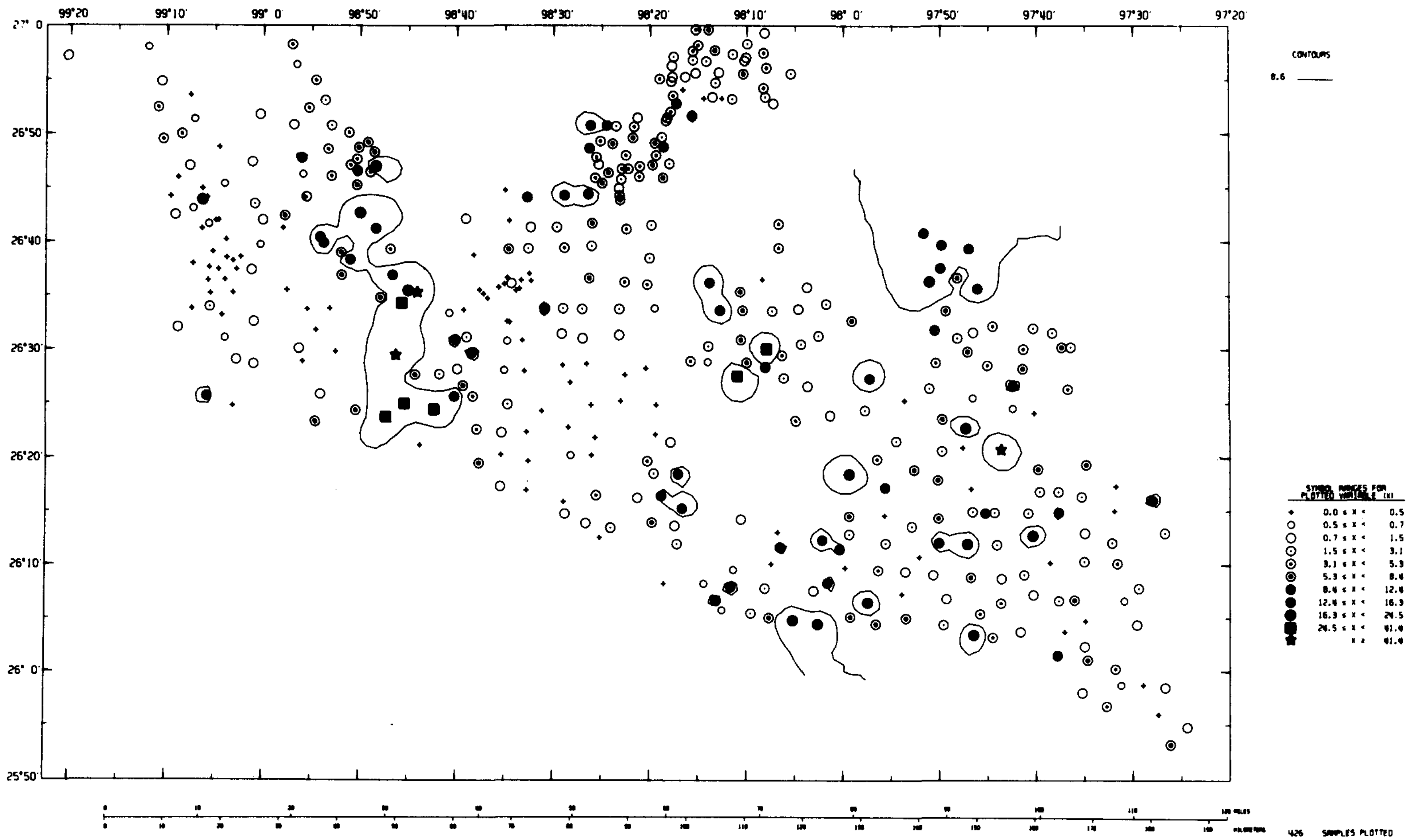


Figure A-4b

GEOCHEMICAL DISTRIBUTION OF ARSENIC (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

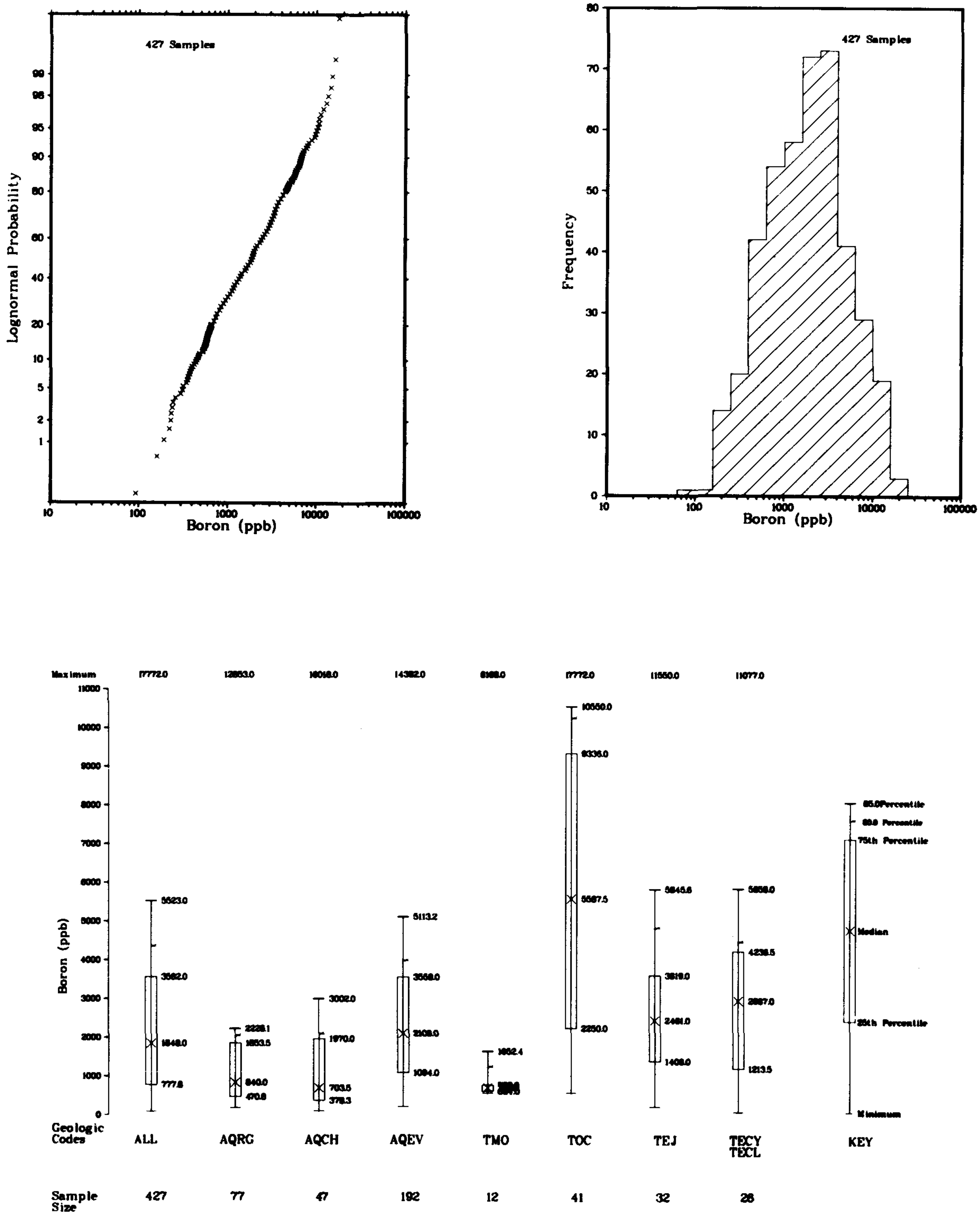


Figure A-5a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR BORON (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

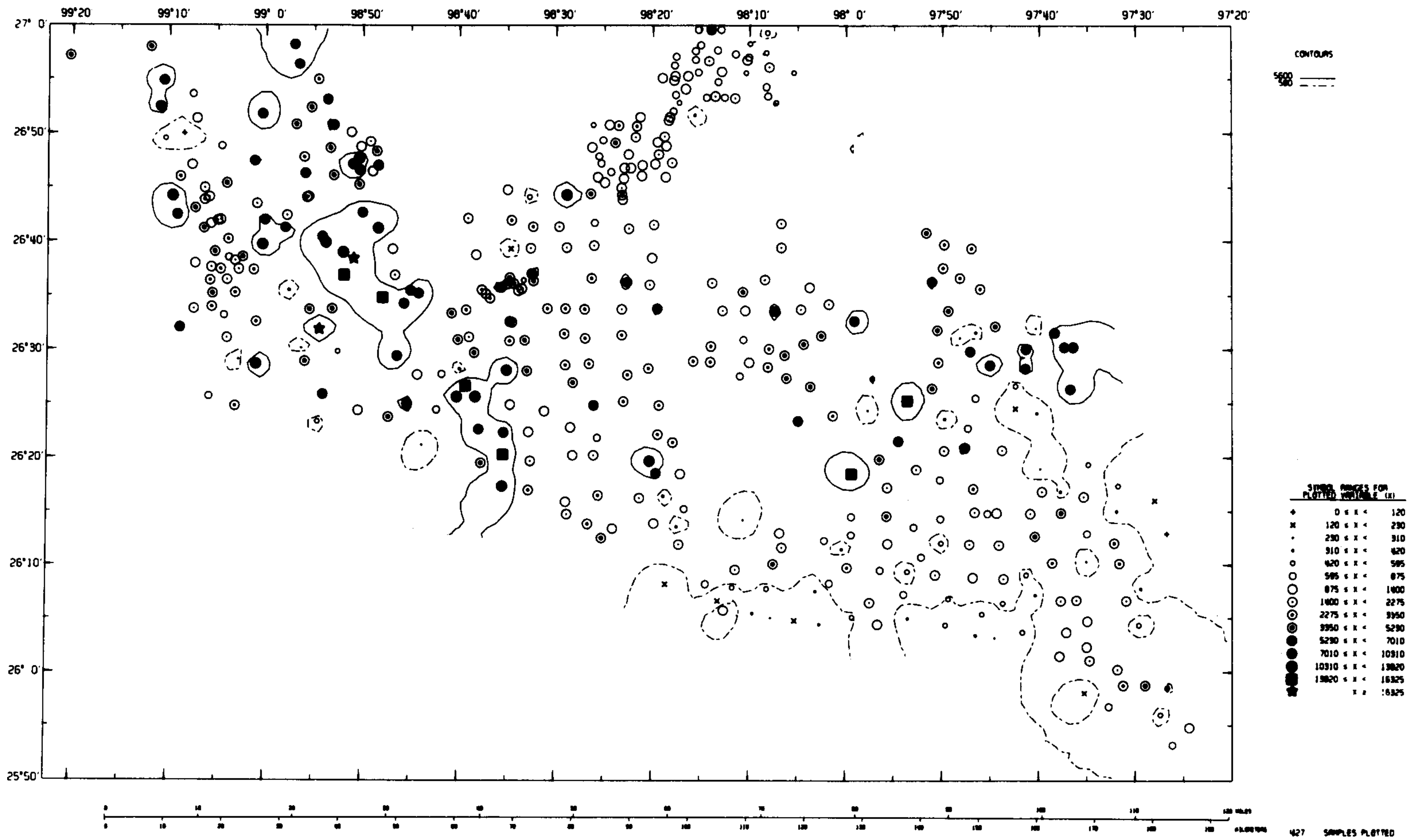


Figure A-5b

GEOCHEMICAL DISTRIBUTION OF BORON (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

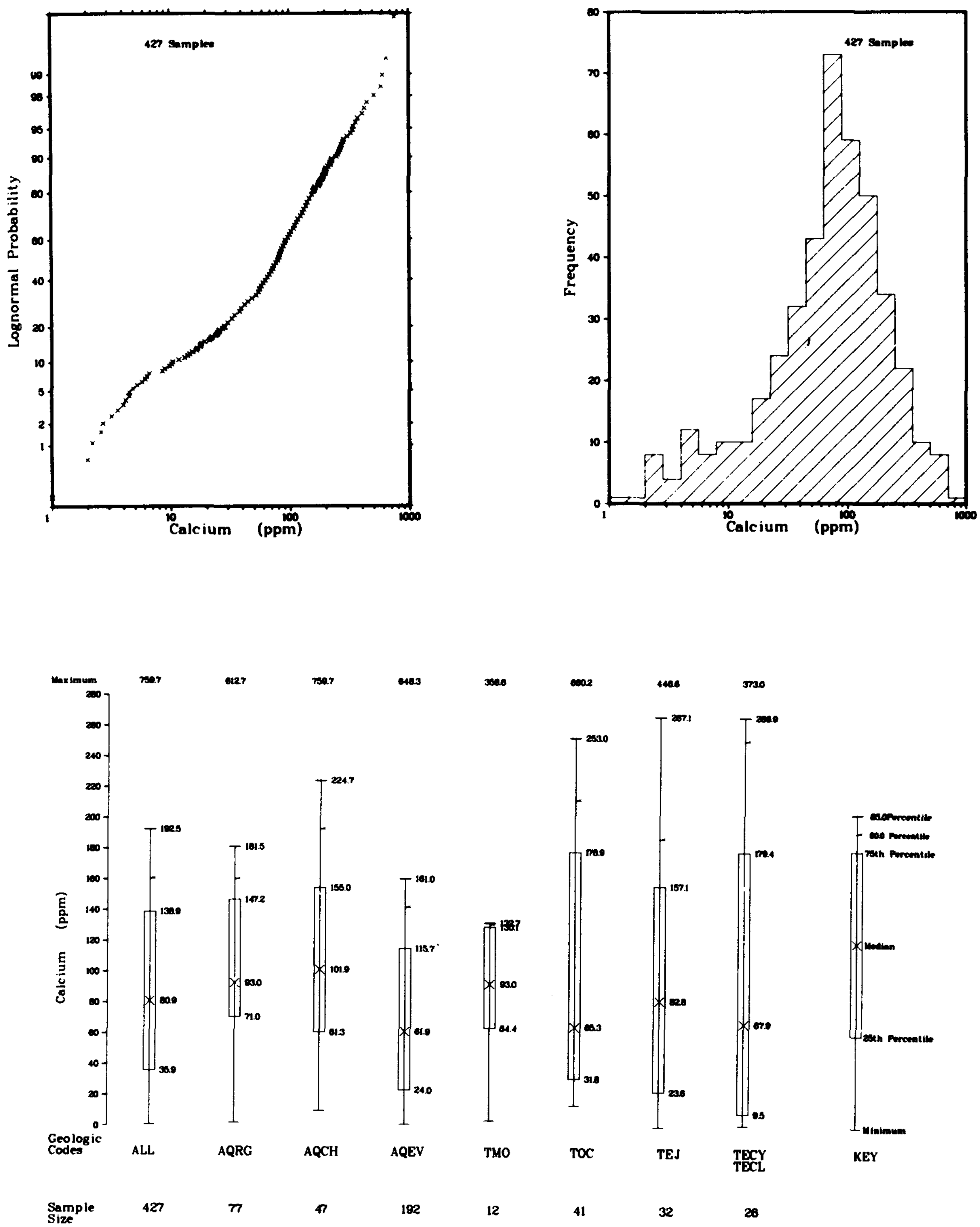


Figure A-6a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR CALCIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

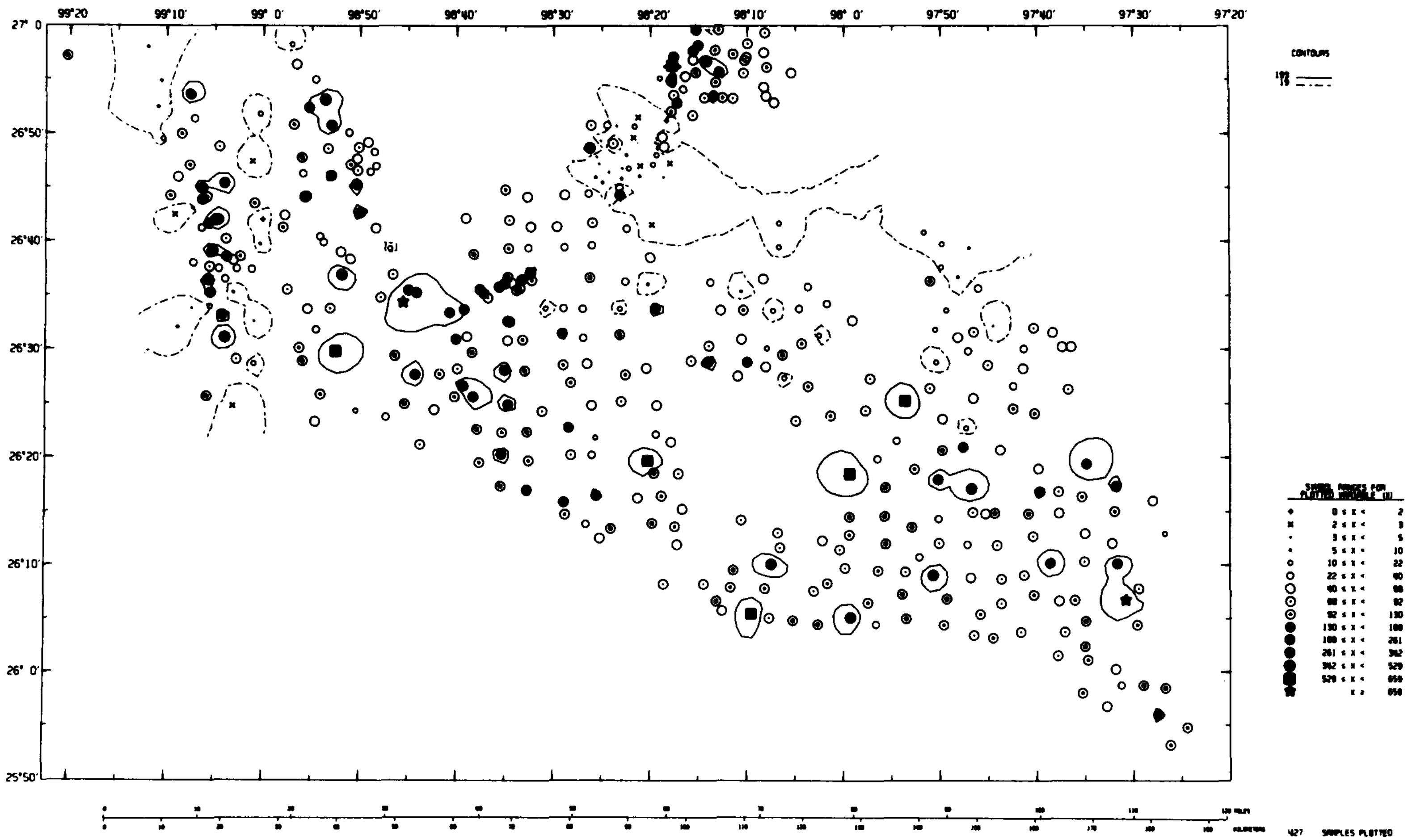
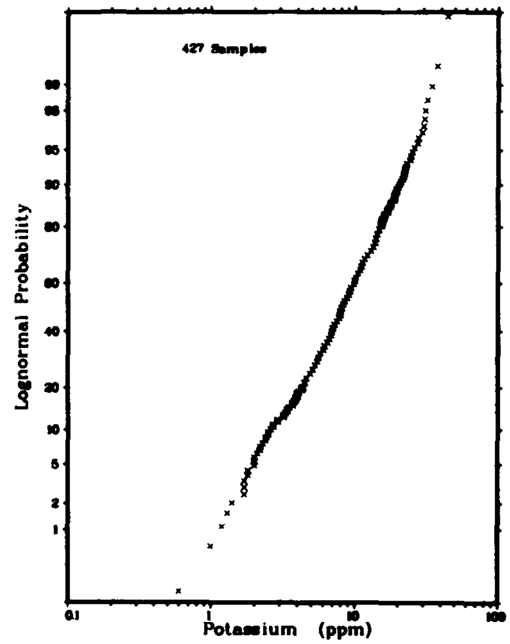
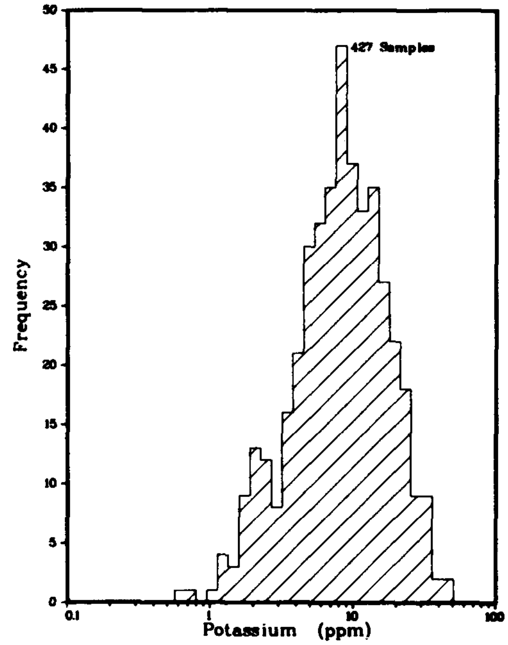


Figure A-6b

GEOCHEMICAL DISTRIBUTION OF CALCIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES





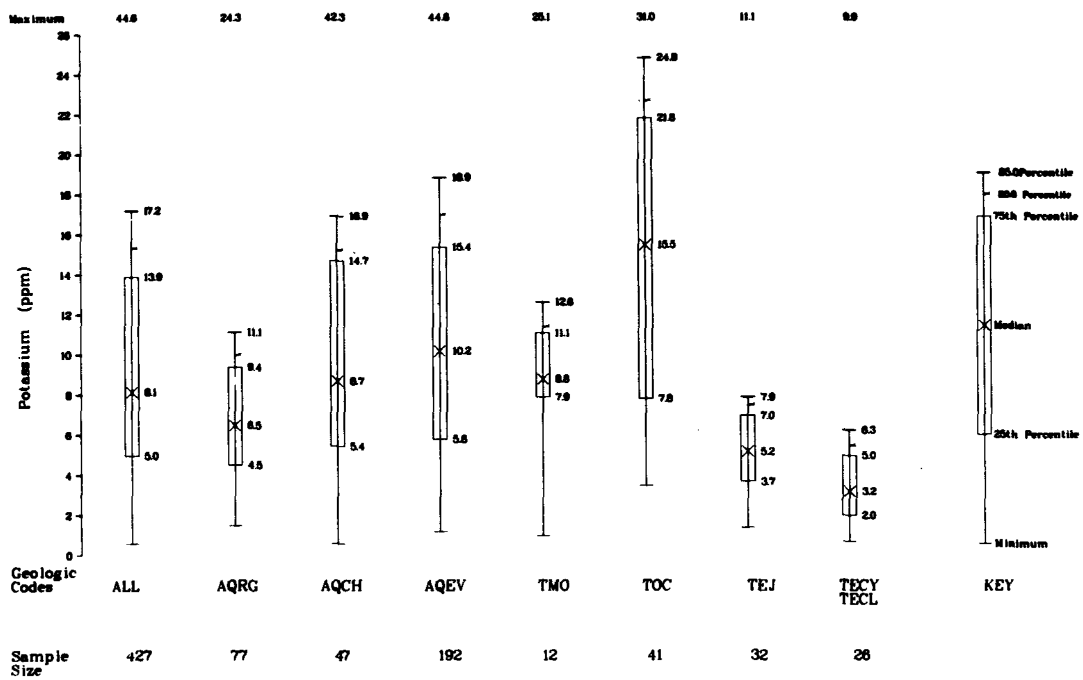


Figure A-7a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR POTASSIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

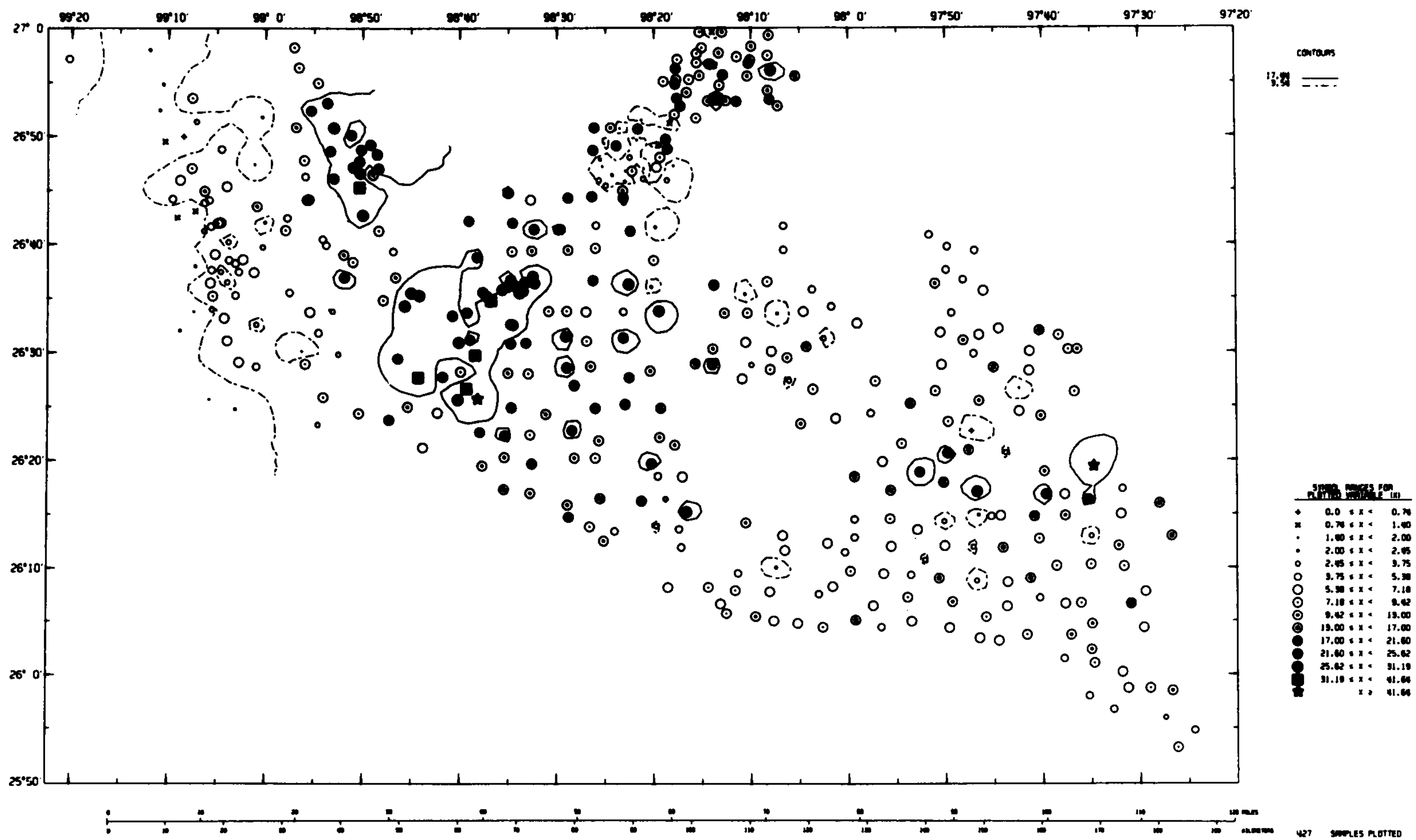


Figure A-7b

GEOCHEMICAL DISTRIBUTION OF POTASSIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

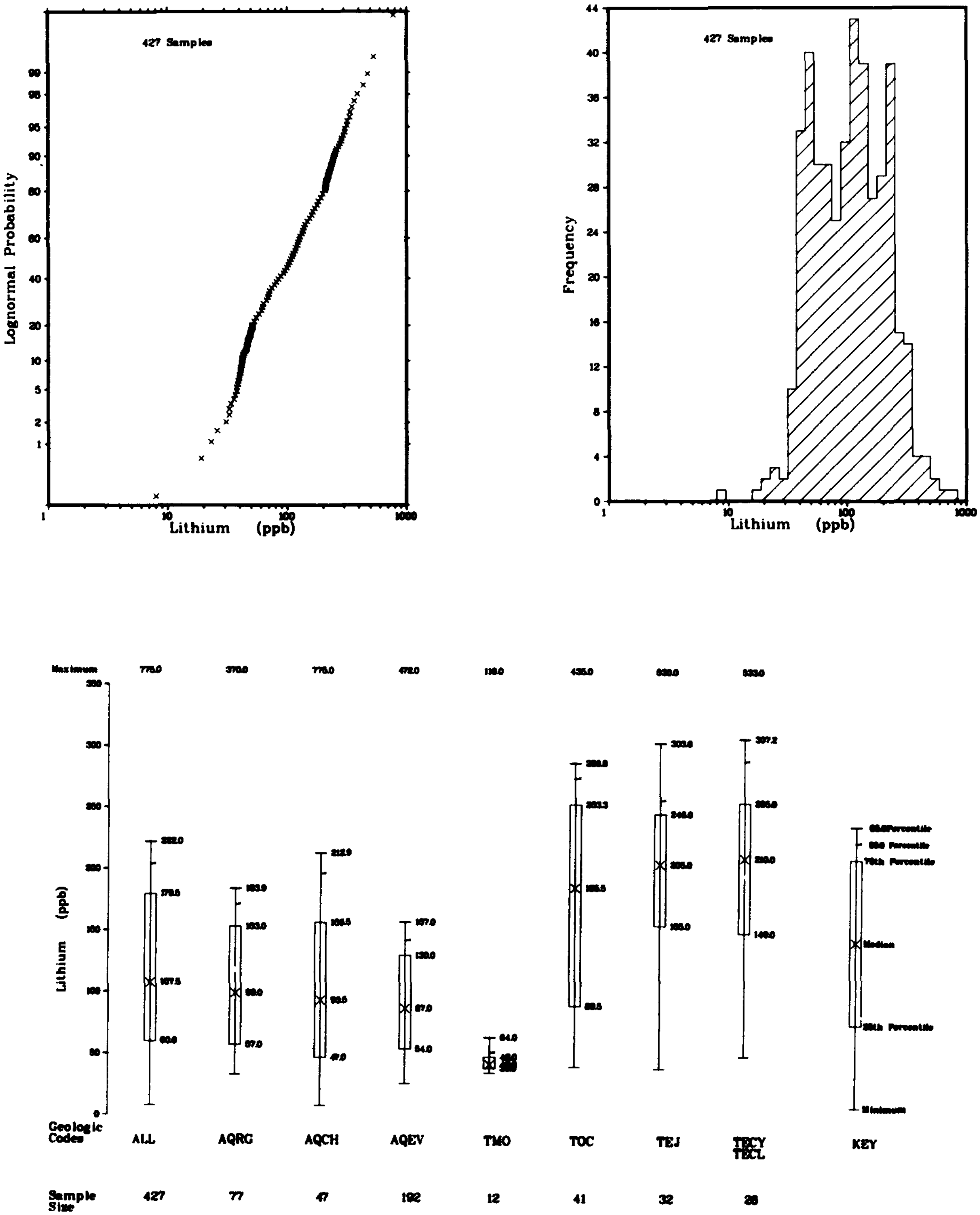


Figure A-8a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR LITHIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

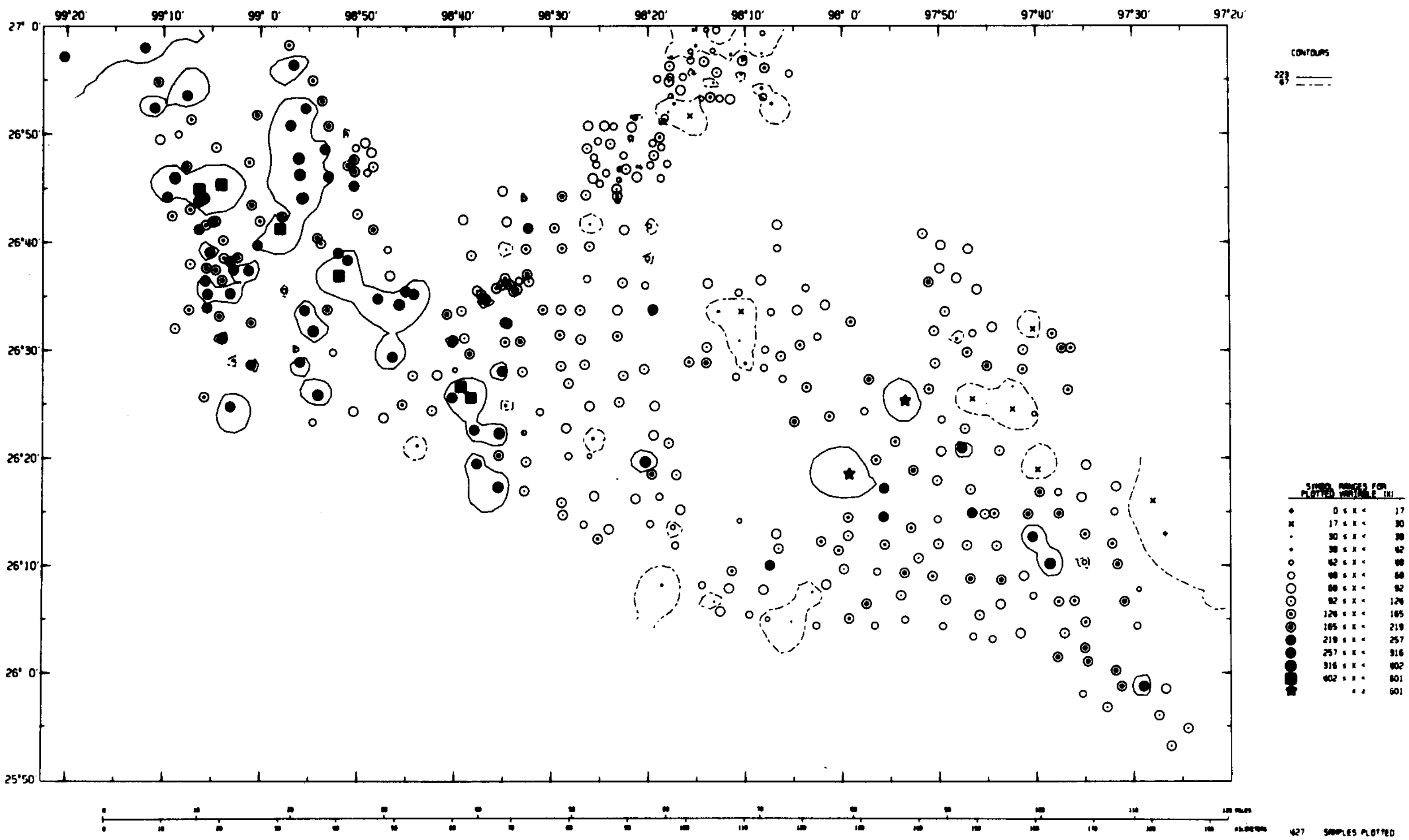


Figure A-8b

GEOCHEMICAL DISTRIBUTION OF LITHIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

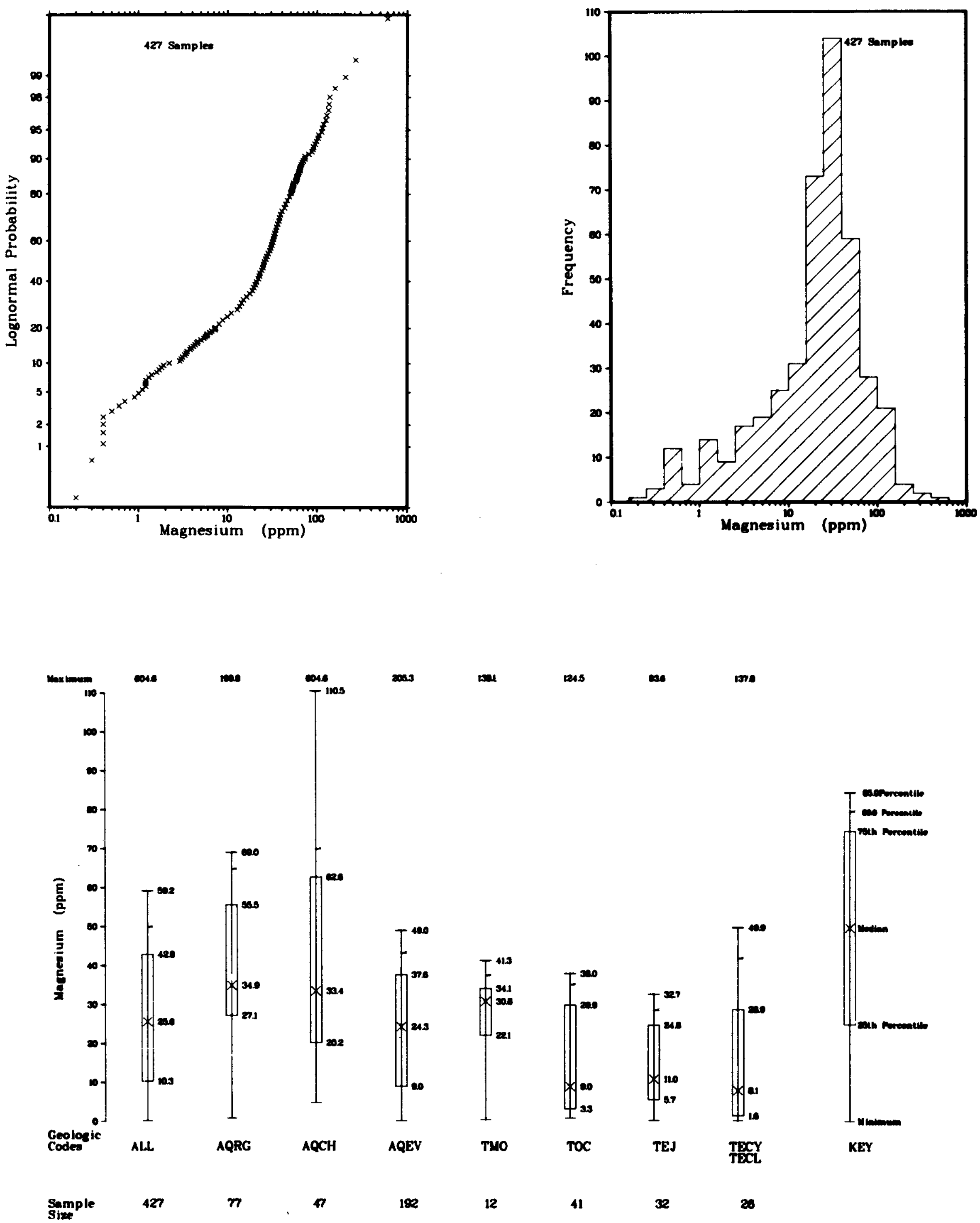


Figure A-9a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR MAGNESIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

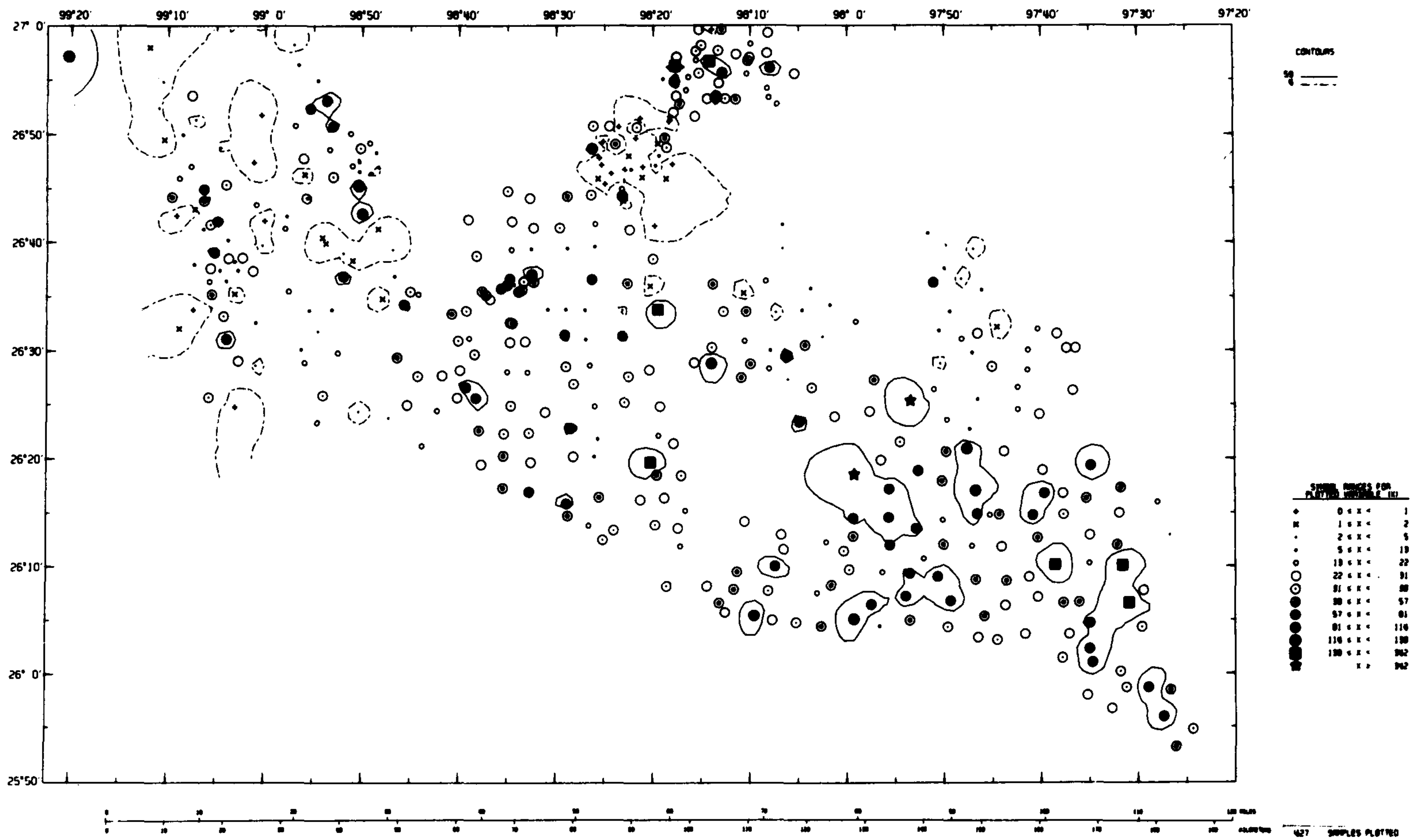


Figure A-9b

GEOCHEMICAL DISTRIBUTION OF MAGNESIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

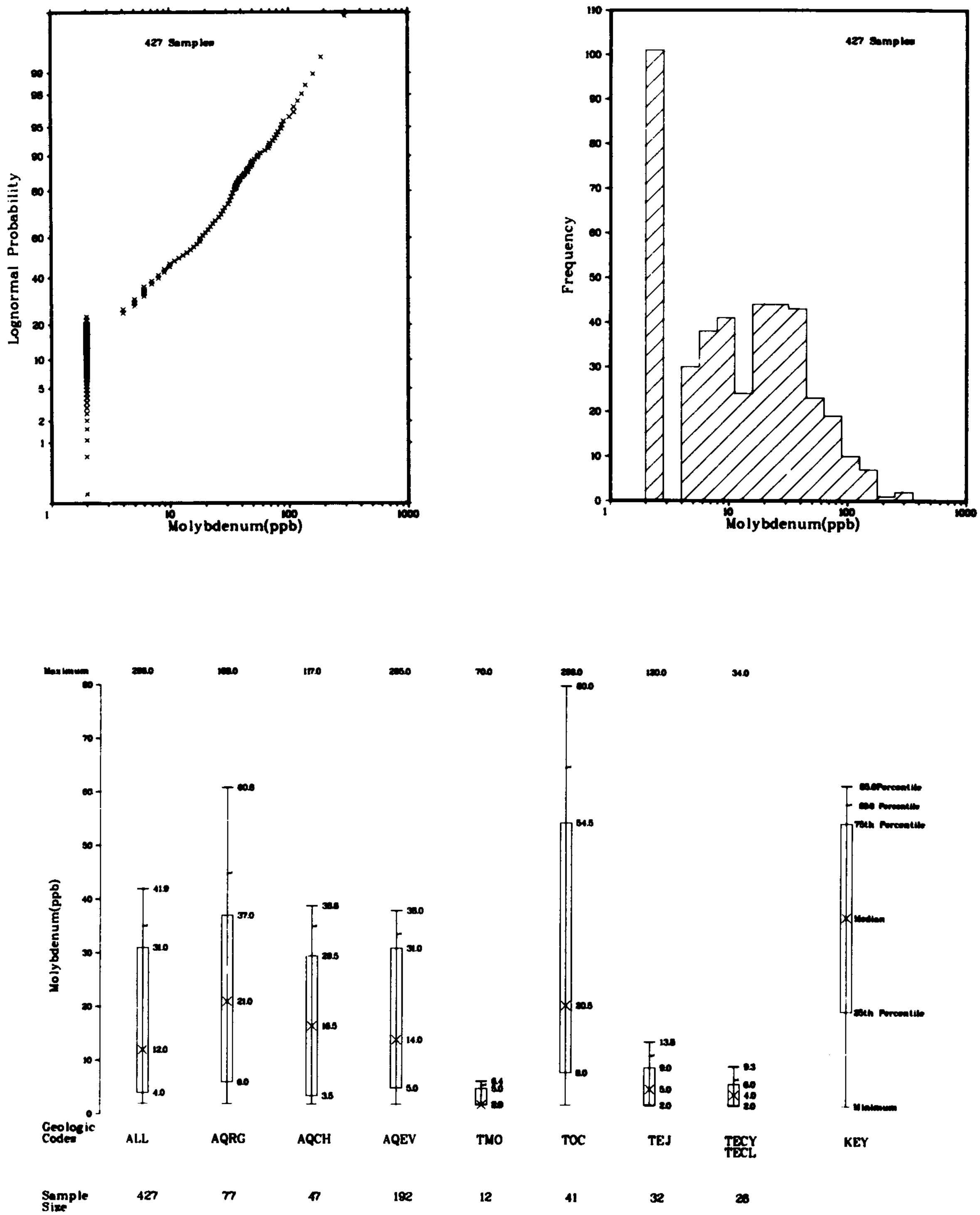


Figure A-10a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR MOLYBDENUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

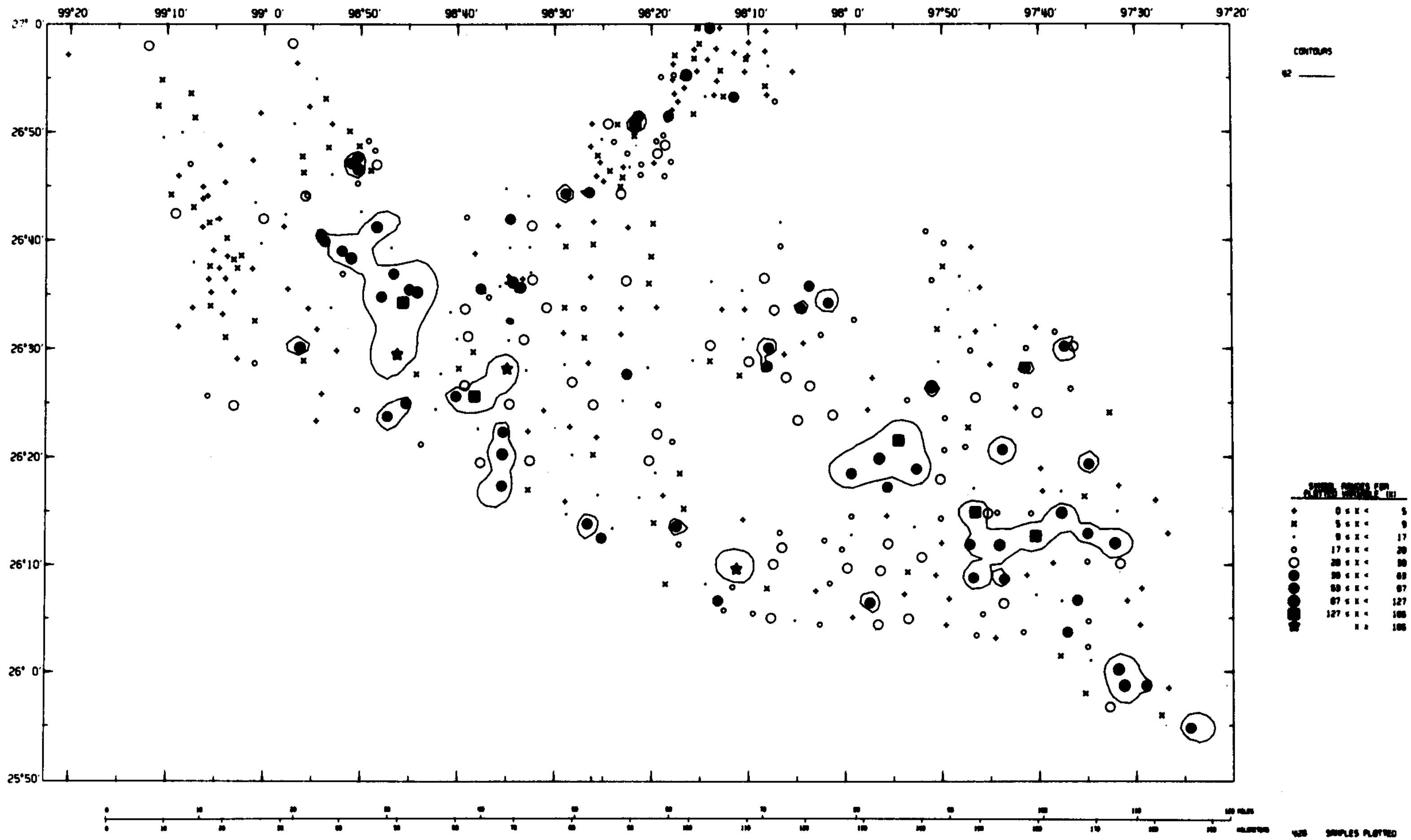


Figure A-10b

GEOCHEMICAL DISTRIBUTION OF MOLYBDENUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

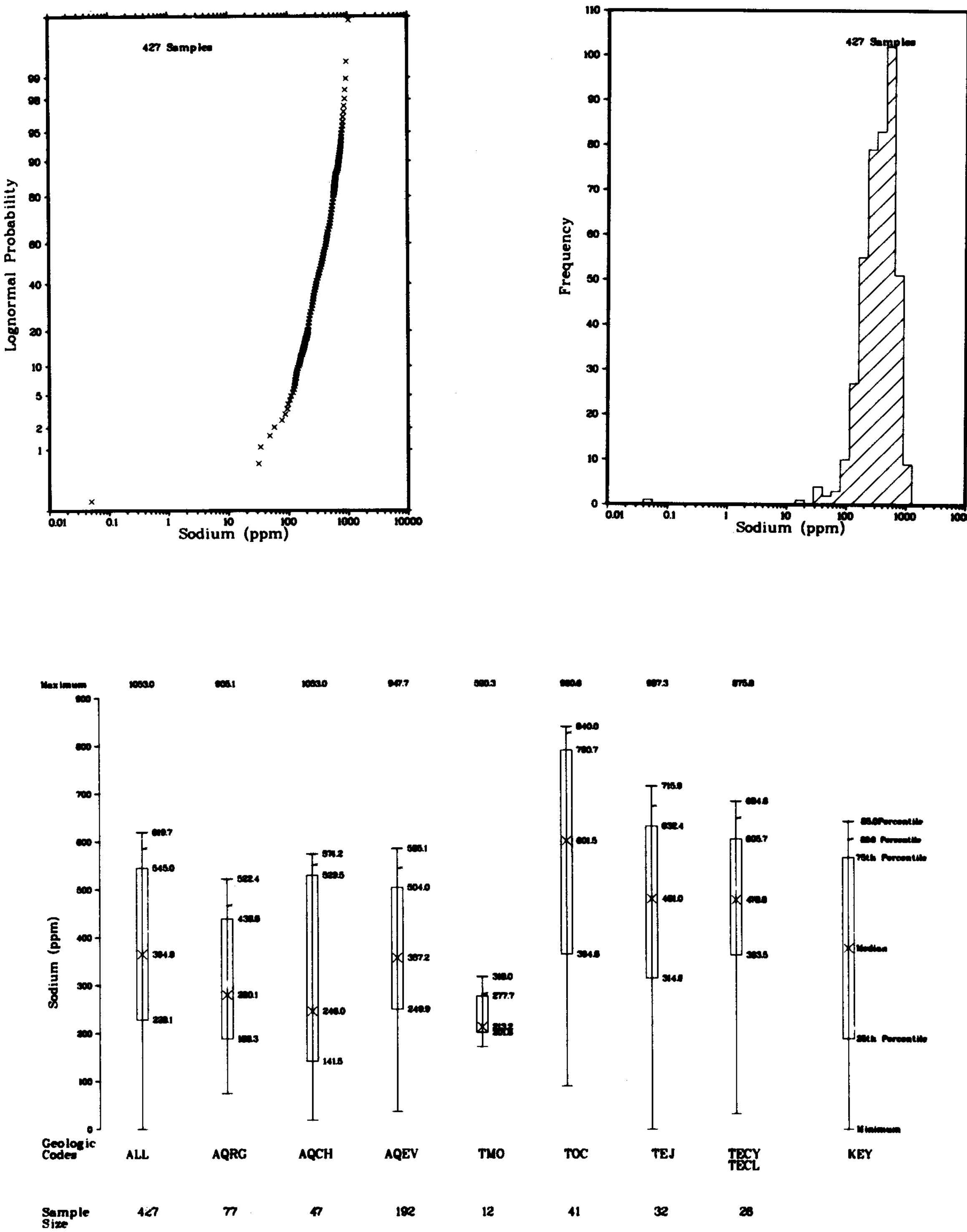


Figure A-11a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SODIUM (PPM)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

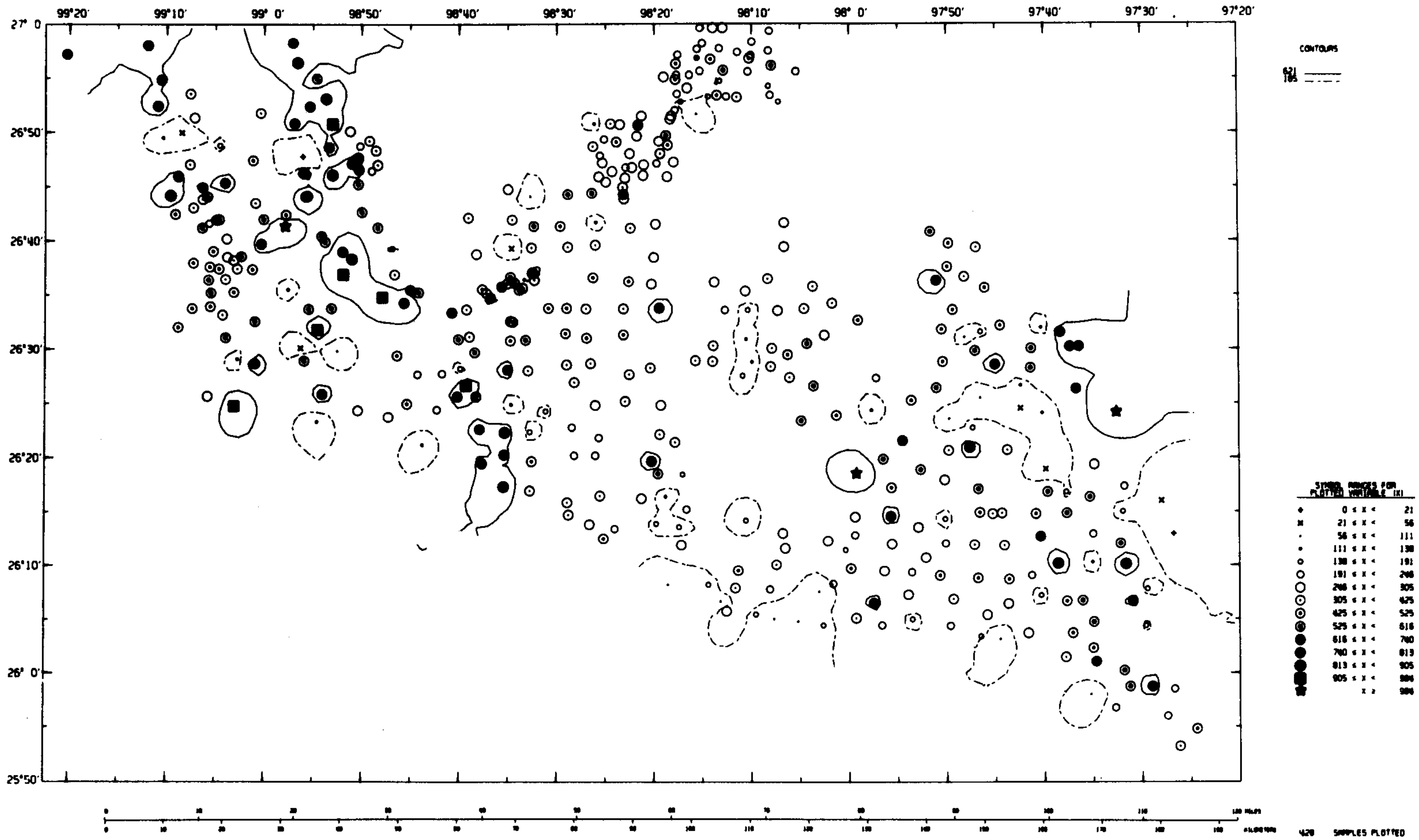
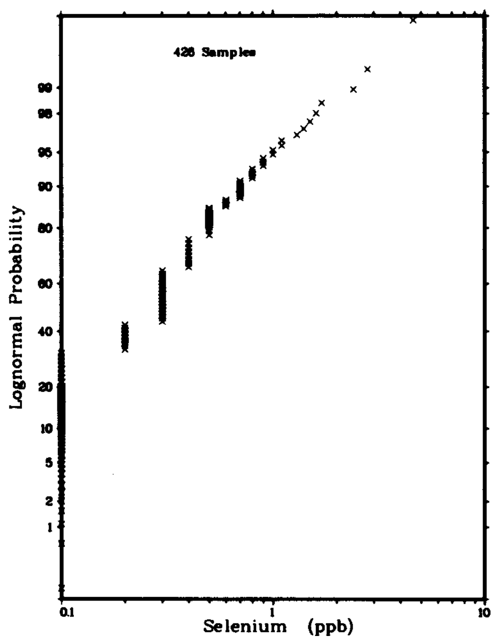
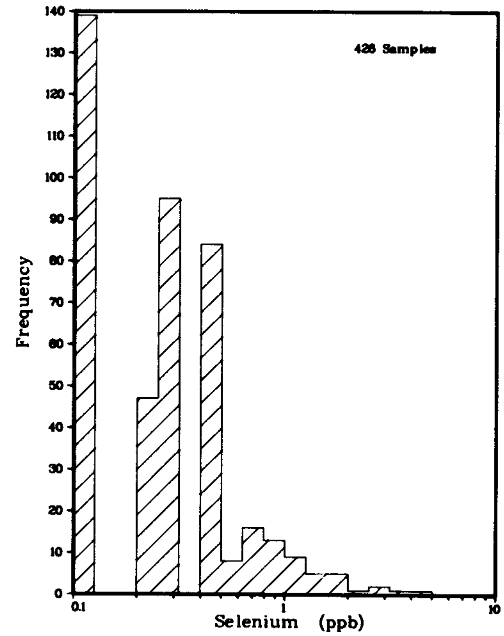


Figure A-11b

GEOCHEMICAL DISTRIBUTION OF SODIUM (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES





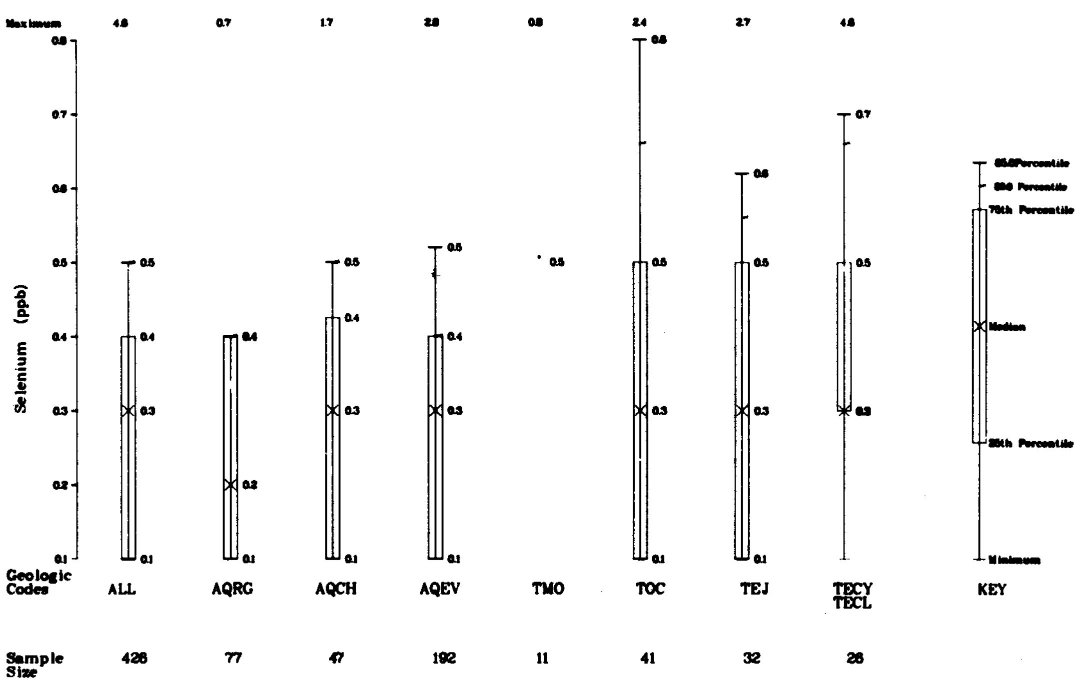


Figure A-12a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SELENIUM (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

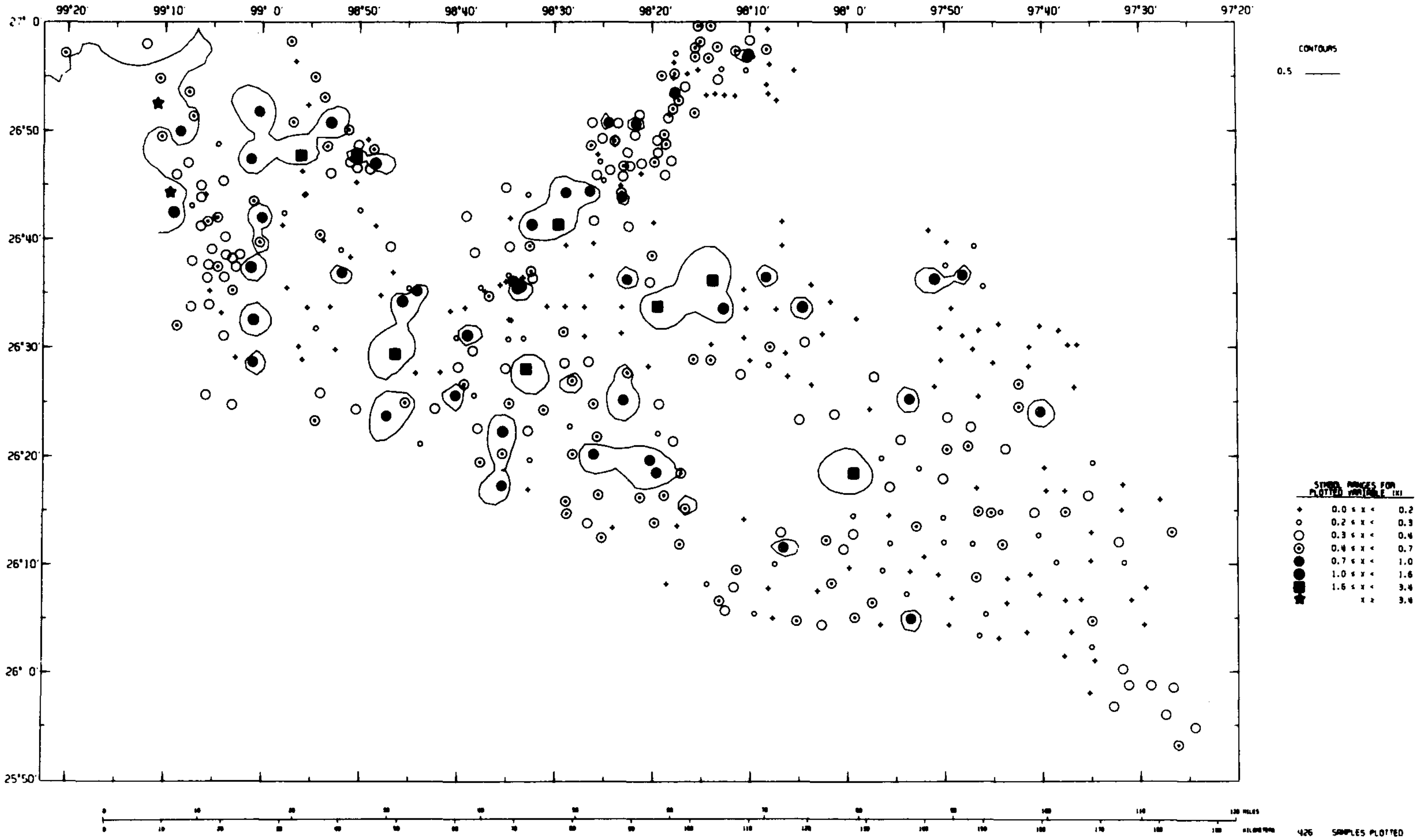


Figure A-12b

GEOCHEMICAL DISTRIBUTION OF SELENIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

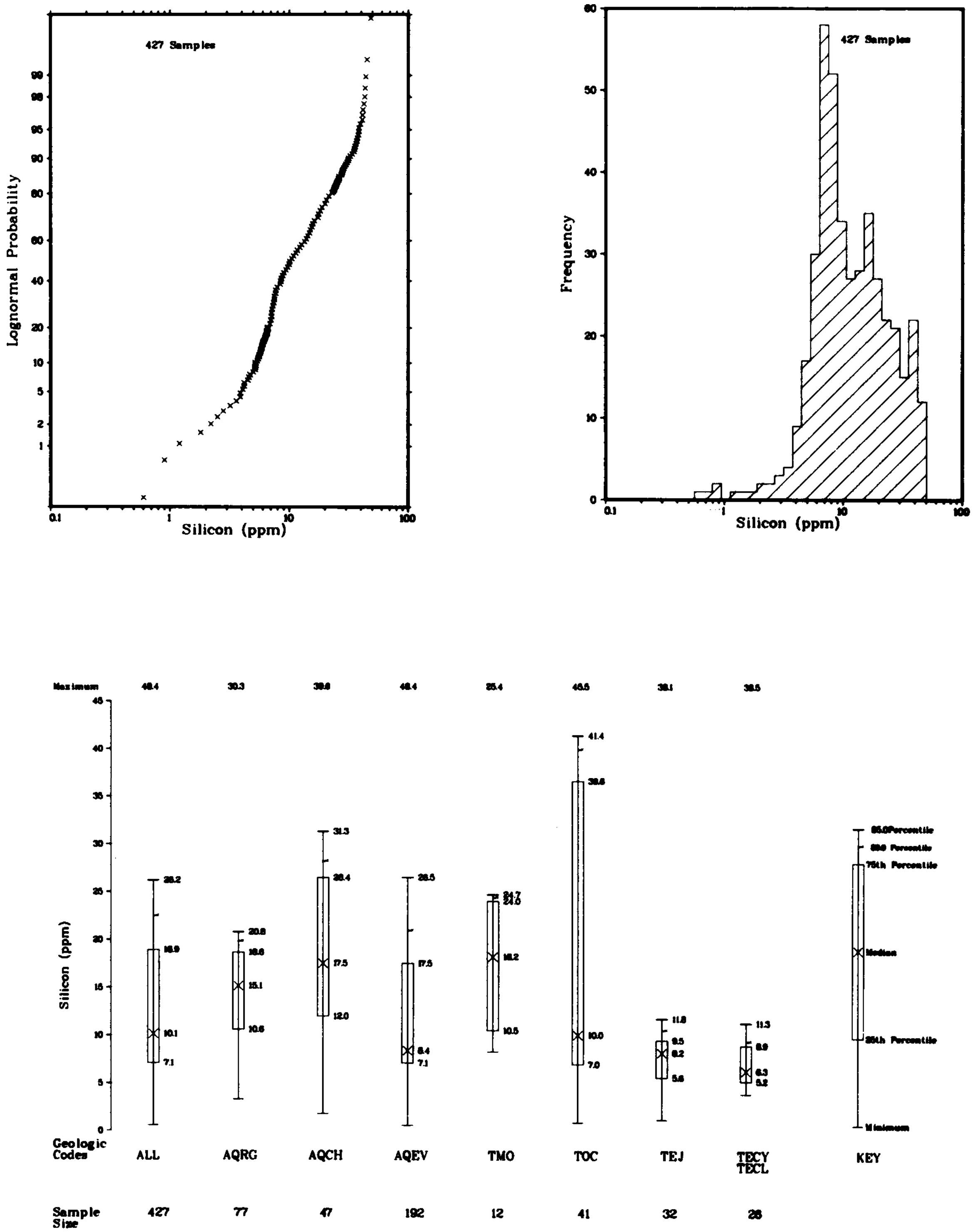


Figure A-13a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SILICON (PPM)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

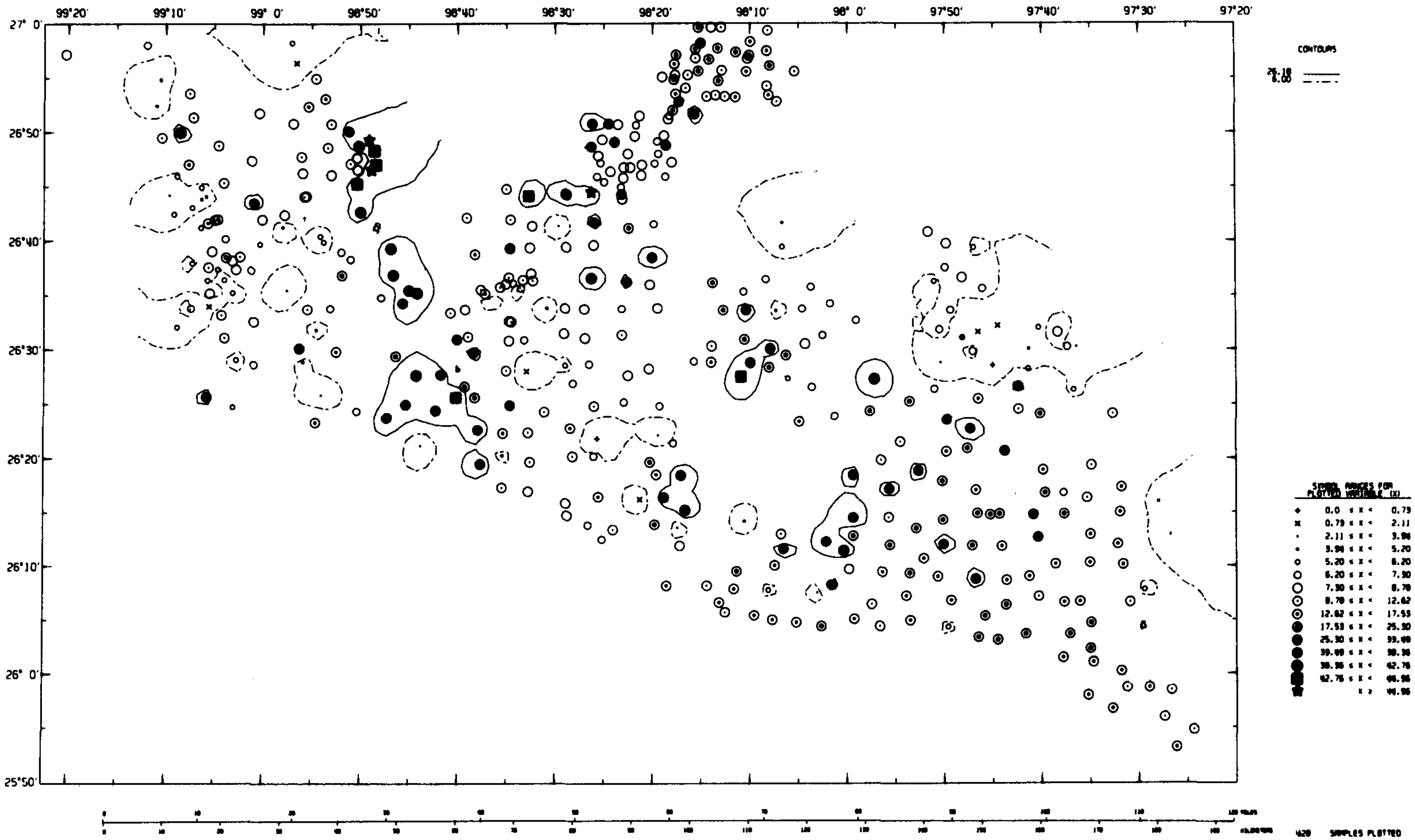


Figure A-13b

GEOCHEMICAL DISTRIBUTION OF SILICON (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

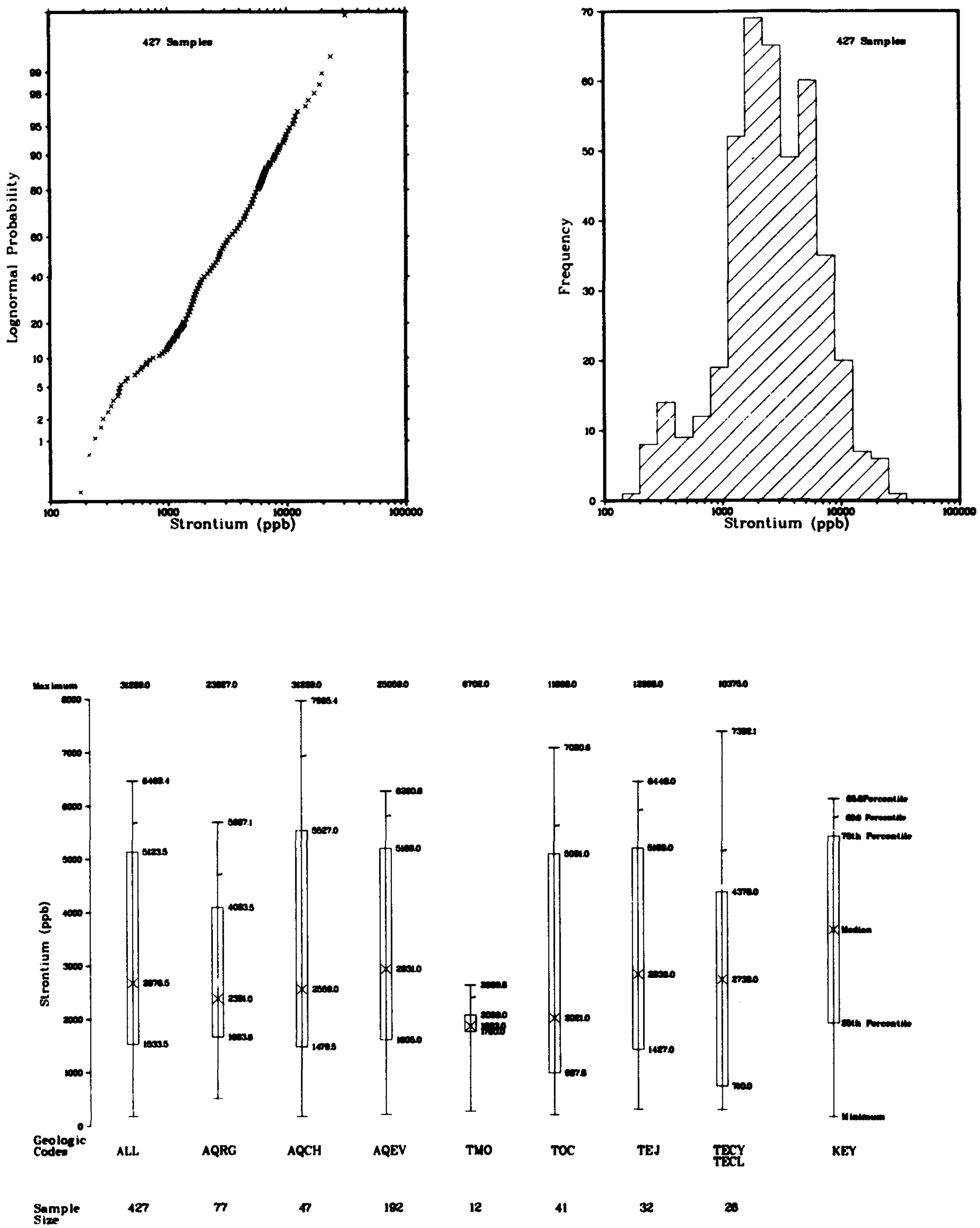


Figure A-14a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR STRONTIUM (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

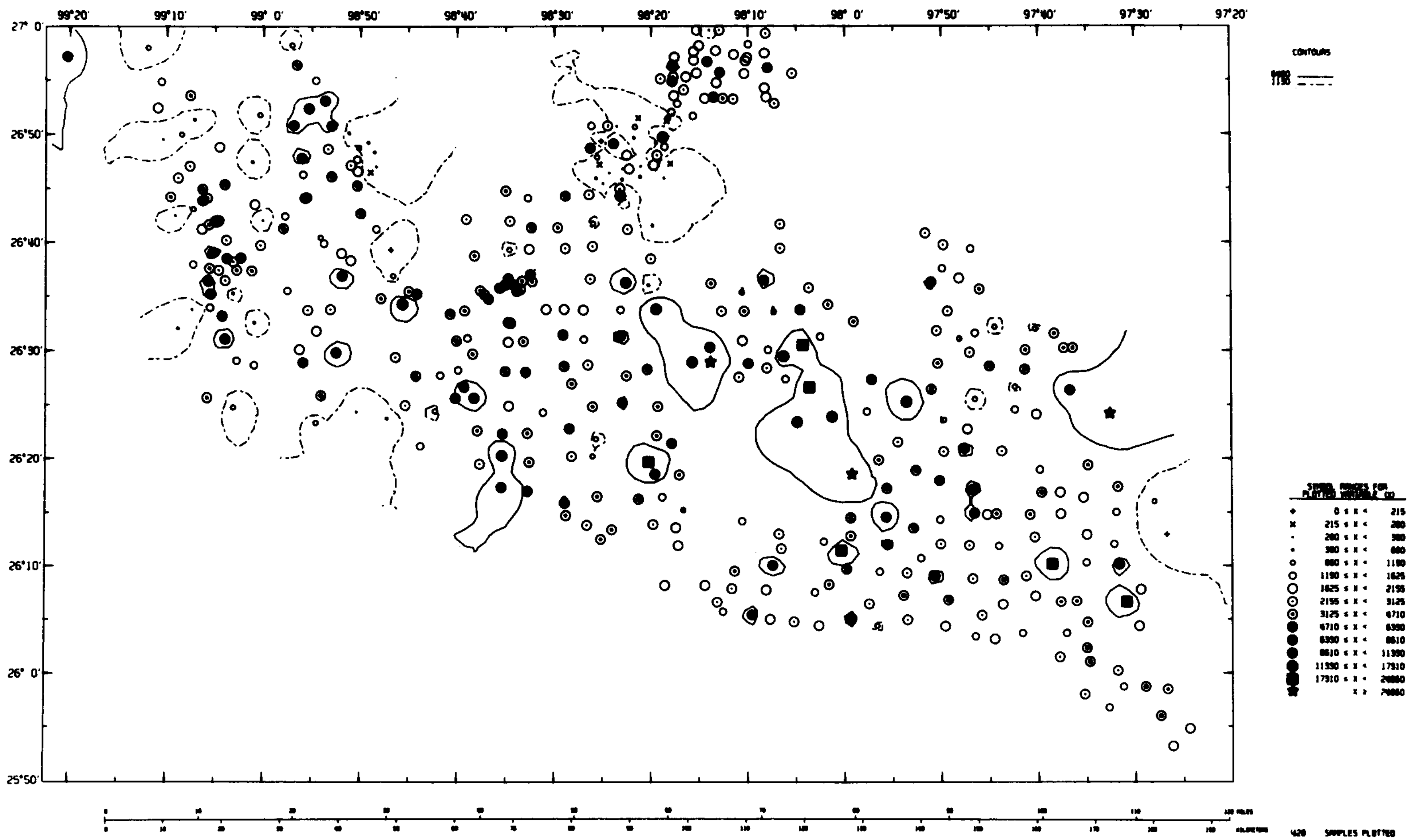


Figure A-14b

GEOCHEMICAL DISTRIBUTION OF STRONTIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

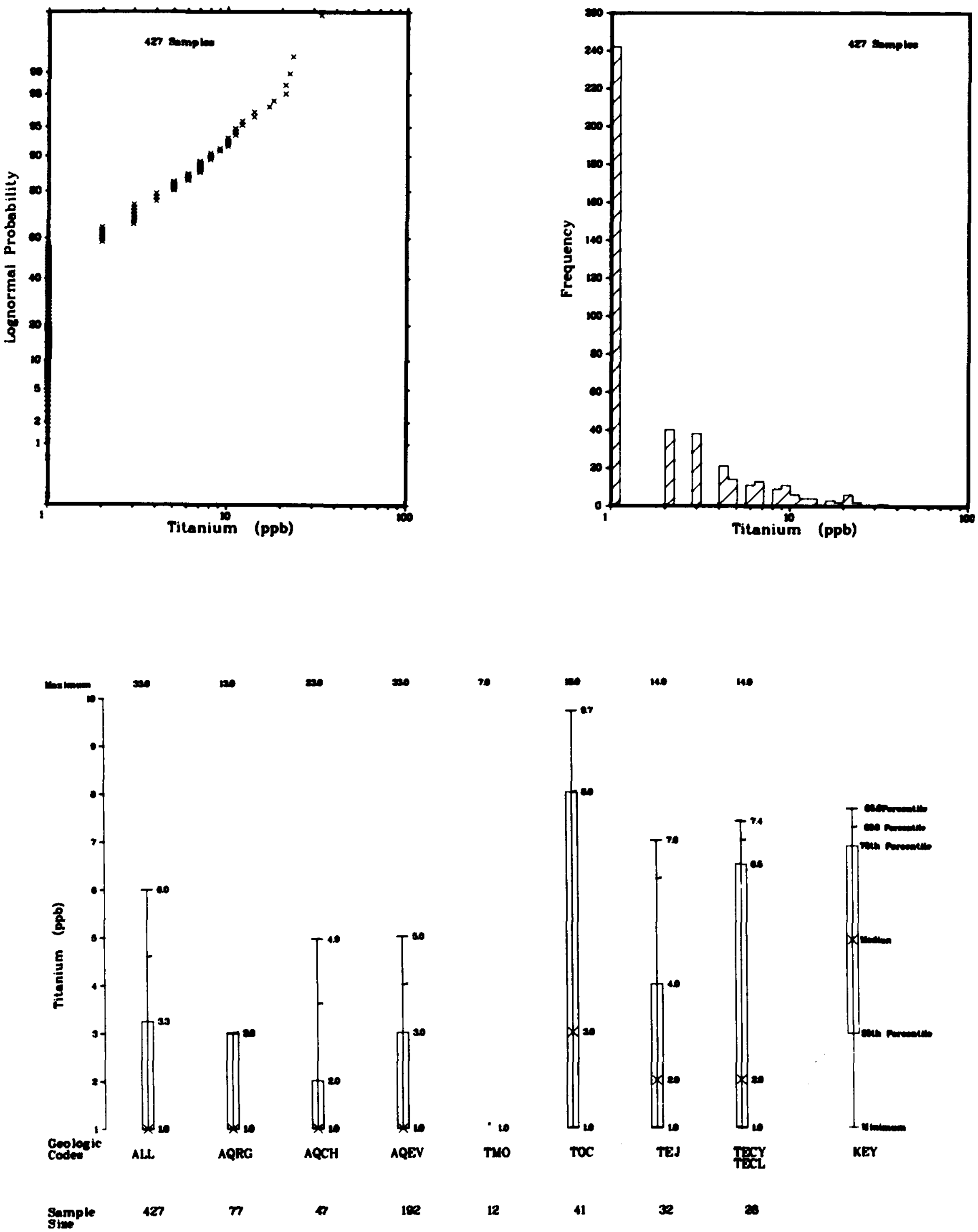


Figure A-15a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR TITANIUM (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

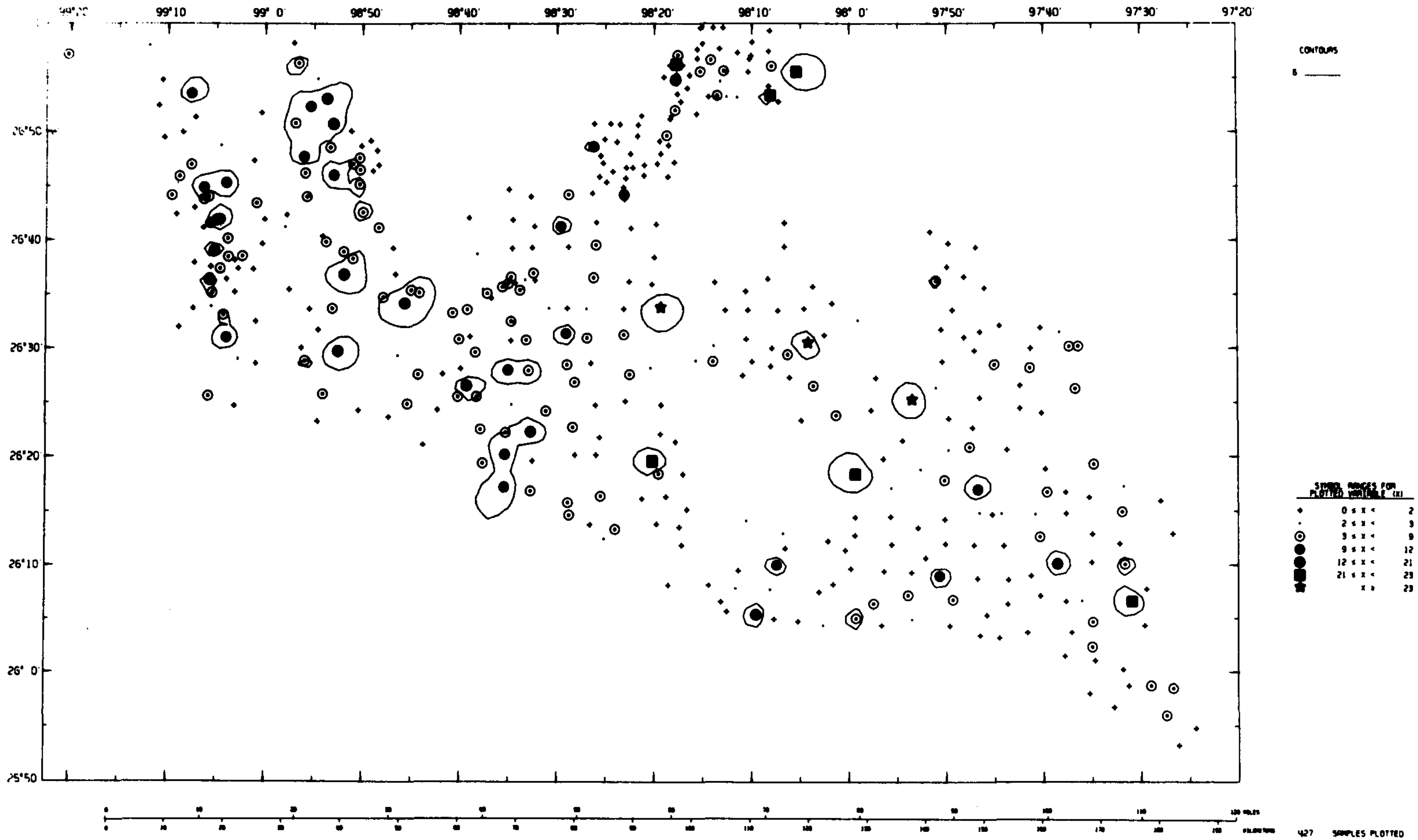


Figure A-15b

GEOCHEMICAL DISTRIBUTION OF TITANIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

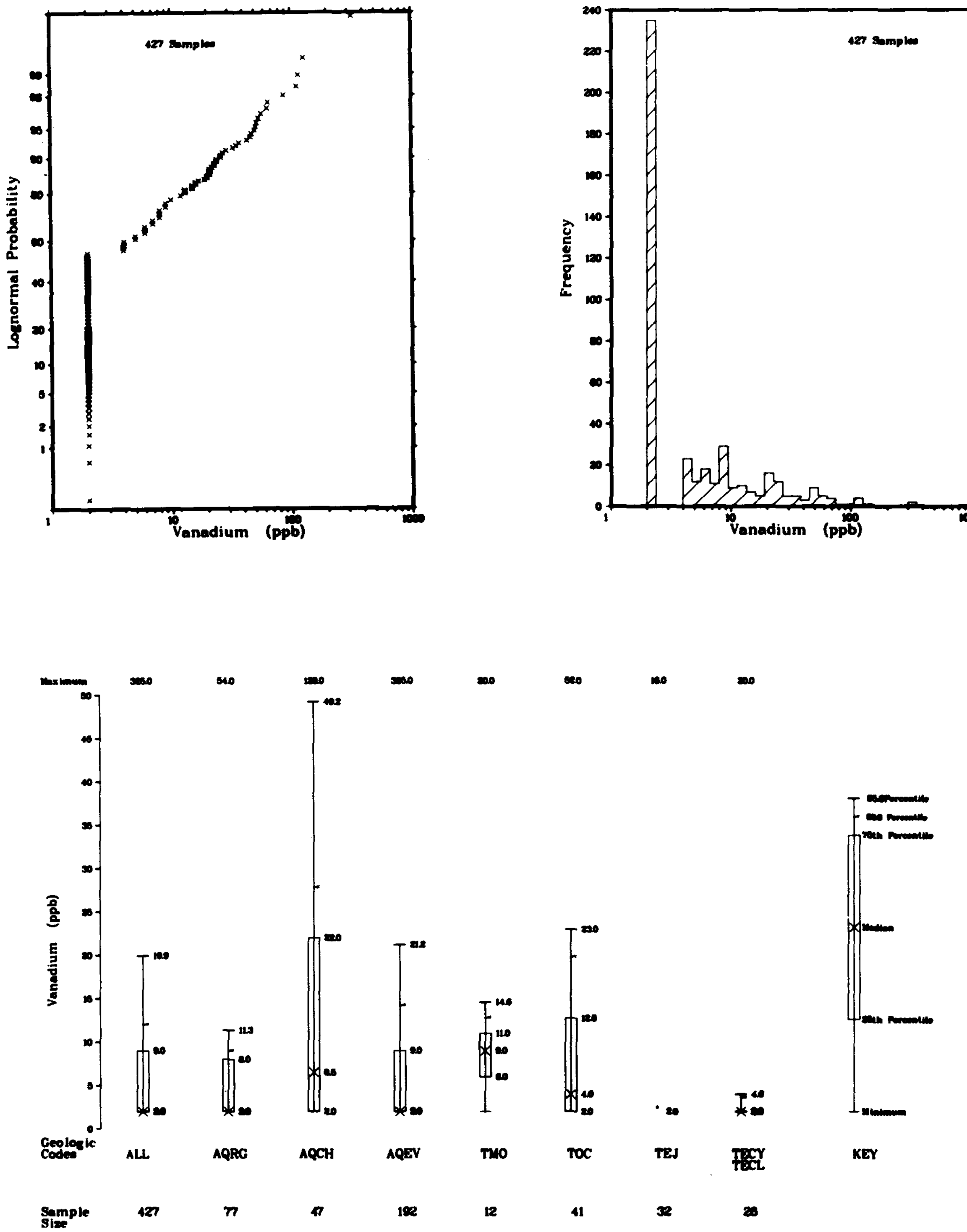


Figure A-16a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR VANADIUM (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

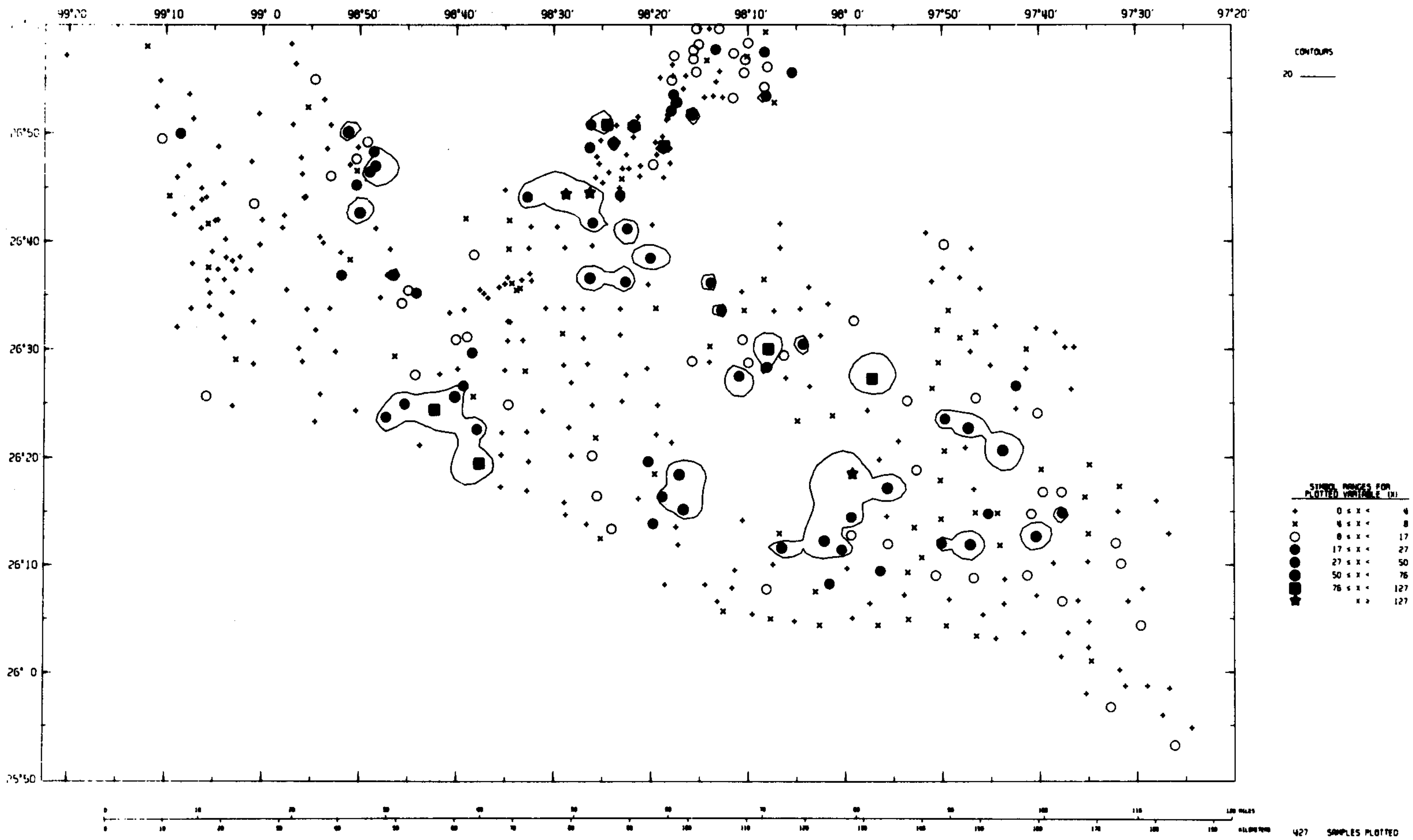


Figure A-16b

GEOCHEMICAL DISTRIBUTION OF VANADIUM (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

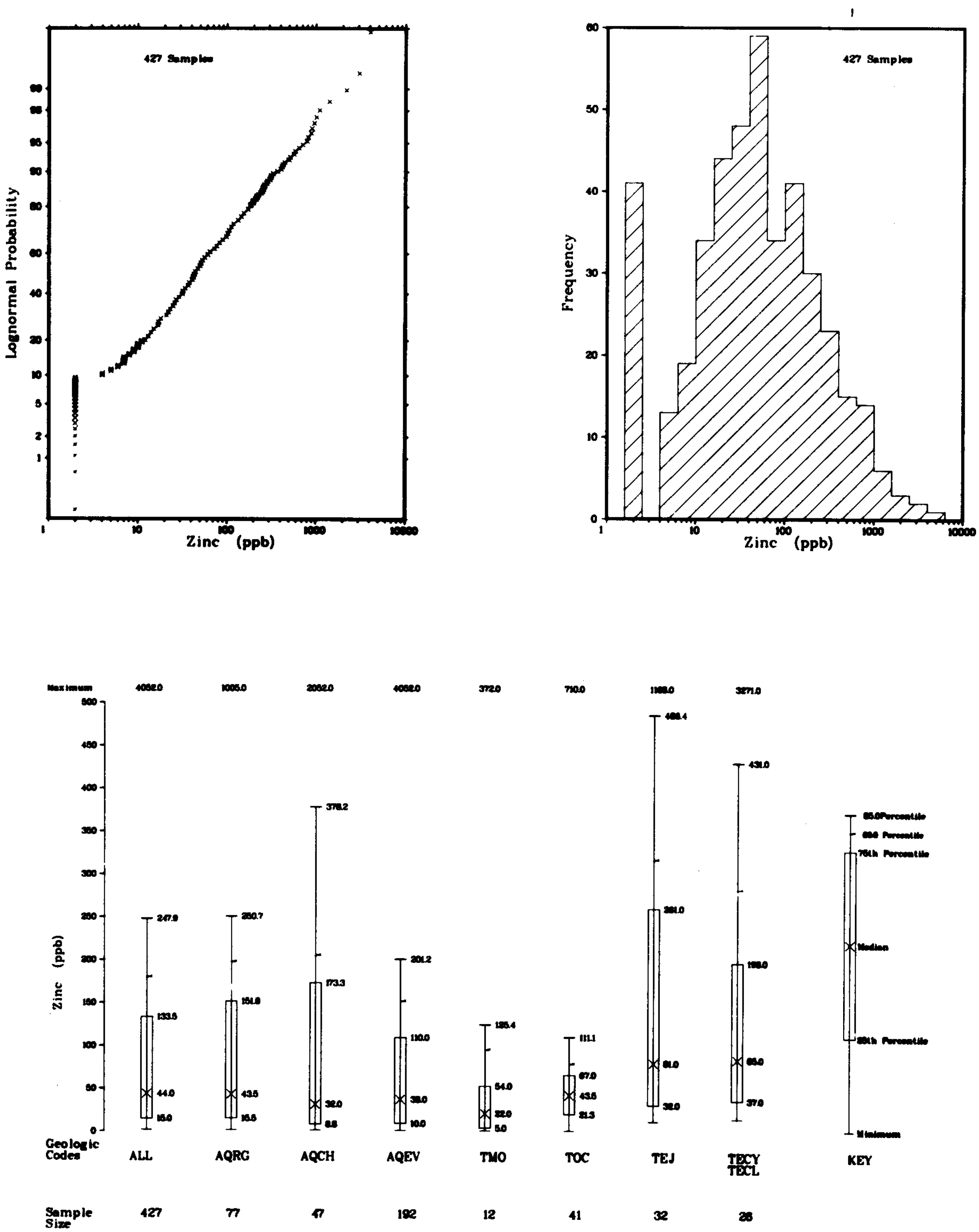


Figure A-17a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ZINC (PPB)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

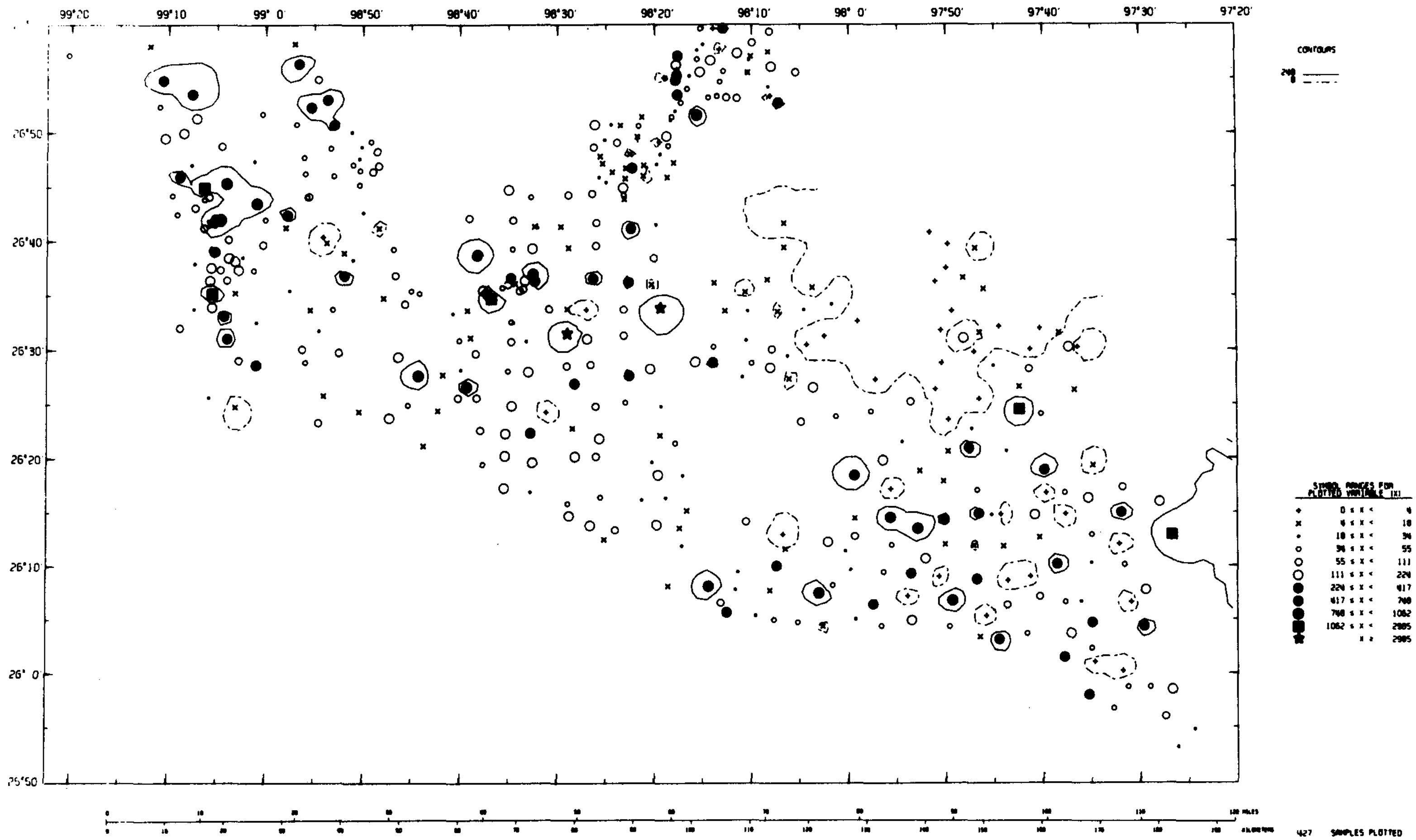


Figure A-17b

GEOCHEMICAL DISTRIBUTION OF ZINC (PPB) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

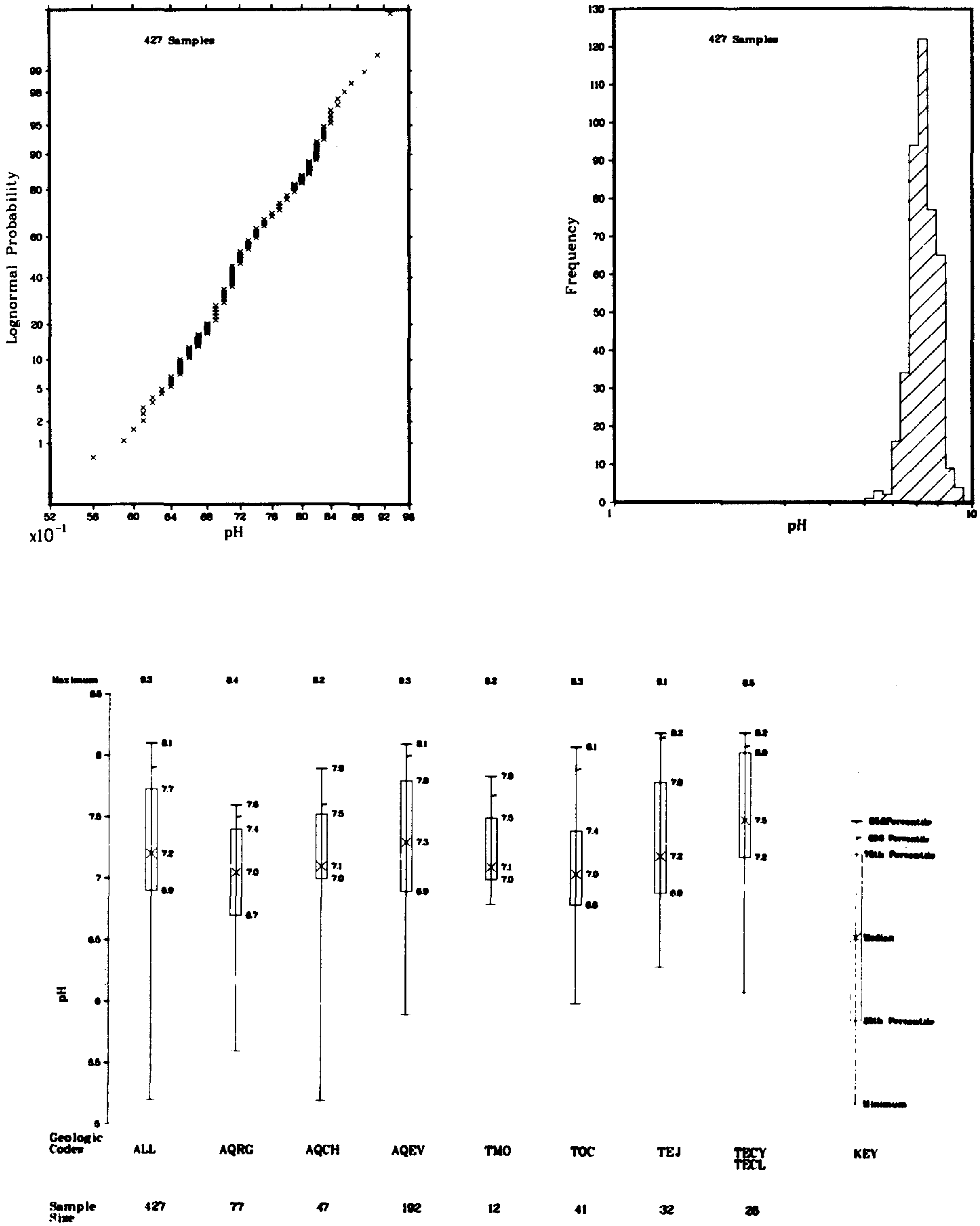


Figure A-18a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR pH
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

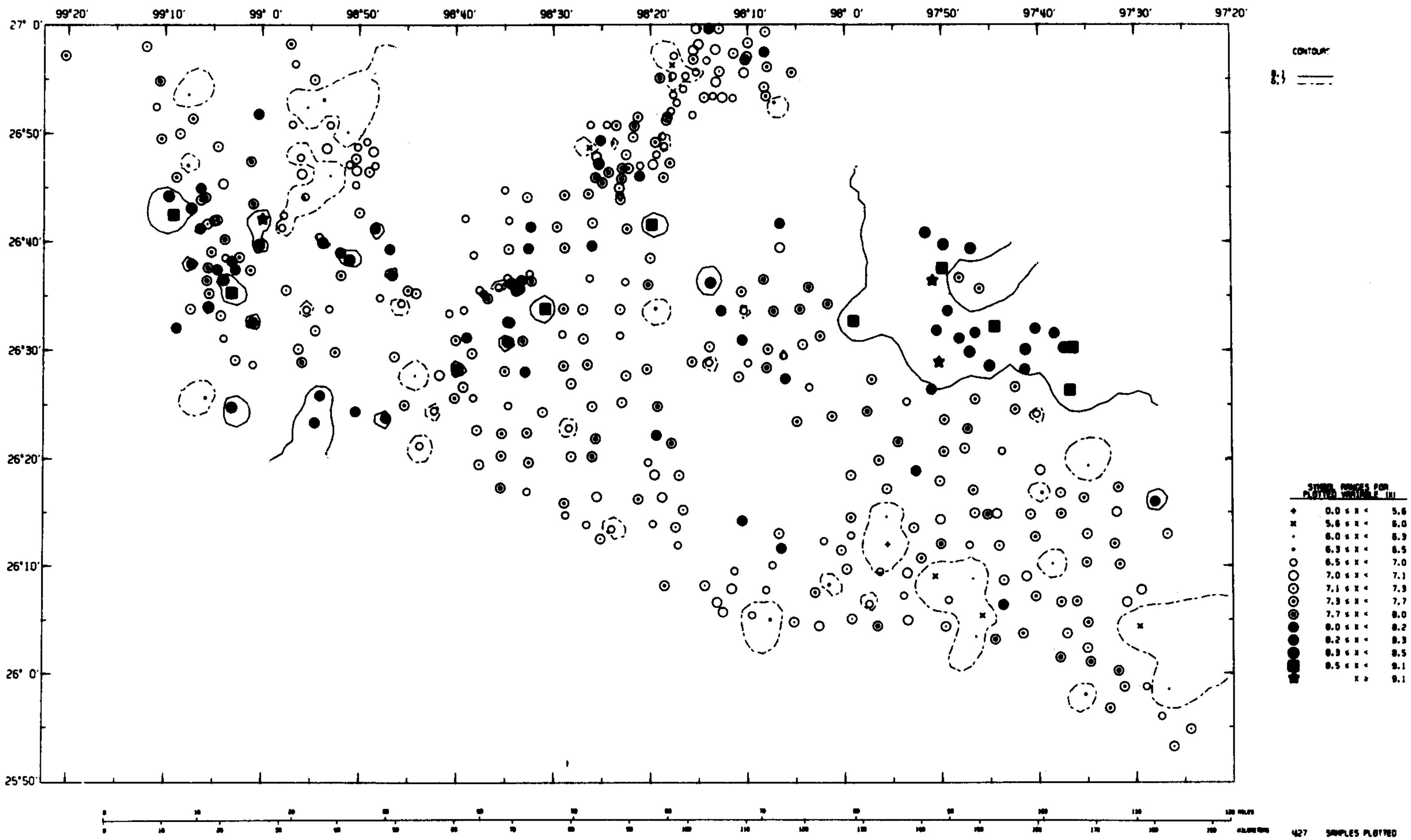


Figure A-18b

GEOCHEMICAL DISTRIBUTION OF pH IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

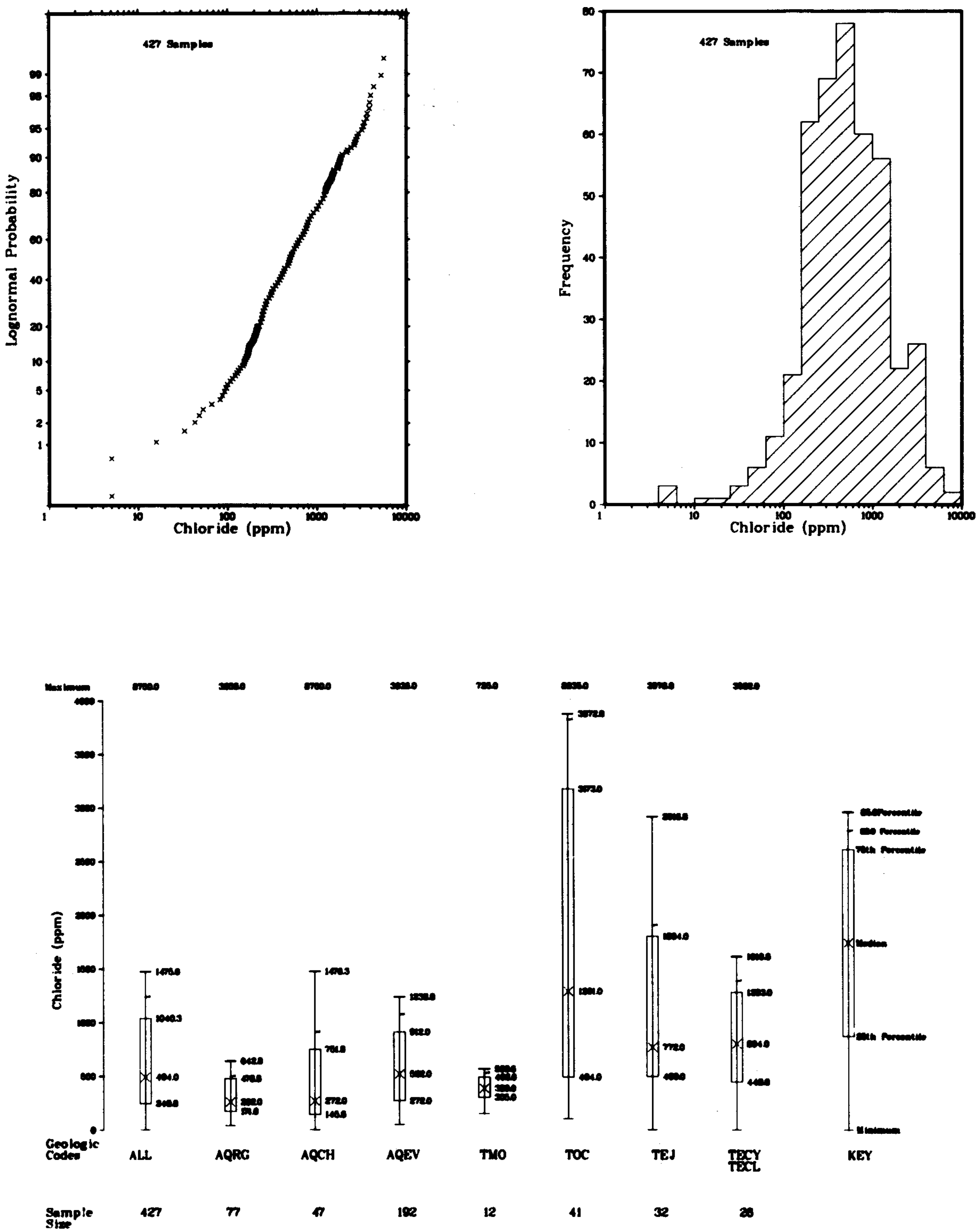


Figure A-19a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR CHLORIDE (PPM)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

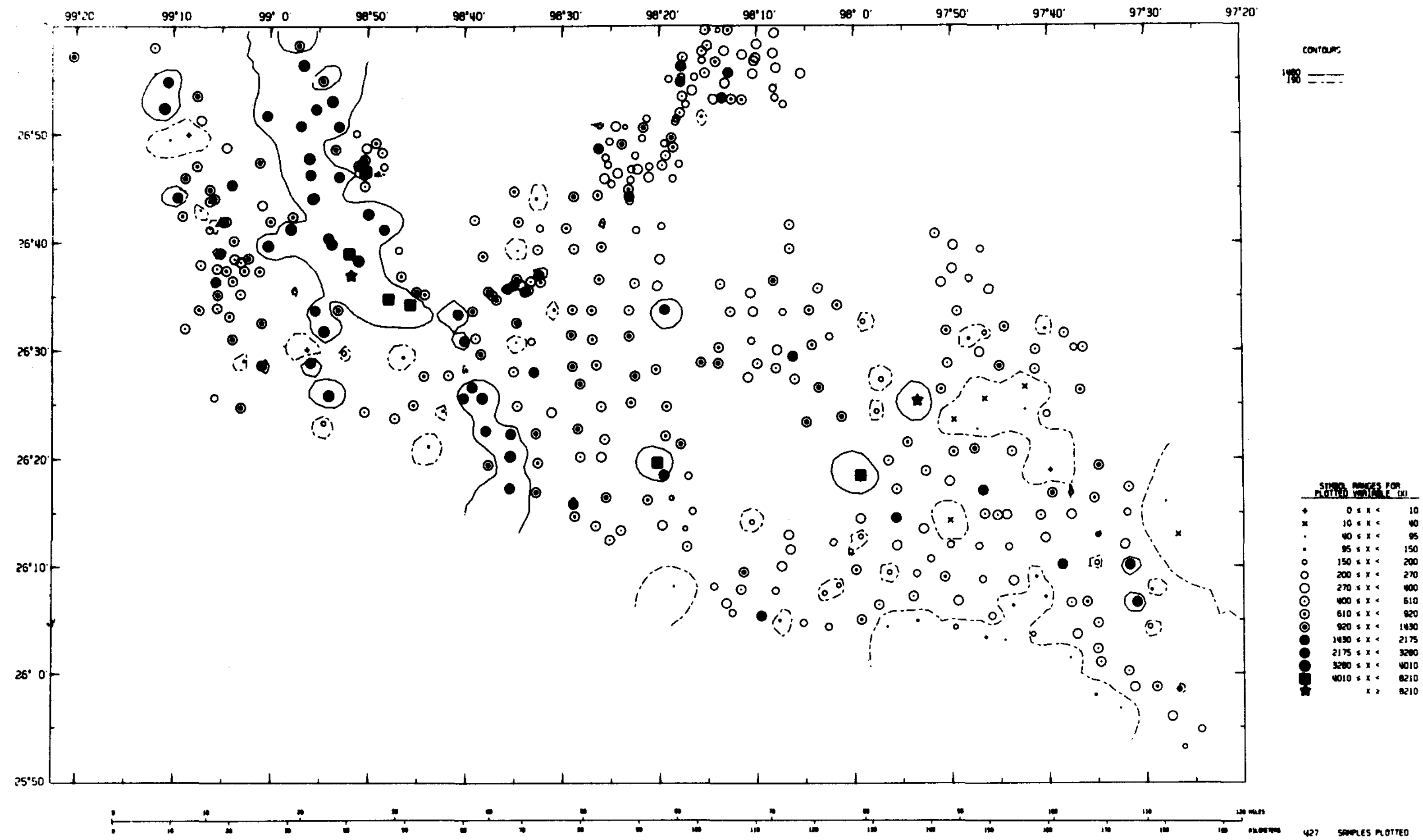


Figure A-19b

GEOCHEMICAL DISTRIBUTION OF CHLORIDE (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

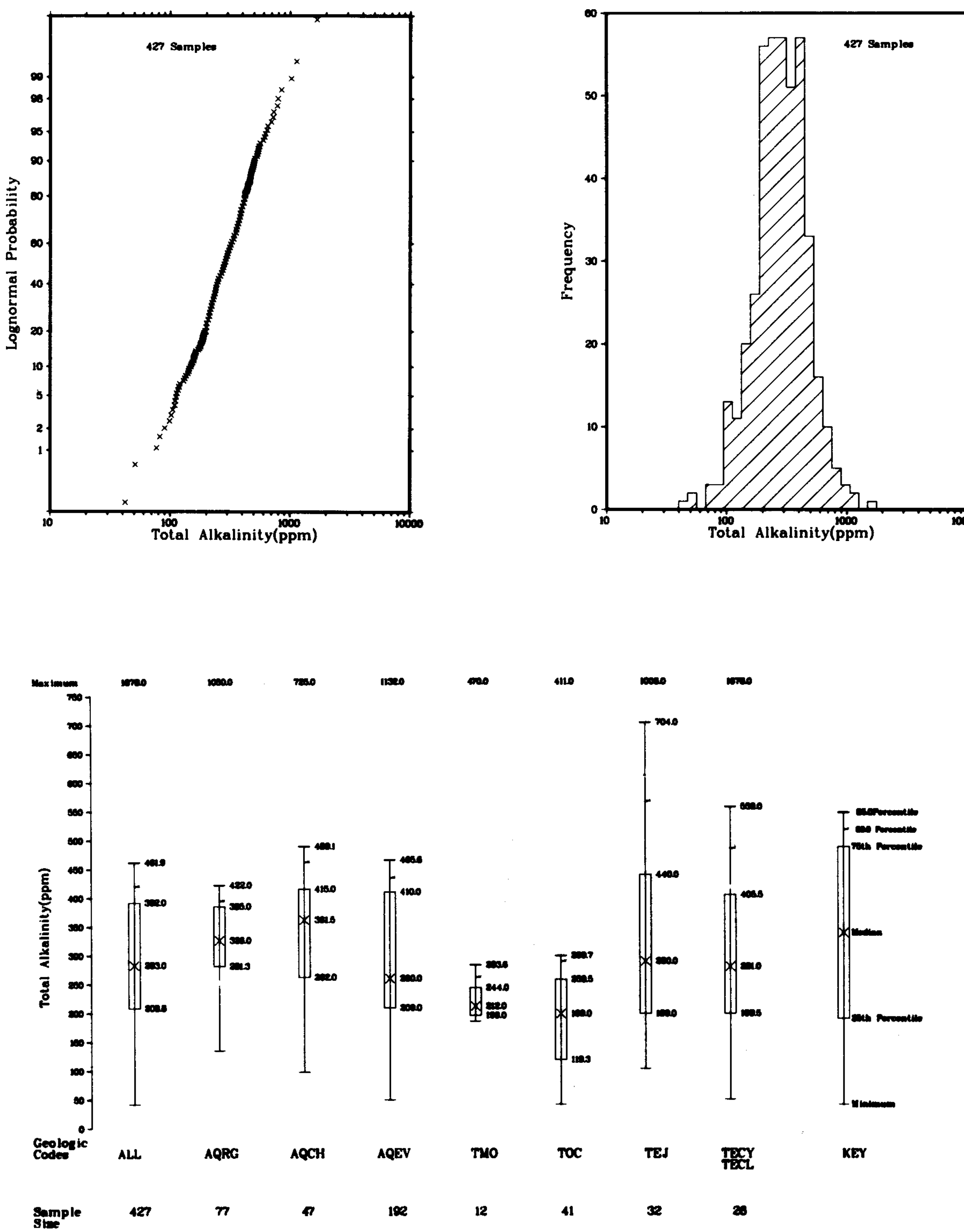


Figure A-20a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR TOTAL ALKALINITY (PPM)
IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

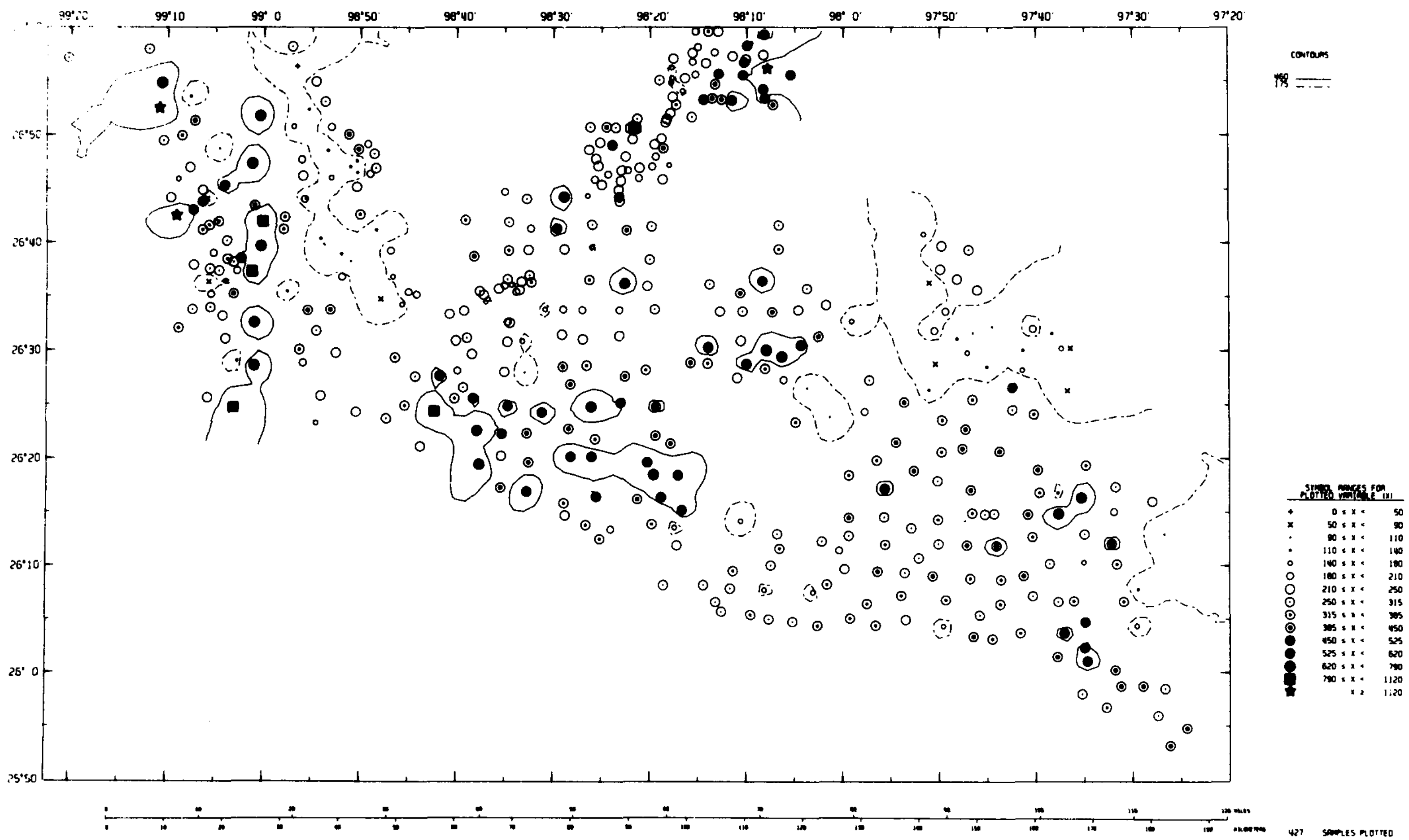


Figure A-20b

GEOCHEMICAL DISTRIBUTION OF TOTAL ALKALINITY (PPM) IN GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

Table A-3

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
24645	48-26.994 -	98.255	-3-03-	2.7	2600	130.	38	31.	8	7.0	7.9	190.	1800	660
24646	48-26.970 -	98.251	-3-03-	3.1	2700	130.	39	32.	5	7.0	8.8	210.	1900	740
24647	48-26.961 -	98.260	-3-03-	2.3	2700	130.	42	34.	<4	7.0	8.5	230.	1900	770
24648	48-26.947 -	98.260	-3-03-	8.8	1600	43.	48	14.	5	7.5	7.3	170.	1800	710
24649	48-26.994 -	98.233	-3-03-	2.0	1900	4.5	47	0.5	70	8.2	1.0	280.	280	6200
24650	48-26.994 -	98.216	-3-03-	4.3	3400	110.	54	40.	<4	7.2	12.	280.	2600	610
24651	48-26.945 -	98.237	-3-03-	12.	9100	360.	120	140.	<4	6.8	25.	520.	6700	2000
24652	48-26.946 -	98.171	-3-03-	14.	4600	93.	100	48.	6	7.8	17.	450.	2700	1600
24653	48-26.962 -	98.222	-3-03-	2.7	2700	120.	42	32.	<4	7.0	9.5	210.	2100	720
24654	48-26.956 -	98.191	-3-03-	2.5	2300	93.	40	27.	<4	7.1	9.1	200.	2000	620
24655	48-26.958 -	98.138	-3-03-	4.1	1900	64.	35	22.	<4	8.0	8.4	200.	1700	570
24656	48-26.951 -	98.168	-3-03-	5.1	2100	72.	46	25.	4	7.1	11.	220.	1800	780
38358	48-26.480 -	97.841	-3-03-	1.2	3600	10.	120	3.4	16	9.3	5.6	480.	3800	2900
38359	48-26.440 -	97.852	-3-03-	1.2	5000	73.	140	19.	48	8.1	7.4	590.	5500	5100
38360	48-26.349 -	97.795	-3-03-	35.	10000	200.	300	110.	23	7.1	15.	830.	7700	6600
38361	48-26.344 -	97.831	-3-03-	8.3	3500	140.	71	45.	26	7.3	20.	360.	2700	2100
38362	48-26.393 -	97.830	-3-03-	6.8	900	60.	61	16.	18	7.6	9.1	99.	1100	390
38363	48-26.497 -	97.786	-3-03-	1.2	4400	25.	130	9.1	26	8.4	5.1	590.	2800	5700
38364	48-26.425 -	97.777	-3-03-	4.3	790	57.	19	7.6	36	7.6	11.	97.	890	760
38365	48-26.299 -	97.838	-3-03-	15.	3500	230.	94	54.	28	7.1	16.	260.	5400	630
38366	48-26.287 -	97.929	-3-03-	33.	4900	140.	220	64.	39	7.1	13.	520.	6000	1800
38367	48-26.455 -	97.955	-3-03-	18.	2200	80.	190	49.	<4	7.3	7.9	210.	6500	580
38368	48-26.248 -	97.740	-3-03-	21.	3400	150.	130	56.	26	7.0	5.5	340.	4000	1100
38369	48-26.247 -	97.682	-3-03-	15.	4300	140.	200	68.	26	7.2	14.	440.	4400	2100
38370	48-26.248 -	97.629	-3-03-	29.	4600	45.	220	36.	130	7.5	12.	600.	1900	4200
38371	48-26.201 -	97.537	-3-03-	15.	4400	61.	160	43.	120	7.6	10.	550.	1500	3100
38372	48-26.198 -	97.736	-3-03-	16.	2600	73.	100	23.	87	7.1	14.	390.	1400	1900
38373	48-26.145 -	97.728	-3-03-	5.6	3800	82.	170	48.	50	7.1	6.3	450.	6100	1700
38374	48-26.151 -	97.689	-3-03-	7.2	2000	92.	70	28.	4	7.0	14.	210.	2700	480
38375	48-26.107 -	97.729	-3-03-	0.47	2000	75.	71	25.	28	8.0	7.1	260.	1700	890
38376	48-26.120 -	97.673	-3-03-	42.	1600	110.	53	25.	11	7.4	5.3	160.	1800	370
38377	48-26.004 -	97.531	-3-03-	0.41	4500	48.	190	34.	88	7.8	5.7	580.	2300	2100
38378	48-26.018 -	97.579	-3-03-	1.4	5200	120.	210	76.	14	7.8	7.2	620.	5200	2100
38379	48-26.025 -	97.631	-3-03-	0.38	2500	79.	170	38.	6	7.9	5.2	320.	2400	940
38380	48-26.053 -	97.743	-3-03-	0.38	1300	110.	51	32.	<4	7.9	6.5	100.	1900	240
38382	48-26.111 -	97.516	-3-03-	52.	13000	760.	210	270.	<4	7.0	17.	670.	20000	1600
38386	48-26.331 -	97.943	-3-03-	20.	4400	38.	140	29.	110	7.3	6.9	540.	3500	4000
38387	48-26.308 -	97.991	-3-03-	160.	19000	600.	780	350.	52	7.1	15.	1100.	31000	15000
38388	48-26.359 -	97.910	-3-03-	43.	5200	34.	150	33.	180	7.7	7.2	620.	3100	5600
38389	48-26.379 -	97.790	-3-03-	22.	1100	11.	94	9.9	7	7.9	0.6	190.	1900	620
38391	48-26.285 -	97.781	-3-03-	19.	8500	510.	120	130.	9	7.3	31.	570.	7000	3000
38394	48-26.073 -	97.494	-3-03-	4.1	1700	93.	54	32.	<4	5.6	5.8	180.	1900	480
38400	48-26.130 -	97.491	-3-03-	4.0	1500	89.	47	30.	<4	7.0	5.5	160.	1800	370
38403	48-26.216 -	97.446	-3-03-	0.23	450	19.	8	4.8	<4	7.2	14.	19.	180	110
38419	48-26.267 -	97.467	-3-03-	1.6	550	48.	17	13.	<4	8.2	13.	48.	660	160
38423	48-26.518 -	97.804	-3-03-	2.4	900	65.	38	16.	10	8.2	11.	110.	1100	240
38424	48-26.560 -	97.824	-3-03-	1.3	3400	22.	120	5.9	9	8.2	4.8	510.	3000	4500
38425	48-26.530 -	97.843	-3-03-	0.60	3500	20.	110	7.6	5	8.2	5.6	500.	2900	3900
38427	48-26.526 -	97.777	-3-03-	3.9	1200	69.	51	23.	<4	8.1	6.8	160.	1400	360
38428	48-26.536 -	97.743	-3-03-	0.40	3100	4.5	82	1.5	13	8.9	6.1	460.	980	3600
38429	48-26.533 -	97.673	-3-03-	2.8	1200	73.	24	15.	<4	8.2	15.	120.	1000	240
38430	48-26.526 -	97.640	-3-03-	0.72	5600	55.	160	22.	26	8.2	8.5	700.	3300	6600
38431	48-26.504 -	97.608	-3-03-	0.55	5900	67.	160	27.	37	8.5	9.9	700.	4300	7600
38434	48-26.501 -	97.690	-3-03-	0.85	4500	30.	110	15.	18	8.4	6.0	530.	4300	6600
38436	48-26.242 -	97.991	-3-03-	19.	3000	140.	130	62.	27	7.4	4.1	290.	5100	630

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
38438	48-26.243 -	97.930	-3-03-	26.	8300	180.	220	110.	<4	6.2	9.4	710.	8000	3700
38439	48-26.200 -	97.928	-3-03-	19.	3500	140.	160	59.	28	5.2	6.1	300.	6700	960
38440	48-26.162 -	97.998	-3-03-	0.46	4200	87.	110	36.	30	7.1	8.3	440.	5900	3100
38441	48-26.156 -	97.894	-3-03-	29.	2300	72.	180	65.	5	7.0	4.0	230.	2700	430
38442	48-26.345 -	97.731	-3-03-	23.	3200	48.	110	26.	69	6.9	3.4	390.	2700	1400
38444	48-26.281 -	97.630	-3-03-	4.4	1700	85.	49	26.	10	7.2	6.3	150.	1600	380
38445	48-26.316 -	97.665	-3-03-	1.2	860	61.	21	30.	<4	7.0	10.	34.	1200	230
38446	48-26.289 -	97.531	-3-03-	9.6	3300	200.	73	53.	<4	7.5	5.0	230.	3800	460
38449	48-26.273 -	97.590	-3-03-	0.78	5700	130.	87	54.	7	7.3	19.	530.	1900	1600
38450	48-26.323 -	97.582	-3-03-	1.2	5000	320.	68	73.	55	6.1	42.	250.	3200	890
38452	48-26.402 -	97.671	-3-03-	6.6	2200	100.	47	26.	31	6.6	10.	130.	1700	330
38455	48-26.249 -	97.778	-3-03-	37.	4900	89.	220	100.	130	7.1	2.4	520.	8800	1500
38456	48-26.247 -	97.756	-3-03-	9.1	2400	58.	100	21.	33	7.8	4.0	400.	1700	740
38459	48-26.201 -	97.836	-3-03-	10.	1600	74.	99	41.	<4	7.8	6.8	190.	2200	450
38460	48-26.281 -	97.662	-3-03-	18.	5700	210.	210	110.	<4	6.4	24.	530.	6000	1900
38461	48-26.439 -	97.613	-3-03-	0.27	7000	86.	150	24.	21	8.8	7.9	620.	11000	8100
38462	48-26.476 -	97.752	-3-03-	0.23	5000	72.	210	33.	<4	8.3	14.	790.	5200	9500
38463	48-26.409 -	97.708	-3-03-	3.2	870	100.	23	20.	<4	7.5	6.7	54.	1600	180
38466	48-26.083 -	97.893	-3-03-	0.60	2500	150.	62	51.	28	7.0	6.7	170.	2900	390
38467	48-26.073 -	97.828	-3-03-	6.1	2100	93.	57	31.	<4	7.1	6.3	190.	1900	490
38468	48-26.121 -	97.900	-3-03-	9.5	3800	160.	110	66.	<4	6.8	9.4	300.	4900	640
38469	48-26.504 -	97.624	-3-03-	0.60	6700	54.	170	26.	70	8.4	9.4	760.	4700	7000
38470	48-26.471 -	97.691	-3-03-	0.33	4400	53.	130	16.	51	8.2	6.7	550.	6300	6400
38471	48-26.444 -	97.708	-3-03-	3.7	1200	40.	34	20.	19	7.3	1.7	140.	1000	420
38490	48-26.199 -	97.787	-3-03-	15.	2100	28.	110	16.	49	6.7	3.3	370.	3100	2000
38491	48-26.239 -	97.837	-3-03-	13.	540	34.	63	19.	18	7.0	2.9	160.	1500	730
38492	48-26.158 -	97.941	-3-03-	5.5	2100	110.	49	17.	32	6.7	6.1	270.	1400	650
38493	48-26.085 -	97.989	-3-03-	0.84	5700	360.	140	130.	<4	7.2	15.	370.	7400	560
38494	48-26.114 -	97.823	-3-03-	2.0	3500	190.	100	74.	<4	6.5	10.	320.	4700	570
38495	48-26.611 -	97.804	-3-03-	0.57	3000	9.8	71	3.1	12	7.5	4.5	380.	1700	3100
38496	48-26.594 -	97.769	-3-03-	1.7	3200	25.	84	7.2	<4	7.3	5.6	430.	3600	3200
38497	48-26.656 -	97.784	-3-03-	0.21	2300	9.8	70	3.8	<4	8.3	4.4	410.	1200	2600
38498	48-26.680 -	97.862	-3-03-	0.29	3700	16.	120	6.8	22	8.3	5.3	530.	2700	3400
38499	48-26.662 -	97.831	-3-03-	0.31	2700	12.	77	4.5	18	8.3	4.3	430.	2500	2700
38500	48-26.544 -	97.986	-3-03-	<0.20	3400	40.	140	14.	20	8.6	6.9	510.	3100	6500
38501	48-26.626 -	97.833	-3-03-	0.48	3000	15.	83	5.6	6	8.5	4.6	470.	1600	2900
38502	48-26.605 -	97.852	-3-03-	0.43	6300	150.	210	60.	25	9.2	11.	750.	7300	5800
38514	48-25.967 -	97.588	-3-03-	1.9	1200	120.	50	27.	5	6.4	5.2	75.	3000	230
38516	48-25.979 -	97.521	-3-03-	<0.20	4300	31.	170	31.	90	7.4	5.8	830.	1500	2500
38518	48-25.979 -	97.483	-3-03-	<0.20	8800	130.	290	90.	46	6.8	8.3	770.	6000	3400
38520	48-25.913 -	97.407	-3-03-	19.	3300	120.	99	32.	74	7.2	3.9	440.	1600	1300
38523	48-25.975 -	97.445	-3-03-	3.4	2600	180.	69	52.	<4	6.1	9.9	210.	3200	560
38524	48-25.933 -	97.457	-3-03-	12.	3200	200.	99	70.	6	6.8	3.7	220.	5400	520
38526	48-25.946 -	97.546	-3-03-	20.	1700	43.	110	30.	37	7.3	4.5	230.	1300	840
38527	48-25.886 -	97.436	-3-03-	9.9	2800	100.	100	43.	9	7.1	7.5	310.	1800	610
38535	48-26.214 -	97.991	-3-03-	20.	2100	92.	120	38.	15	6.8	4.0	220.	3200	740
38536	48-26.226 -	97.883	-3-03-	11.	3200	150.	140	65.	9	7.1	6.9	300.	5200	600
38537	48-26.179 -	97.870	-3-03-	14.	1700	33.	95	15.	37	7.6	3.2	250.	1300	840
38539	48-26.074 -	97.945	-3-03-	12.	1500	29.	56	11.	33	7.9	4.0	220.	1100	880
38562	48-26.315 -	97.879	-3-03-	9.6	4700	120.	210	57.	74	8.0	25.	530.	5100	2000
38564	48-26.212 -	97.674	-3-03-	32.	5000	90.	280	40.	160	7.5	7.8	620.	2400	3400
38566	48-26.169 -	97.528	-3-03-	16.	11000	280.	210	160.	35	7.3	8.3	860.	8000	2400
38569	48-26.421 -	97.895	-3-03-	240.	21000	590.	610	600.	24	6.8	15.	460.	15000	16000
38571	48-26.406 -	97.963	-3-03-	3.8	1500	79.	51	22.	<4	7.7	4.8	120.	1500	310
38572	48-26.062 -	97.619	-3-03-	0.82	3100	76.	100	29.	40	7.1	10.	430.	1500	1200

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

DR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
38573	48-26.062 -	97.095	-3-03-	0.64	2200	73.	81	28.	26	7.5	7.9	280.	1600	470
38574	48-26.111 -	97.629	-3-03-	13.	3400	57.	150	39.	14	7.5	6.1	480.	4100	1600
38575	48-26.039 -	97.584	-3-03-	0.61	4500	180.	180	88.	19	7.2	10.	520.	5300	1200
38576	48-26.112 -	97.602	-3-03-	0.39	4600	110.	140	50.	39	7.4	8.2	550.	4000	2000
38578	48-26.251 -	97.533	-3-03-	4.4	1800	120.	50	25.	13	7.0	7.8	160.	1500	350
38579	48-26.216 -	97.584	-3-03-	8.4	1900	63.	130	30.	55	7.1	2.5	220.	1800	760
38580	48-26.172 -	97.585	-3-03-	2.2	1500	86.	42	19.	17	7.4	9.4	130.	1200	270
38581	48-26.079 -	97.583	-3-03-	0.56	4700	150.	160	64.	27	7.6	11.	550.	3200	1300
38586	48-26.151 -	97.846	-3-03-	23.	6500	430.	150	100.	<4	5.6	16.	460.	7700	1800
38587	48-26.147 -	97.781	-3-03-	20.	3300	44.	180	57.	77	6.2	2.6	430.	2200	1300
38597	48-26.108 -	97.959	-3-03-	6.5	6700	110.	200	90.	68	6.6	6.8	720.	2900	1900
38599	48-26.090 -	97.765	-3-03-	0.55	3300	120.	92	44.	17	5.6	9.3	290.	3100	440
38600	48-26.057 -	97.776	-3-03-	0.21	1900	82.	63	29.	20	6.0	6.4	190.	1500	390
38602	48-26.170 -	97.644	-3-03-	32.	12000	340.	370	200.	<4	6.2	9.4	850.	24000	3300
41900	48-26.481 -	98.234	-3-03-	17.	7300	250.	180	130.	5	6.5	21.	400.	25000	2800
41901	48-26.459 -	98.183	-3-03-	4.6	1900	56.	63	43.	6	7.2	6.4	140.	2600	700
41902	48-26.473 -	98.135	-3-03-	7.6	3500	41.	63	18.	48	7.8	8.8	320.	3100	2300
41903	48-26.390 -	98.083	-3-03-	26.	8100	84.	170	62.	36	7.3	12.	870.	15000	8300
41904	48-26.456 -	98.103	-3-03-	<0.20	3400	13.	67	4.4	36	8.0	3.1	350.	1300	3700
41905	48-26.443 -	98.062	-3-03-	14.	7800	130.	140	37.	29	6.9	7.6	850.	17000	3900
41906	48-26.501 -	98.133	-3-03-	9.4	3500	22.	52	13.	82	7.6	6.9	320.	1300	2300
41907	48-26.515 -	98.177	-3-03-	1.5	1600	40.	32	21.	10	8.0	8.7	130.	2000	870
41908	48-26.560 -	98.213	-3-03-	2.5	3000	55.	41	38.	<4	8.1	11.	240.	2600	1700
41909	48-26.603 -	98.231	-3-03-	6.9	3500	38.	72	49.	15	8.3	14.	290.	3900	1700
41910	48-26.560 -	98.174	-3-03-	5.1	2500	120.	28	51.	<4	6.5	8.4	150.	4200	910
41911	48-26.398 -	98.023	-3-03-	12.	7100	120.	130	30.	34	7.4	6.1	500.	11000	3300
41912	48-26.570 -	98.030	-3-03-	1.1	4000	34.	69	10.	49	7.7	4.6	360.	3900	1600
41913	48-26.562 -	98.078	-3-03-	90.	4500	38.	74	13.	45	7.7	5.7	370.	5700	1700
41914	48-26.596 -	98.063	-3-03-	18.	3300	24.	60	7.6	41	7.7	4.7	330.	3100	1400
41915	48-26.657 -	98.112	-3-03-	9.9	2800	17.	62	4.6	17	7.0	4.0	280.	3000	1800
41916	48-26.694 -	98.112	-3-03-	4.1	3000	18.	73	5.9	9	8.0	4.4	290.	2900	1700
41917	48-26.559 -	98.123	-3-03-	<0.20	2900	12.	61	2.9	34	7.8	2.2	300.	1100	6700
41918	48-26.608 -	98.140	-3-03-	22.	5200	43.	81	21.	31	7.9	7.9	410.	7900	1700
41919	48-26.505 -	98.233	-3-03-	11.	4700	81.	92	38.	33	7.2	12.	340.	10000	2800
41920	48-26.480 -	98.167	-3-03-	8.2	2800	190.	39	48.	33	6.7	3.4	130.	6500	1200
41921	48-26.462 -	98.696	-3-03-	3.5	3100	100.	71	29.	14	7.0	14.	220.	1500	830
41922	48-26.521 -	98.043	-3-03-	<0.20	2600	14.	61	4.3	21	7.3	2.9	270.	1300	4700
41923	48-26.589 -	98.178	-3-03-	<0.20	2400	6.6	53	1.2	11	7.6	2.8	270.	1100	3400
41924	48-26.912 -	98.221	-3-03-	2.3	2300	96.	34	25.	<4	7.0	7.7	160.	1900	630
41925	48-26.890 -	98.226	-3-03-	4.4	8200	280.	120	100.	<4	6.7	38.	440.	5300	1900
41926	48-26.888 -	98.241	-3-03-	0.53	2300	74.	43	22.	10	7.1	11.	170.	1900	700
41928	48-26.888 -	98.210	-3-03-	2.5	3300	130.	49	38.	8	7.0	11.	210.	3800	680
41929	48-26.491 -	98.106	-3-03-	14.	7700	160.	110	83.	<4	6.6	11.	460.	14000	3800
41930	48-26.887 -	98.192	-3-03-	5.3	3600	86.	78	39.	45	6.9	18.	350.	2600	1900
41931	48-26.935 -	98.133	-3-03-	28.	7300	120.	150	110.	16	7.3	31.	560.	5800	1900
41932	48-26.407 -	98.705	-3-03-	15.	2000	59.	100	19.	13	6.6	6.8	220.	930	840
41933	48-26.427 -	98.638	-3-03-	18.	4600	250.	420	81.	140	6.9	45.	600.	8700	11000
41934	48-26.328 -	98.543	-3-03-	8.8	4400	110.	110	29.	32	7.4	14.	500.	3300	1900
41935	48-26.880 -	98.121	-3-03-	5.2	1700	50.	41	20.	19	6.4	11.	190.	2600	580
41936	48-26.904 -	98.138	-3-03-	5.1	1600	54.	41	18.	7	7.1	9.7	190.	1800	610
41937	48-26.926 -	98.173	-3-03-	4.2	1900	71.	41	22.	<4	7.0	10.	200.	1600	590
41938	48-26.928 -	98.215	-3-03-	9.2	6800	330.	100	100.	5	7.1	19.	540.	5200	1400
41939	48-26.989 -	98.136	-3-03-	4.9	2000	74.	42	23.	<4	7.2	11.	210.	2200	860
41940	48-26.972 -	98.166	-3-03-	3.1	2300	69.	37	22.	<4	7.1	10.	240.	1500	560
41941	48-26.461 -	98.738	-3-03-	1.6	3500	250.	110	37.	6	6.2	38.	230.	5000	920

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
41942	48-26.353 -	98.730	-3-03-	3.1	1400	80.	40	21.	21	6.6	6.5	130.	1400	240
41946	48-26.413 -	99.052	-3-03-	<0.20	8400	2.6	270	0.9	36	8.4	2.1	910.	740	2400
42000	48-26.444 -	98.655	-3-03-	21.	3400	290.	470	95.	38	7.1	32.	950.	10000	14000
42001	48-26.427 -	98.670	-3-03-	11.	8400	92.	260	23.	64	7.4	28.	770.	6400	13000
42003	48-26.470 -	98.665	-3-03-	2.0	1500	86.	46	22.	7	8.6	8.4	140.	1400	310
42004	48-26.495 -	98.640	-3-03-	9.1	5800	160.	180	33.	7	7.1	31.	570.	3300	3800
42100	48-26.191 -	98.007	-3-03-	6.4	1500	71.	140	36.	24	7.1	5.3	190.	19000	400
42101	48-26.132 -	98.195	-3-03-	1.3	3100	130.	75	52.	23	7.0	8.2	360.	2500	830
42102	48-26.096 -	98.210	-3-03-	16.	1700	45.	70	23.	21	7.0	8.1	270.	1300	1200
42103	48-26.084 -	98.129	-3-03-	2.3	1000	84.	43	29.	30	6.3	6.6	110.	1700	250
42104	48-26.074 -	98.045	-3-03-	0.44	1800	140.	57	44.	22	7.0	7.7	160.	2100	320
42106	48-26.130 -	98.136	-3-03-	5.1	1800	98.	68	32.	7	6.8	7.0	240.	1900	830
42107	48-26.168 -	98.125	-3-03-	51.	4700	410.	230	95.	32	6.7	2.2	410.	11000	3600
42108	48-26.237 -	98.177	-3-03-	3.5	1300	81.	47	25.	4	8.1	10.	180.	1800	300
42109	48-26.217 -	98.114	-3-03-	6.7	2400	83.	81	31.	21	7.2	7.1	290.	2400	1200
42112	48-26.246 -	98.480	-3-03-	14.	3700	99.	120	47.	16	6.8	13.	400.	4500	1800
42113	48-26.209 -	98.420	-3-03-	6.1	4700	56.	130	35.	39	7.1	11.	500.	3800	4300
42114	48-26.137 -	98.310	-3-03-	5.0	1800	71.	40	32.	8	7.3	5.9	88.	1800	230
42115	48-26.227 -	98.291	-3-03-	4.4	1800	100.	43	25.	69	7.1	5.8	140.	1700	380
42126	48-26.615 -	98.865	-3-03-	70.	22000	430.	440	91.	18	7.5	25.	910.	11000	18000
42127	48-26.674 -	98.902	-3-03-	<0.20	7600	32.	170	1.6	45	6.6	4.5	810.	1200	8100
42128	48-26.650 -	98.866	-3-03-	0.45	11000	64.	220	4.1	56	8.1	11.	770.	1700	11000
42130	48-26.687 -	98.806	-3-03-	<0.20	9900	53.	190	1.0	110	8.2	7.8	890.	1300	11000
42131	48-26.563 -	98.885	-3-03-	0.25	9100	82.	170	9.6	9	6.6	3.5	876.	2400	4400
42132	48-26.562 -	98.924	-3-03-	0.38	14000	58.	260	7.7	<4	6.6	6.7	880.	2800	3600
42133	48-26.502 -	98.938	-3-03-	4.6	570	99.	42	8.4	120	7.1	1.4	38.	1600	230
42134	48-26.735 -	98.929	-3-03-	33.	9300	200.	240	34.	34	6.3	11.	740.	8000	2600
42135	48-26.736 -	98.926	-3-03-	22.	6800	81.	250	11.	17	6.6	9.2	700.	3600	2000
42136	48-26.707 -	98.963	-3-03-	0.37	4300	68.	210	8.1	13	6.6	5.0	520.	1600	1800
42137	48-26.688 -	98.966	-3-03-	<0.20	12000	100.	530	21.	4	6.5	7.7	990.	5200	6000
42138	48-26.530 -	98.909	-3-03-	0.37	12000	28.	350	4.2	<4	7.2	4.6	960.	2100	16000
42139	48-26.592 -	98.959	-3-03-	4.3	1300	81.	42	21.	<4	7.1	8.2	139.	1800	260
42143	48-26.556 -	98.679	-3-03-	36.	7900	250.	200	50.	12	6.9	22.	630.	5700	4700
42144	48-26.561 -	98.654	-3-03-	13.	4300	190.	100	38.	29	6.9	14.	380.	3700	2300
42145	48-26.592 -	98.627	-3-03-	14.	4400	160.	120	45.	45	6.9	14.	460.	4800	2900
42146	48-26.596 -	98.594	-3-03-	16.	6500	200.	140	62.	12	6.5	15.	630.	6200	8100
42147	48-26.601 -	98.584	-3-03-	16.	5700	180.	140	59.	9	6.4	19.	800.	6200	4000
42150	48-26.490 -	98.773	-3-03-	13.	5300	140.	290	38.	300	7.1	25.	800.	2500	9700
42152	48-26.571 -	98.761	-3-03-	5.3	14000	660.	320	73.	130	6.5	26.	790.	12000	7800
42153	48-26.580 -	98.798	-3-03-	<0.20	13000	87.	280	1.7	67	6.8	8.8	920.	3100	15000
42154	48-26.587 -	98.736	-3-03-	3.0	7800	260.	290	17.	95	7.1	26.	560.	6500	7100
42155	48-26.591 -	98.758	-3-03-	5.0	560	280.	220	32.	80	7.3	30.	620.	4400	5400
42156	48-26.615 -	98.777	-3-03-	0.72	4880	68.	89	8.0	50	8.2	12.	390.	680	1900
42157	48-26.655 -	98.781	-3-03-	2.4	1600	17.	51	2.2	16	8.1	5.1	180.	210	1100
42163	48-26.406 -	98.840	-3-03-	0.42	2900	19.	68	3.3	18	8.0	7.5	290.	340	1200
42166	48-26.543 -	99.016	-3-03-	<0.20	6300	4.5	200	5.7	6	8.2	3.4	830.	660	3000
42167	48-26.588 -	99.052	-3-03-	<0.20	4608	5.4	250	1.8	4	8.7	3.8	440.	640	2500
42168	48-26.633 -	99.121	-3-03-	<0.20	4800	24.	120	6.3	12	8.2	2.0	430.	1400	1000
42169	48-26.587 -	99.091	-3-03-	<0.20	8600	280.	260	44.	4	7.4	9.4	850.	9900	3400
42200	48-26.254 -	98.278	-3-03-	11.	2300	51.	71	20.	8	7.1	28.	250.	1100	710
42201	48-26.274 -	98.314	-3-03-	6.9	1300	97.	61	23.	<4	7.0	3.5	130.	1600	420
42202	48-26.271 -	98.285	-3-03-	8.4	3200	56.	83	28.	14	7.4	18.	280.	5000	2100
42203	48-26.275 -	98.426	-3-03-	7.0	4900	200.	71	44.	15	7.0	16.	320.	4500	2700
42204	48-26.265 -	98.482	-3-03-	7.4	5700	200.	94	67.	<4	7.5	12.	348.	6800	1400
42206	48-26.337 -	98.470	-3-03-	7.2	2400	78.	84	22.	14	7.1	11.	210.	2600	1200

A-53

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
42207	48-26.337 -	98.434	-3-03-	39.	1800	27.	47	13.	7	7.8	8.8	220.	1100	1700
42208	48-26.308 -	98.285	-3-03-	15.	2100	86.	110	31.	7	7.1	6.3	190.	4000	1800
42209	48-26.309 -	98.327	-3-03-	57.	9000	180.	170	54.	9	7.0	4.8	570.	8600	6300
42210	48-26.328 -	98.338	-3-03-	50.	5300	550.	390	210.	29	6.8	25.	770.	19000	13000
42211	48-26.357 -	98.298	-3-03-	0.91	4000	63.	95	25.	24	7.7	12.	340.	6100	3000
42212	48-26.369 -	98.324	-3-03-	0.47	3400	33.	78	20.	36	8.1	11.	310.	4400	2000
42213	48-26.414 -	98.322	-3-03-	<0.20	3400	61.	84	24.	23	7.8	14.	300.	4600	2700
42214	48-26.380 -	98.474	-3-03-	7.7	4200	190.	90	65.	<4	6.5	20.	240.	5900	1300
42216	48-26.414 -	98.434	-3-03-	13.	2500	54.	88	20.	35	7.2	16.	260.	3700	5300
42217	48-26.449 -	98.470	-3-03-	26.	5100	100.	110	33.	33	7.2	15.	360.	4500	3700
42218	48-26.476 -	98.483	-3-03-	16.	4900	120.	120	38.	10	7.3	20.	360.	4800	3100
42219	48-26.478 -	98.442	-3-03-	1.8	3400	47.	100	15.	<4	7.5	12.	320.	2500	2400
42221	48-26.420 -	98.383	-3-03-	56.	3800	83.	96	37.	9	7.2	18.	340.	6700	2000
42222	48-26.364 -	98.428	-3-03-	0.37	2200	21.	38	8.8	<4	7.8	11.	210.	950	750
42223	48-26.461 -	98.376	-3-03-	13.	3800	100.	95	35.	42	7.2	16.	360.	4500	2600
42224	48-26.471 -	98.340	-3-03-	7.2	3500	62.	100	26.	15	7.6	13.	360.	5100	2000
42227	48-26.482 -	98.263	-3-03-	9.8	4500	74.	130	31.	16	7.6	13.	420.	16000	3300
42229	48-26.283 -	98.546	-3-03-	4.8	4800	190.	100	58.	6	6.7	11.	380.	6300	2000
42230	48-26.373 -	98.546	-3-03-	5.5	3800	170.	46	33.	<4	7.5	7.9	150.	4300	1000
42231	48-26.405 -	98.519	-3-03-	7.1	2200	77.	54	23.	<4	7.1	10.	180.	1600	1200
42235	48-26.467 -	98.549	-3-03-	7.5	6300	160.	110	14.	11	8.1	8.2	400.	6700	3600
42236	48-26.338 -	98.590	-3-03-	17.	3200	220.	190	52.	91	7.6	9.8	640.	12000	14000
42237	48-26.468 -	98.584	-3-03-	3.4	8100	220.	270	19.	300	7.5	11.	710.	5700	11000
42238	48-26.415 -	98.578	-3-03-	1.7	2100	210.	41	34.	38	6.9	14.	140.	1900	1100
42239	48-26.372 -	98.589	-3-03-	9.9	8600	99.	330	31.	58	7.4	19.	840.	6200	9700
42240	48-26.377 -	98.632	-3-03-	20.	7000	150.	230	46.	14	7.1	15.	680.	4700	8700
42241	48-26.325 -	98.628	-3-03-	28.	5400	97.	230	25.	28	7.1	10.	630.	2900	4600
42244	48-26.289 -	98.591	-3-03-	22.	2600	160.	340	49.	77	7.9	16.	900.	9900	13000
42256	48-26.428 -	99.097	-3-03-	10.	2700	140.	150	34.	21	6.4	1.5	280.	3900	810
42258	48-26.485 -	99.046	-3-03-	<0.20	1200	83.	39	23.	<4	7.1	5.9	110.	1400	260
42259	48-26.478 -	99.016	-3-03-	<0.20	7800	14.	240	3.3	20	6.9	4.3	790.	1200	11000
42262	48-26.835 -	98.853	-3-03-	13.	1900	32.	40	14.	7	6.1	14.	270.	440	1200
42265	48-26.940 -	98.943	-3-03-	<0.20	1600	55.	310	8.5	<4	6.9	8.9	870.	5500	6700
42266	48-26.971 -	98.951	-3-03-	<0.20	5500	15.	140	3.1	35	7.4	7.5	650.	930	6400
42267	48-26.916 -	98.910	-3-03-	16.	4700	32.	130	5.4	15	7.1	8.7	550.	1500	3100
42268	48-26.885 -	98.894	-3-03-	7.1	4100	350.	210	98.	8	6.3	23.	830.	9400	5000
42269	48-26.847 -	98.948	-3-03-	20.	300	130.	310	20.	9	6.9	12.	780.	7200	4700
42272	48-26.873 -	98.922	-3-03-	27.	330	190.	250	59.	<4	6.0	20.	790.	9600	3900
42274	48-26.796 -	98.934	-3-03-	36.	4800	170.	340	25.	8	6.5	9.3	<0.1	8600	2600
42275	48-26.846 -	98.883	-3-03-	41.	5400	330.	210	71.	4	6.9	30.	960.	8400	6000
42277	48-26.768 -	98.883	-3-03-	33.	1300	220.	230	36.	9	6.1	20.	830.	5600	4800
42278	48-26.771 -	98.932	-3-03-	<0.20	110	26.	350	1.2	6	7.0	4.3	840.	1300	5900
42279	48-26.810 -	98.889	-3-03-	24.	370	88.	250	14.	5	7.0	19.	810.	3000	4000
42280	48-26.774 -	98.816	-3-03-	12.	1500	22.	49	3.4	8	7.2	12.	230.	230	1300
42281	48-26.783 -	98.806	-3-03-	12.	2800	26.	120	3.8	28	6.9	20.	390.	330	5700
42282	48-26.805 -	98.809	-3-03-	11.	2700	39.	79	6.6	25	7.0	17.	360.	480	4300
42283	48-26.794 -	98.839	-3-03-	16.	7500	58.	210	3.3	80	7.1	19.	740.	1600	10000
42284	48-26.776 -	98.838	-3-03-	32.	7600	88.	200	6.4	110	7.0	21.	720.	1980	10000
42285	48-26.754 -	98.839	-3-03-	20.	8000	260.	230	130.	27	6.8	34.	590.	4800	3500
42286	48-26.820 -	98.820	-3-03-	10.	2800	58.	82	13.	23	6.9	22.	330.	660	1000
42287	48-26.812 -	98.836	-3-03-	24.	2300	85.	51	32.	7	6.7	19.	210.	1200	1100
42288	48-26.785 -	98.850	-3-03-	34.	7900	120.	180	13.	56	6.7	23.	700.	2300	10000
42292	48-26.784 -	99.127	-3-03-	0.43	2900	130.	190	17.	26	6.3	8.7	320.	2700	930
42296	48-26.967 -	99.199	-3-03-	0.32	8900	8.5	240	1.1	34	7.1	2.4	780.	780	4500
42297	48-26.833 -	99.141	-3-03-	3.2	710	98.	49	7.2	12	7.1	0.7	33.	1100	93

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. D. E. SAMPLE ST LAT LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
42300	48-26.159 - 98.190	-3-03-	20.	5600	180.	130	53.	190	6.7	3.9	440.	4100	2100
42301	48-26.111 - 98.220	-3-03-	0.33	1900	190.	36	41.	43	7.0	6.6	95.	2700	210
42302	48-26.091 - 98.160	-3-03-	0.24	6100	610.	61	130.	23	6.6	10.	180.	8900	310
42303	48-26.080 - 98.088	-3-03-	<0.20	1600	170.	33	35.	14	7.1	5.8	80.	2400	190
42304	48-26.126 - 98.052	-3-03-	3.5	1200	86.	33	22.	<4	7.4	4.6	110.	1800	350
42305	48-26.138 - 98.028	-3-03-	11.	2500	130.	76	53.	27	6.4	5.5	190.	3400	670
42306	48-26.137 - 98.241	-3-03-	9.6	1700	81.	53	29.	11	7.2	7.4	170.	1700	870
42307	48-26.194 - 98.110	-3-03-	16.	2600	75.	93	26.	35	8.1	5.9	270.	2600	1700
42308	48-26.205 - 98.037	-3-03-	10.	1300	44.	140	18.	19	6.9	6.2	270.	1500	700
42309	48-26.231 - 98.444	-3-03-	39.	3000	38.	64	20.	72	6.9	7.8	270.	2200	2500
42310	48-26.224 - 98.401	-3-03-	11.	3500	140.	70	37.	11	6.5	4.9	220.	4700	1100
42311	48-26.199 - 98.287	-3-03-	0.68	3300	51.	49	14.	22	6.9	3.8	250.	1800	2100
42312	48-26.232 - 98.330	-3-03-	9.7	3000	150.	57	33.	7	6.9	3.3	180.	2500	1300
42323	48-26.482 - 98.932	-3-03-	0.65	3800	160.	300	19.	6	7.7	7.2	610.	6600	5200
42324	48-26.639 - 98.850	-3-03-	<0.20	20000	63.	250	1.4	110	8.3	7.9	840.	2100	18000
42326	48-26.665 - 98.896	-3-03-	<0.20	8800	36.	140	1.2	41	8.3	3.9	530.	1400	12000
42327	48-26.711 - 98.833	-3-03-	33.	12000	220.	120	120.	10	7.2	28.	590.	5200	6800
42329	48-26.389 - 98.910	-3-03-	5.8	1500	52.	51	14.	<4	8.2	3.7	120.	990	530
42330	48-26.396 - 98.788	-3-03-	3.8	3500	30.	80	4.5	49	8.2	16.	280.	550	4100
42331	48-26.416 - 98.756	-3-03-	18.	7200	130.	130	24.	46	7.4	13.	430.	2400	6500
42342	48-26.431 - 98.901	-3-03-	0.45	13000	110.	320	32.	<4	8.2	8.0	720.	4900	5800
42343	48-26.497 - 98.675	-3-03-	6.7	3200	590.	63	20.	<4	7.4	3.7	90.	8700	580
42344	48-26.607 - 98.555	-3-03-	3.1	2200	160.	65	37.	4	8.0	14.	120.	3500	580
42345	48-26.594 - 98.558	-3-03-	26.	4700	120.	140	44.	84	8.1	23.	480.	4700	2600
42346	48-26.591 - 98.564	-3-03-	17.	5900	160.	170	61.	21	8.2	27.	580.	5500	3300
42347	48-26.602 - 98.572	-3-03-	3.9	4300	57.	210	9.0	87	8.4	11.	570.	6200	4900
42348	48-26.606 - 98.538	-3-03-	14.	2600	110.	120	41.	34	7.9	22.	420.	3500	3500
42349	48-26.542 - 98.575	-3-03-	15.	4400	140.	140	38.	17	7.5	22.	480.	3500	3100
42350	48-26.543 - 98.579	-3-03-	16.	5400	100.	180	26.	18	7.7	18.	520.	4000	3400
42351	48-26.586 - 98.620	-3-03-	13.	4300	180.	150	50.	16	6.6	17.	400.	4400	2000
42352	48-26.617 - 98.541	-3-03-	29.	10000	270.	210	120.	9	6.6	22.	870.	8400	8800
42353	48-26.611 - 98.579	-3-03-	16.	6200	160.	150	63.	<4	6.9	20.	620.	5500	4700
42354	48-26.699 - 98.576	-3-03-	10.	3400	79.	87	26.	39	6.8	14.	370.	2800	2400
42355	48-26.689 - 98.539	-3-03-	7.3	4400	61.	220	23.	33	8.0	22.	550.	5000	2500
42356	48-26.579 - 98.613	-3-03-	10.	8200	82.	330	30.	19	7.7	34.	740.	5000	3300
42358	48-26.702 - 98.651	-3-03-	19.	2600	67.	91	23.	27	6.8	16.	340.	2200	2000
42359	48-26.746 - 98.583	-3-03-	5.1	2800	110.	84	36.	11	6.8	18.	300.	3500	1300
42360	48-26.735 - 98.545	-3-03-	4.5	780	60.	45	29.	11	7.1	5.7	77.	1400	450
42361	48-26.655 - 98.577	-3-03-	2.6	240	100.	33	16.	10	7.1	9.3	37.	750	220
42362	48-26.646 - 98.637	-3-03-	4.3	3300	160.	110	35.	<4	6.8	18.	300.	3900	960
42363	48-26.515 - 98.668	-3-03-	14.	6900	200.	260	37.	10	7.3	31.	610.	4900	3400
42364	48-26.519 - 98.649	-3-03-	5.5	3400	56.	95	19.	37	8.0	15.	380.	1200	1900
42365	48-26.513 - 98.579	-3-03-	8.8	4500	60.	130	25.	13	8.4	17.	430.	1900	3000
42366	48-26.514 - 98.553	-3-03-	14.	6500	97.	210	24.	31	7.8	14.	590.	4100	5200
42367	48-26.563 - 98.514	-3-03-	1.4	4700	10.	160	5.0	28	9.0	9.1	480.	1800	2600
42368	48-26.656 - 98.543	-3-03-	6.4	3500	33.	160	10.	15	8.1	13.	410.	2100	1800
42400	48-26.731 - 98.365	-3-03-	<0.20	1500	6.2	46	1.1	10	7.3	3.2	270.	530	1100
42401	48-26.738 - 98.386	-3-03-	13.	9100	190.	140	140.	31	6.7	23.	620.	12800	4600
42402	48-26.749 - 98.387	-3-03-	7.2	3100	30.	95	14.	7	7.1	10.	400.	2300	1600
42403	48-26.695 - 98.433	-3-03-	1.9	1200	73.	31	21.	<4	7.1	5.3	140.	1000	698
42404	48-26.657 - 98.481	-3-03-	0.72	2900	34.	130	12.	5	7.4	11.	390.	2700	1900
42405	48-26.740 - 98.440	-3-03-	25.	4100	36.	110	33.	53	7.5	17.	680.	2300	5200
42406	48-26.689 - 98.494	-3-03-	12.	5600	65.	130	32.	<4	7.3	18.	450.	4600	1800
42407	48-26.508 - 98.073	-3-03-	14.	6900	92.	160	44.	<4	7.1	13.	600.	20000	4700
42408	48-26.890 - 98.135	-3-03-	3.2	1800	52.	50	19.	<4	7.3	14.	190.	2000	620

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
42409	48-26.926 -	98.091	-3-03-	4.5	2100	59.	57	25.	<4	7.3	16.	220.	2700	890
42410	48-26.563 -	98.325	-3-03-	19.	1900	230.	230	140.	<4	6.4	30.	750.	17000	5800
42411	48-26.600 -	98.338	-3-03-	0.34	1900	5.7	52	1.1	6	7.9	2.4	300.	560	2100
42412	48-26.692 -	98.331	-3-03-	<0.20	1500	2.7	45	0.4	6	8.5	2.0	260.	400	1700
42413	48-26.738 -	98.481	-3-03-	46.	6600	55.	210	40.	62	7.6	16.	580.	5500	12000
42414	48-26.660 -	98.434	-3-03-	0.40	3200	27.	110	7.2	6	8.1	8.0	390.	3100	1900
42415	48-26.562 -	98.386	-3-03-	0.43	2800	15.	74	3.6	<4	7.1	5.1	360.	1800	1900
42416	48-26.562 -	98.450	-3-03-	0.25	3400	24.	120	5.1	18	7.2	5.8	330.	1900	2300
42417	48-26.563 -	98.483	-3-03-	<0.20	3700	22.	120	6.2	7	7.4	7.2	450.	1600	2600
42418	48-26.524 -	98.485	-3-03-	16.	6000	220.	120	66.	<4	6.9	22.	450.	5900	3200
42419	48-26.517 -	98.449	-3-03-	1.4	4200	29.	120	11.	7	7.1	7.9	500.	1800	3300
42420	48-26.522 -	98.386	-3-03-	15.	5700	140.	140	60.	<4	6.9	22.	510.	7000	3200
42421	48-26.641 -	98.334	-3-03-	3.3	2100	68.	46	31.	6	7.2	8.8	250.	2300	1400
42422	48-26.610 -	98.438	-3-03-	7.5	4600	160.	54	59.	<4	6.8	15.	440.	2800	2400
42423	48-26.604 -	98.377	-3-03-	49.	4000	39.	120	46.	33	6.7	31.	450.	14000	6800
42424	48-26.686 -	98.374	-3-03-	10.	2300	39.	68	25.	<4	7.3	13.	330.	2700	2200
42425	48-26.797 -	98.426	-3-03-	0.38	1400	4.6	60	0.6	8	7.0	2.3	240.	690	810
42426	48-26.858 -	98.304	-3-03-	<0.20	1500	4.2	48	1.3	42	7.4	2.1	260.	1000	1500
42427	48-26.952 -	98.293	-3-03-	2.3	2500	140.	38	30.	7	6.6	8.3	210.	1700	750
42428	48-26.938 -	98.296	-3-03-	7.4	470	650.	110	210.	<4	5.9	21.	460.	12000	660
42429	48-26.811 -	98.438	-3-03-	15.	6900	340.	110	120.	<4	5.9	22.	420.	7200	1400
42430	48-26.846 -	98.436	-3-03-	6.4	1400	79.	70	33.	<4	6.8	14.	130.	1600	570
42431	48-26.846 -	98.408	-3-03-	8.2	2400	35.	77	27.	31	6.7	12.	340.	1700	1400
42433	48-26.845 -	98.392	-3-03-	0.26	1700	3.6	48	0.3	5	7.6	1.8	300.	390	3000
42434	48-26.918 -	98.317	-3-03-	0.86	1400	18.	60	11.	19	7.7	7.9	250.	2200	1200
42435	48-26.921 -	98.273	-3-03-	<0.20	1500	49.	60	16.	100	6.6	9.3	220.	1700	1000
42436	48-26.927 -	98.255	-3-03-	1.8	2400	130.	41	34.	<4	6.5	10.	210.	2100	790
42437	48-26.858 -	98.355	-3-03-	<0.20	1500	2.6	43	0.2	46	7.4	1.4	260.	260	1300
42438	48-26.844 -	98.361	-3-03-	23.	370	14.	86	34.	160	7.7	19.	740.	970	2700
42439	48-26.921 -	98.295	-3-03-	<0.20	1500	39.	60	13.	22	6.7	9.8	230.	2500	1200
42440	48-26.914 -	98.297	-3-03-	2.9	8100	470.	110	140.	<4	6.1	16.	440.	6100	1400
42441	48-26.867 -	98.298	-3-03-	2.8	2200	97.	36	24.	<4	6.7	7.9	220.	1400	810
42442	48-26.901 -	98.277	-3-03-	15.	1300	35.	70	14.	<4	6.9	11.	250.	2700	1100
42443	48-26.892 -	98.294	-3-03-	2.8	2400	85.	46	28.	<4	6.7	14.	220.	2100	730
42444	48-26.880 -	98.288	-3-03-	2.9	2300	140.	38	43.	<4	6.8	15.	160.	1600	550
42445	48-26.818 -	98.398	-3-03-	29.	5800	69.	120	54.	23	6.4	16.	520.	7900	3700
42446	48-26.822 -	98.419	-3-03-	<0.20	1300	3.2	54	0.4	10	8.0	1.7	230.	210	740
42447	48-26.786 -	98.422	-3-03-	<0.20	1400	3.4	50	0.3	<4	8.4	1.8	260.	270	810
42448	48-26.765 -	98.428	-3-03-	<0.20	1600	6.1	76	1.7	<4	7.7	3.4	270.	450	890
42449	48-26.757 -	98.416	-3-03-	<0.20	1600	5.0	49	0.9	<4	7.8	2.7	250.	390	930
42450	48-26.735 -	99.097	-3-03-	<0.20	6100	95.	360	5.4	<4	7.8	4.4	610.	3400	1400
42451	48-26.756 -	99.067	-3-03-	<0.20	7000	300.	440	36.	<4	7.0	7.0	720.	6200	3400
42452	48-26.708 -	99.152	-3-03-	<0.20	4400	2.2	120	0.7	32	8.5	1.2	510.	340	10000
42453	48-26.773 -	98.405	-3-03-	<0.20	1500	4.7	51	0.6	6	7.9	2.1	250.	350	840
42454	48-26.763 -	98.383	-3-03-	0.59	1600	6.3	44	3.0	6	7.9	2.3	250.	590	1000
42455	48-26.779 -	98.382	-3-03-	0.49	1400	4.0	43	0.5	<4	7.9	1.9	230.	300	890
42456	48-26.779 -	98.371	-3-03-	16.	1800	18.	100	8.6	12	7.4	9.2	300.	1700	1100
42457	48-26.767 -	98.352	-3-03-	<0.20	1500	6.3	74	1.8	24	8.2	3.5	260.	410	950
42458	48-26.783 -	98.351	-3-03-	<0.20	1400	2.8	41	0.4	18	6.9	1.8	250.	380	1100
42459	48-26.800 -	98.323	-3-03-	23.	2900	18.	95	10.	35	6.9	8.1	380.	2900	1500
42460	48-26.813 -	98.310	-3-03-	9.9	4300	42.	58	37.	29	6.5	15.	460.	1200	1400
42461	48-26.819 -	98.325	-3-03-	<0.20	1500	3.8	55	1.2	21	7.4	2.8	270.	600	1200
42462	48-26.828 -	98.313	-3-03-	16.	6500	67.	140	40.	17	6.5	14.	590.	12000	1800
42463	48-26.853 -	98.306	-3-03-	<0.20	1600	1.8	44	0.3	23	7.3	1.2	280.	240	1600
42464	48-26.787 -	98.300	-3-03-	<0.20	1500	2.2	48	0.4	23	7.3	1.7	280.	280	2000

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	CA (PPM)	LI (PPB)	MG (PPM)	MO (PPB)	PH	K (PPM)	NA (PPM)	SR (PPB)	B (PPB)
42465	48-26.765 -	98.311	-3-03-	<0.20	1500	4.2	64	1.2	17	7.5	2.6	260.	380	1000
42466	48-26.827 -	98.363	-3-03-	<0.20	1400	2.6	42	0.4	8	7.2	1.7	260.	600	1400
42467	48-26.800 -	98.375	-3-03-	<0.20	1500	5.2	67	1.3	18	7.2	2.9	260.	1600	990
42468	48-26.785 -	98.329	-3-03-	15.	2200	18.	63	7.9	<4	7.0	6.4	220.	1700	1100
42469	48-26.861 -	98.261	-3-03-	2.4	1200	89.	26	28.	6	6.8	7.9	58.	1200	360
42470	48-26.813 -	99.076	-3-03-	<0.20	2200	89.	120	3.9	<4	7.2	4.9	180.	2100	600
42471	48-26.914 -	99.176	-3-03-	<0.20	11000	8.7	190	2.9	5	7.7	2.0	630.	1400	7400
42472	48-26.863 -	99.006	-3-03-	<0.20	7900	10.	180	0.8	<4	8.1	2.2	380.	700	7600
42499	48-26.651 -	99.087	-3-03-	0.26	7800	370.	300	89.	4	7.3	6.0	480.	9500	4100
42500	48-26.670 -	99.064	-3-03-	<0.20	4700	85.	140	7.3	6	7.8	2.7	280.	2600	3000
42501	48-26.731 -	99.105	-3-03-	16.	5700	230.	370	50.	<4	7.5	4.8	390.	8000	2300
42503	48-26.718 -	99.121	-3-03-	<0.20	3700	8.9	130	1.8	6	8.3	1.3	350.	890	4400
42504	48-26.687 -	99.106	-3-03-	<0.20	3400	29.	220	9.8	<4	8.2	3.2	600.	1700	3900
42505	48-26.725 -	99.015	-3-03-	23.	3000	110.	180	16.	9	7.7	10.	380.	1700	1900
42506	48-26.700 -	99.001	-3-03-	0.20	4600	1.0	160	0.4	36	9.1	2.4	600.	320	6200
42507	48-26.749 -	99.105	-3-03-	20.	7700	270.	530	64.	<4	8.0	9.9	660.	5300	2200
42508	48-26.700 -	99.077	-3-03-	5.6	3600	270.	160	19.	4	7.5	5.5	340.	4400	1400
42509	48-26.699 -	99.082	-3-03-	0.50	8600	450.	310	44.	9	7.2	7.9	630.	12000	1600
42512	48-26.694 -	99.094	-3-03-	51.	2800	260.	160	32.	6	7.2	3.9	230.	4400	1000
42513	48-26.534 -	99.147	-3-03-	0.52	3300	7.0	120	1.9	<4	8.1	2.0	470.	520	5400
42515	48-26.766 -	99.147	-3-03-	<0.20	6800	68.	320	15.	<4	7.6	5.4	700.	2400	3300
42516	48-26.566 -	99.092	-3-03-	0.48	5200	14.	220	2.8	5	8.3	2.5	480.	1400	3000
42517	48-26.627 -	99.093	-3-03-	0.31	4400	82.	190	26.	5	7.9	4.4	450.	3800	1400
42518	48-26.563 -	99.123	-3-03-	0.22	4700	4.4	140	0.4	<4	7.2	1.7	510.	380	2300
42522	48-26.518 -	99.066	-3-03-	1.1	8600	410.	240	94.	5	6.9	6.8	590.	9800	2300
42523	48-26.553 -	99.071	-3-03-	0.40	4400	270.	170	34.	4	7.1	7.0	310.	6400	670
42524	48-26.637 -	99.052	-3-03-	<0.20	3400	40.	200	8.8	5	7.8	4.1	330.	2800	1900
42525	48-26.642 -	99.063	-3-03-	<0.20	3800	270.	150	28.	<4	6.9	4.9	250.	5500	830
42526	48-26.643 -	99.039	-3-03-	0.34	8100	110.	190	24.	6	7.5	7.0	540.	4900	4300
42527	48-26.662 -	99.005	-3-03-	0.34	13000	9.9	220	2.1	10	8.3	3.7	720.	2900	12000
42528	48-26.623 -	99.020	-3-03-	0.25	7100	25.	250	29.	<4	7.6	6.7	480.	4200	3100
42530	48-26.624 -	99.046	-3-03-	<0.20	4100	39.	240	11.	5	8.1	4.3	370.	4200	1600
42531	48-26.608 -	99.066	-3-03-	0.25	5100	26.	210	5.8	<4	8.3	2.9	420.	3000	2000
42532	48-26.624 -	99.077	-3-03-	<0.20	5700	29.	180	8.1	<4	8.1	2.5	450.	2700	3000
42533	48-26.607 -	99.095	-3-03-	0.43	9000	370.	240	18.	<4	7.9	5.5	560.	10000	3100
42534	48-26.737 -	99.160	-3-03-	8.0	14000	110.	230	53.	5	8.4	4.8	880.	3700	11000
42535	48-26.953 -	99.338	-3-03-	0.59	9800	130.	230	140.	<4	7.5	4.6	680.	7300	3400
42569	48-26.893 -	99.126	-3-03-	0.30	6000	340.	310	25.	6	6.1	8.9	380.	4400	640
42572	48-26.874 -	99.182	-3-03-	0.27	13000	5.8	250	3.9	7	6.9	2.2	810.	1700	7800
42575	48-26.856 -	99.119	-3-03-	0.43	2700	25.	130	3.5	5	7.4	2.7	290.	820	1000
42577	48-26.825 -	99.173	-3-03-	5.6	920	17.	83	1.4	9	7.3	1.3	130.	310	470
42578	48-26.790 -	99.019	-3-03-	0.24	6200	2.0	160	0.4	<4	7.8	1.8	500.	400	5700

APPENDIX B

STREAM SEDIMENT

APPENDIX B

STREAM SEDIMENT

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

Table B-1

STATISTICAL SUMMARY FOR STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

	NO. SAMPLES ANALYZED										LN TRANSFORMATION			
													ROBUST	
ELEMENT	MEASURABLE VALUES	BELOW DETECTION LIMIT	DETECTION LIMIT	MINIMUM VALUE	MAXIMUM VALUE	MEAN	MEDIAN	MODE	STANDARD DEVIATION	COEFFICIENT OF VARIATION	MEAN	S. D.	MEAN	S. D.
U-FL	171			0.84	6.14	2.01	1.85	1.61	0.763	0.379	0.64	0.34	0.63	0.36
U-NT	169			1.20	14.40	2.50	2.30	2.28	1.216	0.486	0.86	0.31	0.84	0.28
TH	156	15	<2	<2	13	6	6	7	2.3	0.4	1.72	0.41	1.69	0.48
U/TU	169			0.20	1.42	0.82	0.81	0.81	0.188	0.229	-0.23	0.26	-0.21	0.24
TH/U	169			0.32	7.22	2.41	2.22	2.26	1.284	0.533	0.71	0.64	0.74	0.72
AG	0	171	<2	<2	<2		<2	<2						
AL	171			2.40	6.20	4.43	4.50	4.37	0.693	0.157	1.47	0.17	1.48	0.16
AS	171			0.7	9.3	2.6	2.1	2.1	1.51	0.58	0.82	0.51	0.81	0.54
B	162	9	<10	<10	181	35	28	25	23.8	0.7	3.39	0.58	3.32	0.69
BA	171			227	2851	632	544	507	354.4	0.6	6.37	0.35	6.34	0.32
BE	168	3	<1	<1	2	1	<1	<1	0.4	0.3	0.11	0.26		
CA	171			0.35	11.11	4.65	4.36	2.49	2.595	0.557	1.32	0.73	1.37	0.72
CE	170	1	<10	<10	238	39	37	35	17.2	0.4	3.63	0.25	3.62	0.21
CO	97	74	<4	<4	19	5	<4	<4	2.0	0.3	1.69	0.28		
CR	171			8	86	22	21	25	8.0	0.4	3.04	0.32	3.04	0.30
CU	170	1	<2	<2	31	11	11	11	4.6	0.4	2.36	0.41	2.37	0.40
FE	171			0.71	15.78	1.89	1.75	1.79	1.215	0.644	0.56	0.34	0.55	0.31
K	171			0.40	1.64	1.15	1.14	1.01	0.210	0.183	0.12	0.20	0.13	0.19
LI	171			11	40	21	21	21	6.0	0.3	3.04	0.27	3.05	0.29
MG	171			0.16	1.53	0.64	0.60	0.42	0.266	0.418	-0.54	0.44	-0.53	0.44
MN	171			130	2987	493	365	318	419.3	0.8	6.01	0.55	5.98	0.51
MO	27	144	<4	<4	8	4	<4	<4	1.2	0.2	1.56	0.21		
NA	171			0.24	6.18	0.97	0.87	0.67	0.617	0.636	-0.15	0.45	-0.16	0.43
NB	164	7	<4	<4	46	7	7	6	3.5	0.5	1.95	0.28	1.93	0.23
NI	169	2	<2	<2	43	11	11	7	4.8	0.4	2.40	0.40	2.39	0.42
P	171			101	2600	536	438	483	359.5	0.7	6.11	0.58	6.11	0.57
SC	170	1	<1	<1	21	4	4	3	1.9	0.4	1.48	0.33	1.47	0.34
SE	90	81	<0.1	<0.1	1.2	0.3	0.1	<0.1	0.23	0.68	-1.26	0.63		
SR	171			72	1133	274	257	292	139.7	0.5	5.49	0.52	5.50	0.53
TI	171			1256	58582	2908	2310	2361	4580.8	1.6	7.80	0.40	7.75	0.28
V	171			6	523	53	48	40	41.0	0.8	3.88	0.40	3.87	0.32
Y	171			6	31	12	13	13	3.1	0.2	2.54	0.24	2.54	0.23
ZN	171			19	162	62	55	46	27.7	0.4	4.05	0.43	4.05	0.46
ZR	171			25	189	65	65	67	16.4	0.3	4.15	0.24	4.16	0.22

NOTE: Refer to Table 1, Page 25 and Table C-1, Page C-4 for concentration units and symbol definitions.

Table B-2

CORRELATION MATRIX FOR STREAM SEDIMENT
OF THE BROWNSVILLE-McALLEN QUADRANGLES

	L-U	LUNT	L-CA	L-SR	L-AS	L-K	L-NA	L-AL	L-LI	L-CU	L-MG	L-NI
L-U	1.00 (171)											
LUNT	0.68*** 0.72*** (169)	1.00 (169)										
L-CA	0.52*** 0.59*** (171)	0.41*** 0.58*** (169)	1.00 (171)									
L-SR	0.59*** 0.67*** (171)	0.47*** 0.60*** (169)	0.82*** 0.82*** (171)	1.00 (171)								
L-AS	0.46*** 0.50*** (171)	0.35*** 0.45*** (169)	0.58*** 0.64*** (171)	0.54*** 0.59*** (171)	1.00 (171)							
L-K	-0.13* -0.15** (171)	-0.30*** -0.23*** (169)	-0.26*** -0.33*** (171)	-0.28*** -0.34*** (171)	-0.12 -0.19** (171)	1.00 (171)						
L-NA	0.01 0.03 (171)	0.02 0.13 (169)	0.18** 0.08 (171)	0.46*** 0.38*** (171)	0.13* 0.12 (171)	-0.24*** -0.28*** (171)	1.00 (171)					
L-AL	0.35*** 0.39*** (171)	0.04 0.20*** (169)	0.27*** 0.25*** (171)	0.27*** 0.27*** (171)	0.45*** 0.43*** (171)	0.41*** 0.29*** (171)	0.00 -0.02 (171)	1.00 (171)				
L-LI	0.56*** 0.59*** (171)	0.31*** 0.48*** (169)	0.57*** 0.63*** (171)	0.62*** 0.66*** (171)	0.63*** 0.62*** (171)	0.17** 0.07 (171)	0.15* 0.14* (171)	0.73*** 0.68*** (171)	1.00 (171)			
L-CU	0.49*** 0.48*** (170)	0.23*** 0.32*** (168)	0.31*** 0.38*** (170)	0.22*** 0.29*** (170)	0.46*** 0.44*** (170)	0.40*** 0.38*** (170)	-0.31*** -0.41*** (170)	0.65*** 0.67*** (170)	0.66*** 0.63*** (170)	1.00 (170)		
L-MG	0.50*** 0.52*** (171)	0.28*** 0.37*** (169)	0.49*** 0.54*** (171)	0.35*** 0.43*** (171)	0.59*** 0.56*** (171)	0.32*** 0.26*** (171)	-0.14* -0.26*** (171)	0.70*** 0.69*** (171)	0.74*** 0.72*** (171)	0.84*** 0.86*** (170)	1.00 (171)	
L-NI	0.45*** 0.47*** (169)	0.29*** 0.36*** (167)	0.33*** 0.41*** (169)	0.22*** 0.33*** (169)	0.43*** 0.43*** (169)	0.32*** 0.33*** (169)	-0.33*** -0.39*** (169)	0.50*** 0.57*** (169)	0.61*** 0.60*** (169)	0.82*** 0.87*** (169)	0.80*** 0.81*** (169)	1.00 (169)
L-P	0.53*** 0.53*** (171)	0.37*** 0.45*** (169)	0.60*** 0.63*** (171)	0.45*** 0.51*** (171)	0.48*** 0.47*** (171)	0.23*** 0.22*** (171)	-0.21*** -0.28*** (171)	0.53*** 0.53*** (171)	0.63*** 0.62*** (171)	0.76*** 0.75*** (170)	0.78*** 0.79*** (171)	0.73*** 0.74*** (169)
L-ZN	0.50*** 0.48*** (171)	0.45*** 0.47*** (169)	0.41*** 0.44*** (171)	0.35*** 0.39*** (171)	0.43*** 0.37*** (171)	0.23*** 0.30*** (171)	-0.27*** -0.34*** (171)	0.48*** 0.50*** (171)	0.61*** 0.58*** (171)	0.77*** 0.79*** (170)	0.77*** 0.76*** (171)	0.79*** 0.81*** (169)
L-TH	0.25*** 0.25*** (186)	0.21*** 0.22*** (154)	0.12 0.14* (156)	0.05 0.11 (156)	0.13 0.13 (156)	-0.01 -0.02 (156)	-0.14* -0.17** (156)	0.27*** 0.28*** (156)	0.19** 0.15* (156)	0.32*** 0.32*** (156)	0.36*** 0.32*** (156)	0.26*** 0.27*** (155)
L-BA	-0.11 -0.18** (171)	0.01 -0.08 (169)	-0.02 -0.14* (171)	-0.04 -0.17** (171)	-0.06 -0.16** (171)	-0.17** -0.14* (171)	0.05 0.20*** (171)	-0.13 -0.22*** (171)	-0.19** -0.31*** (171)	-0.25*** -0.35*** (170)	-0.26*** -0.32*** (171)	-0.34*** -0.43*** (169)
L-CE	0.28*** 0.34*** (170)	0.58*** 0.47*** (168)	0.01 0.12 (170)	0.01 0.16** (170)	0.14* 0.16** (170)	-0.13* 0.22*** (170)	-0.14* -0.17** (170)	0.22*** 0.52*** (170)	0.18** 0.29*** (170)	0.29*** 0.49*** (170)	0.31*** 0.50*** (170)	0.38*** 0.52*** (169)
L-ZR	0.36*** 0.40*** (171)	0.45*** 0.39*** (169)	0.09 0.16** (171)	0.02 0.12 (171)	0.30*** 0.31*** (171)	0.19** 0.37*** (171)	-0.18** -0.26*** (171)	0.45*** 0.59*** (171)	0.45*** 0.44*** (171)	0.57*** 0.63*** (170)	0.59*** 0.67*** (171)	0.58*** 0.61*** (169)
L-CR	0.51*** 0.51*** (171)	0.59*** 0.53*** (169)	0.35*** 0.44*** (171)	0.26*** 0.37*** (171)	0.46*** 0.46*** (171)	0.09 0.25*** (171)	-0.26*** -0.32*** (171)	0.47*** 0.57*** (171)	0.54*** 0.57*** (171)	0.70*** 0.80*** (170)	0.73*** 0.77*** (171)	0.76*** 0.82*** (169)
L-SC	0.51*** 0.51*** (170)	0.56*** 0.49*** (168)	0.36*** 0.45*** (170)	0.30*** 0.41*** (170)	0.54*** 0.53*** (170)	-0.01 0.14* (170)	-0.12 -0.19** (170)	0.59*** 0.71*** (170)	0.62*** 0.64*** (170)	0.66*** 0.76*** (170)	0.74*** 0.80*** (170)	0.70*** 0.75*** (169)
L-FE	0.44*** 0.49*** (171)	0.65*** 0.58*** (169)	0.29*** 0.44*** (171)	0.24*** 0.39*** (171)	0.43*** 0.46*** (171)	-0.11 0.15** (171)	-0.15** -0.22*** (171)	0.33*** 0.61*** (171)	0.39*** 0.54*** (171)	0.50*** 0.70*** (170)	0.56*** 0.73*** (171)	0.59*** 0.73*** (169)
L-Y	0.48*** 0.50*** (171)	0.53*** 0.48*** (169)	0.29*** 0.36*** (171)	0.21*** 0.32*** (171)	0.45*** 0.43*** (171)	0.12 0.24*** (171)	-0.16** -0.21*** (171)	0.55*** 0.68*** (171)	0.49*** 0.52*** (171)	0.62*** 0.69*** (170)	0.72*** 0.76*** (171)	0.65*** 0.69*** (169)
L-MN	0.43*** 0.52*** (171)	0.58*** 0.62*** (169)	0.39*** 0.44*** (171)	0.43*** 0.51*** (171)	0.36*** 0.36*** (171)	-0.10 0.07 (171)	-0.03 -0.08 (171)	0.22*** 0.42*** (171)	0.35*** 0.41*** (171)	0.40*** 0.53*** (170)	0.45*** 0.56*** (171)	0.48*** 0.56*** (169)
L-NB	0.31*** 0.37*** (164)	0.66*** 0.61*** (162)	0.25*** 0.41*** (164)	0.24*** 0.42*** (164)	0.20*** 0.27*** (164)	-0.29*** -0.06 (164)	0.03 0.05 (164)	-0.09 0.12 (164)	0.13* 0.26*** (164)	0.09 0.25*** (163)	0.15* 0.31*** (164)	0.25*** 0.38*** (162)
L-V	0.44*** 0.60*** (171)	0.70*** 0.76*** (169)	0.41*** 0.66*** (171)	0.42*** 0.65*** (171)	0.43*** 0.59*** (171)	-0.36*** -0.22*** (171)	0.03 0.07 (171)	0.15* 0.44*** (171)	0.44*** 0.61*** (171)	0.30*** 0.47*** (170)	0.32*** 0.53*** (171)	0.39*** 0.53*** (169)
L-TI	0.07 0.14* (171)	0.59*** 0.38*** (169)	0.01 0.09 (171)	0.01 0.08 (171)	0.02 0.10 (171)	-0.49*** -0.08 (171)	0.08 0.16** (171)	-0.19** 0.22*** (171)	-0.15** 0.06 (171)	-0.21*** 0.00 (170)	-0.18** 0.04 (171)	-0.10 0.07 (169)

NOTE: (1) Pearson correlation/Spearman correlation/(sample size). If either element has a concentration below the laboratory detection limits, it is omitted from the pairwise computations.
(2) Significance levels: *-10%, **-5%, ***-1%.

	L-P	L-ZN	L-TH	L-BA	L-CE	L-ZR	L-CR	L-SC	L-FE	L-Y	L-NI	L-NB	L-V	L-TI
L-P	1.00 (171)													
L-ZN	0.87*** 0.85*** (171)	1.00 (171)												
L-TH	0.25*** 0.23*** (156)	0.29*** 0.24*** (156)	1.00 (156)											
L-BA	-0.34*** -0.40*** (171)	-0.35*** -0.42*** (171)	-0.09 -0.08 (156)	1.00 (171)										
L-CE	0.32*** 0.44*** (170)	0.49*** 0.56*** (170)	0.40*** 0.49*** (156)	-0.12 -0.18** (170)	1.00 (170)									
L-ZR	0.51*** 0.57*** (171)	0.68*** 0.70*** (171)	0.47*** 0.44*** (156)	-0.10 -0.13* (171)	0.76*** 0.76*** (170)	1.00 (171)								
L-CR	0.75*** 0.79*** (171)	0.87*** 0.89*** (171)	0.37*** 0.33*** (156)	-0.25*** -0.40*** (171)	0.70*** 0.68*** (170)	0.78*** 0.76*** (171)	1.00 (171)							
L-SC	0.69*** 0.72*** (170)	0.79*** 0.80*** (170)	0.39*** 0.37*** (156)	-0.28*** -0.35*** (170)	0.73*** 0.72*** (170)	0.80*** 0.76*** (170)	0.90*** 0.89*** (170)	1.00 (170)						
L-FE	0.60*** 0.72*** (171)	0.76*** 0.83*** (171)	0.34*** 0.34*** (156)	-0.17** -0.31*** (171)	0.82*** 0.76*** (170)	0.75*** 0.76*** (171)	0.90*** 0.92*** (171)	0.89*** 0.92*** (170)	1.00 (171)					
L-Y	0.67*** 0.70*** (171)	0.76*** 0.76*** (171)	0.41*** 0.39*** (156)	-0.15** -0.22*** (171)	0.76*** 0.79*** (170)	0.85*** 0.89*** (171)	0.88*** 0.83*** (171)	0.89*** 0.89*** (170)	0.87*** 0.89*** (171)	1.00 (171)				
L-NI	0.56*** 0.63*** (171)	0.62*** 0.67*** (171)	0.26*** 0.29*** (156)	-0.19** -0.24*** (171)	0.54*** 0.62*** (170)	0.53*** 0.59*** (171)	0.64*** 0.70*** (171)	0.63*** 0.72*** (170)	0.68*** 0.75*** (171)	0.63*** 0.71*** (171)	1.00 (171)			
L-NB	0.27*** 0.39*** (164)	0.43*** 0.48*** (164)	0.26*** 0.29*** (151)	-0.02 -0.11 (164)	0.71*** 0.59*** (163)	0.56*** 0.48*** (164)	0.54*** 0.49*** (164)	0.53*** 0.46*** (163)	0.70*** 0.58*** (164)	0.57*** 0.52*** (164)	0.54*** 0.54*** (164)	1.00 (164)		
L-V	0.41*** 0.57*** (171)	0.57*** 0.61*** (171)	0.24*** 0.24*** (156)	-0.07 -0.21*** (171)	0.69*** 0.53*** (170)	0.62*** 0.48*** (171)	0.67*** 0.69*** (171)	0.75*** 0.73*** (170)	0.78*** 0.78*** (171)	0.58*** 0.61*** (171)	0.61*** 0.69*** (171)	0.72*** 0.61*** (164)	1.00 (171)	
L-TI	-0.06 0.11 (171)	0.09 0.16** (171)	0.10 0.12 (156)	0.12 0.13* (171)	0.71*** 0.51*** (170)	0.39*** 0.41*** (171)	0.35*** 0.29*** (171)	0.39*** 0.31*** (170)	0.63*** 0.47*** (171)	0.39*** 0.39*** (171)	0.38*** 0.36*** (171)	0.67*** 0.43*** (164)	0.66*** 0.51*** (171)	1.00 (171)

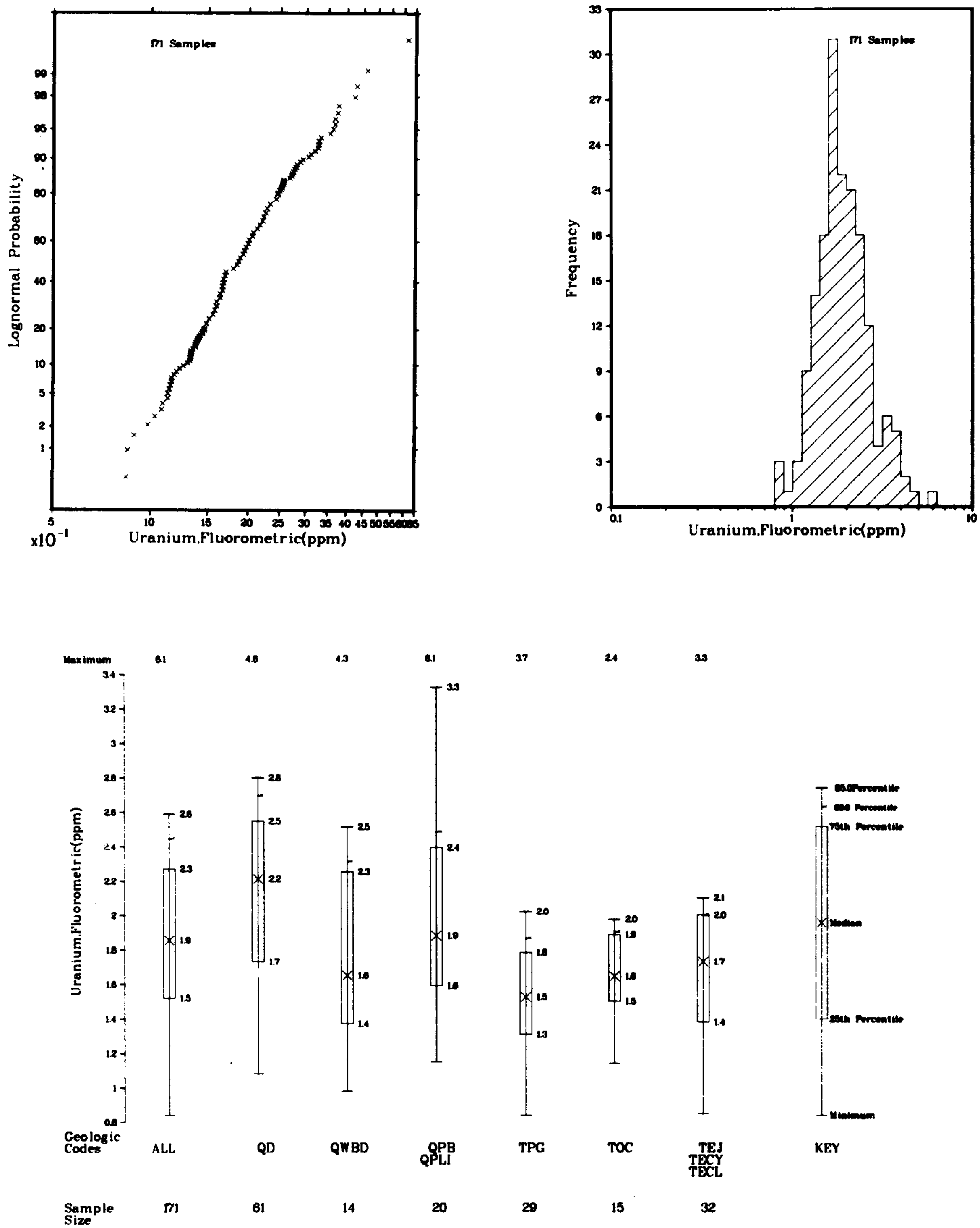


Figure B-1a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SOLUBLE URANIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

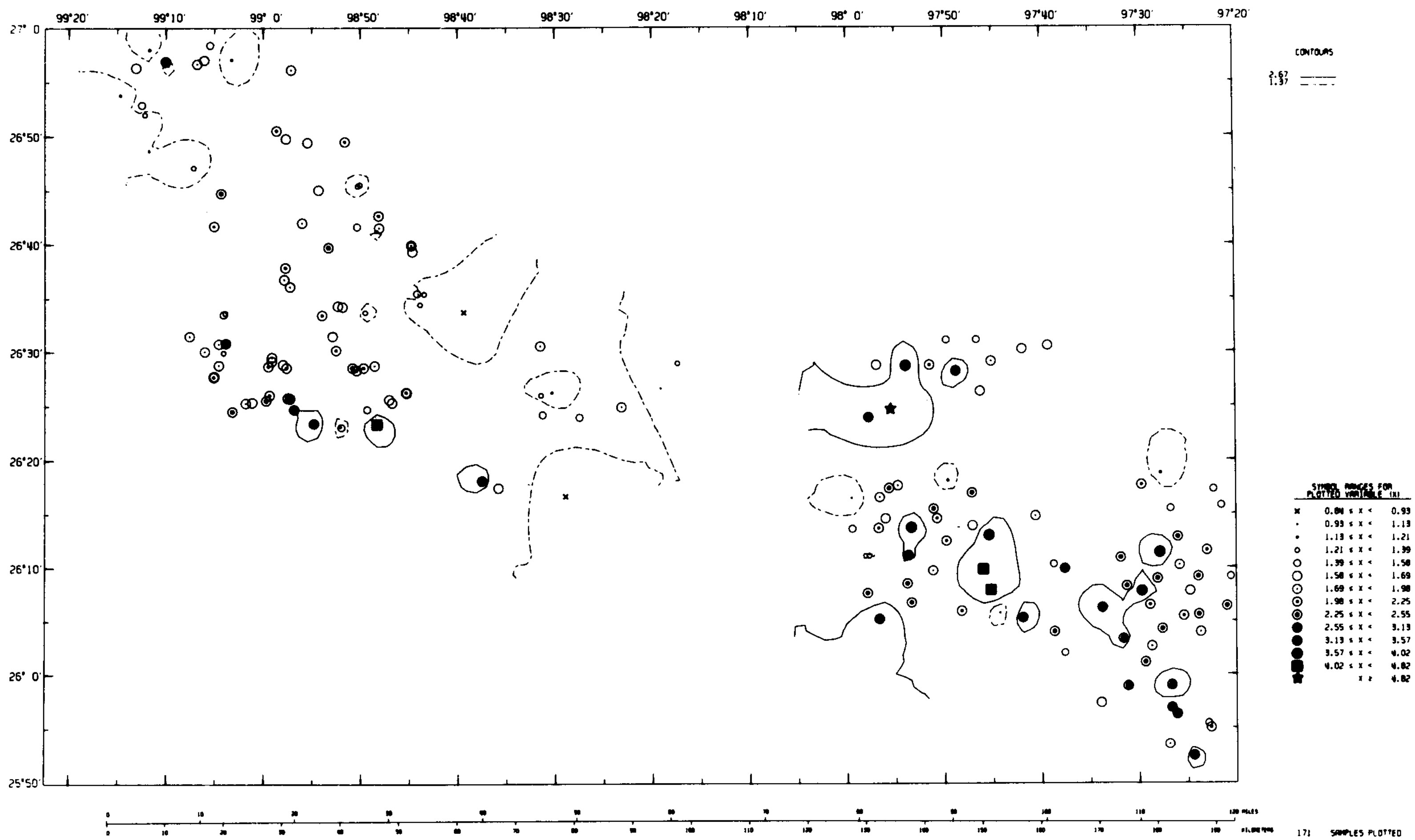


Figure B-1b

GEOCHEMICAL DISTRIBUTION OF SOLUBLE URANIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

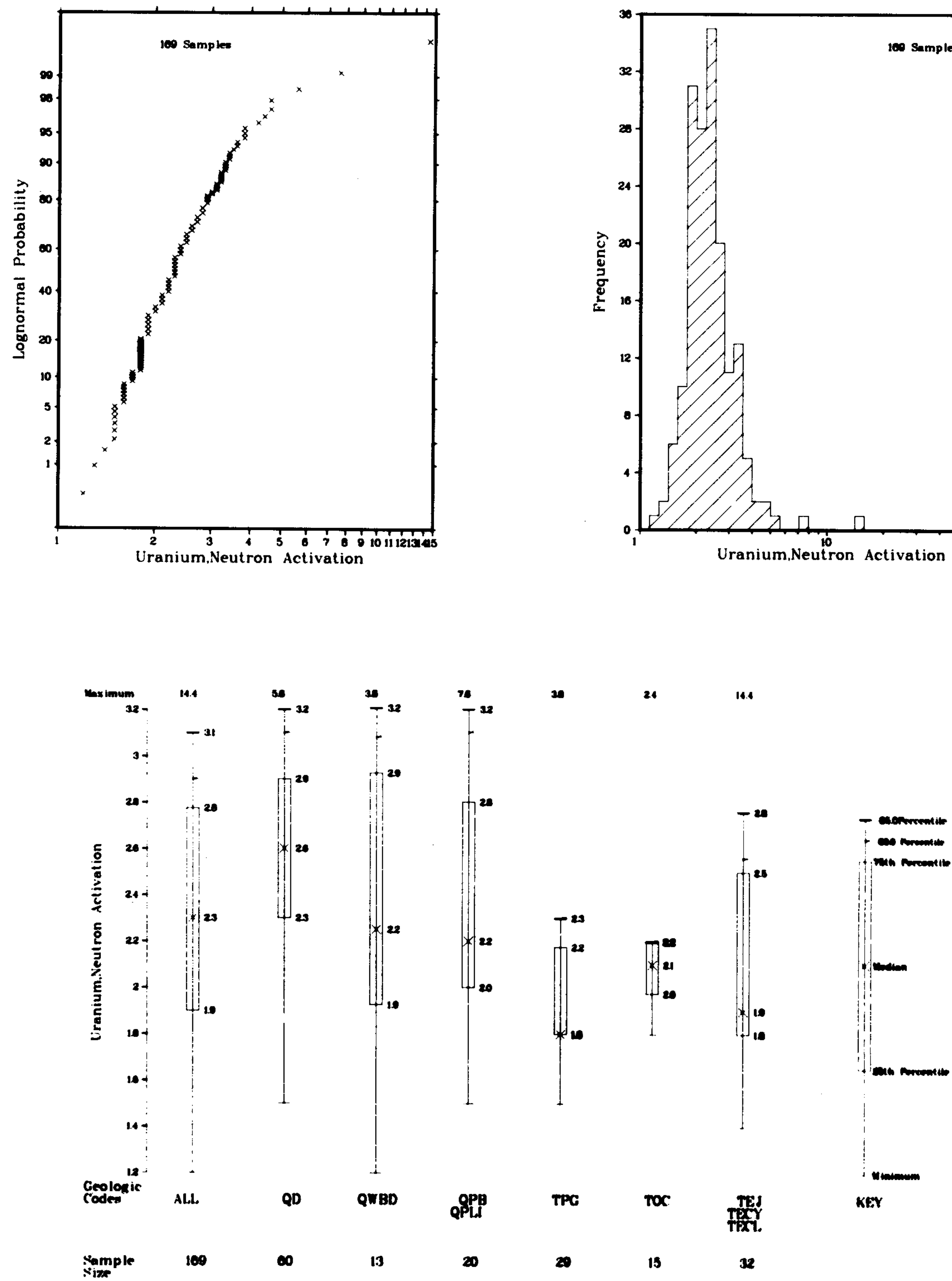


Figure B-2a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR URANIUM BY NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

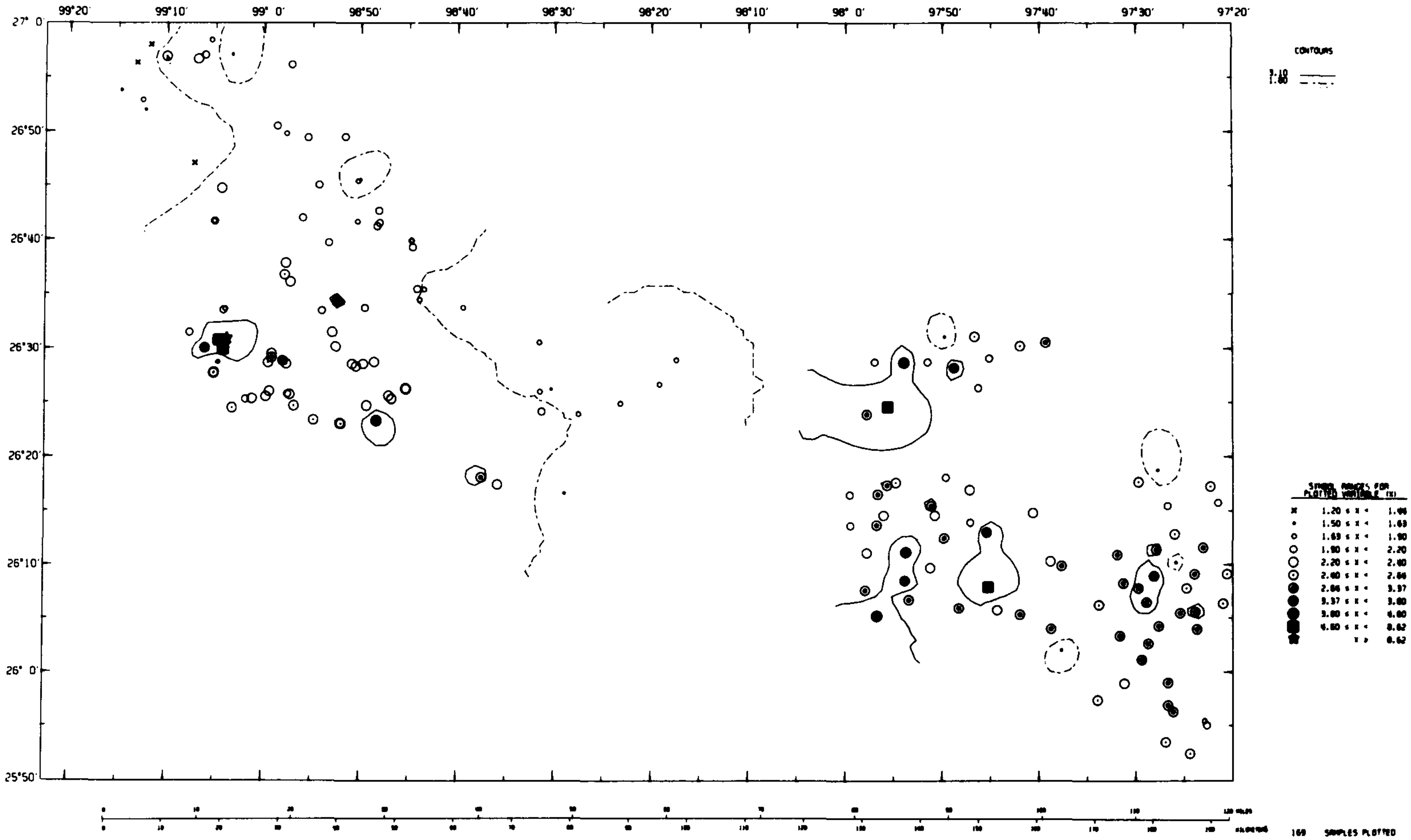
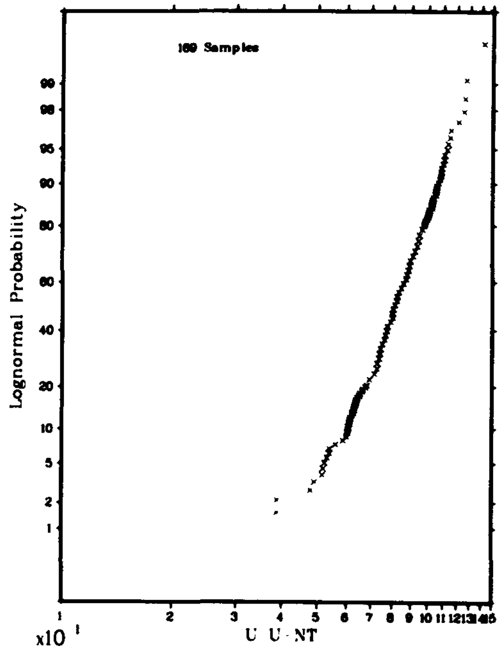
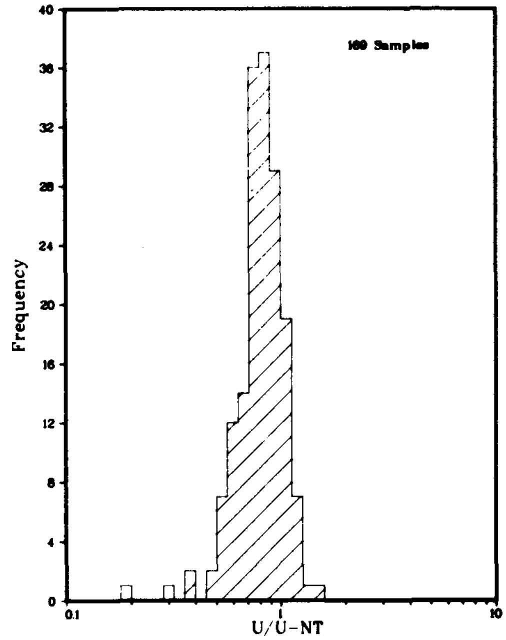


Figure B-2b

GEOCHEMICAL DISTRIBUTION OF URANIUM BY NEUTRON ACTIVATION
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES





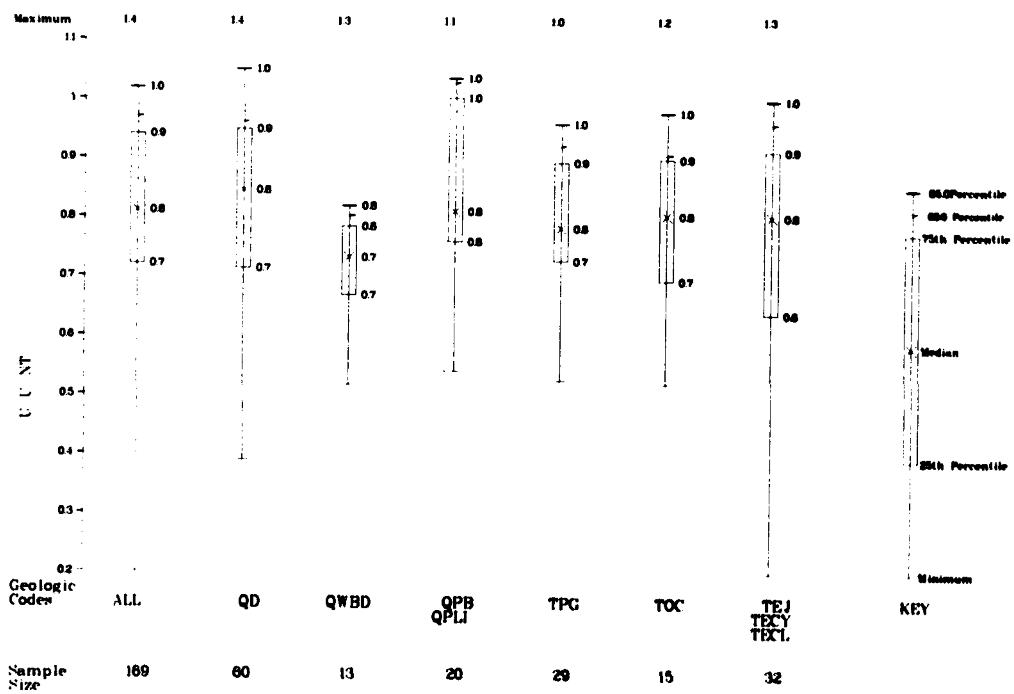


Figure B-3a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS
FOR URANIUM FLUOROMETRIC/URANIUM NEUTRON ACTIVATION
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

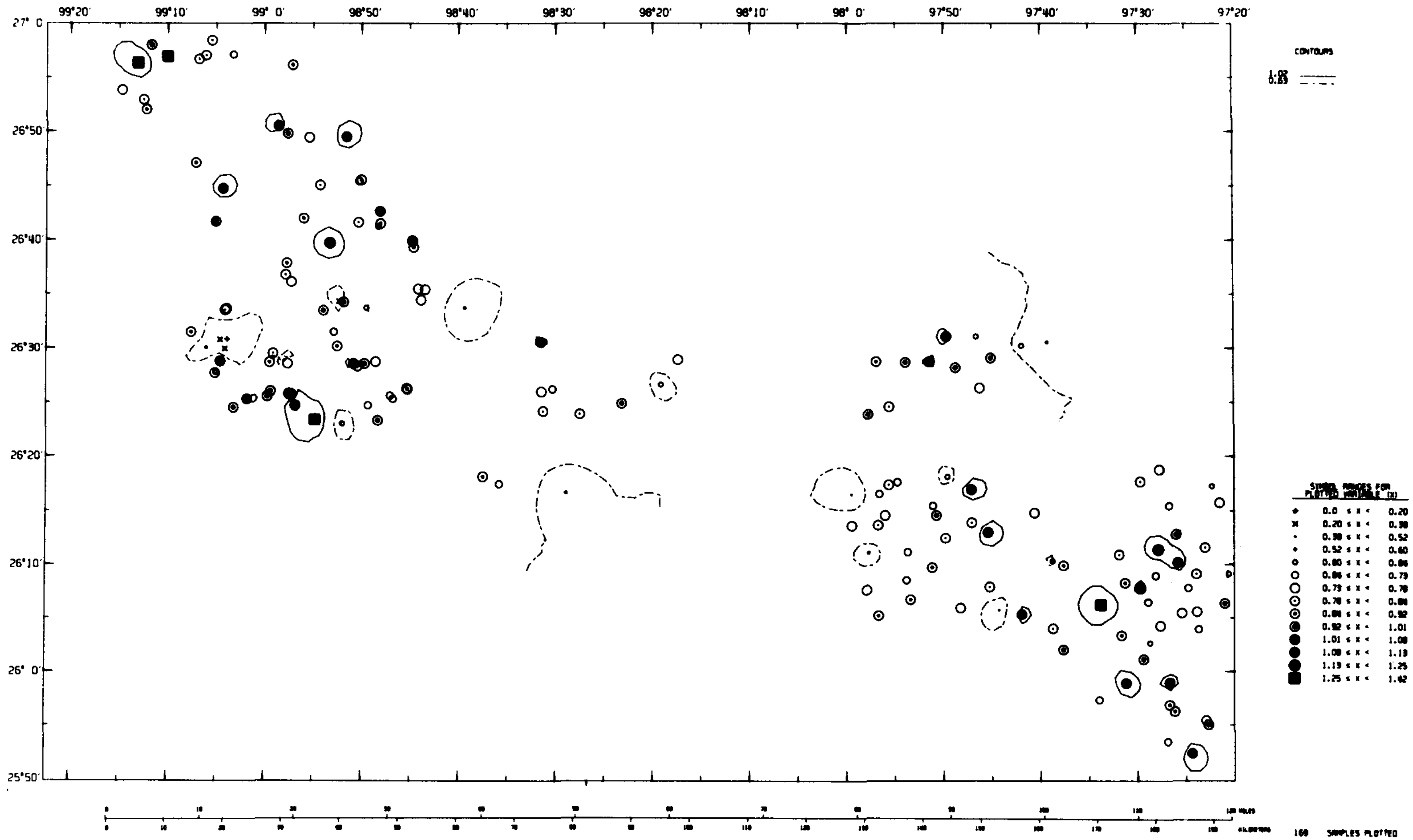


Figure B-3b

GEOCHEMICAL DISTRIBUTION OF URANIUM FLUOROMETRIC/URANIUM NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

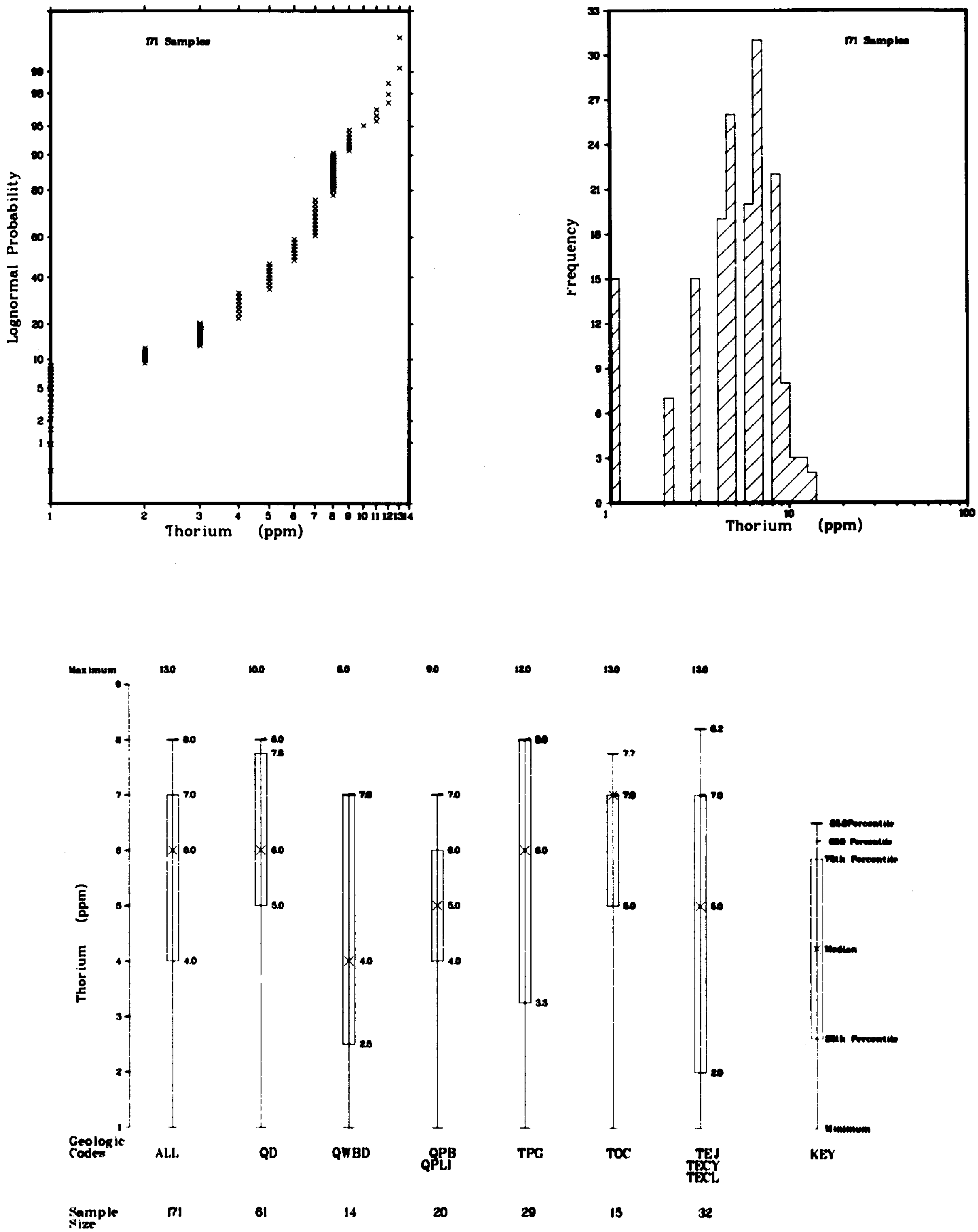


Figure B-4a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR THORIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

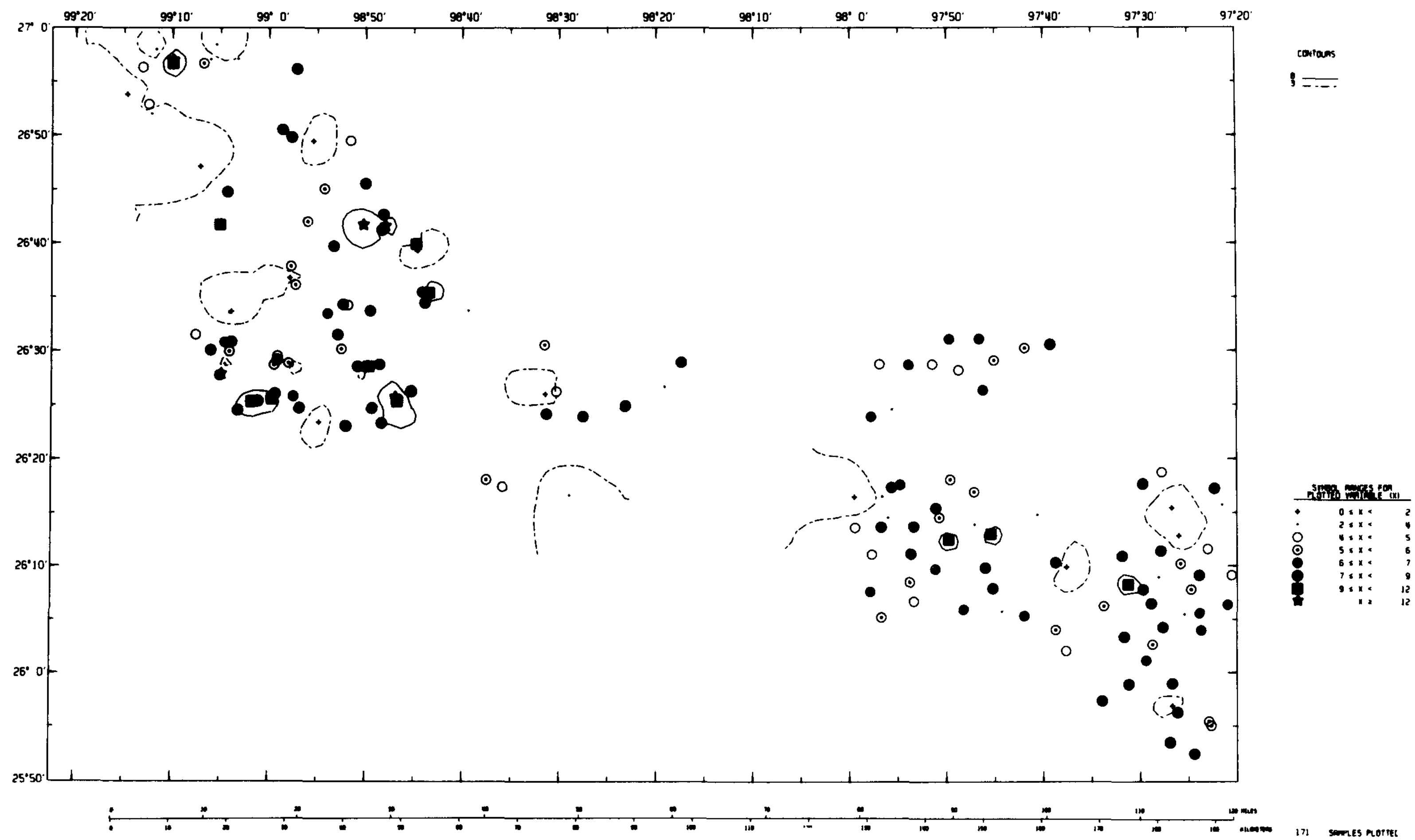


Figure B-4b

GEOCHEMICAL DISTRIBUTION OF THORIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

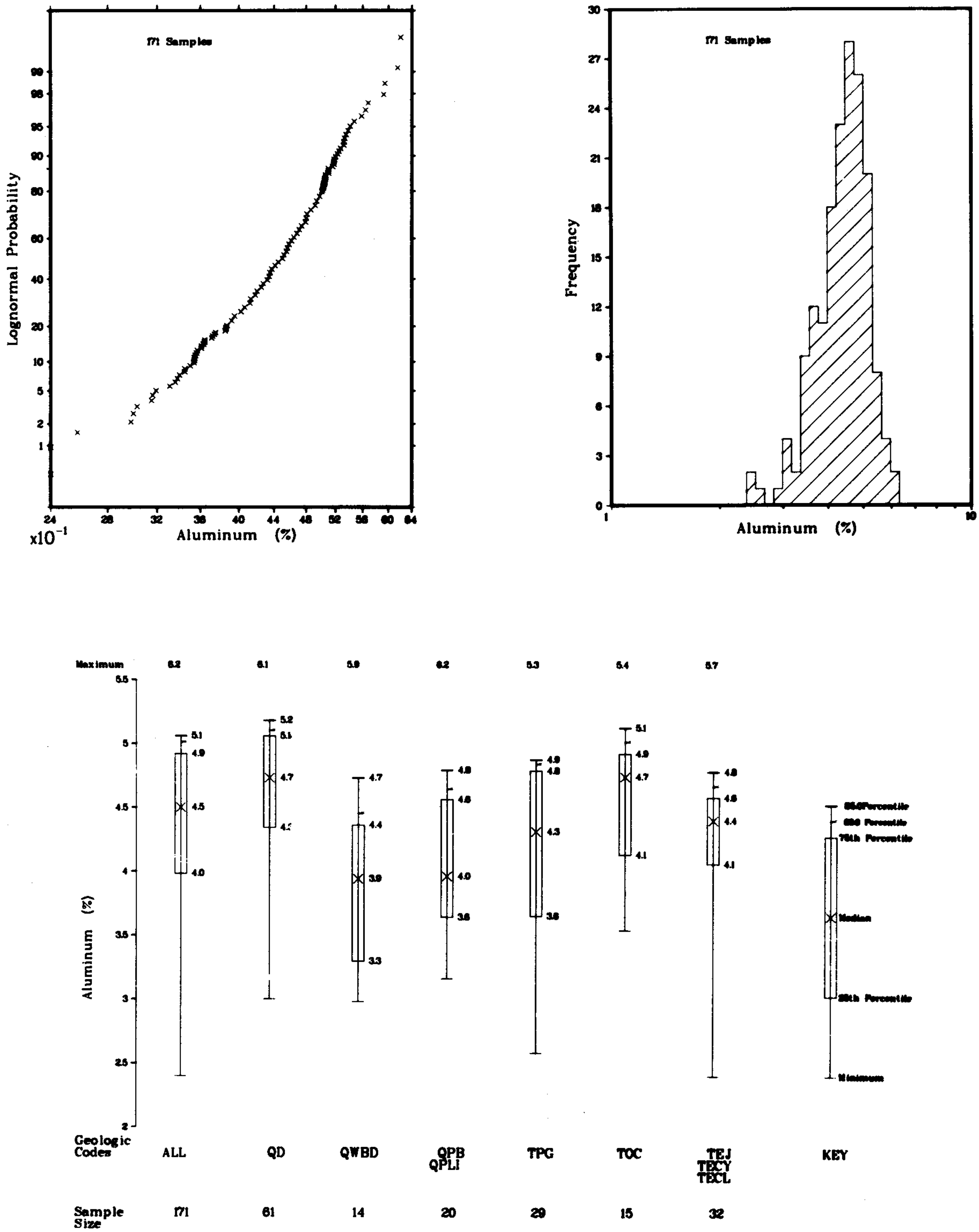


Figure B-5a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ALUMINUM (%) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

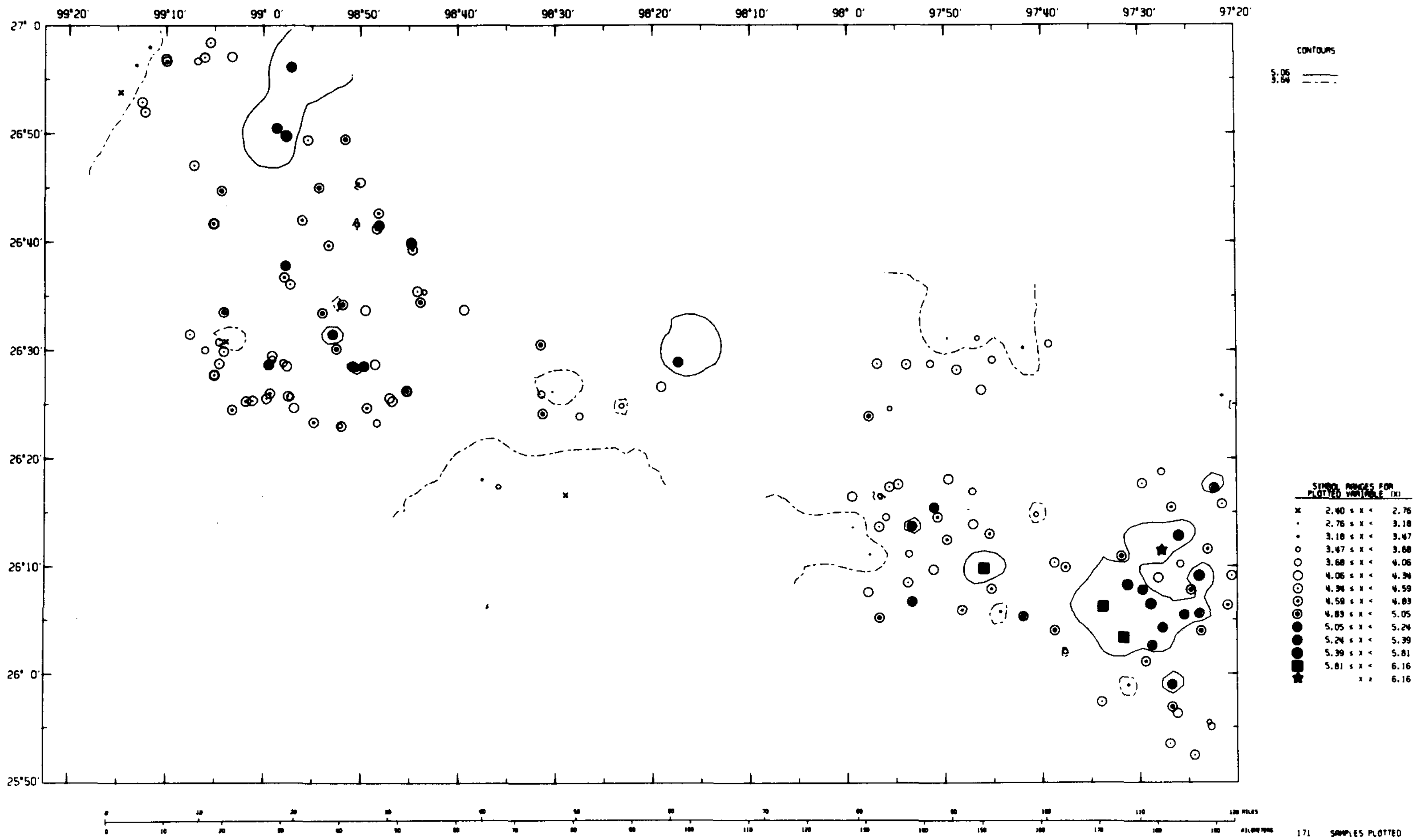


Figure B-5b

GEOCHEMICAL DISTRIBUTION OF ALUMINUM (%)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

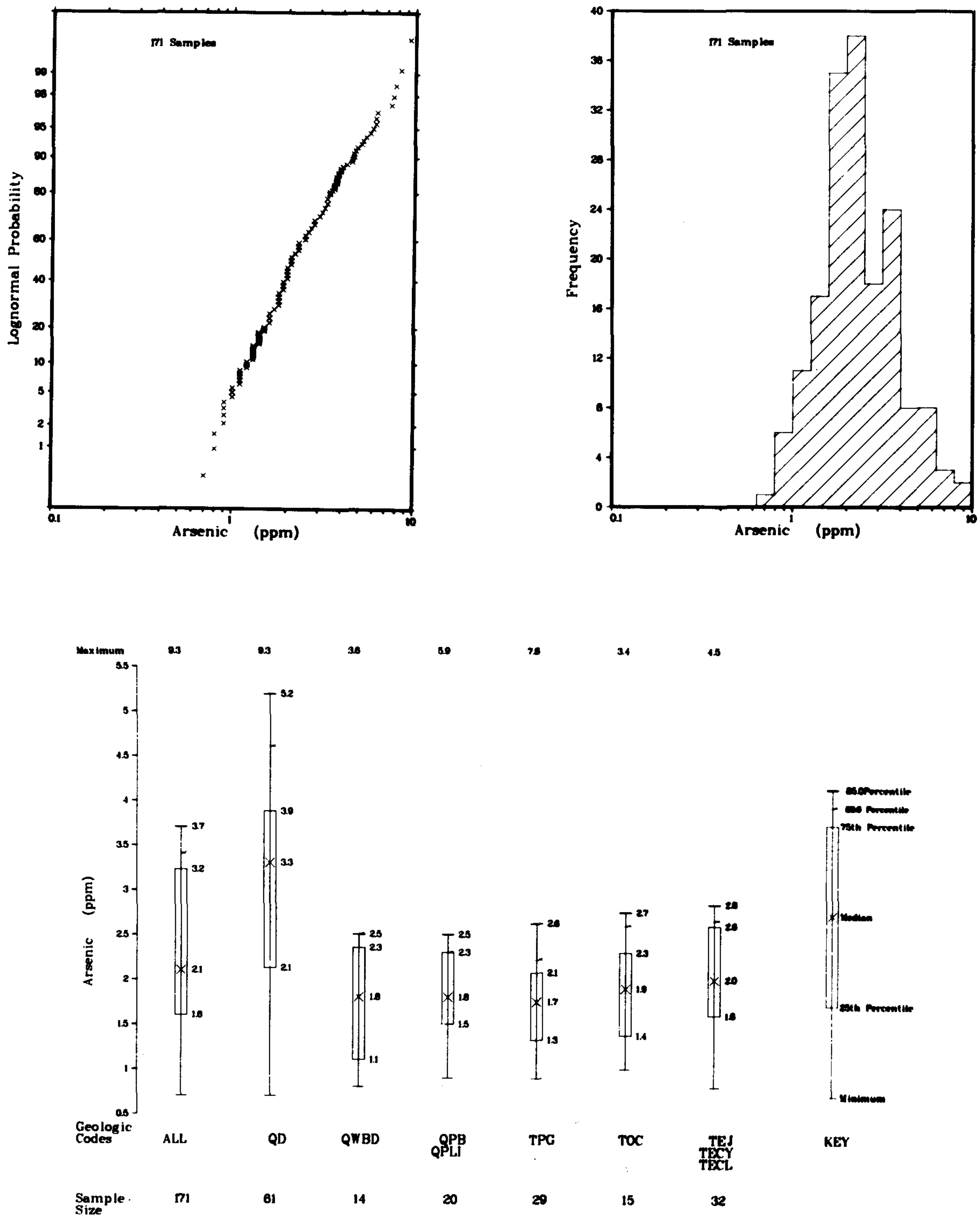


Figure B-6a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ARSENIC (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

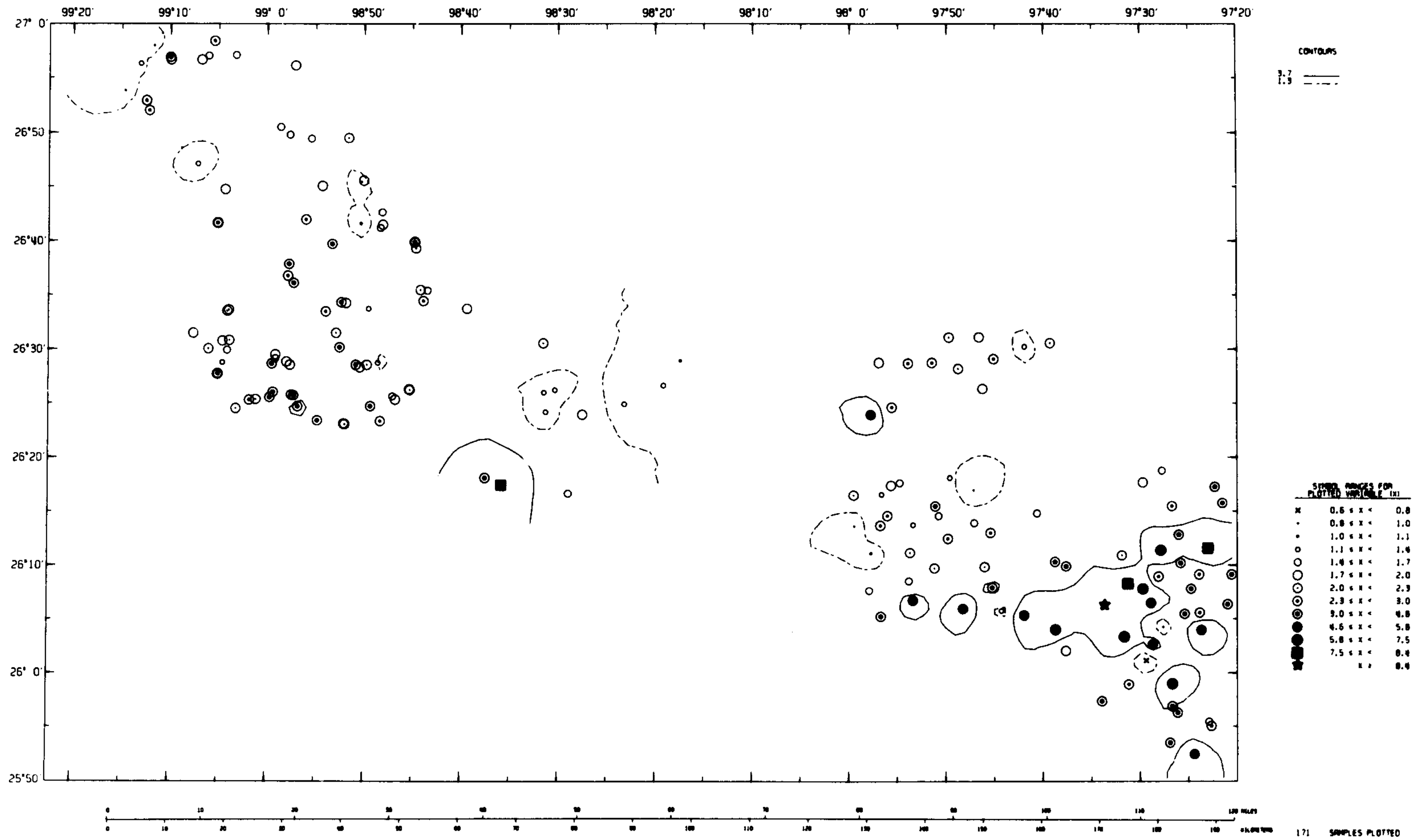
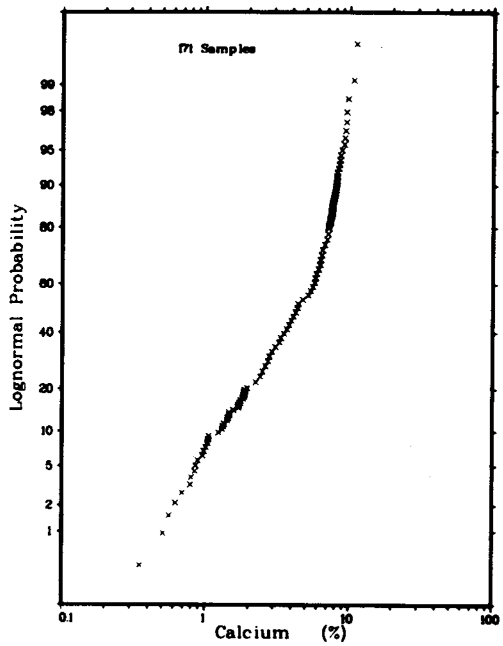
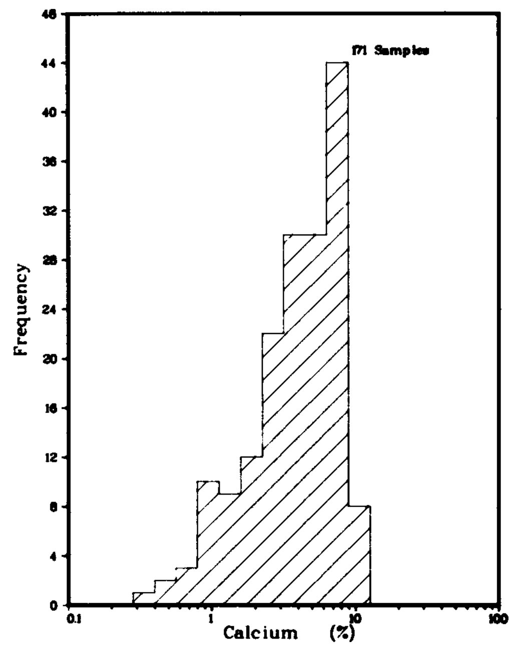


Figure B-6b

GEOCHEMICAL DISTRIBUTION OF ARSENIC (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES





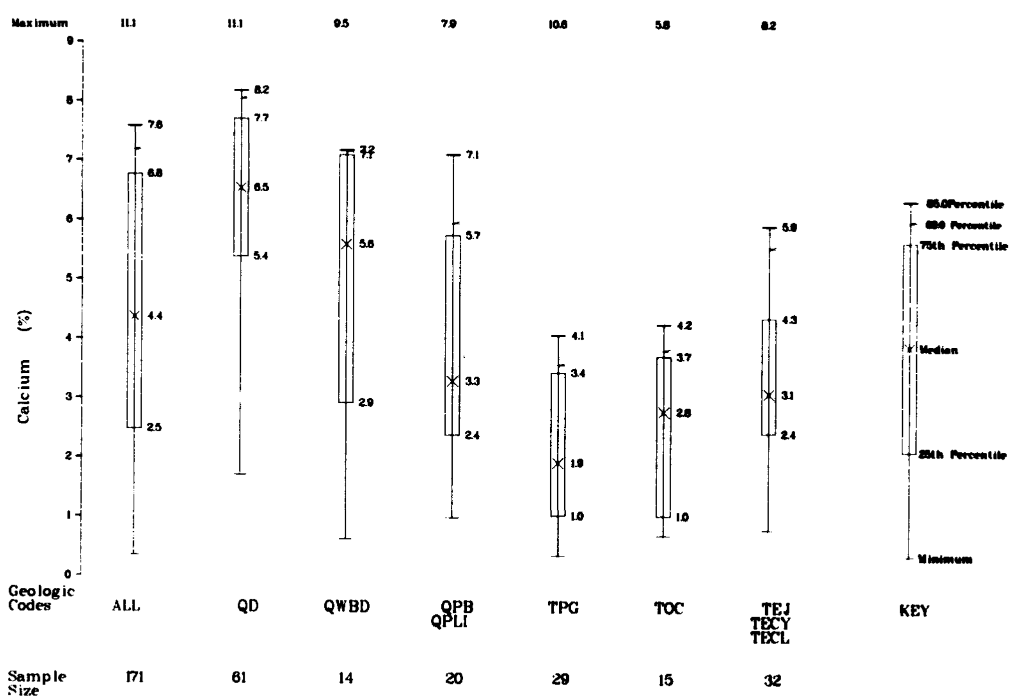


Figure B-7a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR CALCIUM (%) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

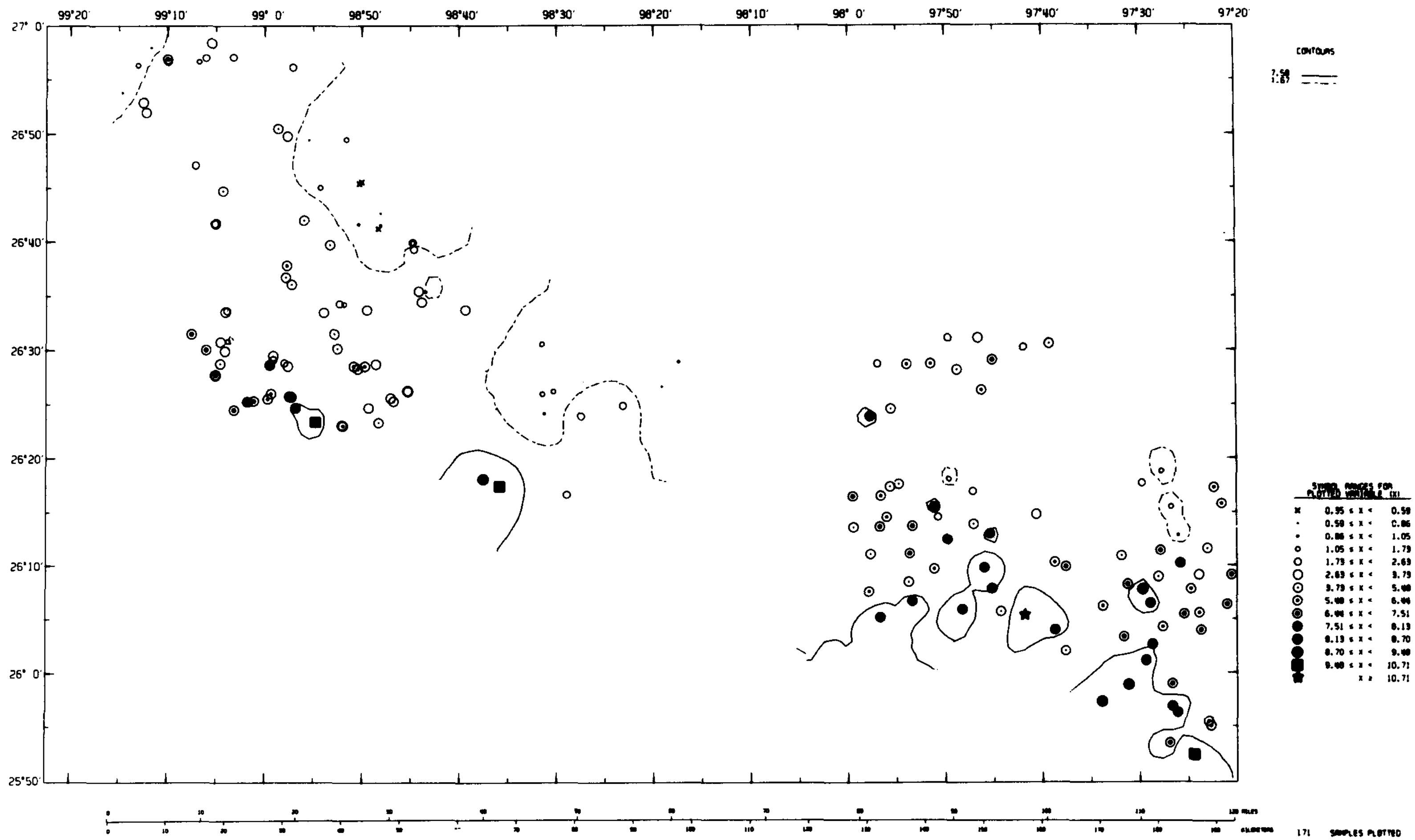


Figure B-7b

GEOCHEMICAL DISTRIBUTION OF CALCIUM (%)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

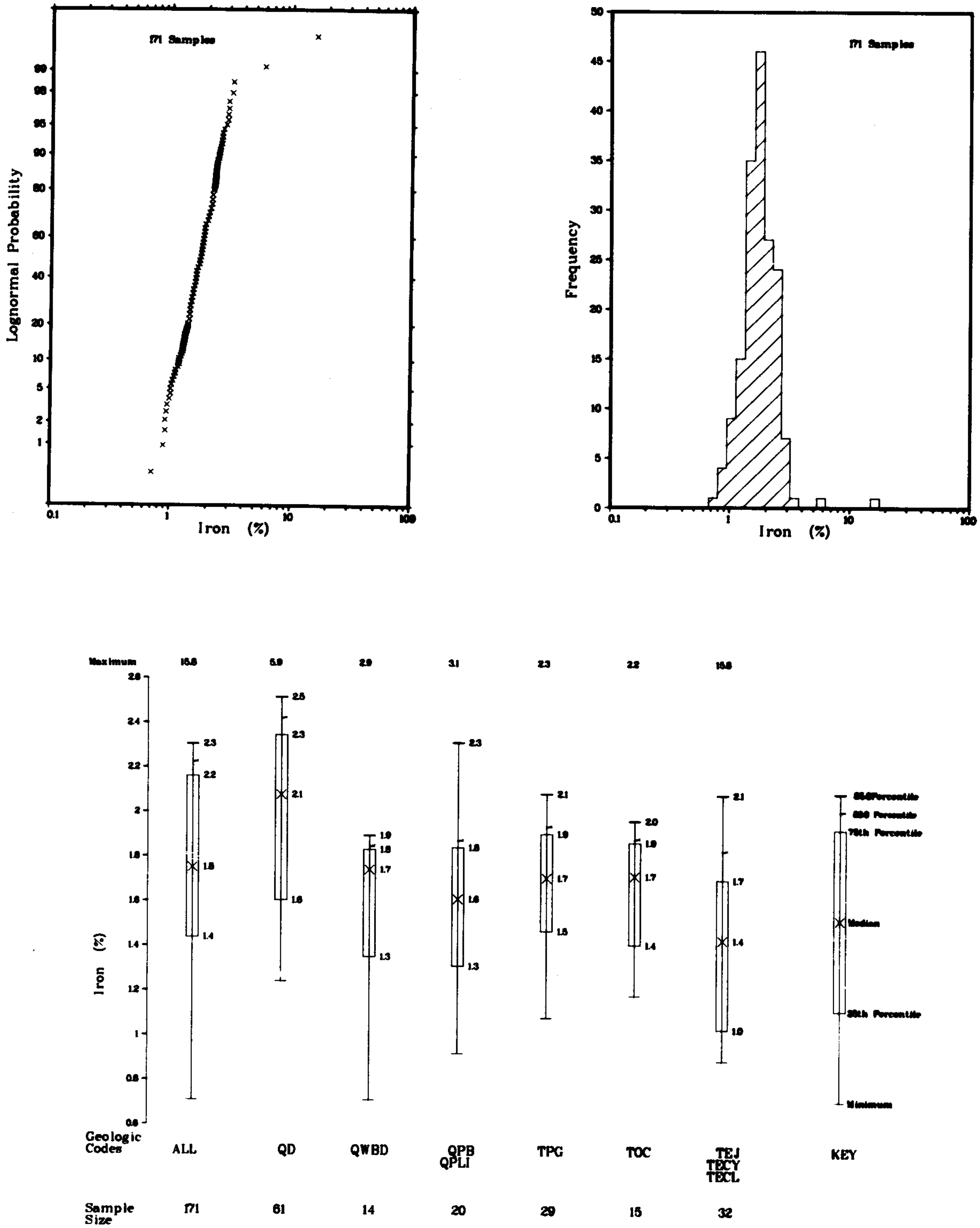


Figure B-8a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR IRON (%) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

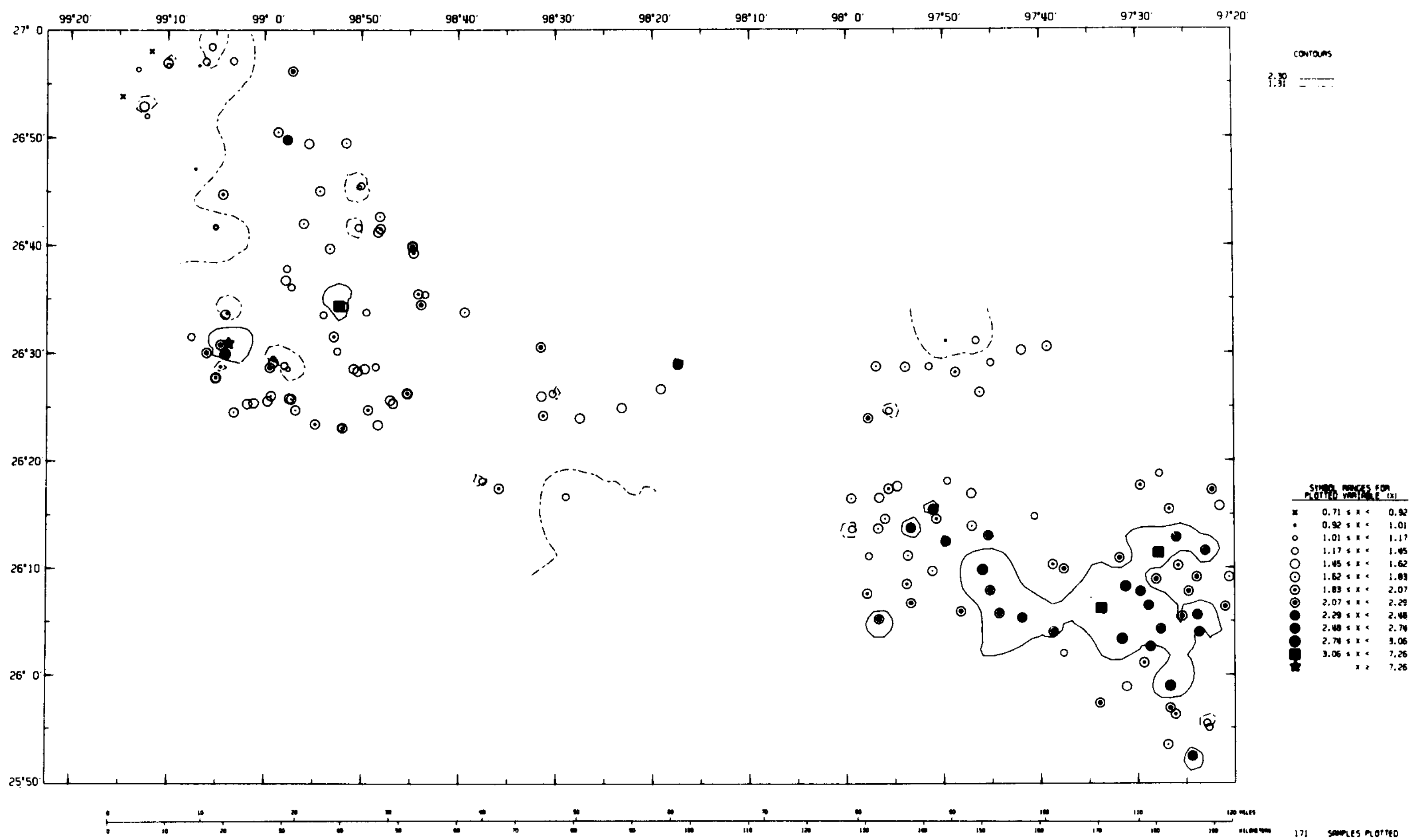


Figure B-8b

GEOCHEMICAL DISTRIBUTION OF IRON (%)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

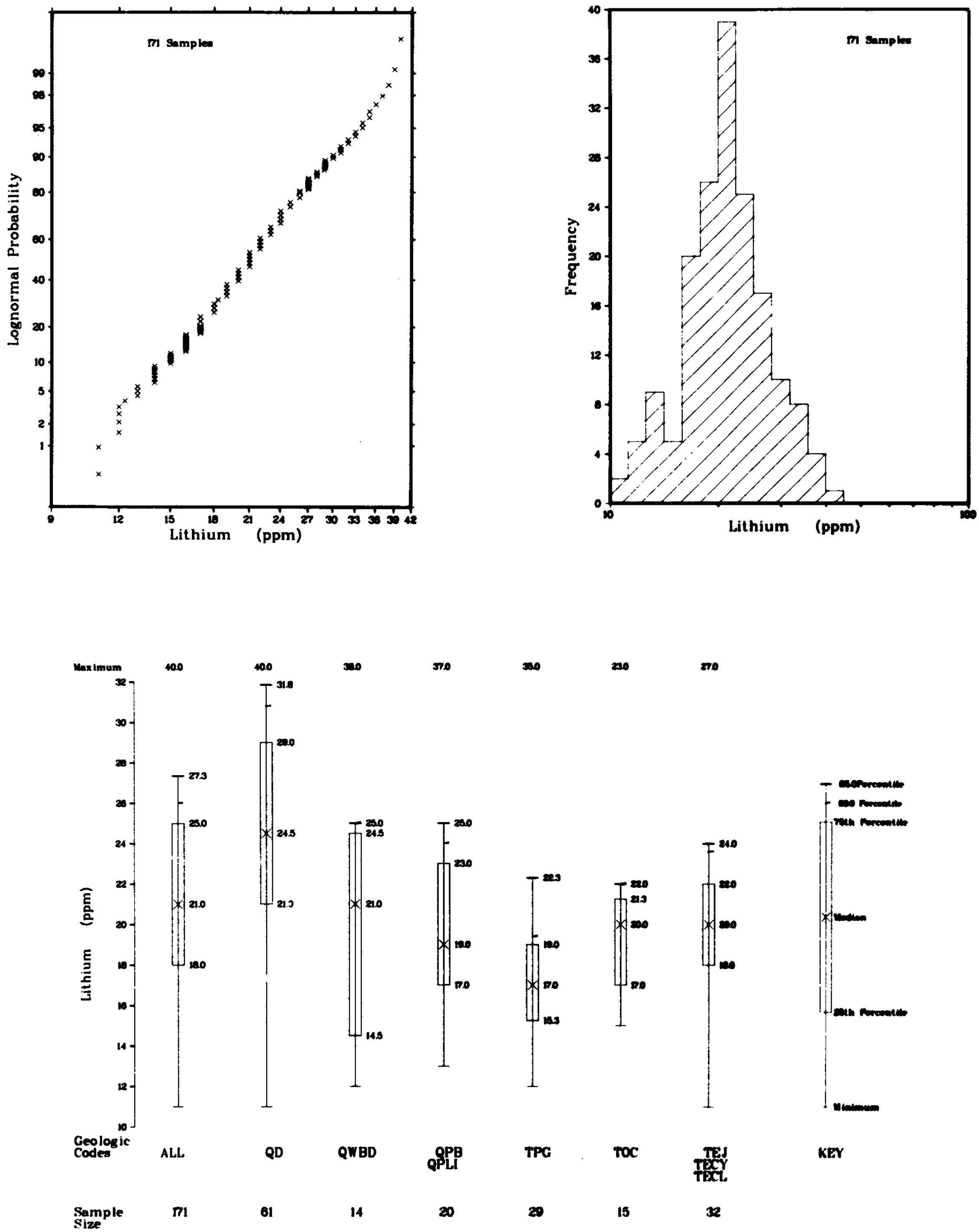


Figure B-9a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR LITHIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

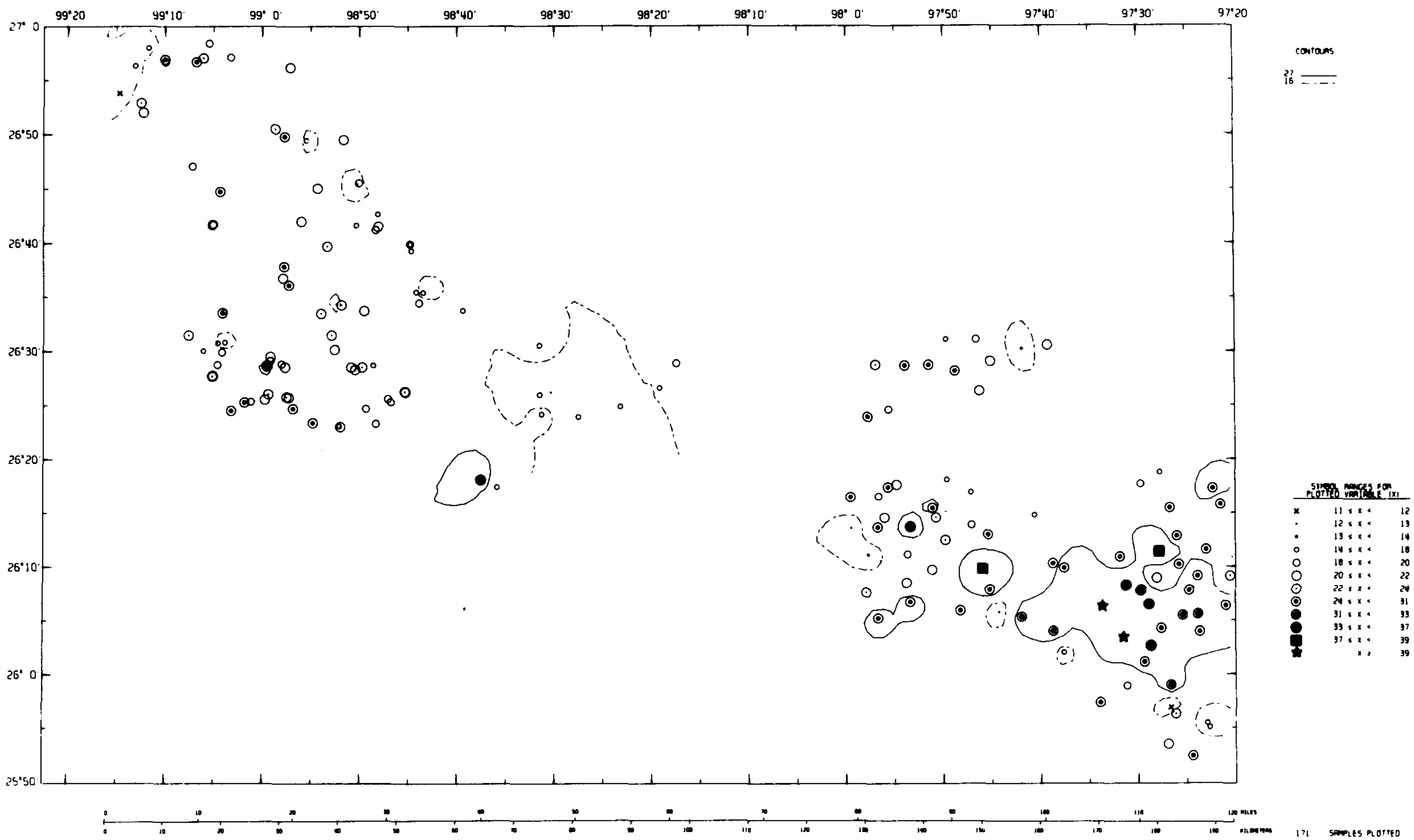


Figure B-9b

GEOCHEMICAL DISTRIBUTION OF LITHIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

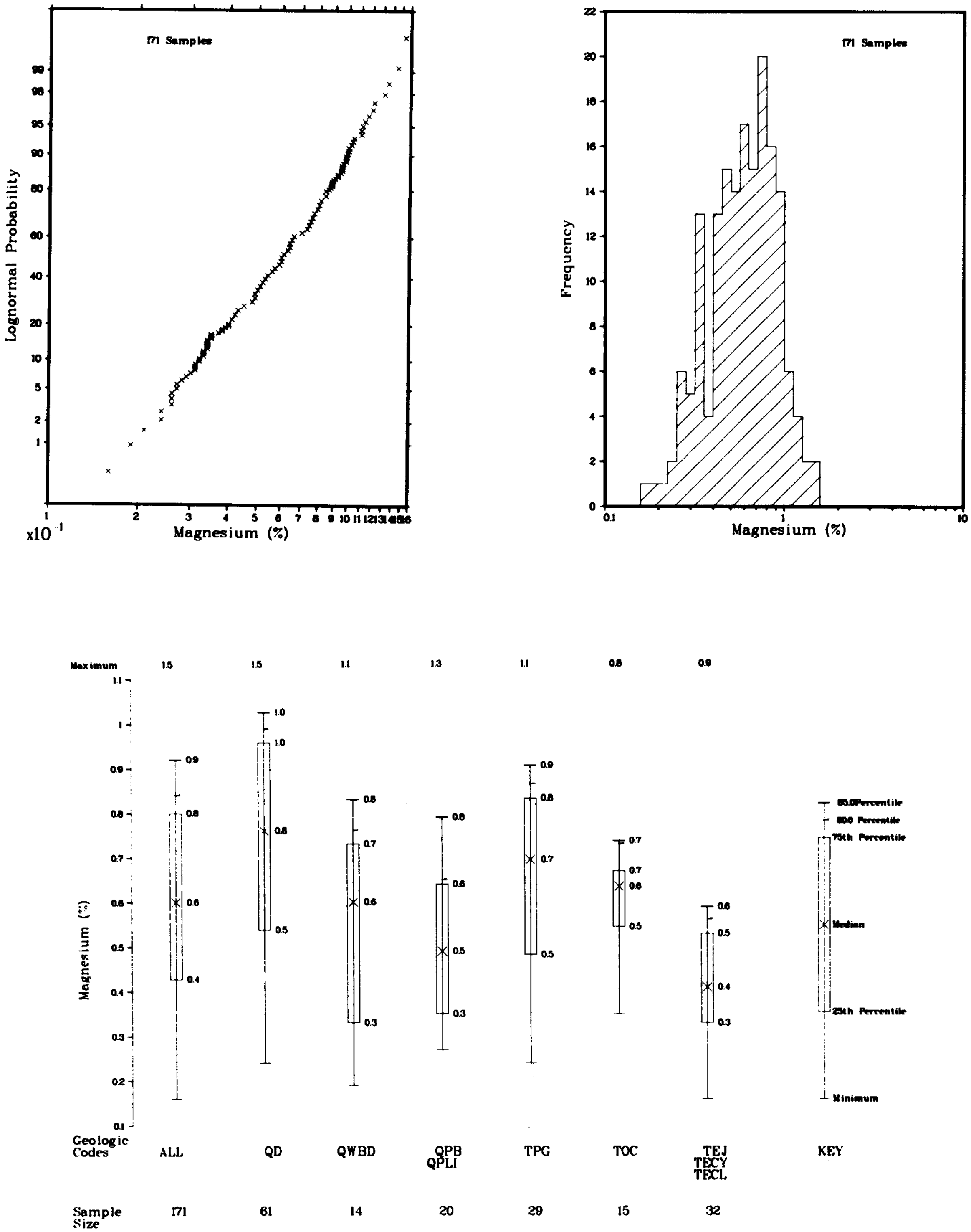


Figure B-10a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR MAGNESIUM (%) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

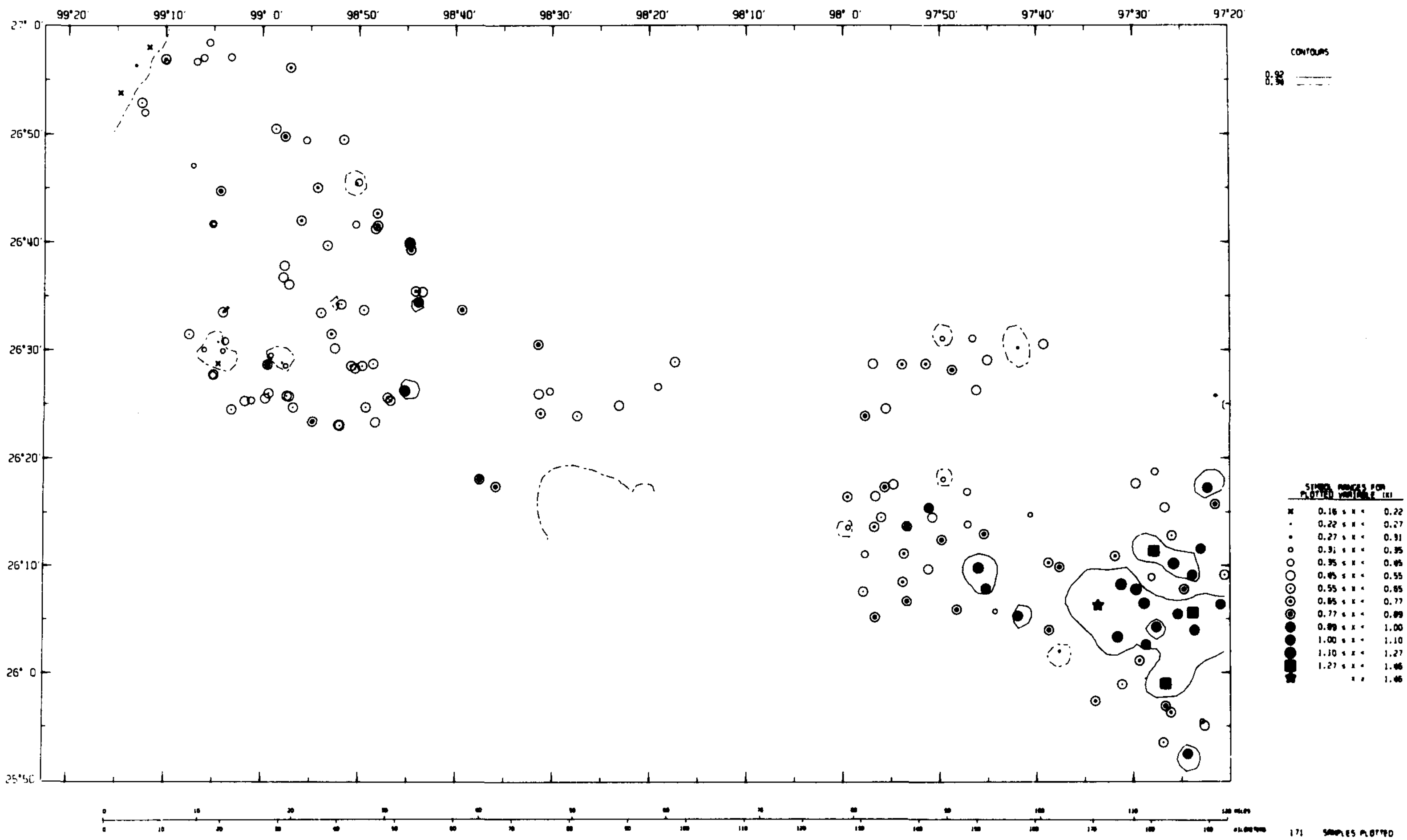


Figure B-10b

GEOCHEMICAL DISTRIBUTION OF MAGNESIUM (%)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

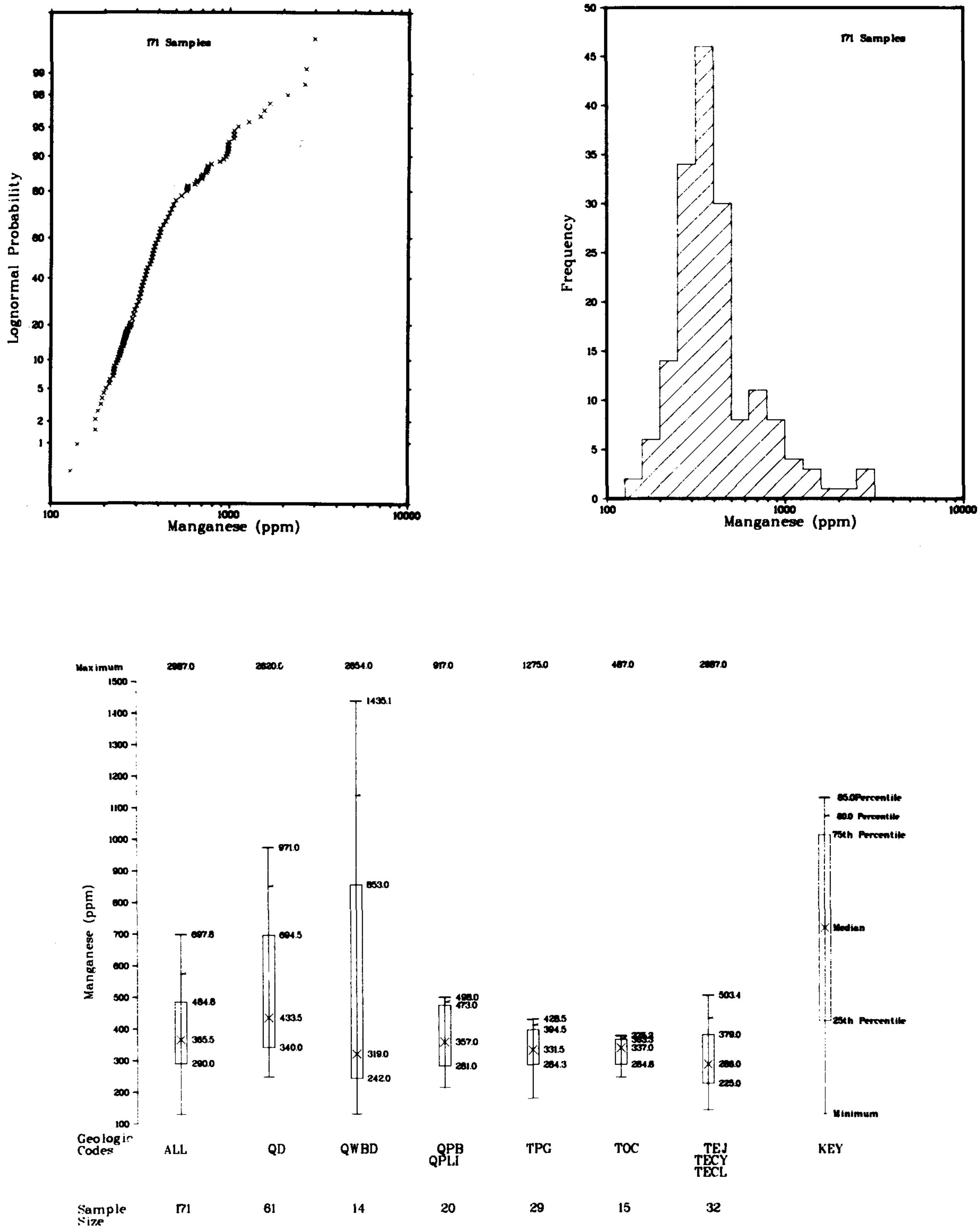


Figure B-11a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR MANGANESE (PPM) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

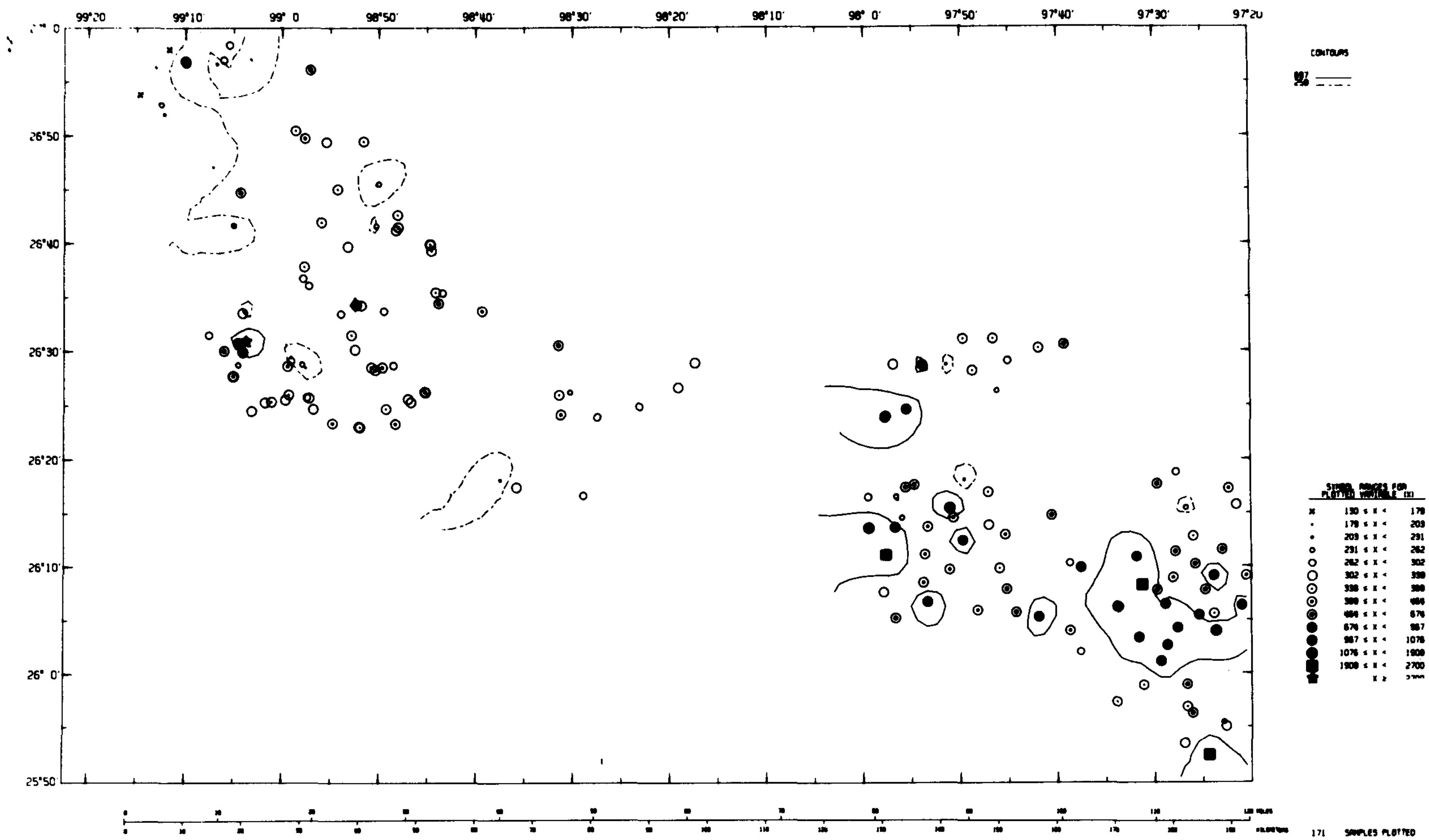


Figure B-11b

GEOCHEMICAL DISTRIBUTION OF MANGANESE (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

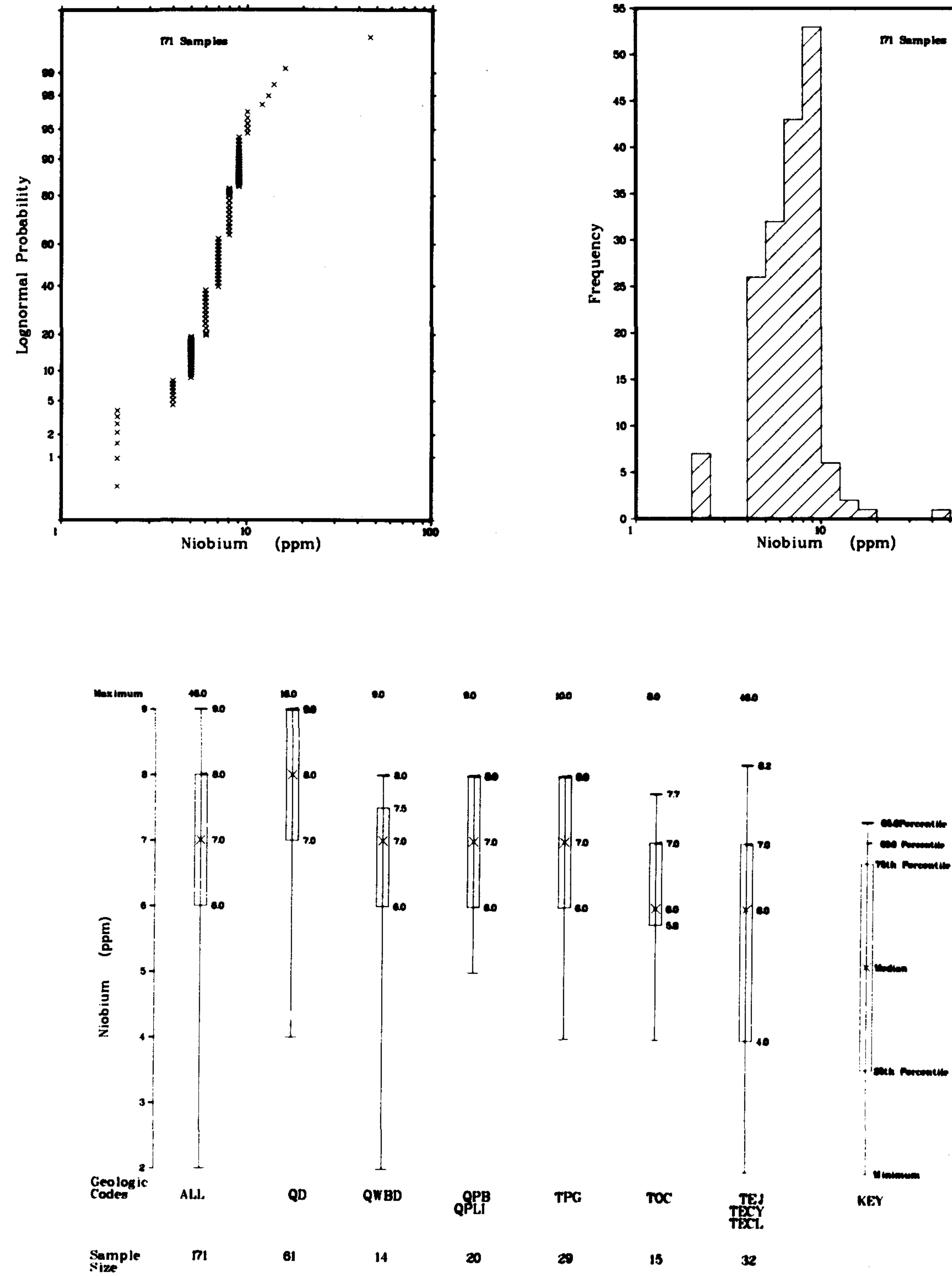


Figure B-12a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR NIOBIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

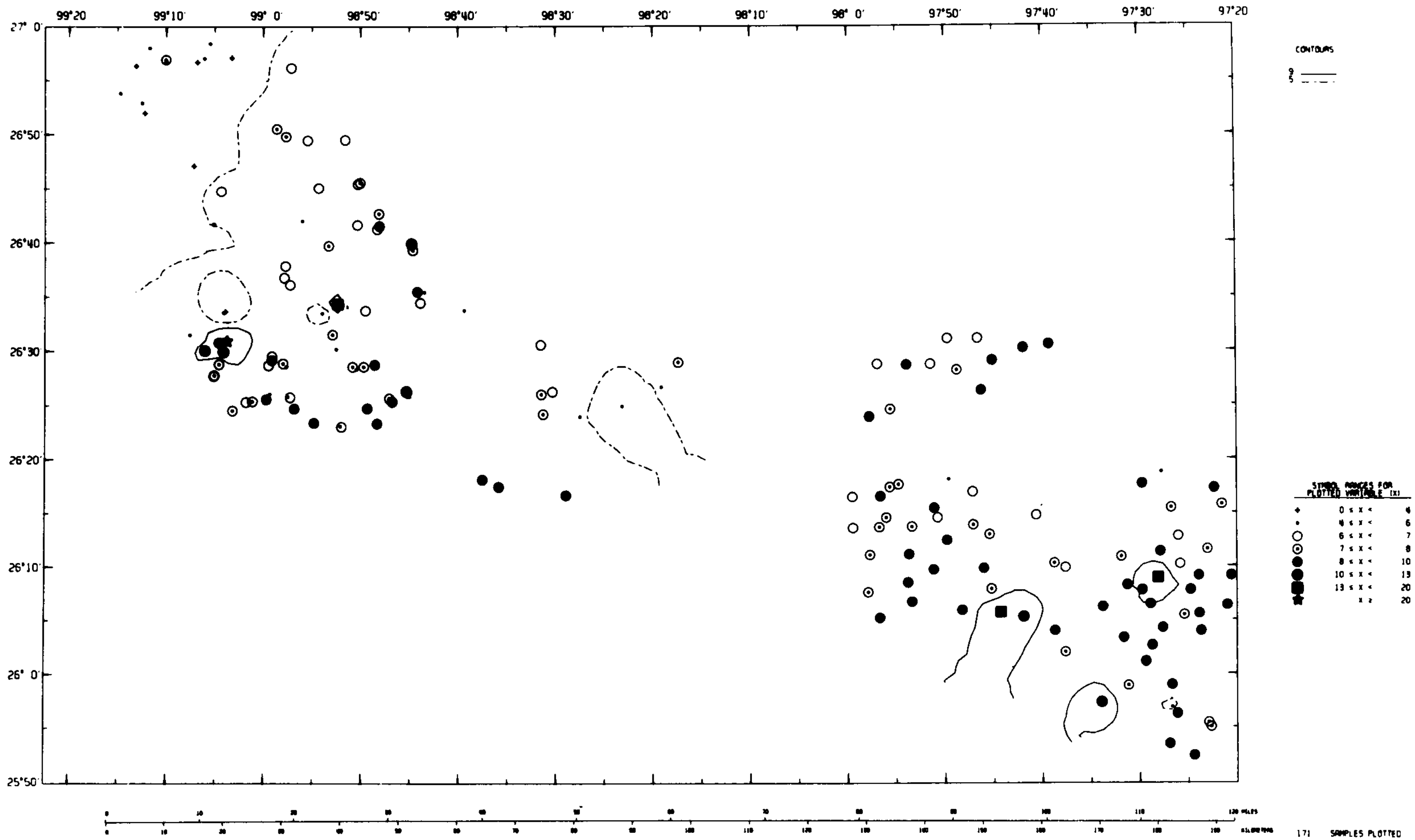


Figure B-12b

GEOCHEMICAL DISTRIBUTION OF NIOBIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

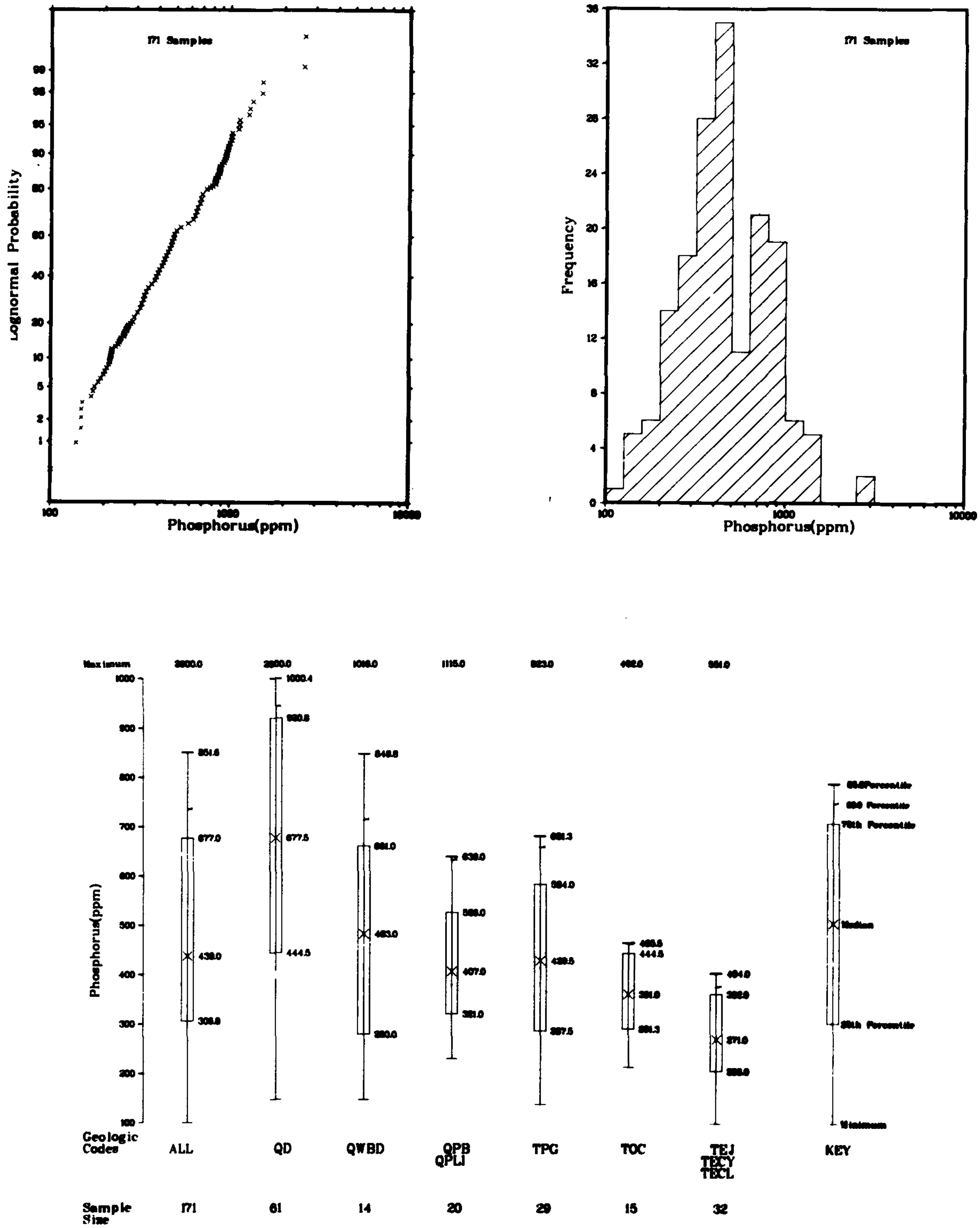


Figure B-13a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR PHOSPHORUS (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

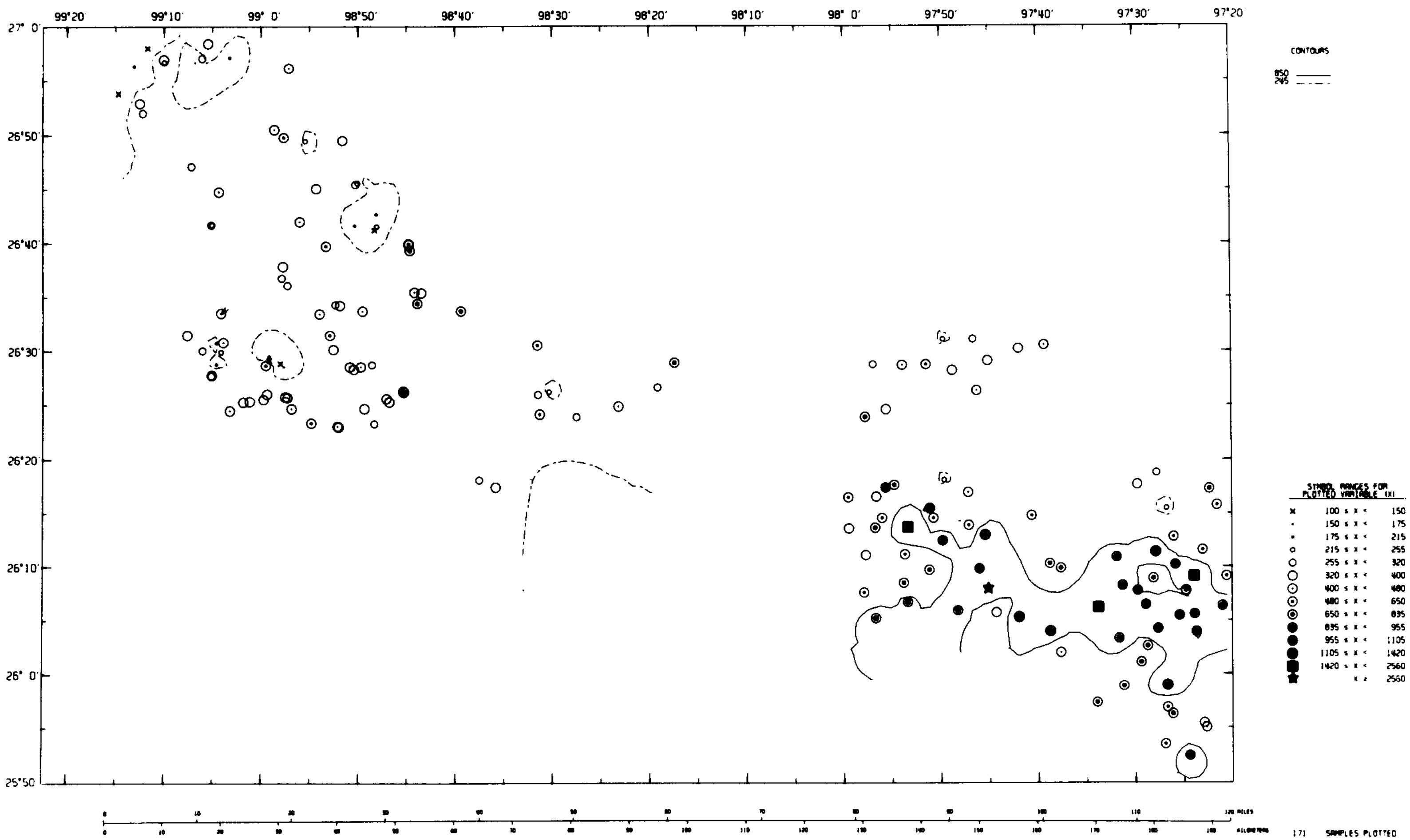


Figure B-13b

GEOCHEMICAL DISTRIBUTION OF PHOSPHORUS (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

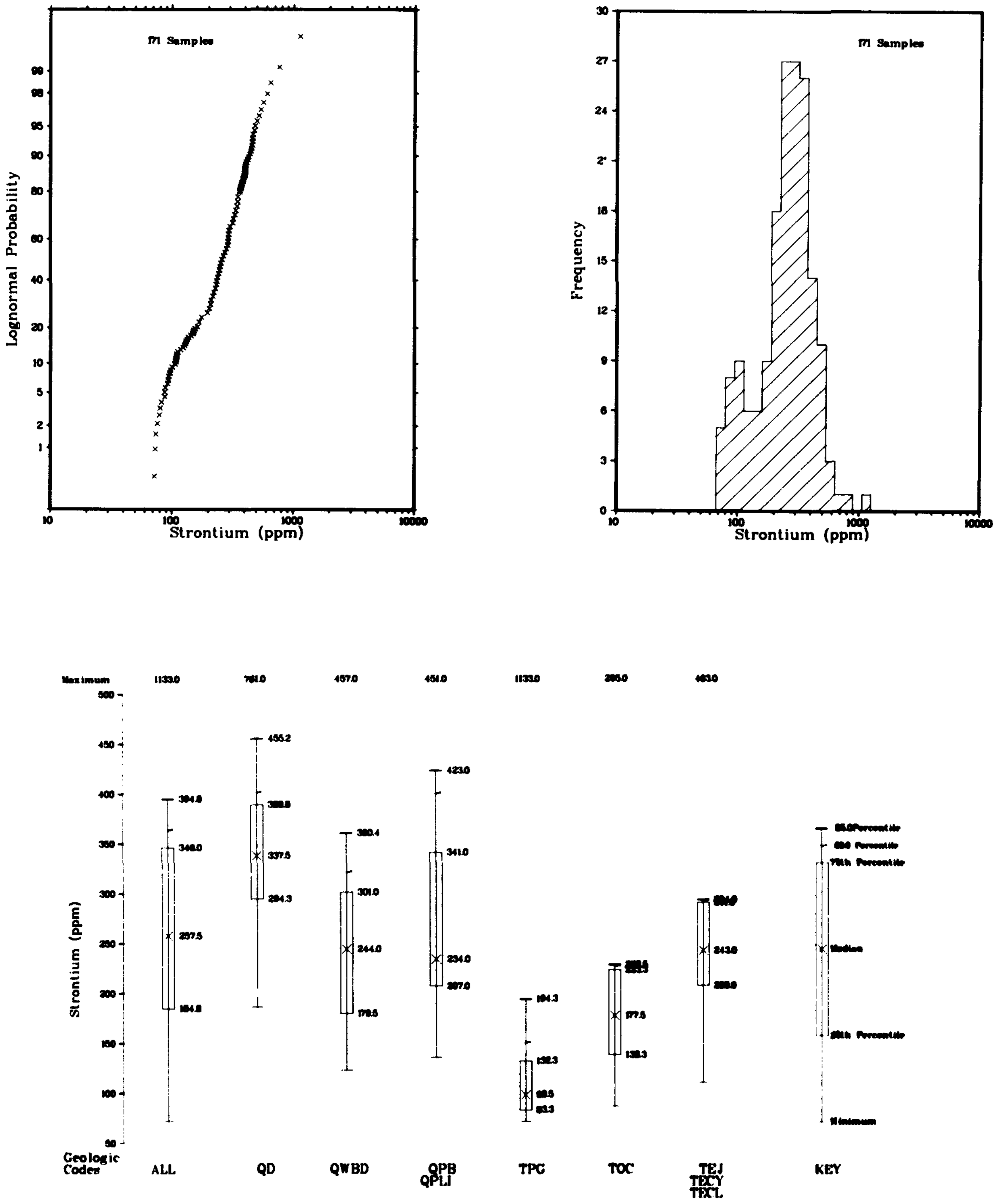


Figure B-14a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR STRONTIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

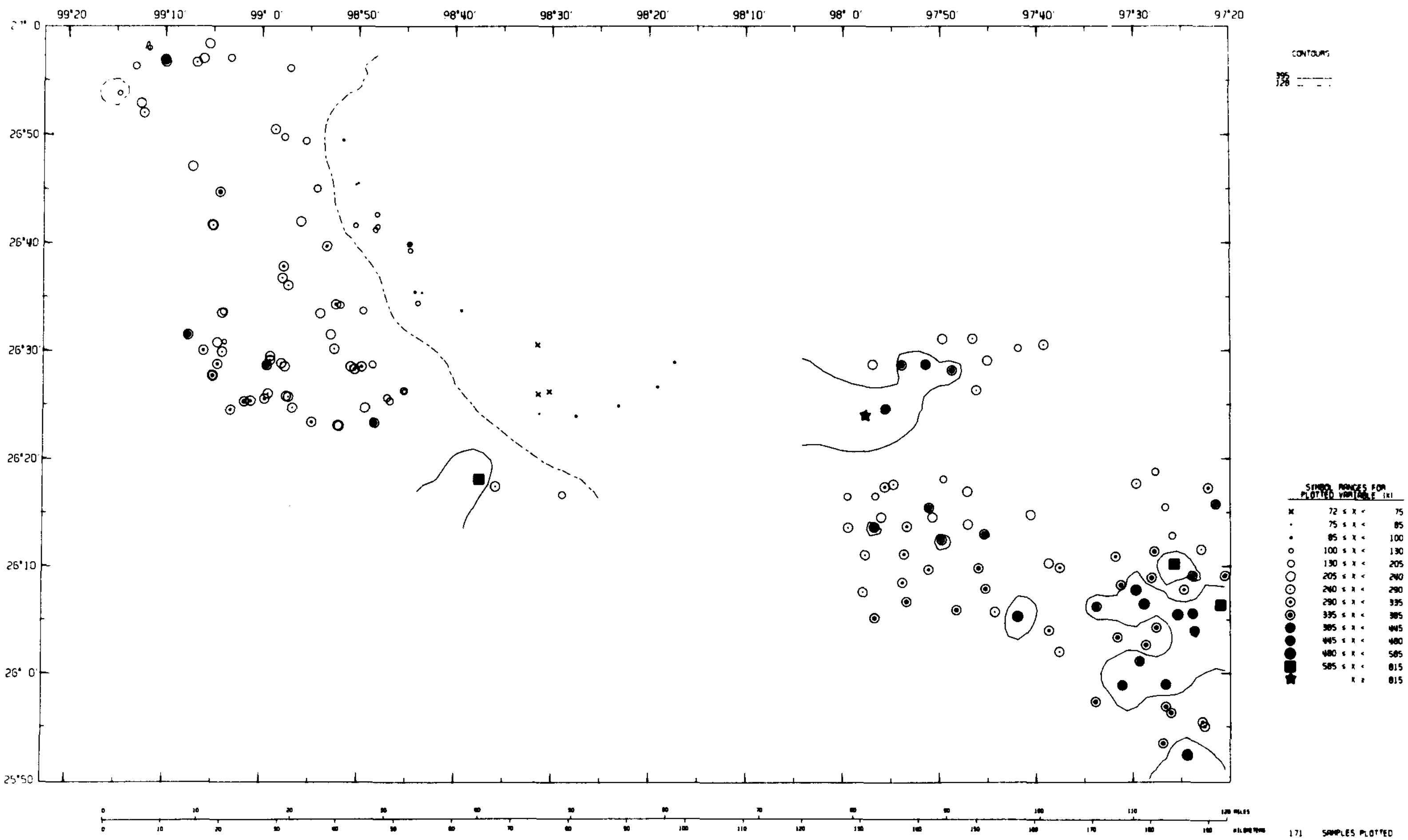


Figure B-14b

GEOCHEMICAL DISTRIBUTION OF STRONTIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

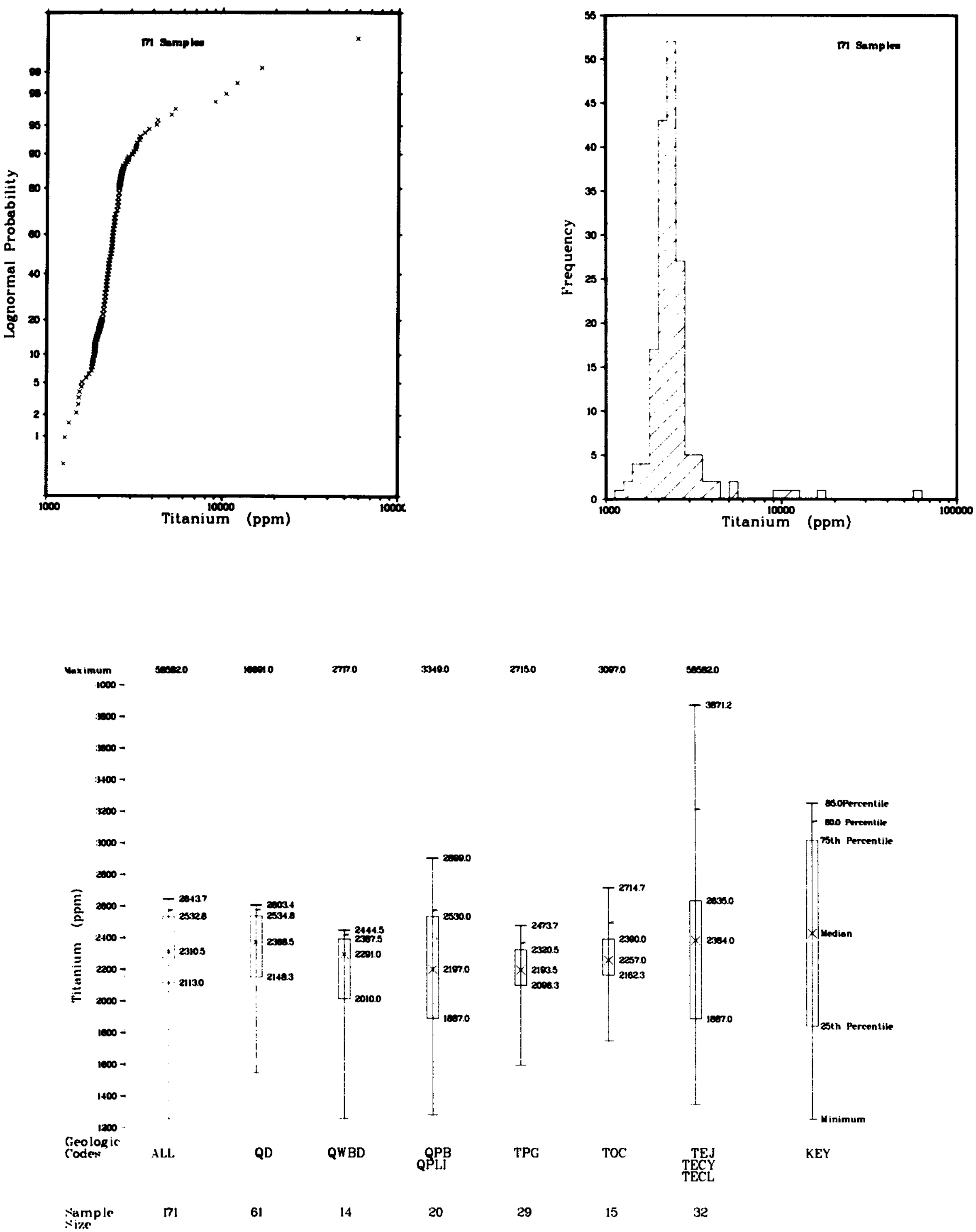


Figure B-15a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR TITANIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

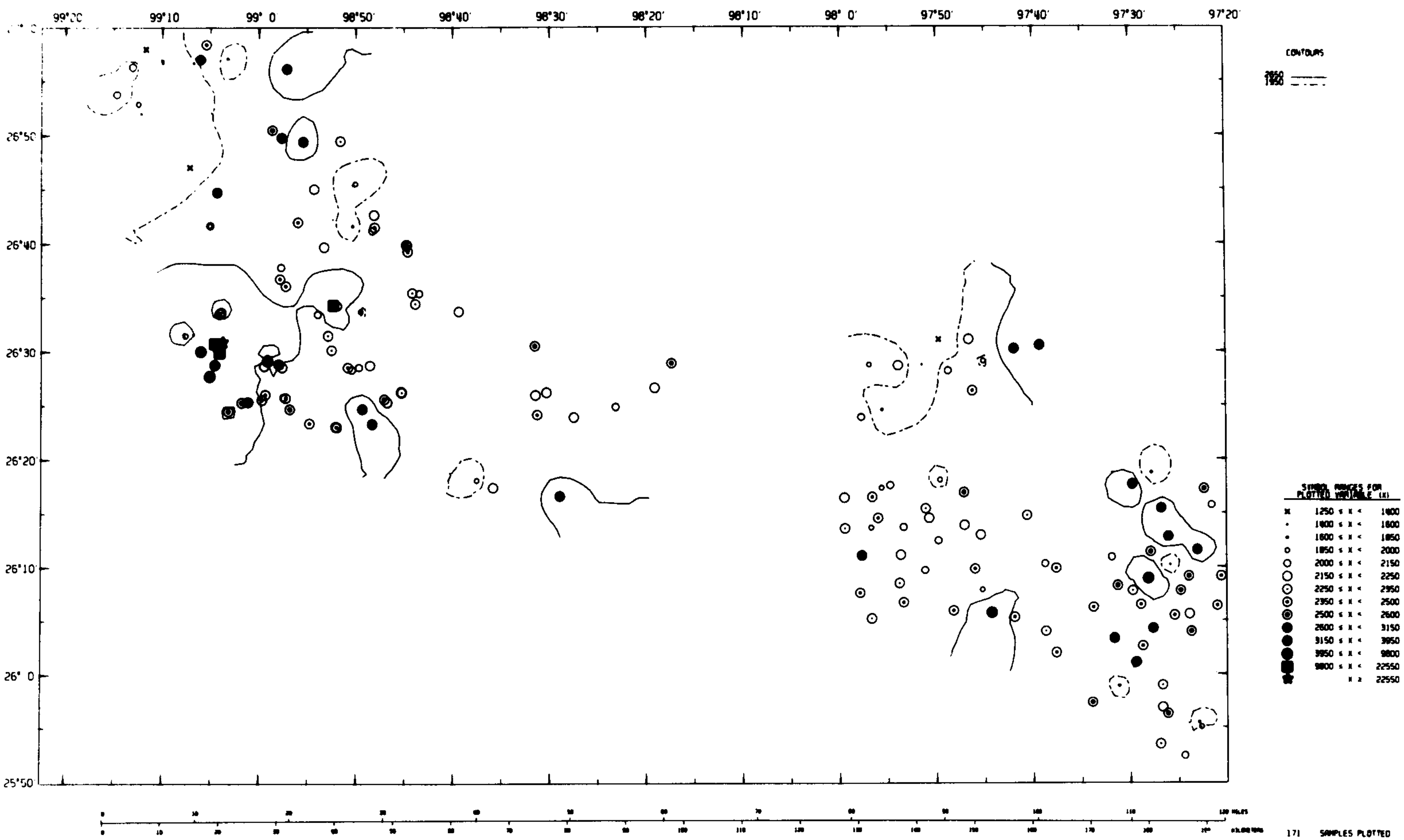


Figure B-15b

GEOCHEMICAL DISTRIBUTION OF TITANIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

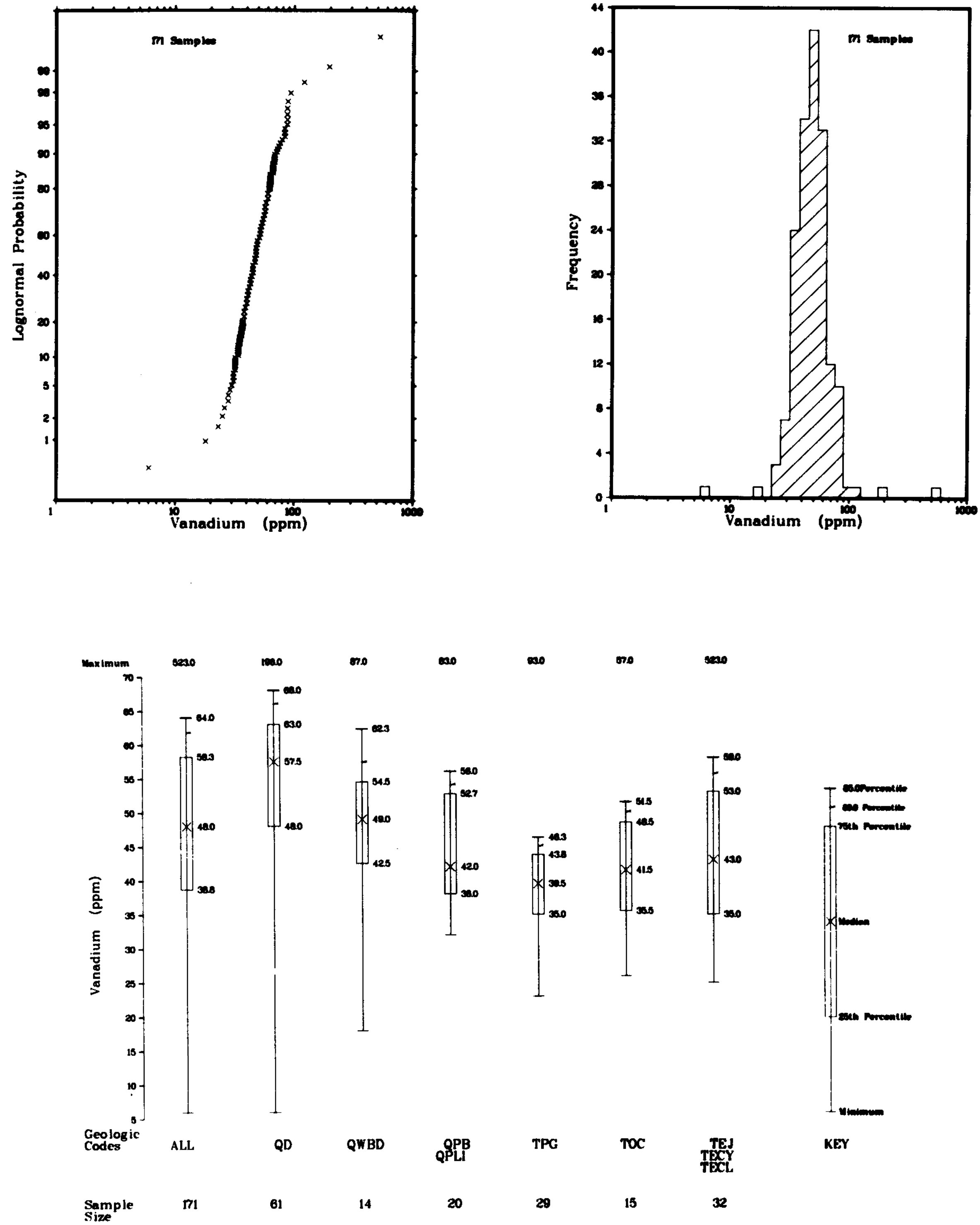


Figure B-16a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR VANADIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

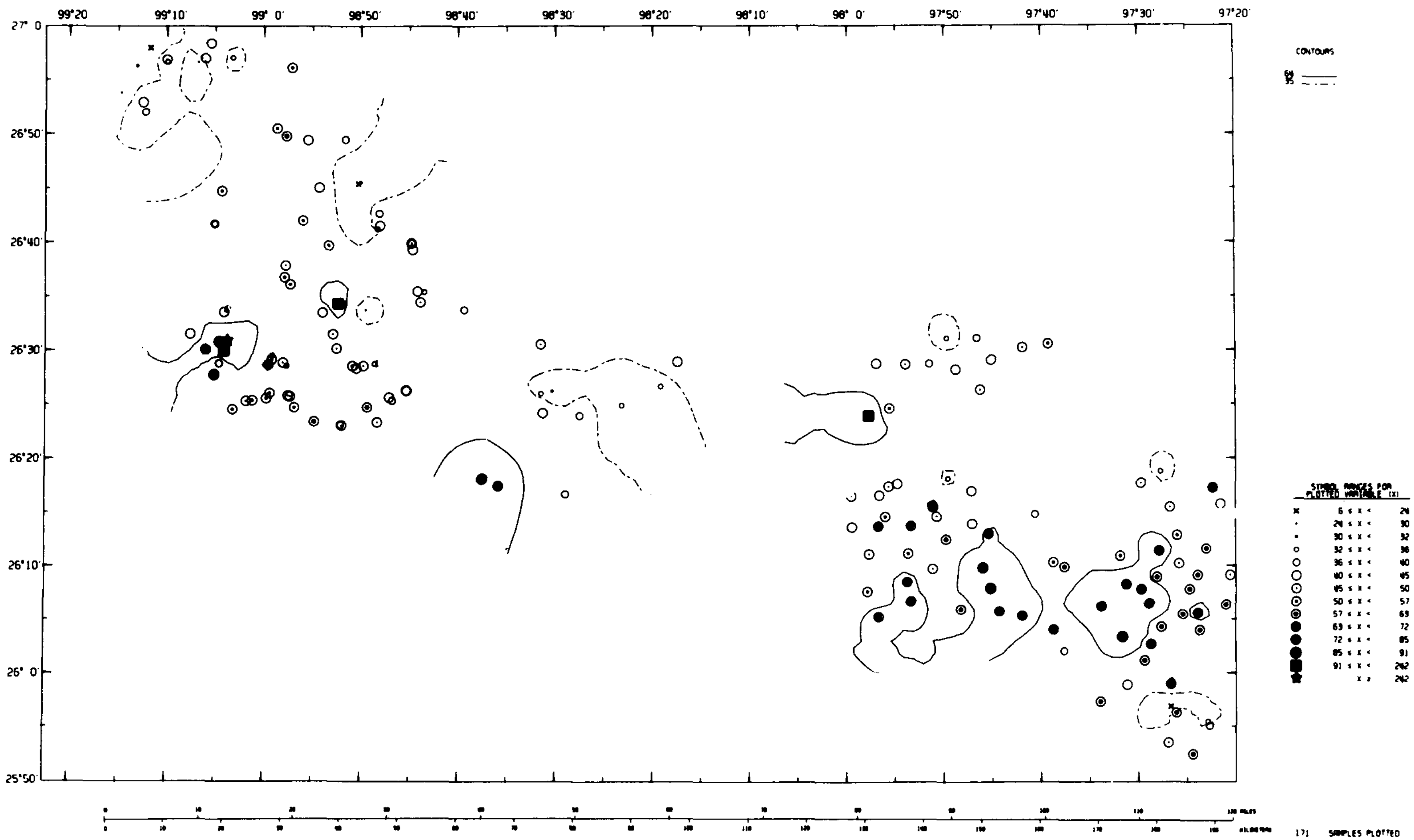


Figure B-16b

GEOCHEMICAL DISTRIBUTION OF VANADIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

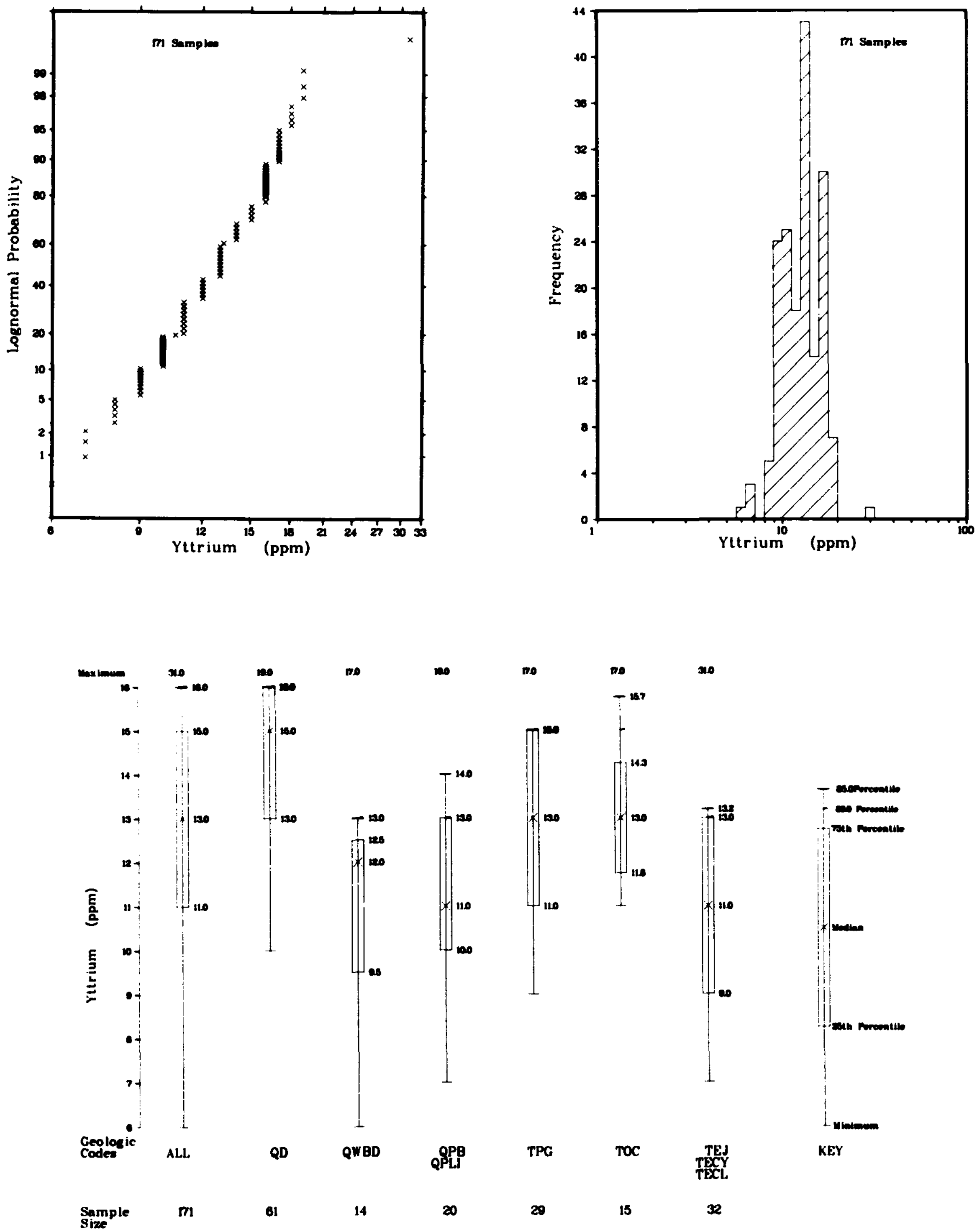


Figure B-17a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR YTTRIUM (PPM) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

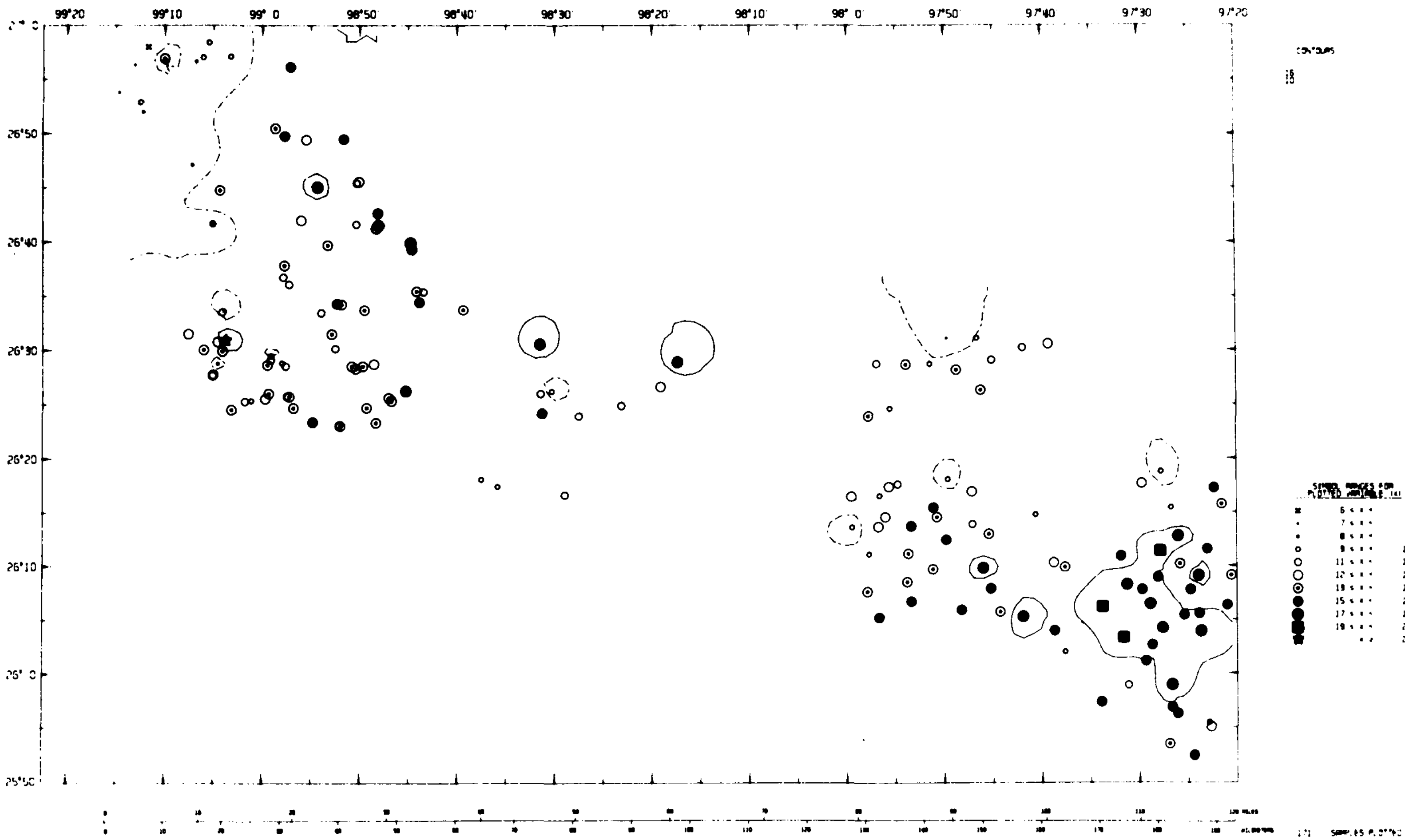


Figure B-17b

GEOCHEMICAL DISTRIBUTION OF YTTRIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

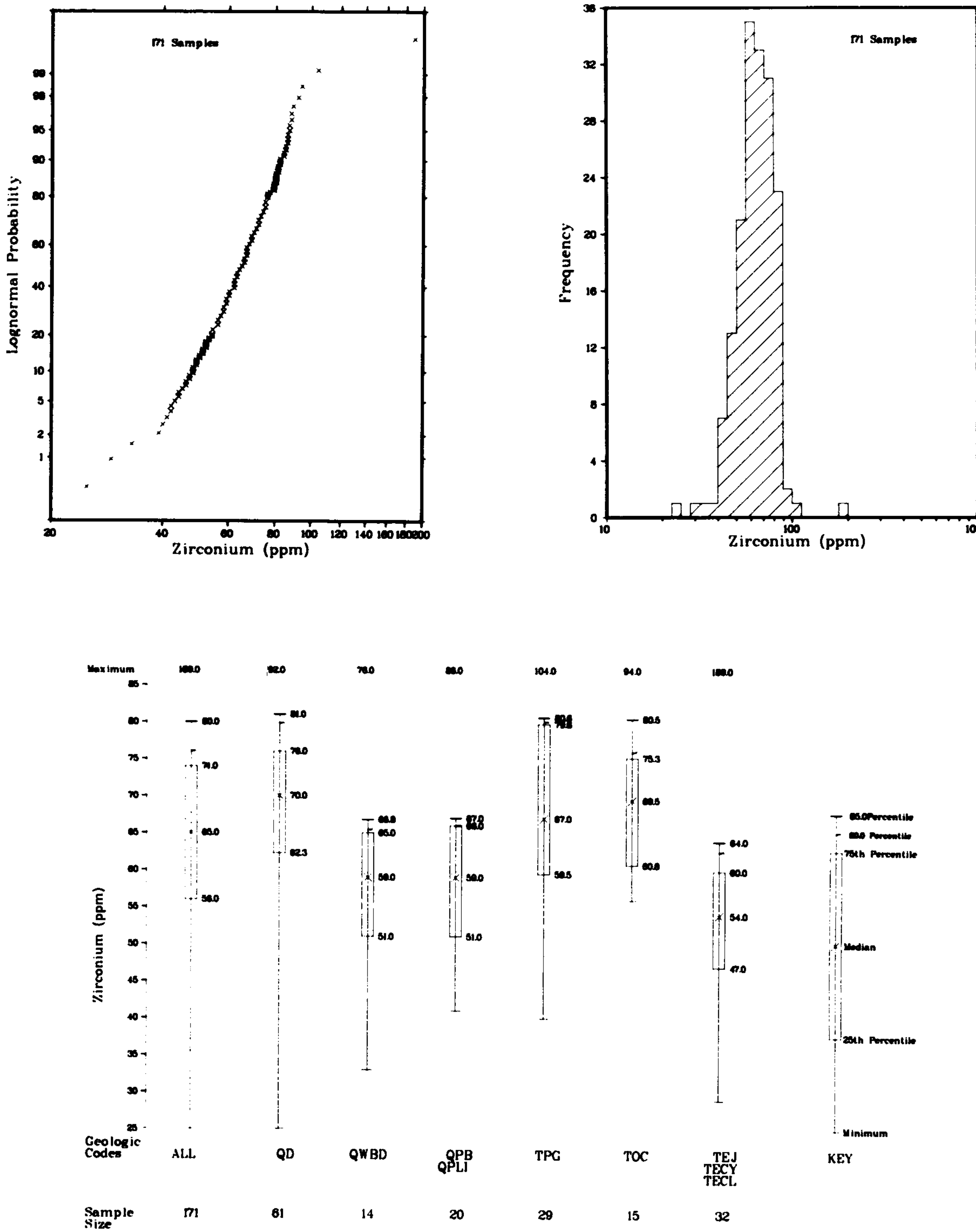


Figure B-18a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ZIRCONIUM (PPM) IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

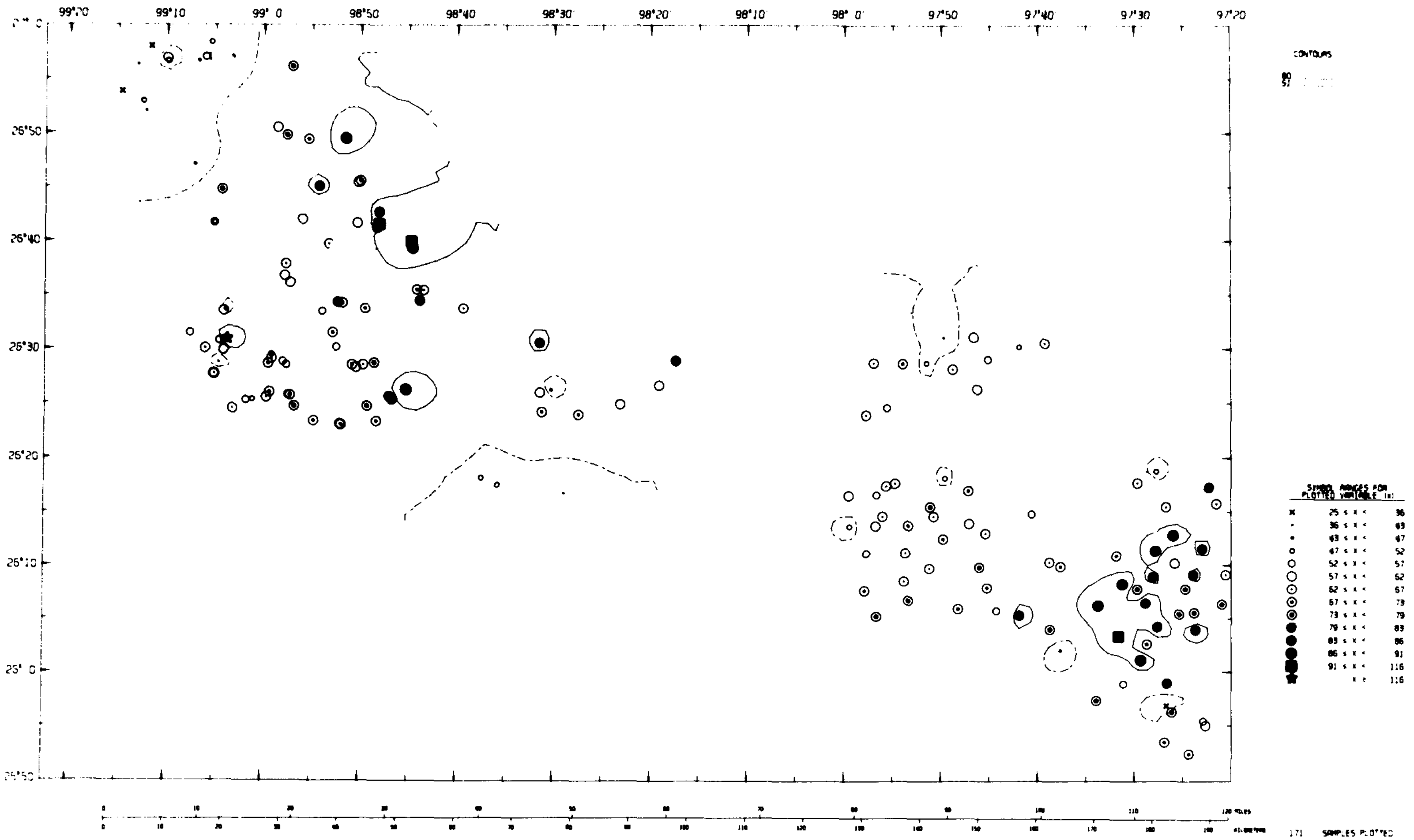


Figure B-18b

GEOCHEMICAL DISTRIBUTION OF ZIRCONIUM (PPM)
IN STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

Table B-3

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	U/TU	TH (PPM)	AL (%)	AS (PPM)	CA (%)	MN (PPM)	V (PPM)	P (PPM)	TI (PPM)
38381	48-26.104 -	97.564	-3-12-	3.3	2.6	1.3	5	6.1	9.3	6.3	1500	79	1500	2500
38383	48-26.138 -	97.522	-3-12-	2.4	2.8	0.85	9	5.6	8.3	7.2	2100	83	1100	2500
38384	48-26.056 -	97.528	-3-12-	2.8	3.1	0.89	8	5.9	7.4	7.4	1100	87	920	2600
38385	48-26.089 -	97.700	-3-12-	3.1	2.9	1.1	6	5.0	5.7	11.	960	66	1300	2400
38392	48-26.283 -	97.787	-3-12-	2.4	2.2	1.1	5	3.9	0.9	2.5	350	40	450	2500
38393	48-26.258 -	97.853	-3-12-	2.3	3.3	0.68	7	5.1	3.6	9.5	1500	68	870	2300
38395	48-26.019 -	97.490	-3-12-	2.5	2.7	0.93	6	4.6	0.7	7.7	1100	59	660	2700
38396	48-26.071 -	97.461	-3-12-	2.3	3.0	0.76	8	5.1	0.9	5.9	980	61	1000	2600
38397	48-26.066 -	97.395	-3-12-	1.9	2.8	0.66	6	4.9	5.1	6.9	1100	60	840	2600
38398	48-26.112 -	97.304	-3-15-	3.2	2.2	1.4	6	3.7	0.6	5.2	300	39	480	2200
38399	48-26.108 -	97.482	-3-15-	2.2	3.2	0.67	7	5.5	5.2	8.1	740	74	940	2500
38401	48-26.193 -	97.384	-3-15-	2.2	2.7	0.82	4	4.7	7.6	4.6	480	62	620	2800
38402	48-26.214 -	97.434	-3-12-	2.5	2.5	0.99	<2	5.4	3.9	0.98	340	56	640	3000
38404	48-26.149 -	97.469	-3-12-	2.4	3.6	0.68	3	4.1	2.5	4.1	460	62	660	5100
38405	48-26.130 -	97.413	-3-12-	1.7	2.4	0.69	5	5.0	3.3	6.0	650	58	820	2500
38406	48-26.152 -	97.343	-3-12-	1.6	2.5	0.62	4	4.4	3.2	6.6	440	48	530	2400
38407	48-26.091 -	97.424	-3-12-	2.2	2.9	0.77	3	5.1	3.7	6.6	700	60	960	2500
38408	48-26.106 -	97.350	-3-12-	2.4	2.6	0.93	6	4.8	3.3	7.5	750	58	940	2400
38409	48-26.170 -	97.431	-3-12-	1.7	1.5	1.1	5	4.0	3.6	7.8	540	47	870	1500
38410	48-26.130 -	97.496	-3-12-	3.7	3.3	1.1	8	5.3	6.1	9.3	580	76	850	2300
38412	48-26.190 -	97.465	-3-15-	3.7	3.2	1.1	7	6.2	5.9	7.1	500	83	1100	2600
38413	48-26.152 -	97.399	-3-12-	2.3	2.8	0.80	7	5.6	2.5	3.7	980	57	1500	2600
38414	48-26.093 -	97.398	-3-15-	2.5	3.3	0.76	6	5.2	2.8	5.8	370	68	970	2200
38415	48-26.044 -	97.479	-3-12-	1.8	2.9	0.64	5	5.2	4.8	7.6	950	63	820	2400
38416	48-26.288 -	97.372	-3-15-	1.5	2.4	0.63	8	5.2	3.3	6.4	440	63	730	2600
38417	48-26.263 -	97.359	-3-15-	1.5	2.0	0.74	3	4.3	3.3	5.9	320	43	580	2000
38418	48-26.258 -	97.446	-3-12-	1.4	2.1	0.66	<2	4.8	2.5	1.5	240	46	220	2700
38420	48-26.313 -	97.463	-3-12-	1.2	1.5	0.77	4	3.9	1.6	1.4	280	32	270	1700
38421	48-26.295 -	97.496	-3-12-	2.0	2.4	0.83	8	4.6	1.8	2.5	480	48	320	2900
38422	48-26.518 -	97.778	-3-12-	1.5	2.4	0.63	6	3.5	1.8	3.3	360	38	320	2200
38426	48-26.518 -	97.830	-3-12-	1.5	1.5	1.0	6	3.2	2.0	2.6	350	32	240	1300
38432	48-26.509 -	97.656	-3-15-	1.7	3.1	0.54	7	3.9	2.0	3.9	530	54	410	3200
38433	48-26.504 -	97.700	-3-12-	1.6	2.6	0.61	5	3.3	1.1	2.2	370	48	360	3300
38437	48-26.228 -	97.947	-3-12-	2.2	2.7	0.81	8	4.3	2.9	7.2	1000	63	680	1900
38453	48-26.164 -	97.768	-3-12-	4.3			7	5.9	2.1	8.4	370	87	1000	2400
38454	48-26.112 -	97.891	-3-12-	2.4	2.8	0.88	4	5.0	4.6	8.1	970	66	860	2400
38457	48-26.217 -	97.758	-3-12-	3.8	3.4	1.1	9	4.6	2.5	7.9	400	66	1100	2200
38458	48-26.208 -	97.831	-3-12-	2.2	2.8	0.78	9	4.8	2.3	7.6	920	60	990	2100
38464	48-26.132 -	97.755	-3-15-	4.6	5.6	0.82	8	4.7	4.0	7.6	550	87	2600	1900
38465	48-26.142 -	97.898	-3-12-	2.3	3.5	0.65	5	4.4	1.5	5.1	410	68	790	2300
38515	48-25.956 -	97.566	-3-15-	1.7	2.6	0.64	7	4.6	3.2	9.1	380	57	770	2500
38517	48-25.983 -	97.445	-3-12-	3.0	2.9	1.0	8	5.2	6.1	6.5	570	66	1300	2300
38519	48-25.948 -	97.445	-3-15-	2.5	2.8	0.91	<2	4.9	3.8	8.6	360	6	590	2200
38521	48-25.917 -	97.378	-3-12-	2.0	2.1	0.55	5	3.9	2.7	6.1	330	36	470	2000
38522	48-25.982 -	97.520	-3-12-	2.5	2.3	1.1	8	3.4	2.3	9.2	380	42	700	1800
38528	48-25.891 -	97.449	-3-12-	1.8	2.5	0.73	7	4.3	3.0	7.3	310	49	640	2300
38529	48-25.924 -	97.382	-3-12-	1.4	1.8	0.80	5	3.6	1.6	5.6	250	34	420	1800
38530	48-25.938 -	97.436	-3-12-	2.7	3.1	0.86	7	4.2	3.4	7.9	500	59	670	2600
38538	48-26.087 -	97.946	-3-12-	3.3	3.8	0.86	5	4.9	3.7	8.6	580	66	940	2300
38541	48-25.873 -	97.407	-3-12-	2.8	2.6	1.1	8	4.5	5.4	9.5	2600	57	1000	2100
38542	48-26.485 -	97.753	-3-12-	1.9	2.0	0.94	5	4.0	2.3	7.3	260	41	390	1900
38543	48-26.470 -	97.814	-3-12-	3.3	3.4	0.98	4	4.5	2.0	4.2	360	42	400	2100
38544	48-26.294 -	97.914	-3-12-	1.8	2.6	0.71	6	4.3	1.4	4.0	570	43	690	2100
38545	48-26.275 -	97.993	-3-15-	0.98	1.9	0.52	<2	4.2	2.2	7.1	290	45	480	2200
38546	48-26.302 -	97.828	-3-12-	1.1	1.9	0.61	5	4.1	1.3	1.5	210	34	230	1900

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	U/TU	TH (PPM)	AL (%)	AS (PPM)	CA (%)	MN (PPM)	V (PPM)	P (PPM)	TI (PPM)
38547	48-26.276 -	97.945	-3-12-	2.0	2.7	0.73	3	3.5	1.3	5.6	240	44	390	2400
38548	48-26.290 -	97.929	-3-15-	2.5	3.2	0.79	7	4.4	1.8	5.4	660	49	890	2000
38549	48-26.399 -	97.964	-3-12-	3.2	3.3	0.96	6	4.8	4.7	8.0	1300	93	820	2100
38550	48-26.479 -	97.859	-3-12-	2.0	2.0	1.0	4	3.7	2.3	5.9	230	38	510	1500
38551	48-26.478 -	97.900	-3-12-	3.7	3.8	0.97	6	4.4	2.3	5.6	750	48	430	2200
38552	48-26.439 -	97.772	-3-12-	1.6	2.1	0.76	6	4.1	1.8	5.7	260	45	470	2400
38563	48-26.479 -	97.950	-3-12-	1.7	1.9	0.87	4	4.6	1.8	1.9	320	40	290	2000
38565	48-26.182 -	97.532	-3-12-	2.3	2.8	0.80	7	5.0	2.1	4.4	870	52	870	2100
38567	48-26.165 -	97.628	-3-12-	2.7	3.1	0.87	<2	4.8	3.1	7.0	690	63	740	2400
38570	48-26.410 -	97.928	-3-12-	6.1	7.6	0.81	3	3.6	2.8	4.0	740	53	330	1800
38577	48-26.247 -	97.678	-3-12-	1.7	2.2	0.77	3	3.6	1.4	3.2	470	38	530	2300
38588	48-26.232 -	97.786	-3-12-	1.7	2.1	0.79	3	4.1	1.5	5.2	320	42	480	2200
38589	48-26.243 -	97.847	-3-12-	2.2	2.2	1.0	5	4.8	1.6	2.4	460	45	630	2200
38590	48-26.229 -	97.891	-3-12-	3.6			7	5.3	1.3	7.2	410	63	2600	2100
38591	48-26.243 -	97.935	-3-12-	1.6	2.2	0.74	3	3.9	2.5	5.8	260	52	500	2400
38592	48-26.227 -	97.992	-3-12-	1.5	2.0	0.73	4	3.0	0.8	4.3	1700	41	340	2300
38593	48-26.127 -	97.966	-3-12-	2.3	3.0	0.75	6	4.2	1.6	6.4	320	56	620	2400
38594	48-26.185 -	97.963	-3-12-	1.3	2.3	0.59	4	3.1	1.0	4.4	2700	49	380	2600
38595	48-26.186 -	97.896	-3-12-	2.7	3.8	0.72	7	3.8	2.0	7.0	450	53	650	2200
38596	48-26.162 -	97.854	-3-12-	1.9	2.3	0.84	6	4.3	2.0	6.3	390	46	650	2100
38598	48-26.099 -	97.805	-3-12-	2.1	2.7	0.76	6	4.7	4.6	8.1	400	61	910	2400
38601	48-26.172 -	97.647	-3-15-	1.4	2.3	0.61	7	4.4	3.3	6.2	300	54	690	2100
38603	48-26.067 -	97.646	-3-12-	2.3	2.9	0.80	5	5.0	6.2	8.2	450	63	1300	2300
38604	48-26.034 -	97.628	-3-12-	1.4	1.5	0.95	4	3.6	1.7	4.7	260	37	440	2400
38605	48-26.096 -	97.739	-3-12-	1.1	2.2	0.49	3	3.4	1.2	5.3	470	68	320	5400
41944	48-26.423 -	99.019	-3-15-	1.6	2.3	0.69	8	4.6	2.0	6.7	340	52	400	3600
41945	48-26.422 -	99.030	-3-15-	1.9	1.9	1.0	9	4.6	2.5	7.6	310	48	340	2500
41947	48-26.409 -	99.053	-3-12-	2.4	2.4	1.0	8	4.6	2.1	6.9	330	53	420	2600
41948	48-26.480 -	99.076	-3-15-	1.7	1.6	1.1	2	4.3	1.3	4.1	230	38	210	3200
42110	48-26.389 -	98.805	-3-15-	4.2	4.4	0.96	8	4.0	2.3	4.4	410	48	300	3400
42111	48-26.426 -	98.995	-3-15-	2.3	2.3	0.98	11	4.4	3.1	5.5	320	51	330	2400
42116	48-26.430 -	98.958	-3-15-	1.6	2.0	0.81	6	4.5	2.6	4.5	290	48	470	2100
42117	48-26.412 -	98.947	-3-15-	2.7	2.5	1.1	7	4.3	4.2	8.2	330	53	440	2600
42118	48-26.476 -	98.847	-3-15-	2.5	2.3	1.1	8	5.1	3.7	6.3	430	56	470	2400
42119	48-26.476 -	98.828	-3-15-	2.1	2.3	0.93	10	5.1	2.2	6.3	410	49	430	2100
42120	48-26.503 -	98.875	-3-15-	2.1	2.3	0.90	5	4.9	3.6	4.9	320	47	340	2300
42121	48-26.571 -	98.864	-3-15-	1.6	1.7	0.94	4	5.0	1.8	1.7	330	37	340	2100
42122	48-26.694 -	98.839	-3-15-	1.5	1.8	0.84	13	3.6	1.0	0.89	250	26	210	1700
42123	48-26.662 -	98.888	-3-15-	2.4	2.1	1.2	7	4.7	3.4	5.2	340	50	490	2200
42124	48-26.558 -	98.899	-3-15-	2.0	2.0	1.0	6	4.9	2.6	3.5	290	41	410	2100
42125	48-26.602 -	98.954	-3-15-	1.7	2.2	0.77	5	4.5	3.8	4.3	300	50	290	2400
42129	48-26.711 -	98.802	-3-15-	2.1	2.1	1.0	7	4.8	1.4	0.80	380	37	190	2200
42140	48-26.613 -	98.964	-3-15-	1.9	2.4	0.80	<2	4.7	2.6	3.8	290	52	310	2400
42141	48-26.631 -	98.962	-3-15-	2.1	2.3	0.90	5	5.0	3.7	5.5	370	48	390	2100
42142	48-26.591 -	98.736	-3-15-	1.4	1.9	0.74	6	4.5	2.0	2.9	370	43	460	2300
42148	48-26.509 -	98.525	-3-15-	1.8	1.8	1.0	5	5.0	2.1	1.3	500	45	480	2800
42149	48-26.412 -	98.822	-3-15-	1.6	2.2	0.71	7	4.8	3.0	3.7	380	57	350	3100
42151	48-26.479 -	98.809	-3-15-	1.7	2.2	0.77	7	4.1	1.1	2.8	270	34	320	2200
42158	48-26.655 -	98.744	-3-15-	1.7	1.9	0.87	<2	4.7	2.0	2.0	380	41	650	2400
42159	48-26.665 -	98.746	-3-15-	1.7	1.8	0.94	11	5.3	3.3	1.8	370	45	480	2500
42160	48-26.665 -	98.746	-3-15-	1.5	1.8	0.82	<2	4.3	1.8	1.2	330	37	490	2200
42161	48-26.590 -	98.724	-3-15-	1.3	1.7	0.74	11	3.5	1.6	1.0	280	35	330	2100
42162	48-26.574 -	98.731	-3-15-	1.3	1.8	0.74	7	4.9	2.8	2.8	460	47	710	2300
42164	48-26.559 -	99.068	-3-15-	1.5	1.9	0.80	3	5.0	2.1	3.3	310	43	400	2600
42165	48-26.561 -	99.065	-3-15-	1.3	1.8	0.74	<2	3.6	2.1	1.8	210	31	200	2300

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	U/TU	TH (PPM)	AL (%)	AS (PPM)	CA (%)	MN (PPM)	V (PPM)	P (PPM)	TI (PPM)
42205	48-26.278 -	98.482	-3-12-	0.84	1.5	0.56	2	2.6	1.6	2.2	280	37	150	2700
42220	48-26.415 -	98.386	-3-15-	1.8	1.8	1.0	7	3.6	1.1	1.9	270	32	430	2100
42225	48-26.444 -	98.319	-3-15-	1.0	1.7	0.61	3	4.1	1.3	0.85	310	32	290	2200
42226	48-26.482 -	98.290	-3-15-	1.3	1.8	0.74	8	5.3	1.0	0.96	310	44	680	2500
42228	48-26.399 -	98.458	-3-15-	1.4	1.8	0.80	8	3.9	1.9	2.4	300	36	310	2200
42232	48-26.403 -	98.521	-3-15-	1.6	1.9	0.83	8	4.9	1.2	1.0	400	40	620	2400
42233	48-26.437 -	98.505	-3-15-	1.2	1.6	0.73	4	3.0	1.1	1.3	260	31	220	2200
42234	48-26.433 -	98.524	-3-15-	1.4	1.8	0.76	<2	3.7	1.3	1.0	340	35	290	2200
42242	48-26.302 -	98.625	-3-12-	2.9	3.2	0.91	5	3.4	4.5	8.8	230	87	270	1900
42243	48-26.291 -	98.597	-3-15-	1.7	2.3	0.73	4	3.5	7.8	11.	310	72	390	2200
42257	48-26.499 -	99.068	-3-15-	1.4	4.6	0.30	5	4.4	1.6	3.7	700	120	250	12000
42260	48-26.463 -	99.084	-3-15-	1.6	2.5	0.64	13	4.3	3.0	7.3	390	62	360	3800
42261	48-26.462 -	99.085	-3-15-	2.0	2.5	0.80	4	4.5	2.2	5.8	360	56	290	4200
42263	48-26.825 -	98.860	-3-15-	2.0	1.9	1.1	4	4.8	2.0	1.1	340	36	370	2300
42264	48-26.936 -	98.952	-3-15-	1.7	2.0	0.84	7	5.4	1.9	1.9	490	56	470	2800
42270	48-26.830 -	98.961	-3-15-	1.7	1.8	0.92	8	5.7	1.4	2.7	460	57	550	2600
42271	48-26.842 -	98.977	-3-15-	2.0	1.9	1.1	7	5.3	1.4	4.3	380	53	420	2500
42273	48-26.824 -	98.924	-3-15-	1.6	2.1	0.77	<2	4.5	1.4	0.69	320	44	220	2900
42276	48-26.751 -	98.905	-3-15-	1.6	1.9	0.83	5	5.0	1.9	1.6	370	40	350	2200
42289	48-26.759 -	98.834	-3-15-	1.4	1.6	0.86	8	4.1	1.7	0.51	240	31	220	1900
42291	48-26.757 -	98.838	-3-15-	1.3	1.8	0.72	3	3.4	0.9	0.35	180	23	300	1600
42293	48-26.897 -	99.245	-3-15-	1.2	1.6	0.75	<2	2.4	0.8	0.79	140	28	100	2100
42294	48-26.939 -	99.218	-3-15-	1.6	1.3	1.3	4	3.4	1.2	1.4	180	30	180	2000
42295	48-26.967 -	99.195	-3-15-	1.1	1.2	0.94	2	3.2	0.9	0.62	130	18	150	1300
42298	48-26.785 -	99.119	-3-15-	1.2	1.4	0.88	<2	4.5	1.1	1.9	190	25	260	1300
42299	48-26.945 -	99.166	-3-15-	0.85	1.6	0.53	9	4.7	1.8	2.4	290	32	240	1500
42313	48-26.434 -	98.989	-3-15-	2.2	2.3	0.96	7	4.6	3.5	6.2	350	55	380	2400
42314	48-26.478 -	98.991	-3-15-	2.1	2.4	0.88	5	5.2	3.9	8.5	400	71	530	2200
42315	48-26.429 -	98.954	-3-15-	2.8	2.3	1.2	2	3.9	3.3	7.5	310	49	400	2400
42316	48-26.390 -	98.913	-3-15-	3.5	2.5	1.4	<2	4.8	3.1	9.7	410	60	580	2400
42317	48-26.472 -	98.840	-3-15-	2.0	2.3	0.89	<2	5.0	1.9	6.2	400	47	450	2000
42318	48-26.525 -	98.881	-3-15-	1.7	2.3	0.73	7	5.3	2.1	4.4	360	48	490	2300
42319	48-26.572 -	98.872	-3-15-	1.6	4.2	0.39	8	3.0	3.4	2.6	970	200	260	17000
42320	48-26.562 -	98.825	-3-15-	1.3	2.1	0.63	8	4.1	1.3	2.8	270	28	440	1900
42321	48-26.687 -	98.805	-3-15-	1.2	1.9	0.62	7	4.7	1.4	0.56	350	34	140	2100
42322	48-26.700 -	98.933	-3-15-	1.9	2.1	0.90	5	4.8	2.8	3.8	340	52	420	2400
42328	48-26.692 -	98.801	-3-15-	1.9	2.1	0.90	12	5.2	1.7	0.86	410	42	220	2400
42332	48-26.422 -	98.779	-3-15-	1.7	2.3	0.73	9	4.2	1.7	4.3	320	39	460	2200
42333	48-26.427 -	98.784	-3-15-	1.6	2.5	0.65	12	4.2	1.6	3.7	340	40	480	2600
42334	48-26.438 -	98.755	-3-15-	2.0	2.3	0.89	6	4.9	1.8	3.3	420	40	680	2200
42335	48-26.437 -	98.754	-3-15-	2.0	2.2	0.89	8	4.6	2.2	3.4	430	41	690	2300
42336	48-26.476 -	98.960	-3-15-	2.0	2.6	0.77	2	4.2	2.1	2.9	200	35	170	2300
42337	48-26.481 -	98.966	-3-15-	1.6	3.4	0.48	5	4.0	1.9	2.6	250	45	150	3200
42338	48-26.486 -	98.985	-3-15-	1.9	3.2	0.60	7	3.8	1.6	2.4	290	51	150	4300
42339	48-26.492 -	98.985	-3-15-	2.0	2.5	0.78	5	4.2	1.8	3.0	200	35	180	1900
42340	48-26.384 -	98.866	-3-12-	1.5	2.4	0.61	7	4.3	2.2	5.8	360	45	340	2500
42341	48-26.385 -	98.868	-3-12-	1.1	2.2	0.52	6	3.5	1.8	3.3	320	37	460	2300
42369	48-26.562 -	98.656	-3-15-	0.89	1.7	0.52	3	4.3	1.9	3.5	400	38	820	2200
42502	48-26.746 -	99.072	-3-15-	2.3	2.2	1.1	7	4.9	1.8	3.8	480	55	430	2600
42510	48-26.695 -	99.085	-3-15-	1.1	1.8	0.61	3	4.7	2.6	2.6	230	38	270	2000
42511	48-26.695 -	99.084	-3-15-	1.9	1.9	0.98	9	4.3	2.7	3.1	260	39	250	2100
42514	48-26.525 -	99.126	-3-15-	1.7	1.9	0.91	4	4.4	1.9	7.0	280	41	330	1900
42519	48-26.501 -	99.100	-3-15-	1.9	3.6	0.54	7	3.7	2.1	6.4	580	83	280	9000
42520	48-26.514 -	99.064	-3-15-	2.9	14.	0.20	7	2.4	2.0	1.3	3000	520	450	59000
42521	48-26.513 -	99.076	-3-15-	1.8	4.6	0.39	6	3.9	1.9	3.1	630	88	200	10000

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE BROWNSVILLE-McALLEN QUADRANGLES

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	U/TU	TH (PPM)	AL (%)	AS (PPM)	CA (%)	MN (PPM)	V (PPM)	P (PPM)	TI (PPM)
42568	48-26.949 -	99.167	-3-12-	3.3	2.6	1.3	12	4.3	4.5	6.5	780	48	360	1800
42570	48-26.951 -	99.101	-3-15-	1.6	1.9	0.84	3	4.6	1.6	1.9	280	41	260	2600
42571	48-26.945 -	99.113	-3-15-	1.9	2.3	0.82	5	3.9	1.9	1.7	220	29	170	1500
42573	48-26.882 -	99.208	-3-15-	1.5	1.8	0.81	4	4.5	2.5	2.7	260	44	320	1900
42574	48-26.867 -	99.203	-3-15-	1.3	1.5	0.88	2	4.4	2.8	3.2	230	36	270	1600
42579	48-26.952 -	99.054	-3-15-	1.1	1.6	0.71	3	4.1	1.5	1.7	190	34	210	1800
42580	48-26.974 -	99.091	-3-15-	1.5	1.8	0.81	2	4.6	2.3	2.9	290	43	320	2400

APPENDIX C

MICROFICHE OF FIELD AND LABORATORY DATA

APPENDIX C

MICROFICHE OF FIELD AND LABORATORY DATA

LIST OF TABLES

Table C-1

COMPUTER CODE LIST OF GEOCHEMICAL VARIABLES

Variable[a]	Code	Variable[a]	Code
Uranium Measured by Fluorometry[b]	U-FL	Scandium	SC
		Silicon	SI
Uranium Measured by Mass Spectrometry[b]	U-MS	Strontium	SR
Uranium Measured by Neutron Activation	U-NT	Thorium	TH
		Titanium	TI
Arsenic	AS	Vanadium	V
Selenium	SE	Yttrium	Y
Silver	AG	Zinc	ZN
Aluminum	AL	Zirconium	ZR
Boron	B	Sulfate (ppm)	SO_4
Barium	BA	Chloride (ppm)	CL
Beryllium	BE	Conductivity from Lab (μmhos/cm)	CT-L
Calcium	CA	Conductivity from Field (μmhos/cm)	CT-F
Cerium	CE	Dissolved Oxygen (ppm)	DO
Cobalt	CO	Air Temperature (°C)	ATEM
Chromium	CR	Water Temperature (°C)	WTEM
Copper	CU	pH	PH
Iron	FE	pH Measured by Lo Ion Paper	PH-P
Hafnium	HF	Total Alkalinity (ppm)	T-AK
Potassium	K	M-Alkalinity (ppm)	M-AK
Lanthanum	LA	P-Alkalinity (ppm)	P-AK
Lithium	LI	Carbonate (ppm)[c]	CB
Mangesium	MG	Bicarbonate (ppm)[c]	BC
Manganese	MN	Undissociated Carbonic Acid (ppm)[c]	CAB
Molybdenum	MO	U-NT/U-FL	TU/U
Sodium	NA	U-FL/U-NT	U/TU
Niobium	NB	TH/U-NT	TH/U
Nickel	NI	1,000·U/SP	U/SP
Phosphorus	P	1,000·U/B	U/B
Lead	PB	1,000·U/SO	U/SO
Platinum	PT		

(a)If natural logarithm of variable is used, L or L- precedes the variable code.

(b)If method is not specified for waters, U-FL is used, except where value is below laboratory detection limit in which case U-MS is substituted if it is available.

(c)These variables were approximated using cubic spline functions to fit the curves in Hem (1970), p. 155.

Table C-2

OAK RIDGE GEOCHEMICAL SAMPLING FORM
SHOWING FIELD DATA RECORDED ON MICROFICHE

OAK RIDGE GEOCHEMICAL SAMPLING FORM

1 Card Number

GENERAL SITE DATA

Attach Identical Sample Number Here (2 3 4 5 6 7)

8 9 10 11 Site Number

12 13 14 15 – 16 17 Map Code

Sample Type (18)

M	Stream Sediment
H	Lake Sediment
S	Stream Water
W	Well Water
P	Spring Water
L	Lake Water
A	Bog Water
B	Plant
F	Soil (Use Remarks)
G	Rock
Ø	Other

19 Replicate Letter (A–Z)

Hour (20 21) Day (22 23) Month (24 25) Year (26 27)

28 29 30 Collector's Initials

31 Phase (P, 1, 2, or G)

Field Sheet Status (32)

Ø	Original
C	Correction
V	Voiding

Control Sample (33)

A	Sediment, High U
B	Sediment, Low U
C	Water, High U
D	Water, Low U
Ø	Other

34 35 36 37 Air Temperature (°C)

Location

Latitude			Longitude		
Deg.	Min.	Sec.	Deg.	Min.	Sec.
38 39	40 41	42 43	44 45 46	47 48	49 50

51 52 53 54 Surface Geologic Unit Code

Type of Vegetation (55) (Within 1 Km Upstream)

C	Conifer
&	Conifer & Deciduous
D	Deciduous
B	Brush
G	Grass
M	Moss
L	Lichen
Ø	Other

Density of Vegetation (56) (Within 1 Km Upstream)

B	Barren
S	Sparse
M	Moderate
D	Dense
V	Very Dense

Local Relief (57) (Within 1 Km Upstream)

F	Flat	(<2m)
L	Low	(2–15m)
G	Gentle	(15–60m)
M	Moderate	(60–300m)
H	High	(>300m)
Ø	Other	

Weather

58		59	
C	Calm	C	Clear
P	Lt Wind	L	Pt Cldy
V	Windy	W	Overcst
R	V. Windy	V	Rainy
S	Gale	G	Snowy

Classes of Contaminants (60)

N	None
M	Mining (Use Remarks)
A	Agriculture
F	Oil Field
I	Industry
S	Sewage
P	Power Plant
U	Urban
Ø	Other

Average Stream Velocity (m/sec) (61 62 63)

N = No Visible Movement
P = Stagnant Pool

64 65 66 Water Width (m)

67 68 69 Average Depth (m)

Water Level

70		70	
D	Dry	N	Normal
P	Pools	H	High
L	Low	F	Flood

Dominant Bed Material (71)

B	Boulder
C	Cobble
P	Pebble
S	Sand
T	Silt
Y	Clay
N	None (Use Remarks)

Sample Color (Except Plants)

Adj (72 73 74) Noun (75 76)

V	V Lt	PK	Pink
L	Light	RD	Red
M	Medium	GN	Green
D	Dark	BU	Blue
CL	Clear	BN	Brown
WH	White	GY	Gray
YL	Yellow	BK	Black
OR	Orange	ØT	Other

Odor of Sampled Material (77)

N	None
S	H_2S
Ø	Other

78 R **Results Request** (Use Remarks)

2 Card Number

PLANT SAMPLE

18 19 Number of Plants Sampled (Number of grabs for moss)

20 21 22 Trunk Diameter (m) (1 m above ground)

23 24 25 Plant Height (m) (Average of Plants Sampled)

Name of Tree, Deciduous

26		26	
R	Alto Verde	U	Locust
A	Ash	P	Maple
B	Beech	M	Mesquite
I	Birch	K	Oak, Other
D	Box Elder	V	Olive
F	Cherry	Y	Poplar
N	Cottonwood	S	Sycamore
E	Elm	T	Salt Cedar
H	Hackberry	G	Walnut
C	Hickory	X	Willow
W	Huisache	Ø	Other
L	Live Oak		

Name of Tree, Conifer

27		27	
A	N. Wh. Cedar	L	Larch
C	Cedar, Other	P	Pine
F	Fir	S	Spruce
H	Hemlock	Ø	Other
J	Juniper		

Name of Bush

28		28	
A	Alder	W	Witch Hazel
B	Blueberry	Y	Yew
P	Pussy Willow	Ø	Other

Name of Moss (29)

P	Peat
S	Sphagnum (live)
Ø	Other

Algae (30)

G	Blue-Green
B	Brown
Ø	Other

UCN-11882
(1 6-77)

Table C-2, Continued

OAK RIDGE GEOCHEMICAL SAMPLING FORM
SHOWING FIELD DATA RECORDED ON MICROFICHE

STREAM OR LAKE SEDIMENT

Sample Condition (31)
- D Dry
- W Wet

Sample Treatment (32)
- N None
- S Sieved
- Ø Other

(33 34) Number of Grabs

(35 36) % Organic Material (Field Estimate)

GENERAL WATER SAMPLES

Water Sample Treatment (37)
- N None
- F Filtered Only
- C Acidified Only
- A Acidified and Filtered
- Ø Other

Depth of Visibility (m) (38 39 40) C = Clear

(41 42 43 44 45) Conductivity (μmhos/cm)

(46 47 48) Dissolved O_2 (ppm)

(49 50 51) Temperature (°C)

(52 53 54) pH

(55) P pH by Lo-Ion Paper

(56 57 58 59) Total Alkalinity (ppm)

(60 61 62 63) P Alkalinity (ppm)

(64 65 66 67) M Alkalinity (ppm)

Appearance of Water (68)
- C Clear
- M Murky
- A Algal
- Ø Other

(69 70 71 72 73) Discharge (liters/min)

(74 75 76 77) Identification of Producing Horizon (Geologic Unit Code)

Confidence of Producing Horizon Identification (78)
- H High Degree
- R Probable
- S Possible

Source of Producing Horizon Identification (79)
- P Publication
- W Owner
- U User
- G Geologic Inference
- Ø Other

(1) 3 Card Number

WELL WATER

Type of Well (18)
- D Drilled
- P Drive Point
- G Dug
- U Unknown
- Ø Other

Power Classification (19)
- A Artesian Flow
- E Electric
- G Gasoline
- W Wind
- H Hand
- Ø Other

Casing (20)
- N None (Below Water Table)
- S Steel
- G Galvanized
- P Plastic
- U Unknown
- Ø Other

Pipe Composition (21)
- F Steel
- Z Galvanized
- C Copper
- P Plastic
- U Unknown
- Ø Other

Sample Location (22 23 24) Meters from Well Head
H = Holding Tank (Use Remarks)

Where Sample Taken With Respect To Pressure Tank (25)
- B Before
- A After
- N No Pressure Tank
- F From Pressure Tank (Use Remarks)

Use of Well (26)
- M Municipal
- H Household
- S Stock
- I Irrigation
- A All of above
- X H and S
- Y H and I
- Z S and I
- N None
- Ø Other

Frequency of Pumping (27)
- C Constant (hourly)
- F Frequent (daily)
- I Infrequent (weekly)
- R Rare (no recent use)

Depth to top of Producing Horizon (28 29 30 31) (Meters)

Confidence of Producing Depth (32)
- H High
- R Probable
- S Possible

Source of Producing Depth Information (33)
- P Publication
- W Owner
- U User
- G Geologic Inference
- Ø Other

Total Well Depth (34 35 36 37) (Meters)

Confidence of Total Depth (38)
- H High
- R Probable
- S Possible

Source of Total Depth Information (39)
- P Publications
- W Owner
- U User
- G Geologic Inference
- Ø Other

LAKE WATER

Type of Lake (65)
- N Natural
- M Manmade

Lake Area (66 67 68 69) (sq km)

REMARKS (Card 4)

MICROFICHE OF FIELD AND LABORATORY DATA

CONTENTS