Geology GJBX-(80)-99

GEOLOGY GJBX- 99 '80

K/UR-135

ORGDP

OAK RIDGE GASEOUS DIFFUSION PLANT

UNION CARBIDE

NATIONAL URANIUM RESOURCE EVALUATION PROGRAM

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR DICKINSON NTMS QUADRANGLE, NORTH DAKOTA

Uranium Resource Evaluation Project

CAUTION
This is a time release report.
Do not release any part of this publication before

March 31, 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.

Date of Issue: March 31, 1980 Report Number: K/UR-135

Subject Category: UC-51, Nuclear Raw Materials

NATIONAL URANIUM RESOURCE EVALUATION PROGRAM

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR DICKINSON NTMS QUADRANGLE, NORTH DAKOTA

Uranium Resource Evaluation Project

Union Carbide Corporation, Nuclear Division
Oak Ridge Gaseous Diffusion Plant
Oak Ridge, Tennessee

Prepared for the U. S. Department of Energy
Assistant Secretary for Resource Applications
Grand Junction Office, Colorado
under U. S. Government Contract W-7405 eng 26

Uranium Resource Evaluation Project
J. W. Arendt, Project Manager
T. R. Butz, Assistant Project Manager

Geology and Geochemistry
T. R. Butz, Project Geologist/Geochemist
N. E. Dean, Field Geology Supervisor

Analytical Chemistry, Reconnaissance Geochemistry, and Report Preparation
J. D. Joyner, Data Management and Information Processing
R. N. Helgerson, Reconnaissance Geochemical Reporting
J. Switek and F. G. Karraker, Coordinating Geologists

Uranium Resource Evaluation Project
Oak Ridge Gaseous Diffusion Plant
P. O. Box P, Mail Stop 246
Oak Ridge, Tennessee 37830
Telephone: (615) 574-8882
FTS 624-8882

Portions of the description of the geology of the Dickinson Quadrangle were provided by Robert Stach.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

(In Back Pocket)

ABSTRACT

Results of a reconnaissance geochemical survey of the Dickinson Quadrangle, North Dakota are reported. Field and laboratory data are presented for 544 groundwater and 554 stream sediment samples. Statistical and areal distributions of uranium and possible uranium-related variables are displayed. A generalized geologic map of the survey area is provided, and pertinent geologic factors which may be of significance in evaluating the potential for uranium mineralization are briefly discussed.

Interpretation of the groundwater data indicates that scattered localities in the central portion of the quadrangle appear most promising for uranium mineralization. High values of uranium in this area are usually found in waters of the Sentinel Butte and Tongue River Formations. Uranium is believed to be concentrated in the lignite beds of the Fort Union Group, with concentrations increasing with proximity to the pre-Oligocene unconformity.

Stream sediment data indicate high uranium values distributed over the central area of the quadrangle. Uranium in stream sediments does not appear to be associated with any particular geologic unit and is perhaps following a structural trend.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR DICKINSON NTMS QUADRANGLE, NORTH DAKOTA

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 (see 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 Dickinson NTMS Quadrangle, North Dakota.

DWG. NO. G-77-830
(U)

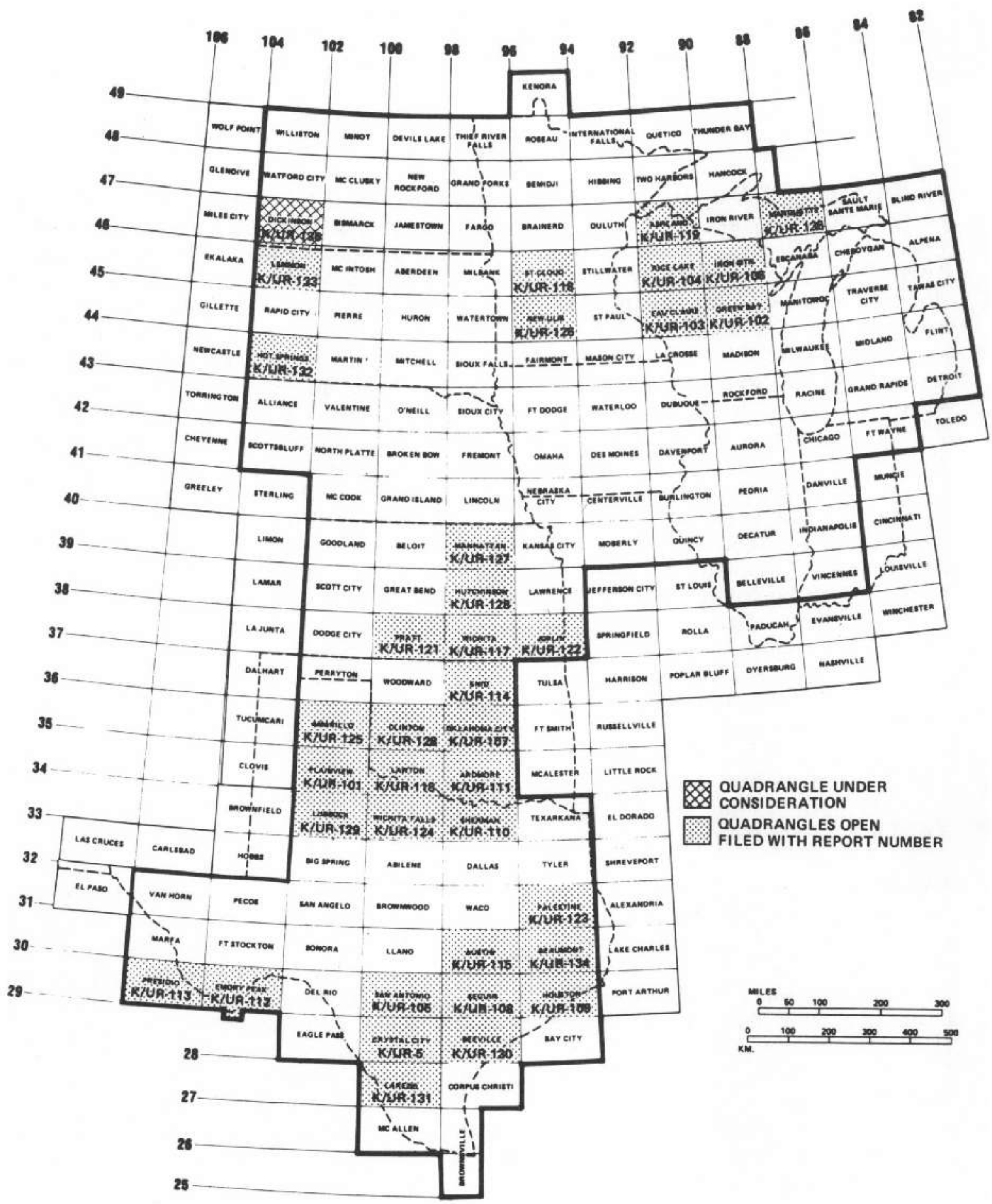


Figure 1

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

GEOLOGY

LOCATION AND GEOLOGIC SETTING

The Dickinson Quadrangle covers a surface area of approximately 17,400 km^2 (6,720 mi^2) between lat. 46° and 47° N. and long. 102° and 104° W. The survey area outlined on the generalized geologic map of North Dakota, shown in Figure 2, includes all or parts of Adams, Billings, Bowman, Dunn, Golden Valley, Grant, Hettinger, Mercer, Morton, Slope, and Stark Counties. A generalized geologic map, along with a stratigraphic column listing geologic unit codes used in this report, is presented in Figure 3 and Plate 7.

The quadrangle is located within the Missouri Plateau subdivision of the Great Plains physiographic province. It is a region of rolling prairie except for buttes and badlands developed along the Little Missouri River. The Little Missouri River flows northward through the western part of the area and dominates the drainage there. In the east, drainage is to the east by the North and South Forks of the Cannonball River and the Heart River. Highest elevation in the quadrangle is White Butte at 1,076 m (3,530 ft), and the lowest area is the northeastern corner where small streams leave the study area at elevations below 640 m (2,100 ft).

LITHOLOGY AND ENVIRONMENTS OF DEPOSITION

Precambrian rocks of Churchillian age (1.8 billion years) are buried by approximately 3,050 to 4,270 m (10,000 to 14,000 ft) of sedimentary rocks (Muehlberger, et al, 1967). Individual rock units and aggregate thicknesses generally increase northward toward the center of the Williston Basin. Approximately 1,372 to 1,981 m (4,500 to 6,500 ft) of the Paleozoic rocks are predominantly marine limestone (Denson and Gill, 1965).

Approximately 1,220 to 1,830 m (4,000 to 6,000 ft) of Mesozoic sediments are present. The lower 305 to 610 m (1,000 to 2,000 ft) consists predominantly of marine and fluviatile sandstone and shale. The oldest rock unit exposed is the Pierre Shale (Late Cretaceous). Exposures are found along the crest of the Cedar Creek Anticline in the extreme southwestern corner of the quadrangle where it is approximately 702 m (2,300 ft) thick (Denson and Gill, 1965).

Conformably overlying the Pierre Shale is the Fox Hills Formation (Late Cretaceous). The thickest sequence recognized is 119 m (391 ft) in the subsurface near the center of the quadrangle, thinning to the north and southwest (Cvancara, 1976b). The Fox Hills represent barrier bar (or island)--deltaic facies, with the lower members representing the shoreface of a barrier bar environment. The upper members are thought to have been deposited within a deltaic complex (Cvancara, 1976b).

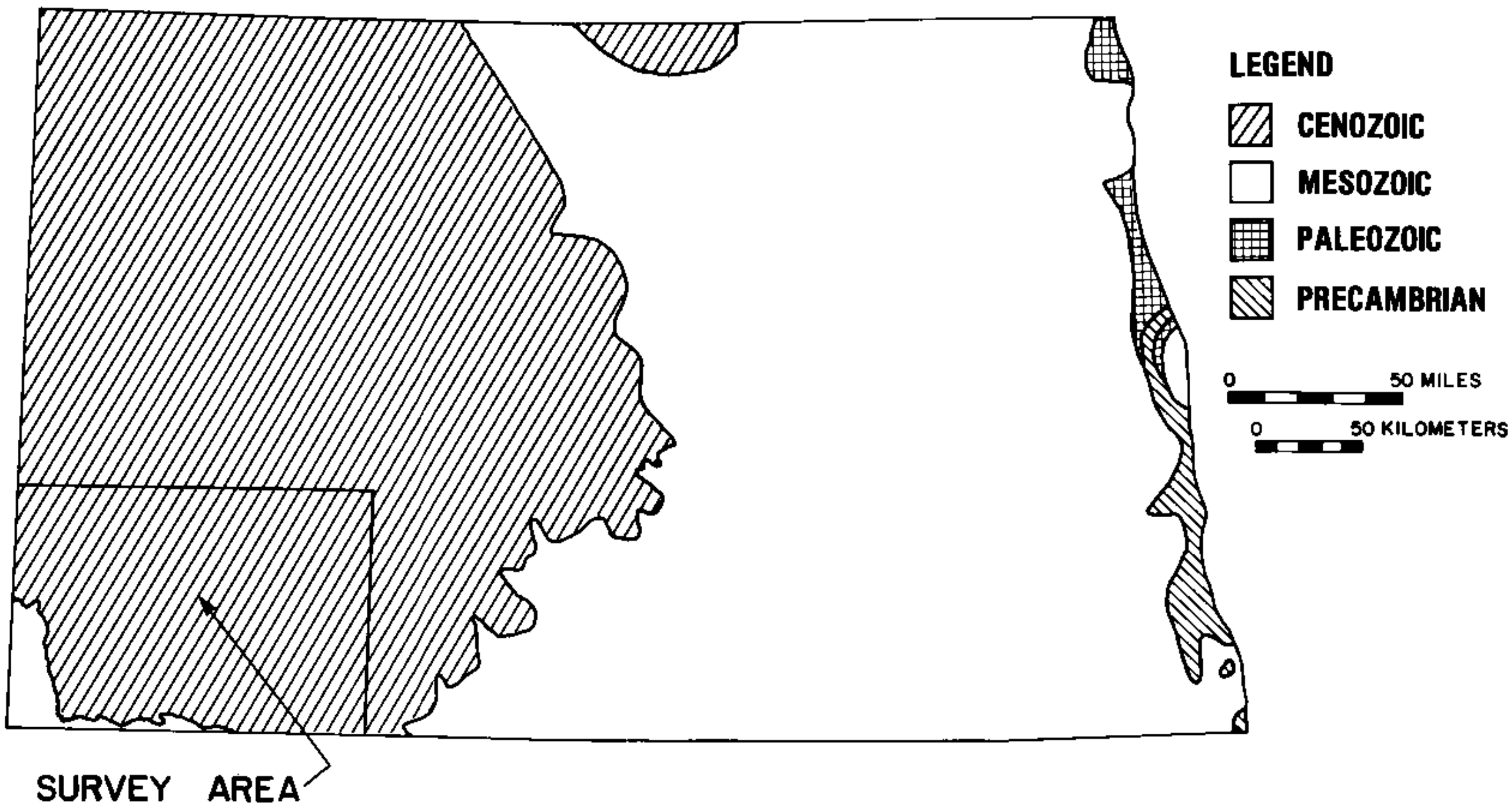


Figure 2

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

STRATIGRAPHIC COLUMN FOR THE DICKINSON QUADRANGLE

ERA	SYSTEM	SERIES	GEOLOGIC UNIT CODE		GEOLOGIC UNIT		MAXIMUM THICKNESS	
							METERS	FEET
CENOZOIC	QUATERNARY	HOLOCENE	QAL		ALLUVIUM		33	110
	TERTIARY	MIOCENE	TAR		ARIKAREE FORMATION		41	135
		OLIGOCENE	TOW		WHITE RIVER GROUP	BRULE FORMATION	20	65
						CHADRON FORMATION	56	185
		EOCENE	TEGV		GOLDEN VALLEY FORMATION		53	175
		PALEOCENE	TPSB		FORT UNION GROUP	SENTINEL BUTTE FORMATION	290	950
			TPTR			TONGUE RIVER FORMATION	198	650
			TPFS			CANNONBALL-LUDLOW FORMATIONS	183	600
MESOZOIC	CRETACEOUS	UPPER CRETACEOUS	KGMH	KGHF	HELL CREEK FORMATION		175	575
			KGMF		FOX HILLS FORMATION		119	391
			KGMC		PIERRE SHALE		702	2,300

SOURCES OF GEOLOGY:

1. CVANCARA, A. M., "GEOLOGY OF THE CANNONBALL FORMATION (PALEOCENE) IN THE WILLISTON BASIN, WITH REFERENCE TO URANIUM POTENTIAL," NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 56, p 22 (1976a).
2. CVANCARA, A. M., "GEOLOGY OF THE FOX HILLS FORMATION (LATE CRETACEOUS) IN THE WILLISTON BASIN, WITH REFERENCE TO URANIUM POTENTIAL," NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 55, p 16 (1976b).
3. DENSON, N. M. AND GILL, J. R., "URANIUM-BEARING LIGNITE AND CARBONACEOUS IN THE SOUTHWESTERN PART OF THE WILLISTON BASIN," U.S. GEOLOGICAL SURVEY, PROFESSIONAL PAPER NO. 463, p 75 (1965).
4. MOORE, W. L., "THE STRATIGRAPHY AND ENVIRONMENTS OF DEPOSITION OF THE CRETACEOUS HELL CREEK FORMATION (RECONNAISSANCE) AND THE PALEOCENE LUDLOW FORMATION (DETAILED), SOUTHWESTERN NORTH DAKOTA," NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 56, p 40 (1976).

LEGEND FOR FIGURE 3

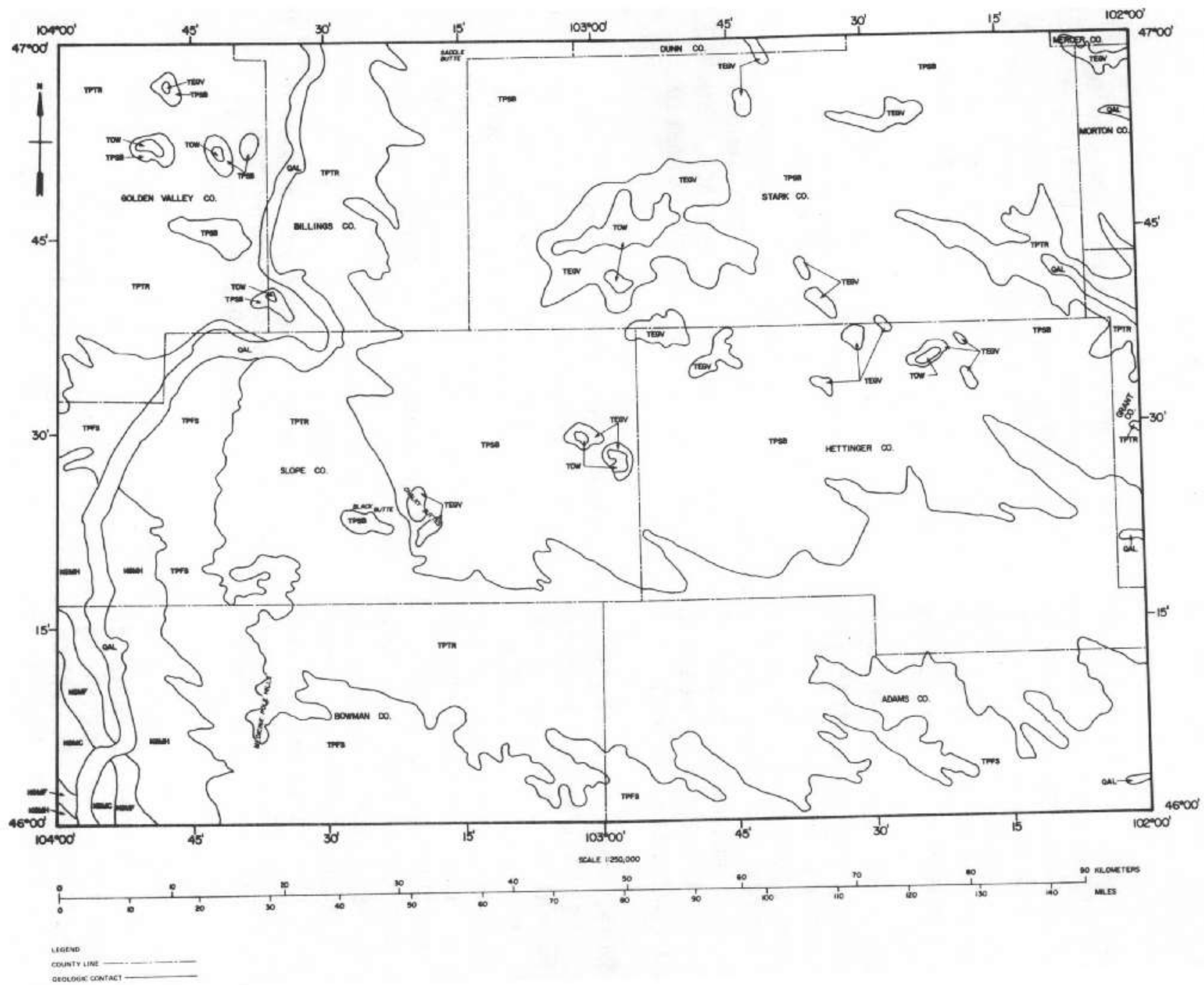


Figure 3

GENERALIZED GEOLOGIC MAP OF THE DICKINSON QUADRANGLE

Conformably overlying and interfingering with the marine Fox Hills Formation is the nonmarine Hell Creek Formation (Late Cretaceous). The formation averages approximately 153 m (500 ft) in thickness, reaching a maximum of 175 m (575 ft). Dominant lithologies are bentonite, silty shale, and claystone with local carbonaceous shales, lignites, and sandstones. Lateral continuity of beds within the Hell Creek Formation is poor and only rarely can individual beds be traced for more than a mile (Moore, 1976).

The Hell Creek Formation is conformably overlain by the nonmarine Ludlow Formation (Paleocene) which is laterally equivalent to and intertongues with the marine Cannonball Formation. The Ludlow Formation is approximately 122 to 183 m (400 to 600 ft) thick and is composed of gray and dark gray carbonaceous shales, gray to light yellow-tan sandstones, and thick lenticular lignites, indicating lacustrine, alluvial, and paludal environments (Denson and Gill, 1965; Moore, 1976).

Lithologically, the marine Cannonball Formation is very similar to the Ludlow Formation; the main difference is the absence of lignites. The formation thickens from 8 m (25 ft), or less, in the south central portion of the study area to a maximum of 159 m (520 ft) (Cvancara, 1976a). A complex nearshore environment is postulated for the Cannonball Formation, including tidal flat, lagoon, beach, shoreface, and shelf facies adjacent to a western lowland where the Ludlow Formation was deposited (Cvancara, 1976a).

The Tongue River Formation (Paleocene) conformably overlies the Ludlow Formation in the southwestern corner of the quadrangle and overlies the Cannonball Formation in the east. The Tongue River Formation is composed of approximately 198 m (650 ft) of sandstone, siltstone, claystone, lignite, and small limestone lenses. Both the Tongue River Formation and the conformably overlying Sentinel Butte Formation (Paleocene) are thought to indicate the progradation of a large deltaic complex into the Cannonball Sea with the Tongue River Formation representing the seaward and the Sentinel Butte the landward portion of the delta plain (Jacob, 1976). Similar lithologies are found in both formations, but the Sentinel Butte is usually more indurated, a darker gray, and contains more sandstone. The Sentinel Butte Formation is reported to be 183 to 290 m (600 to 950 ft) thick (Denson and Gill, 1965).

The continental Golden Valley Formation (Eocene) conformably overlies the Sentinel Butte Formation and, where present, is as much as 53 m (175 ft) thick. The formation consists of gray to yellow sandstone, siltstone, and purplish-gray to white kaolinitic clay and locally a few thin, lenticular beds of lignite and carbonaceous shale (Denson and Gill, 1965).

Following deposition of the Golden Valley Formation, an Eocene paleosol was developed across the area. This unconformity separates the Golden Valley Formation from the overlying White River Group (Oligocene) and

Arikaree Formation (Miocene). Both units are continental in origin and are found as isolated remnants capping buttes. The White River Group can be subdivided into the Chadron Formation and overlying Brule Formation. The Chadron Formation is as much as 56 m (185 ft) thick and is composed of dark gray bentonite and light gray tuffaceous claystone, siltstone, sandstone, and arkose interbedded with thin, lenticular beds of limestone. Maximum thickness of the Brule Formation is 20 m (65 ft), and it is composed of massive, nodular, pinkish-gray calcareous claystone, tuffaceous siltstone, and channel sandstone. The Arikaree Formation unconformably overlying the White River Group is as much as 41 m (135 ft) thick. It is composed of massive greenish-white to light gray tuffaceous sandstone and siltstone with a few thin beds of quartzite, dolomite, and volcanic ash (Denson and Gill, 1965). The Arikaree Formation does not crop out in the survey area.

STRUCTURE

Dominant structural features in the quadrangle are the Williston Basin and the Cedar Creek Anticline. The Williston Basin is a large intracratonic basin with its center lying to the north of the quadrangle. Regional dip is approximately 5 m/km (25 ft/mi) to the north. The Cedar Creek Anticline, a northwest trending structure crossing the extreme southwestern corner of the quadrangle, has been intermittently active since the Paleozoic. Dips are gentle, depending on which stratigraphic unit is chosen as a datum. Minor folds and faults with a few tens of feet of displacement occur in the area, possibly related to activity along the Cedar Creek Anticline (Carlson and Anderson, 1973; Denson and Gill, 1965).

HYDROLOGY

The major aquifers in the area include the Fox Hills-Hell Creek Formations (Cretaceous) and Fort Union Group (Tertiary) with minor amounts of water produced from shallow alluvial and colluvial aquifers.

The Fox Hills-Hell Creek aquifer underlies nearly the entire quadrangle. Individual sand horizons within the aquifer tend to be lenticular and do not extend for more than a few miles. Except for areas near an outcrop, the aquifer is under artesian conditions; the potentiometric surface generally slopes to the east. Wells usually yield less than 114 ℓpm. Water from the aquifer is of a sodium bicarbonate type with a dissolved solids content of 300 to 3,700 mg/ℓ.

The Fort Union aquifer (Cannonball-Ludlow, Tongue River, and Sentinel Butte Formations) underlies most of the quadrangle. It is similar to the Fox Hills-Hell Creek aquifer and is composed of a number of individual lenticular sands which are usually less than 3 m thick. The aquifer also contains lignite beds which produce water of poor quality.

Most production is from domestic and stock wells which produce 8 to 15 ℓpm. Water quality is variable, but is generally a sodium bicarbonate or sulfate type water with dissolved solids usually in the 1,000 to 2,500 mg/ℓ range (Crosby, et al, 1973).

The alluvium produces water of poor quality and is rarely used as an aquifer.

URANIUM OCCURRENCES

Ore-grade uraniferous lignite has been mined in southeastern Billings County. The first ore shipment was made in 1956; however, because of milling difficulty only a few hundred tons were shipped. From 1962 to 1967, uraniferous lignite was burned in kilns or pits and the ash then shipped for milling. Mining was discontinued in 1967. Total production is reported to have been 85,138 tons of ore yielding 592,288 lb of "yellow cake" (U_3O_8) (Noble, 1973).

Several other occurrences of uraniferous lignite have been reported. A proposed mechanism of emplacement involves leaching of uranium from overlying Oligocene (White River Group) and Miocene (Arikaree Formation) tuffaceous sediments and adsorption of the uranium by organic matter in the lignite. Localization of the uranium and associated elements appears to have been controlled by shallow troughs, proximity to the pre-Oligocene erosion surface, and thin sandstones which provided conduits for groundwater movement (Denson and Gill, 1965).

SAMPLE COLLECTION

CHRONOLOGY OF THE SURVEY

Sampling in the Dickinson Quadrangle began in June 1979 and was completed in July 1979. Laboratory analyses, as well as compilation and verification of all field and laboratory data, were completed by October 1979. The final field and laboratory data base used to illustrate the statistical and areal distribution of uranium and uranium-related parameters for this report was completed in October 1979.

FIELD PROCEDURES

Stream sediment and well water sampling was performed, under contract to UCC-ND, by personnel of BCI Geonetics, Inc. A total of 544 groundwater and 554 stream sediment samples was collected within the boundaries of the Dickinson Quadrangle. Spring and well water samples are reported together as groundwater. Plates 1 and 4 are overlays at a scale of 1:250,000 showing locations of groundwater and stream sediment sample sites, respectively. Drainage basins are drawn on Plate 4 to indicate the area represented by the stream sediment samples. Gaps in sample coverage for stream sediment sampling occur along major streams and rivers.

Detailed information regarding techniques of sample collection, recording site data, field equipment, and field measurements may be found in the following reports: "Hydrogeochemical and Stream Sediment Reconnaissance Procedures of the Uranium Resource Evaluation Project" (Arendt, et al, December 1979), "Procedures Manual for Groundwater Reconnaissance Sampling" (Uranium Resource Evaluation Project, March 1978), and "Procedures Manual for Stream Sediment Reconnaissance Sampling" (Uranium Resource Evaluation Project, May 1978). Field observations were recorded on the field form 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 affected by any chlorination, water-softening, or filtering devices were not sampled if the water 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. The fact that the well had no recent use was noted on the field form. Dug wells are noted on the field form since the possibility for contamination is high. Any wells the geologists thought might be contaminated were checked as such on the field forms. Sediment samples were collected upstream from road crossings wherever possible. Visible signs of contamination, the presence of cultivated areas, or oil fields upstream from a sample site were noted on the field form. Wells along major streams produce from the alluvium which is recharged principally from surface water. It is possible that contamination of the groundwater from upstream sources could occur.

Much of the survey area is cultivated, the main crops being wheat, small grains, and sunflowers. Light to moderate fertilization takes place usually in the spring with a nitrogen-phosphate-potash mixture of 18-46-0 in amounts up to 100 lb/acre. Some of the area is pastureland for cattle and sheep. Oil fields are present over much of the quadrangle and may be a possible source of contamination. Numerous scoria pits are in operation in the badlands, and lignite beds have been mined for uranium and molybdenum in Billings County.

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

Table 1

DETECTION LIMITS OF VARIABLES DETERMINED IN WATER AND SEDIMENT SAMPLES

Variable	Method	Detection Limit Sediment (ppm)	Detection Limit 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	8
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	4
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
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.

fraction. Part of the sediment sample was dissolved in 10 ml of 1:1 nitric-hydrofluoric acid. The analytical procedures used have been described by Cagle (1977) and Arendt, et al (December 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 for control samples, analyzed along with the samples included in this survey, is given in Table 2. Results of uranium analyses 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 (1979).

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. Seven well water samples (500418, 500519, 500914, 501036, 501344, 501359, and 501414) and seven stream sediment samples (500420, 500633, 500973, 501000, 501021, 501022, and 501145) 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 400 individual analyses that were compared, the only results considered to be in error in the original analysis and thus require corrections were the U-FL value for Water Sample 500418, sulfate values in Water Samples 500519 and 501414, U-FL values for Sediment Samples 501000, and 501145, and multielement values for Sediment Sample 500973. This low error rate for the unusual samples indicates a high level of reliability for the laboratory measurements.

Table 2

SUMMARY OF THE MEASUREMENTS CONTROL OBTAINED WITH SAMPLES FROM THE DICKINSON QUADRANGLE

		Measurements Control Results for Water							
		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	MS[a]	1	0.52	0.0	0.0	8	9.92	0.496	0.05
U	FL[b]	29	0.68	0.234	0.35	25	10.30	0.632	0.06
As	AA[c]	33	3.5	0.72	0.20	41	0.7	0.29	0.42
Se	AA	37	1.2	0.17	0.14	41	0.8	0.31	0.38
Al	PS[d]	30	96.0	17.6	0.18	30	360.0	21.4	0.06
B	PS	28	1,584.0	71.2	0.04	32	71.0	4.0	0.06
Ba	PS	28	139.0	5.2	0.04	32	32.0	1.4	0.04
Ca	PS	30	10,200.0	540.0	0.05	30	98,500.0	4,310.0	0.04
Co	PS	31	20.0	2.7	0.13	30	95.0	4.6	0.05
Cr	PS	26	95.0	6.0	0.06	34	19.0	3.6	0.19
Cu	PS	30	64.0	18.6	0.29	33	208.0	20.3	0.10
Fe	PS	31	86.0	21.7	0.25	30	984.0	49.5	0.05
K	PS	30	1,910.0	324.0	0.17	34	20,100.0	2,383.0	0.12
Li	PS	31	17.0	2.1	0.12	33	102.0	8.5	0.08
Mg	PS	28	9,300.0	390.0	0.04	30	72,400.0	3,160.0	0.04
Mn	PS	31	20.0	1.7	0.08	30	103.0	4.8	0.05
Mo	PS	28	34.0	7.2	0.21	33	6.0	5.7	0.90
Na	PS	30	1,600.0	220.0	0.14	33	44,800.0	3,780.0	0.08
Ni	PS	28	192.0	8.8	0.05	32	38.0	4.6	0.12
P	PS	31	109.0	21.2	0.19	34	4,790.0	404.2	0.08
Sc	PS	28	62.0	3.8	0.06	31	11.0	0.7	0.06
Si	PS	26	920.0	80.0	0.09	34	7,960.0	912.0	0.11
Sr	PS	30	54.43	3.702	0.07	30	5,155.77	170.646	0.03
Ti	PS	28	113.0	7.0	0.06	32	40.0	2.2	0.05
V	PS	26	10.0	3.0	0.27	30	41.0	5.0	0.12
Y	PS	31	9.0	1.1	0.12	32	47.0	2.0	0.04
Zn	PS	28	498.0	30.4	0.06	28	48.0	22.3	0.46

		Measurements Control Results for Stream Sediment							
		Batch R-3				Batch S-2			
Element	Method	No. of Samples	Mean (ppm)	Standard Deviation (ppm)	Coefficient of Variation	No. of Samples	Mean (ppm)	Standard Deviation (ppm)	Coefficient of Variation
U	FL	52	4.15	0.400	0.10	30	9.93	0.871	0.09
U	NT[e]	61	4.86	0.136	0.03	40	10.26	0.276	0.03
As	AA	38	3.6	0.53	0.15	24	9.8	0.98	0.10
Se	AA	40	0.4	0.24	0.53	27	0.8	0.28	0.36
Al	PS	53	31,900.0	2,450.0	0.08	32	55,800.0	4,470.0	0.08
B	PS	57	12.0	6.1	0.48	32	49.0	9.7	0.20
Ba	PS	50	416.0	16.1	0.04	35	381.0	20.3	0.05
Be	PS	56	1.0	2.3	1.64	35	2.0	0.6	0.27
Ca	PS	57	2,700.0	440.0	0.16	36	3,500.0	470.0	0.13
Ce	PS	49	62.86	10.815	0.17	32	83.19	22.161	0.27
Co	PS	55	13.0	2.3	0.17	34	22.0	4.1	0.18
Cr	PS	53	27.0	1.7	0.06	34	60.0	4.3	0.07
Cu	PS	53	21.0	2.7	0.13	33	45.0	2.9	0.06
Fe	PS	53	17,700.0	1,150.0	0.06	32	33,600.0	1,580.0	0.05
K	PS	53	9,800.0	810.0	0.08	30	19,400.0	1,580.0	0.08
Li	PS	55	22.0	1.5	0.07	34	34.0	3.4	0.10
Mg	PS	53	2,100.0	130.0	0.06	34	5,300.0	330.0	0.06
Mn	PS	53	1,898.0	112.4	0.06	32	761.0	38.4	0.05
Mo	PS	56	2.0	1.2	0.47	34	27.0	2.4	0.09
Na	PS	55	1,500.0	130.0	0.08	34	2,100.0	200.0	0.10
Nb	PS	57	12.0	3.8	0.31	35	10.0	5.3	0.50
Ni	PS	57	18.0	2.4	0.13	34	56.0	3.3	0.06
P	PS	53	1,808.0	251.0	0.14	32	808.0	88.3	0.11
Sc	PS	55	5.0	0.6	0.10	32	11.0	0.7	0.06
Sr	PS	51	54.39	2.899	0.05	35	79.94	5.693	0.07
Th	PS	57	7.0	4.3	0.60	36	8.0	2.6	0.32
Ti	PS	53	3,197.0	281.1	0.09	36	2,955.0	267.7	0.09
V	PS	53	52.0	4.6	0.09	30	157.0	10.7	0.07
Y	PS	55	19.0	1.6	0.08	34	28.0	1.4	0.05
Zn	PS	51	88.0	7.6	0.09	32	100.0	6.2	0.06
Zr	PS	51	131.0	8.9	0.07	32	112.0	5.9	0.05

(a) Mass spectrometry.
(b) Fluorometric analysis.
(c) Atomic absorption.
(d) Plasma source emission spectroscopy.
(e) Neutron activation delayed neutron count.

GEOCHEMICAL RESULTS

GEOCHEMICAL DISTRIBUTIONS IN GROUNDWATER

The sample site locations for groundwater samples collected in the Dickinson Quadrangle are shown on Plate 1 at the 1:250,000 scale. Symbol plots for uranium and specific conductance are presented at this same scale on Plates 2 and 3 and at the 1:1,000,000 scale 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 of sampling is presented in Figure 4. The number of groundwater samples collected from each of the major producing units is presented in Table 3.

Observed data for the variables uranium, specific conductance, boron, calcium, potassium, magnesium, sodium, silicon, strontium, and pH are listed in Table A-3. The figures in Appendix A present log frequency, lognormal probability, percentile, and areal symbol plots for these variables, plus barium, lithium, selenium, zinc, sulfate, and total alkalinity.

Uranium

Figure A-1b indicates that groundwaters with uranium concentrations greater than 15.00 ppb (85th percentile) are distributed throughout the central portion of the quadrangle in clusters of wells producing from the Fort Union Group. The percentile plot (Figure A-1a) shows that waters from the Sentinel Butte Formation have a uranium background range significantly above the regional background. The White River Group, Golden Valley Formation, and the Quaternary alluvium exhibit a high uranium background, but the small number of waters sampled from these units do not allow any conclusions to be drawn from these data.

Clusters of groundwater samples with high uranium values occur from north to south as follows:

1. The highest uranium values occur in the Saddle Butte area (lat. 46°59'40" N. and long. 103°10' W.) in northern Stark and Billings Counties. These groundwaters were produced from the Sentinel Butte Formation.
2. Two groups of high uranium values are found in the middle western portion of the quadrangle at Chalky Butte and Black Butte (between lat. 46°20' to 46°30' N. and long. 103°10' to 103°30' W.). The Chalky Butte waters were from the Sentinel Butte Formation, and the Black Butte waters from the Tongue River Formation.
3. A large cluster of high uranium values is located in the south central part of the survey area, south of Cedar Creek and north of Buffalo Creek (between lat. 46°08' to 46°15' N. and long. 102°50' to 103°20' W.). The majority of these samples is from the Tongue River Formation.

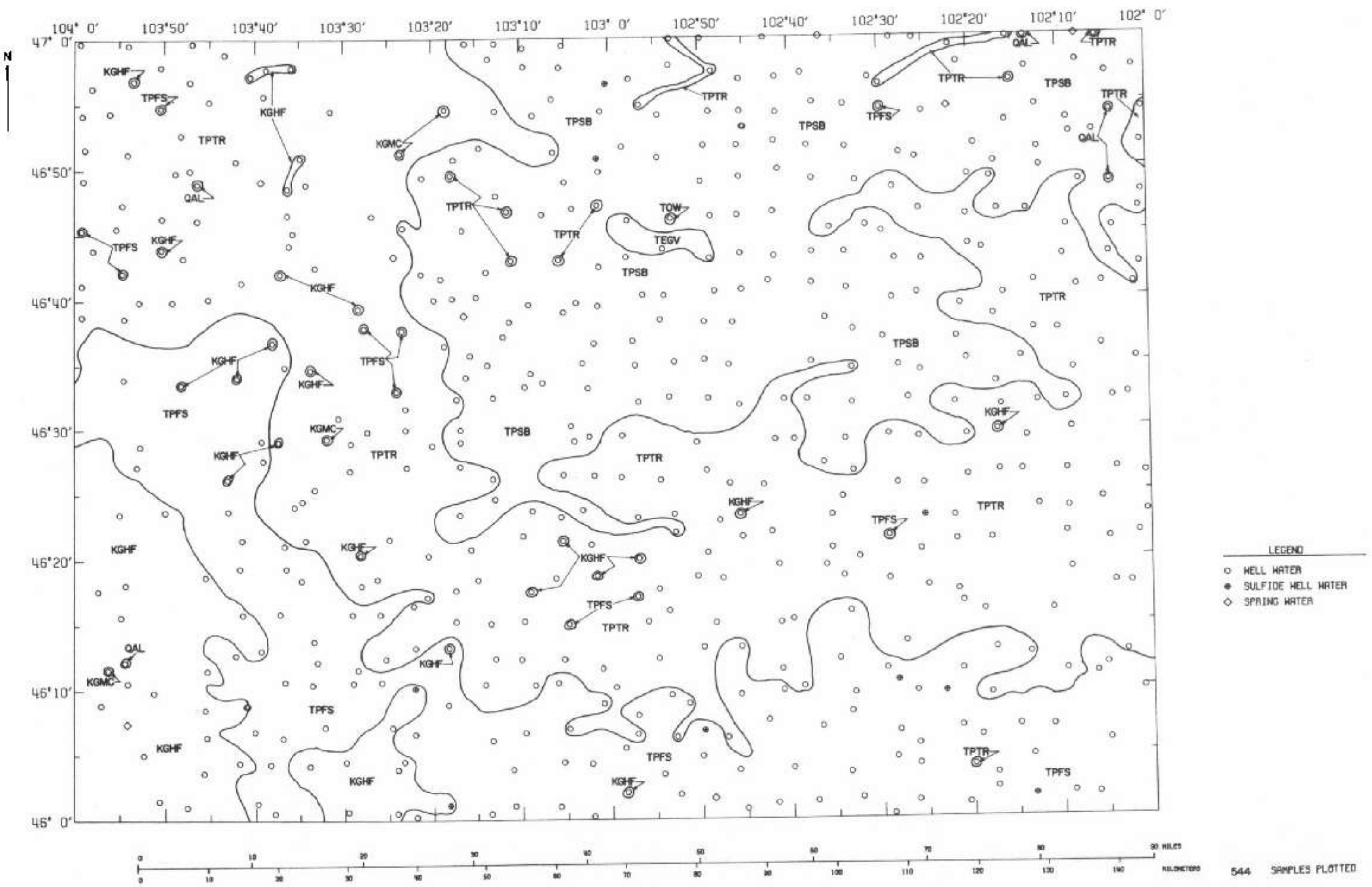


Figure 4

PRODUCING HORIZON MAP FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

Table 3

DISTRIBUTION OF SAMPLES BY GEOLOGIC UNIT FROM THE DICKINSON QUADRANGLE

Geologic Unit	Geologic Unit Code	No. of Groundwater Samples	No. of Sediment Samples
Alluvium	QAL	5	0
White River Group	TOW	1	2
Golden Valley Foramtion	TEGV	3	11
Sentinel Butte Formation	TPSB	163	233
Tongue River Formation	TPTR	205	170
Cannonball-Ludlow Formations	TPFS	109	81
Hell Creek Formation	KGMH	0	26
Fox Hills Formation	KGMF	0	4
Hell Creek - Fox Hills Undifferentiated	KGHF	54	0
Pierre Shale	KGMC	4	5
Total		544	532

4. A group of water samples with high uranium values is found in the southwestern corner of the quadrangle at Medicine Pole Hills (between lat. 46°05' and 46°11' N. and long. 103°33' and 103°40' W.). These waters were produced from the Cannonball and/or Ludlow Formations.

Several high uranium values are also scattered over the north central area of Dickinson Quadrangle, mainly in waters from the Sentinel Butte Formation.

The correlation matrix (Table A-2) indicates significant positive correlations with coefficients for both Pearson and Spearman correlations greater than 0.25, between uranium and calcium, potassium, magnesium, silicon, strontium, and zinc. Uranium shows negative correlation with boron, sodium, pH, and total alkalinity.

Specific Conductance

Figure A-2b indicates that groundwaters with specific conductance values greater than 3,773 μmhos/cm (85th percentile) are scattered throughout the quadrangle except for the west central area. The percentile plot (Figure A-2a) indicates that the background ranges for all aquifers are similar.

High specific conductance values appear to be randomly distributed over most of the quadrangle. Most high values appear to be in the north central area with the largest cluster located near Sentinel Butte. The largest cluster of low values (<1,356 μmhos/cm) is found in Adams and Hettinger Counties. Most low values are scattered uniformly throughout the eastern two-thirds of the survey area. No trends are indicated by the areal distribution plot (Figure A-2b).

The correlation matrix (Table A-2) indicates significant positive correlations, with coefficients for both Pearson and Spearman correlations greater than 0.20, between specific conductance and boron, lithium, potassium, sodium, selenium, strontium, sulfate, and total alkalinity. There is also a significant negative correlation between specific conductance and barium.

Related Variables

According to Denson and Gill (1965), and Geodata International, Inc. (1979), the source rock for uranium in the quadrangle is the Oligocene White River Group and the now eroded Miocene Arikaree Formation, which contain appreciable amounts of volcanic ash. The White River and Arikaree Formations exhibit a uranium content approximately 12 times that of the average sedimentary rock (Denson, Bachman, and Zeller, 1954). Accepted theory is that Oligocene and Miocene source rocks were leached by percolating groundwater. Uranium then moved into the lignite beds where it was adsorbed by organic matter. All known uranium deposits are stratigraphically near the unconformity at the base of the

Oligocene (Denson, Bachman, and Zeller, 1954). Local structure may contribute to the deposition of uranium in that mineralization appears to occur on shallow troughs superimposed on the extensive regional structure of the Williston Basin (Denson and Gill, 1965). Nearly all of the high uranium values come from groundwaters from the formations of the Fort Union aquifer. The members of the Fort Union Group (Cannonball-Ludlow, Tongue River, and Sentinel Butte Formations) outcrop over most of the surface of the quadrangle. They are very similar geochemically and lithologically, and areal distributions of elements show a scattered pattern. Most well waters with uranium concentrations above the 85th percentile (15.00 ppb) appear to occur in the central part of the quadrangle which might loosely be called a trend. This trend cuts across all the formations in the area which may point to some kind of subtle structural control for uranium.

The correlation matrix (Table A-2) and areal distribution plots (Figures A-1a and A-11b) show a high positive correlation between uranium and silicon. The majority of high uranium and silicon values are found in water from the Sentinel Butte Formation. Leaching of tuffaceous rocks in overlying formations could produce high concentrations of silicon and uranium in the groundwater. Waters from the Lemmon Quadrangle to the south show a similar uranium-silicon relationship (Uranium Resource Evaluation Project, 1980). The areal distribution of silicon (Figure A-11b) demonstrates that groundwaters from units stratigraphically closest to the pre-Oligocene unconformity (Golden Valley and Sentinel Butte Formations) have the highest silicon content. The cluster of high uranium values located north of Buffalo Creek and south of Cedar Creek in northern Bowman and Adams Counties was observed in waters from the Tongue River Formation but does not have correspondingly high silicon content.

Groundwaters with high uranium and silicon content tend to have low pH values (less than 15th percentile value of 7.0), and low total alkalinities (less than 15th percentile of 322 ppm).

In southwestern Oklahoma and the Panhandle of Texas, leaching of uraniferous rock occurred in the past, and uranium and barium exhibit a negative correlation. For example, the barium was precipitated while the uranium continued being carried downdip in the Lawton Quadrangle (Uranium Resource Evaluation Project, 1979). The uranium-barium association in the north central area indicates recent or active leaching. The combination of low pH and total alkalinity values with high uranium, and silicon concentrations supports the proposition of leaching in progress.

Summary of Groundwater Data

The most promising area for uranium concentration appears to be in the central and north central parts of the quadrangle where the Sentinel Butte Formation crops out. Groundwaters from the Sentinel Butte have the highest uranium and silicon values and most of the lignites mined for uranium have been from the Sentinel Butte Formation. A potential for uranium is indicated in the extensive lignite beds of the Tongue River Formation.

GEOCHEMICAL DISTRIBUTIONS IN STREAM SEDIMENTS

The sample site locations for stream sediments collected in the Dickinson Quadrangle are shown on Plate 4 at the 1:250,000 scale. The symbol plot for the hot-acid-soluble uranium as determined by fluorometric analysis (U-FL) and thorium is presented at this scale in Plates 5 and 6, respectively, and at the 1:1,000,000 scale in Figures B-1b and B-4b, respectively. The stream sediment data subset used to generate Tables B-1 and B-2 and the figures in Appendix B includes all stream sediment samples collected from basins in the Dickinson Quadrangle that average approximately 25 km^2 (10 mi^2). Samples which were collected from basins larger than 50 km^2 (Phase G) were not included. The number of stream sediment samples (532) in this subset which were collected from the major stratigraphic units of the survey area is presented in Table 3. Results from all stream sediment samples collected from the Dickinson Quadrangle are included in Table B-3 and in the microfiche in Appendix C.

Observed data for the variables hot-acid-soluble uranium (U-FL), total uranium as determined by neutron activation (U-NT), thorium, arsenic, calcium, cobalt, copper, iron, nickel, scandium, and zinc are listed in Table B-3. The figures in Appendix B represent log frequency, lognormal probability, percentile, and areal symbol plots for these same variables, plus U-FL/U-NT, niobium, titanium, vanadium, yttrium, and zirconium.

Uranium

The percentile plots for U-FL and U-NT (Figures B-1a and B-2a, respectively) indicate that sediments from the Golden Valley Formation and White River Group have the highest background ranges for these variables; however, only 13 sediment samples were derived from those units. The geochemical areal distribution plots (Figures B-1b and B-2b, respectively) indicate that most U-FL and U-NT values above the 85th percentile (3.7 and 4.1 ppm, repectively) are in sediments from the Fort Union Group and are located between long. 102°30' and 103°20'W.

Several large groups of sediments with high U-FL and U-NT values are distributed over the central portion of the quadrangle. One cluster occurs in the Saddle Butte locale in the north central part of the survey area where the sediments are derived from the Sentinel Butte Formation. Another grouping of high U-FL and U-NT values is found in north central Hettinger and south central Stark Counties. This group of sediments also represents the Sentinel Butte Formation. A large cluster of high uranium concentrations is located in the region south of Cedar

Creek and north of Buffalo Creek in western Adams and eastern Bowman Counties with sediments derived from the Tongue River Formation.

Many isolated samples and small groups of sediments with high U-FL and U-NT concentrations are scattered throughout the quadrangle. The majority of these sediments represent the Sentinel Butte and Tongue River Formations. Many of the sediments with U-FL and U-NT values less than the 15th percentile (1.9 and 2.4 ppm, respectively) were derived from the Fort Union Group.

The correlation matrix (Table B-2) indicates significant positive correlations with coefficients for both Pearson and Spearman correlations of greater than 0.20 between U-FL and U-NT, arsenic, cobalt, copper, iron, nickel, scandium, and zinc. Negative correlations are indicated between U-FL, U-NT, and calcium.

Thorium

Figure B-4b indicates that sediments with thorium concentrations greater than 9.0 ppm (85th percentile) are scattered over most of the quadrangle and are derived from all geologic units. The percentile plot for thorium (Figure B-4a) indicates that the Golden Valley Formation and White River Group have the highest backgrounds. The lowest background range occurs in sediments from Cretaceous units (Hell Creek and Fox Hills Formations and Pierre Shale). Sediments with thorium values less than 3.0 ppm (15th percentile) are scattered throughout the quadrangle.

The correlation matrix (Table B-2) indicates significant positive correlations, with coefficients greater than 0.20 for both Pearson and Spearman methods, between thorium and cobalt, iron, nickel, niobium, scandium, titanium, vanadium, yttrium, zinc, and zirconium.

Related Variables

All Tertiary units are similar lithologically, and the geochemical data fail to show distinct differences between units. Clusters of high uranium values are not confined to any specific geologic unit and do not show consistent association with any element. The group of high uranium values found in north central Hettinger and south central Stark Counties shows a relation between U-FL, phosphorus, calcium, and selenium. The area located south of Cedar Creek and north of Buffalo Creek exhibits correlation between uranium and arsenic, manganese, and strontium.

Summary of Stream Sediment Data

The majority of the sediment samples were taken from the Fort Union Group. The members of this group are so similar geochemically and lithologically that the uranium data do not present an obvious trend or pattern. The anomalously high concentrations of U-FL and U-NT are distributed in sediments from all of the formations of the Fort Union Group in the central region of the study area. These sediments with high uranium content do not appear to be restricted to specific geologic units, but are more likely controlled by topography or structure.

BIBLIOGRAPHY

1. 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 (December 1979)[GJBX-32(80)].

2. Cagle, G. W., "The Oak Ridge Analytical Program," *Symposium on Hydrogeochemical and Stream Sediment Reconnaissance for Uranium in the United States, March 16 and 17, 1977*, pp 133-156, United States Energy Research and Development Administration, Grand Junction, Colorado, GJBX-77(77) (October 1977).

3. Carlson, C. G. and Anderson, S. B., *Mineral and Water Resources of North Dakota: Structure*, North Dakota Geological Survey, Bulletin 63, pp 43-44 (1973).

4. Crosby, O. A., Armstrong, C. A., and Paulson, Q. F., *Water Resources of North Dakota*, North Dakota Geological Survey, Bulletin 63, p 161 (1973).

5. Cvancara, A. M., *Geology of the Cannonball Formation (Paleocene) in the Williston Basin, with Reference to Uranium Potential*, North Dakota Geological Survey, Report of Investigations 56, p 22 (1976a).

6. Cvancara, A. M., *Geology of the Fox Hills Formation (Late Cretaceous) in the Williston Basin of North Dakota, with Reference to Uranium Potential*, North Dakota Geological Survey, Report of Investigations 55, p 16 (1976b).

7. Denson, N. M., Bachman, G. O., and Zeller, H. D., *Uranium-Bearing Lignite and Its Relation to the White River and Arikaree Formations in Northwestern South Dakota and Adjacent Areas*, U. S. Geological Survey, Professional Paper 467 (1954).

8. Denson, N. M. and Gill, J. R., *Uranium-Bearing Lignite and Carbonaceous Shale in the Southwestern Part of the Williston Basin - A Regional Study*, U. S. Geological Survey, Professional Paper 463, p 75 (1965).

9. D'Silva, A. P., Haas, W. J., Floyd, M. A., *Multilaboratory Analytical Quality Control Program for the Hydrogeochemical and Stream Sediment Reconnaissance*, Ames Laboratory, Iowa State University, Ames, Iowa, IS-4624 (January 1979) (Available from National Technical Information Service, U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161).

10. Geodata International, Inc., *Aerial Radiometric and Magnetic Survey, Dickinson National Topographic Map* (1979).

11. Jacob, A. F., *Geology of the Upper Part of the Fort Union Group (Paleocene), Williston Basin, with Reference to Uranium*, North Dakota Geological Survey, Report of Investigations 58, p 49 (1976).

12. 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)].

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

14. Moore, W. L., *The Stratigraphy and Environments of Deposition of the Cretaceous Hell Creek Formation (Reconnaissance) and the Paleocene Ludlow Formation (Detailed), Southwestern North Dakota,* North Dakota Geological Survey, Report of Investigations 56, p 40 (1976).

15. Muehlberger, W. R., Denison, R. E., and Lidiak, E. C., "Basement Rock in Continental Interior of United States," *AAPG Bulletin,* Vol. 45, pp 2351-2380 (1967).

16. Noble, E. A., *Uranium in Coal,* North Dakota Geological Survey, Bulletin 63, pp 80-83 (1973).

17. Uranium Resource Evaluation Project, *Hydrogeochemical and Stream Sediment Reconnaissance Basic Data for Lemmon NTMS Quadrangle, South Dakota,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-133 (January 1980).

18. Uranium Resource Evaluation Project, *Hydrogeochemical and Stream Sediment Reconnaissance Basic Data for Lawton NTMS Quadrangle, Oklahoma,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, K/UR-101 (June 8, 1978). United States Department of Energy, Grand Junction, Colorado [GJBX-27(79)].

19. 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(78)].

20. 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 [GJBX-84(78)].

APPENDIX A

GROUNDWATER

APPENDIX A

GROUNDWATER

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

Table A-1

STATISTICAL SUMMARY FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

	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	422	32 90	<0.02 <0.20	<0.02	756.40	18.49	0.58	0.21	65.732	3.556	0.50	1.96	-0.26	2.44
SP	544			58	12664	2558	2219	1953	1431.6	0.6	7.69	0.62	7.72	0.55
U/SP	544			0.00	2400.30	12.42	0.25	0.10	112.430	9.030	-0.81	2.45	-0.84	2.58
U/B	544			0.01	27014.28	165.02	1.12	0.77	1305.358	8.274	0.80	2.91	0.80	2.84
U/SO	544			0.00	10085.33	81.30	2.24	0.49	535.902	6.338	1.02	2.53	0.99	2.64
AG	156	388	<2	<2	84	3	<2	<2	7.2	2.0	1.00	0.49		
AL	121	423	<10	<10	3029	127	<10	<10	402.2	3.1	3.72	1.18		
AS	112	432	<0.5	<0.5	18.5	1.8	<0.5	<0.5	2.83	1.57	0.04	0.89		
B	544			14	4223	576	489	387	439.2	0.8	6.02	0.93	6.07	0.96
BA	532	12	<2	<2	599	32	19	5	45.3	1.4	2.94	1.02	2.89	1.05
BE	76	468	<1	<1	11	1	<1	<1	1.2	1.0	0.10	0.35		
CA	544			0.6	543.9	65.4	23.1	3.6	93.14	1.42	2.83	1.69	2.87	1.71
CO	258	286	<2	<2	639	6	<2	<2	40.1	5.9	1.25	0.64		
CR	63	481	<4	<4	58	6	<4	<4	6.9	1.1	1.69	0.42		
CU	183	364	<2	<2	637	33	<2	<2	82.1	2.5	2.35	1.33		
FE	236	308	<10	<10	1907	145	<10	<10	218.2	1.5	4.25	1.22		
K	544			0.2	161.6	4.9	3.2	0.9	8.55	1.74	1.11	0.97	1.11	0.93
LI	544			4	304	52	38	30	44.2	0.8	3.71	0.66	3.70	0.67
MG	544			0.1	744.4	41.4	11.3	1.7	76.23	1.84	2.16	2.06	2.17	1.99
MN	381	163	<2	<2	5493	127	7	<2	490.8	3.1	3.25	1.75	1.96	2.49
MO	265	279	<4	<4	84	11	<4	<4	9.0	0.8	2.25	0.58		
NA	544			0.5	952.8	278.8	299.5	309.9	165.01	0.59	5.33	0.95	5.42	0.89
NI	107	437	<4	<4	2692	33	<4	<4	259.7	7.8	1.95	0.80		
P	235	309	<40	<40	927	238	<40	<40	164.8	0.7	5.22	0.73		
SC	26	518	<1	<1	9	1	<1	<1	1.6	1.1	0.22	0.49		
SE	505	39	<0.2	<0.2	27.9	0.6	0.4	0.5	1.25	2.25	-0.73	0.43	-0.85	0.45
SI	544			0.1	27.4	4.6	3.9	2.8	2.86	0.62	1.40	0.47	1.39	0.41
SR	543	1	<2	<2	13334	1105	428	39	1740.0	1.6	5.99	1.50	5.97	1.45
TI	179	365	<2	<2	2021	108	<2	<2	225.7	2.1	3.29	1.79		
V	221	323	<4	<4	139	10	<4	<4	12.2	1.2	2.08	0.59		
Y	225	319	<1	<1	121	2	<1	<1	8.2	3.8	0.27	0.63		
ZN	538	6	<4	<4	8506	151	47	30	509.3	3.4	4.14	1.08	4.05	1.03
ZR	264	280	<2	<2	55	6	<2	<2	7.6	1.2	1.49	0.71		
T-AK	544			34	1716	553	542	600	237.3	0.4	6.22	0.46	6.23	0.45
M-AK	544			34	1675	550	540	604	236.2	0.4	6.22	0.46	6.23	0.43
P-AK	544			0	200	25	0	0	39.6	1.5				
CL	320	224	<10	<10	410	37	12	<10	52.0	1.4	3.19	0.76		
NA/C	544			0.04	159.70	30.31	21.36	1.35	28.123	0.928	2.79	1.35	2.89	1.30
PH	544			4.7	11	7.8	7.7	7.5	0.93	0.12				
SO4	544			10	7425	605	389	67	728.0	1.2	5.85	1.14	5.84	1.15

NOTE: Refer to Table 1, Page 22 and Table C-1, Page C-4 for concentration units and symbol definitions.

Table A-2

CORRELATION MATRIX FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

	L-U	L-SI	L-B	L-NA	LTAK	L-SE	L-ZN	L-SP
L-U	1.00 (422)							
L-SI	0.39*** 0.42*** (422)	1.00 (544)						
L-B	-0.44*** -0.43*** (422)	-0.30*** -0.38*** (544)	1.00 (544)					
L-NA	-0.31*** -0.34*** (422)	-0.25*** -0.39*** (544)	0.70*** 0.55*** (544)	1.00 (544)				
LTAK	-0.34*** -0.38*** (422)	-0.52*** -0.49*** (544)	0.53*** 0.58*** (544)	0.55*** 0.61*** (544)	1.00 (544)			
L-SE	0.05 -0.07 (396)	-0.16*** -0.19*** (505)	0.20*** 0.25*** (505)	0.30*** 0.38*** (505)	0.45*** 0.57*** (505)	1.00 (505)		
L-ZN	0.26*** 0.27*** (420)	0.08* 0.04 (538)	-0.04 -0.00 (538)	-0.07 -0.02 (538)	-0.04 0.04 (538)	0.18*** 0.14*** (500)	1.00 (538)	
L-SP	0.07 0.05 (422)	-0.06 -0.12*** (544)	0.38*** 0.35*** (544)	0.57*** 0.66*** (544)	0.28*** 0.32*** (544)	0.31*** 0.30*** (505)	0.17*** 0.16*** (538)	1.00 (544)
LS04	0.16*** 0.16*** (422)	-0.00 0.00 (544)	0.23*** 0.15*** (544)	0.41*** 0.44*** (544)	-0.06 -0.03 (544)	0.11*** 0.05 (505)	0.15*** 0.11*** (538)	0.65*** 0.77*** (544)
L-LI	0.16*** 0.15*** (422)	0.12*** 0.17*** (544)	0.18*** 0.14*** (544)	0.34*** 0.28*** (544)	0.07* 0.09** (544)	0.25*** 0.18*** (505)	0.21*** 0.19*** (538)	0.49*** 0.53*** (544)
L-BA	0.18*** 0.14*** (417)	0.12*** 0.15*** (532)	-0.24*** -0.12*** (532)	-0.43*** -0.39*** (532)	-0.08* -0.03 (532)	0.02 0.04 (494)	0.16*** 0.16*** (529)	-0.35*** -0.42*** (532)
L-CA	0.65*** 0.65*** (422)	0.48*** 0.50*** (544)	-0.44*** -0.45*** (544)	-0.39*** -0.37*** (544)	-0.56*** -0.57*** (544)	-0.10** -0.19*** (505)	0.30*** 0.25*** (538)	0.13*** 0.20*** (544)
L-MG	0.67*** 0.67*** (422)	0.40*** 0.45*** (544)	-0.39*** -0.42*** (544)	-0.34*** -0.33*** (544)	-0.49*** -0.51*** (544)	-0.05 -0.15*** (505)	0.32*** 0.28*** (538)	0.17*** 0.24*** (544)
L-SR	0.51*** 0.52*** (422)	0.36*** 0.39*** (543)	-0.26*** -0.31*** (543)	-0.21*** -0.22*** (543)	-0.40*** -0.43*** (543)	-0.00 -0.13*** (505)	0.29*** 0.25*** (538)	0.26*** 0.30*** (543)
L-K	0.47*** 0.48*** (422)	0.32*** 0.37*** (544)	-0.26*** -0.32*** (544)	-0.15*** -0.18*** (544)	-0.38*** -0.42*** (544)	-0.04 -0.17*** (505)	0.24*** 0.21*** (538)	0.21*** 0.26*** (544)
L-MN	0.05 0.08 (304)	0.20*** 0.22*** (381)	-0.03 -0.07 (381)	-0.19*** -0.18*** (381)	-0.25*** -0.23*** (381)	0.00 -0.05 (351)	0.19*** 0.17*** (379)	0.14*** 0.17*** (381)
PH	-0.34*** -0.40*** (422)	-0.33*** -0.42*** (544)	0.20*** 0.28*** (544)	0.22*** 0.30*** (544)	0.38*** 0.44*** (544)	0.08* 0.14*** (505)	-0.17*** -0.15*** (538)	-0.11** -0.12*** (544)

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%.

	LSO4	L-LI	L-BA	L-CA	L-MG	L-SR	L-K	L-MN	PH
LSO4	1.00 (544)								
L-LI	0.52*** 0.52*** (544)	1.00 (544)							
L-BA	-0.54*** -0.58*** (532)	-0.33*** -0.33*** (532)	1.00 (532)						
L-CA	0.39*** 0.43*** (544)	0.41*** 0.43*** (544)	-0.10** -0.13*** (532)	1.00 (544)					
L-MG	0.41*** 0.44*** (544)	0.44*** 0.46*** (544)	-0.13*** -0.14*** (532)	0.97*** 0.97*** (544)	1.00 (544)				
L-SR	0.49*** 0.50*** (543)	0.58*** 0.58*** (543)	-0.20*** -0.23*** (532)	0.93*** 0.93*** (543)	0.93*** 0.93*** (543)	1.00 (543)			
L-K	0.44*** 0.45*** (544)	0.55*** 0.57*** (544)	-0.25*** -0.28*** (532)	0.80*** 0.81*** (544)	0.81*** 0.82*** (544)	0.85*** 0.88*** (543)	1.00 (544)		
L-MN	0.26*** 0.29*** (381)	0.44*** 0.43*** (381)	-0.03 -0.05 (377)	0.58*** 0.57*** (381)	0.55*** 0.54*** (381)	0.60*** 0.61*** (381)	0.37*** 0.59*** (381)	1.00 (381)	
PH	-0.22*** -0.24*** (544)	-0.28*** -0.31*** (544)	-0.00 0.02 (532)	-0.56*** -0.64*** (544)	-0.53*** -0.63*** (544)	-0.51*** -0.60*** (543)	-0.44*** -0.56*** (544)	-0.39*** -0.42*** (381)	1.00 (544)

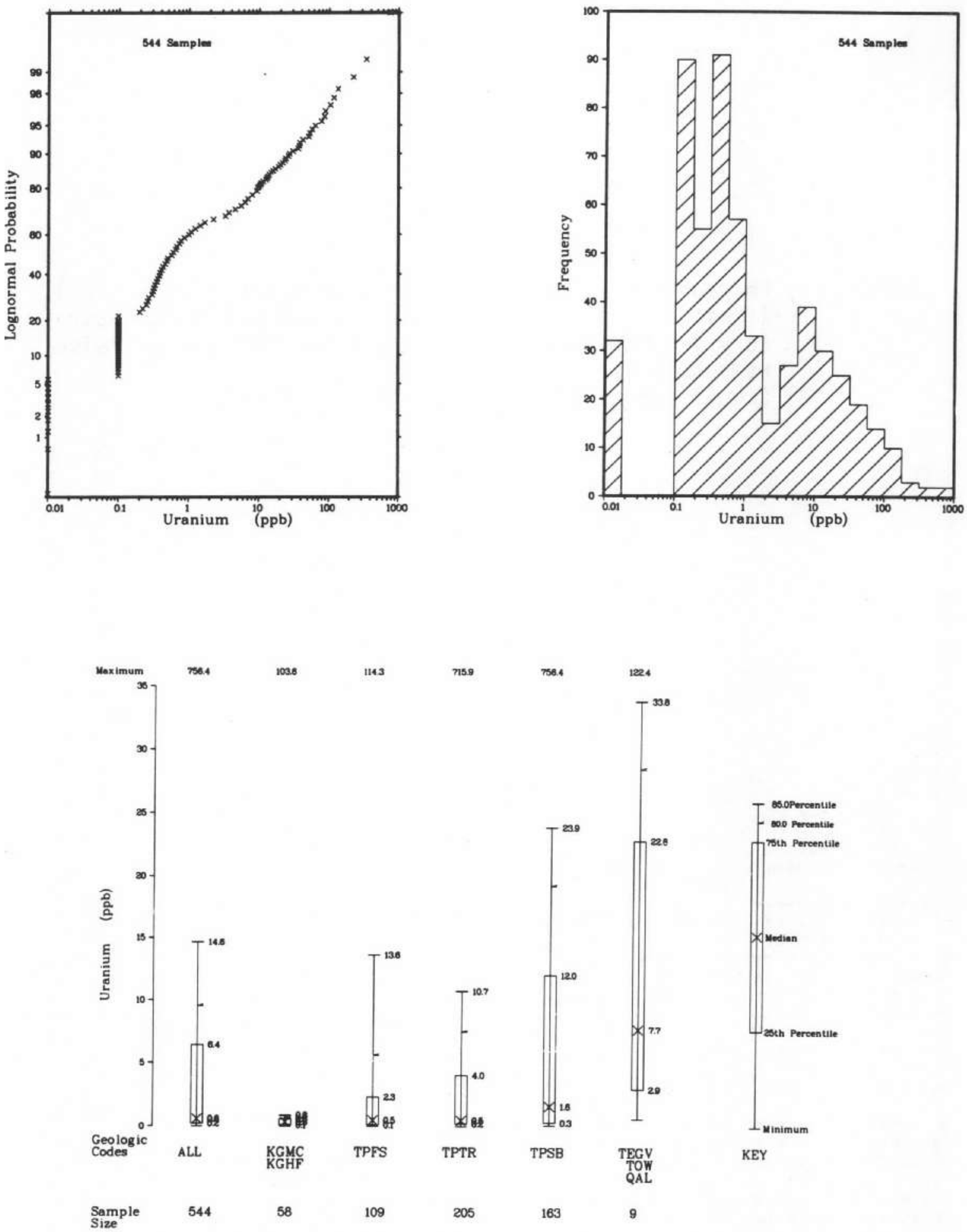


Figure A-1a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR URANIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

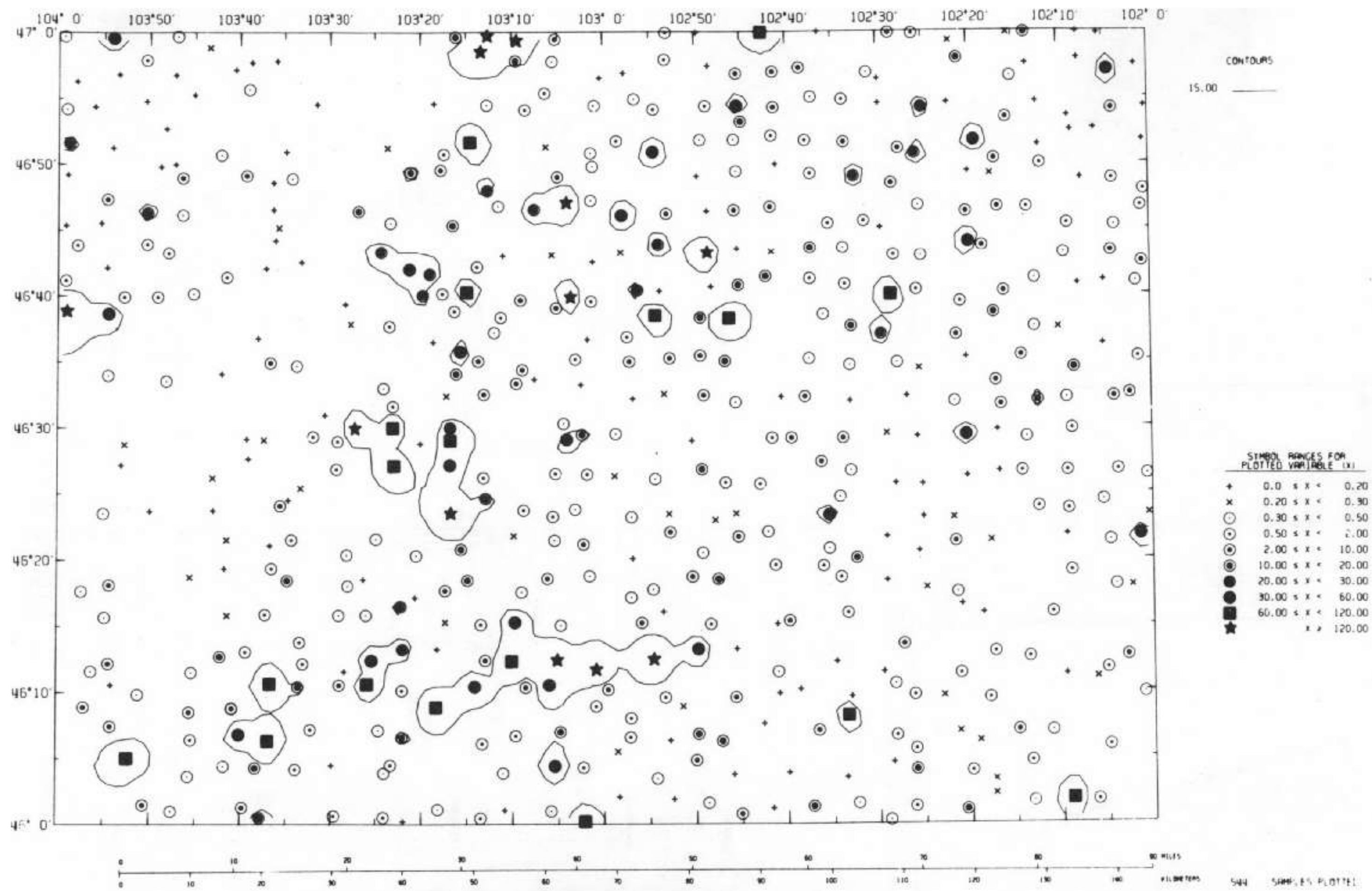


Figure A-1b

GEOCHEMICAL DISTRIBUTION OF URANIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

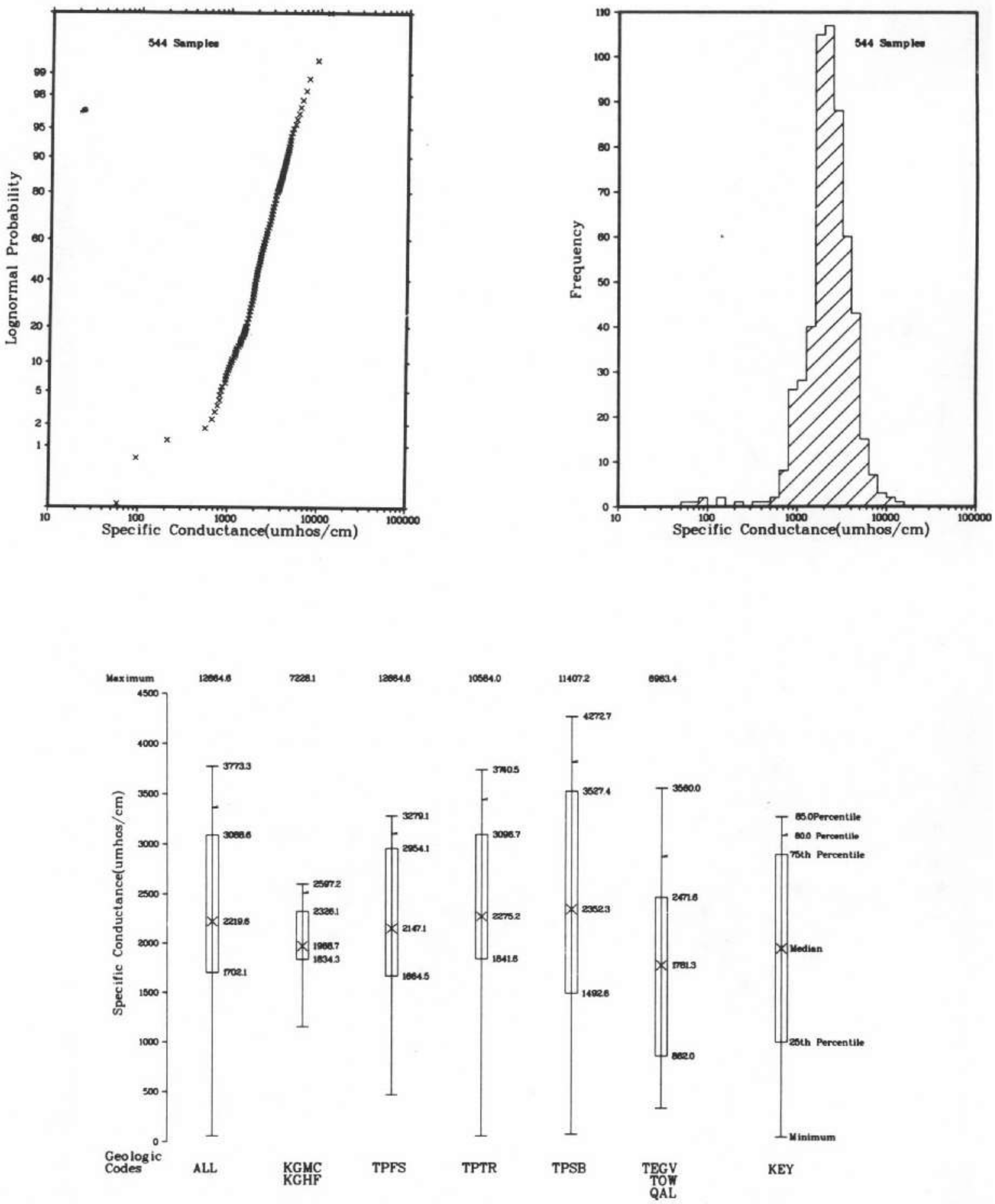


Figure A-2a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SPECIFIC CONDUCTANCE (μMHOS/CM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

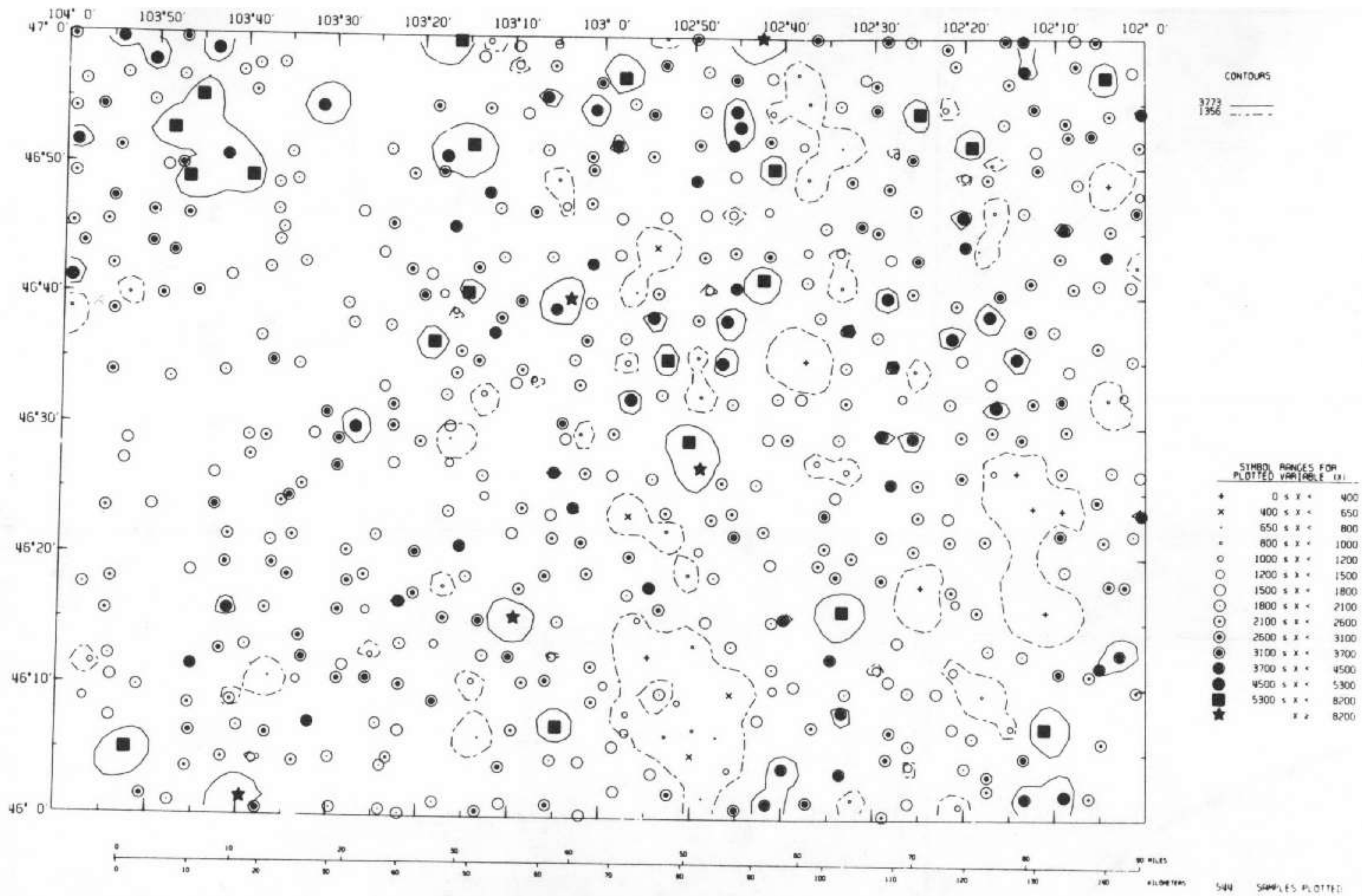


Figure A-2b

GEOCHEMICAL DISTRIBUTION OF SPECIFIC CONDUCTANCE (μMHOS/CM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

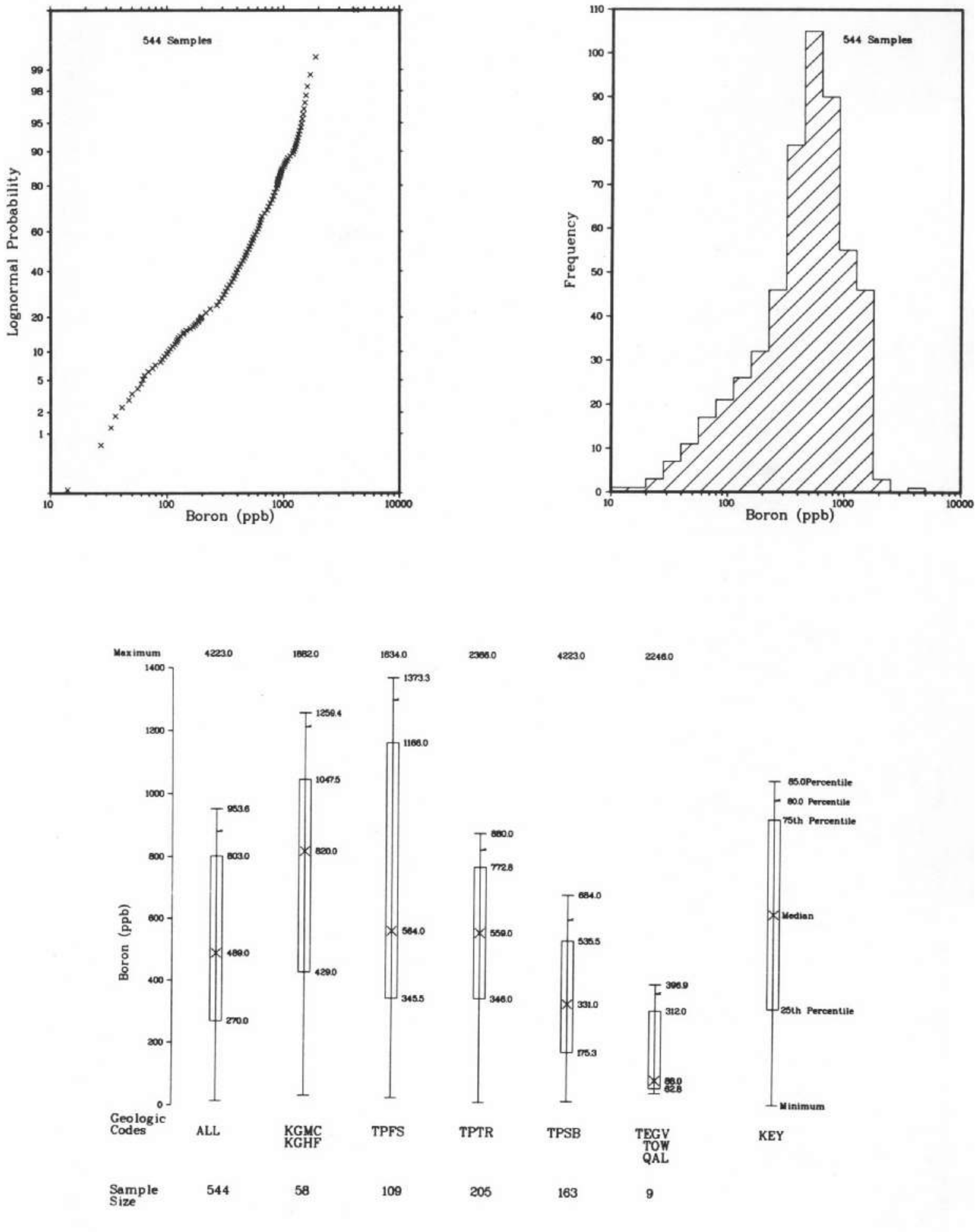


Figure A-3a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR BORON (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

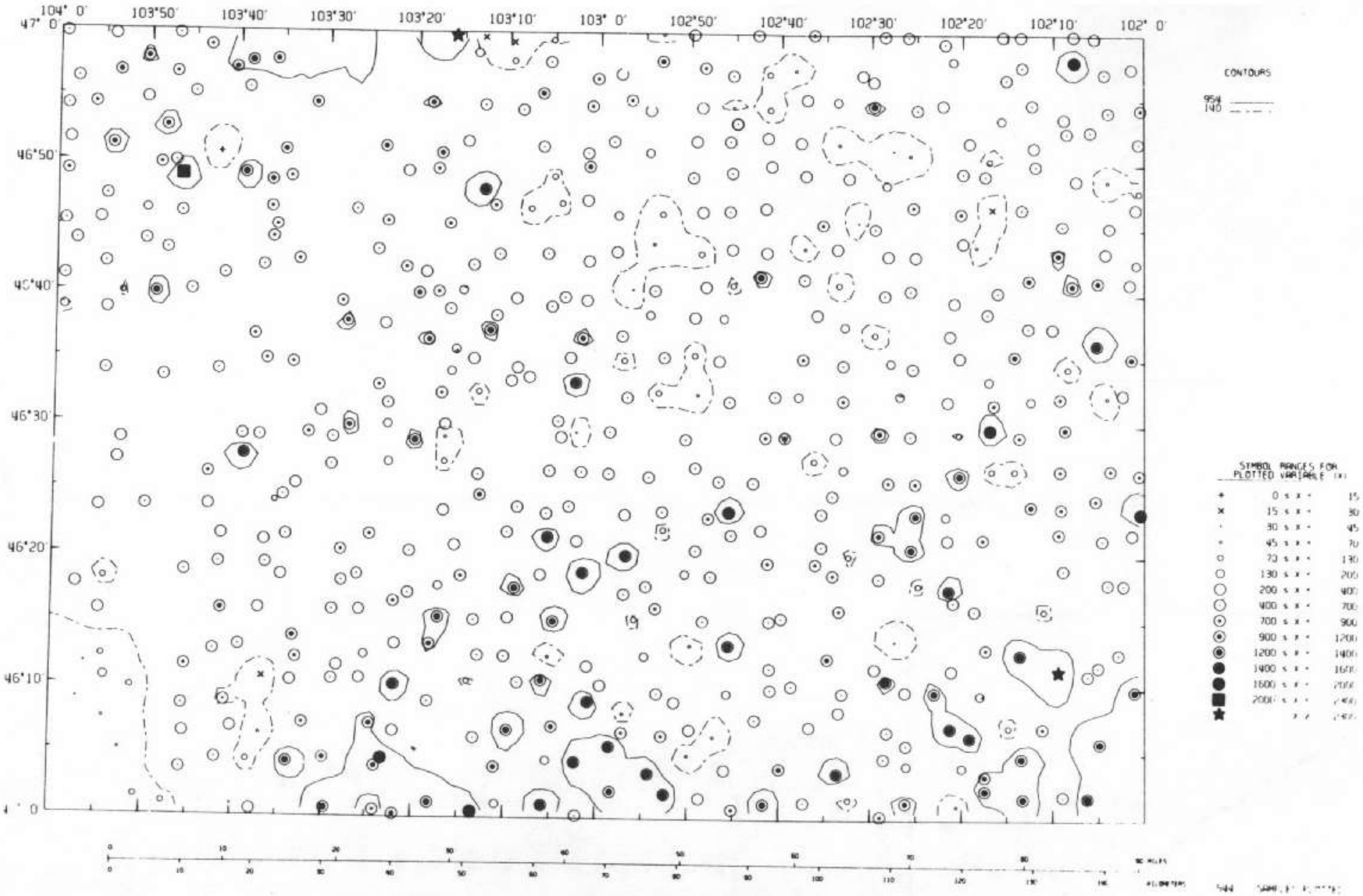


Figure A-3b

GEOCHEMICAL DISTRIBUTION OF BORON (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

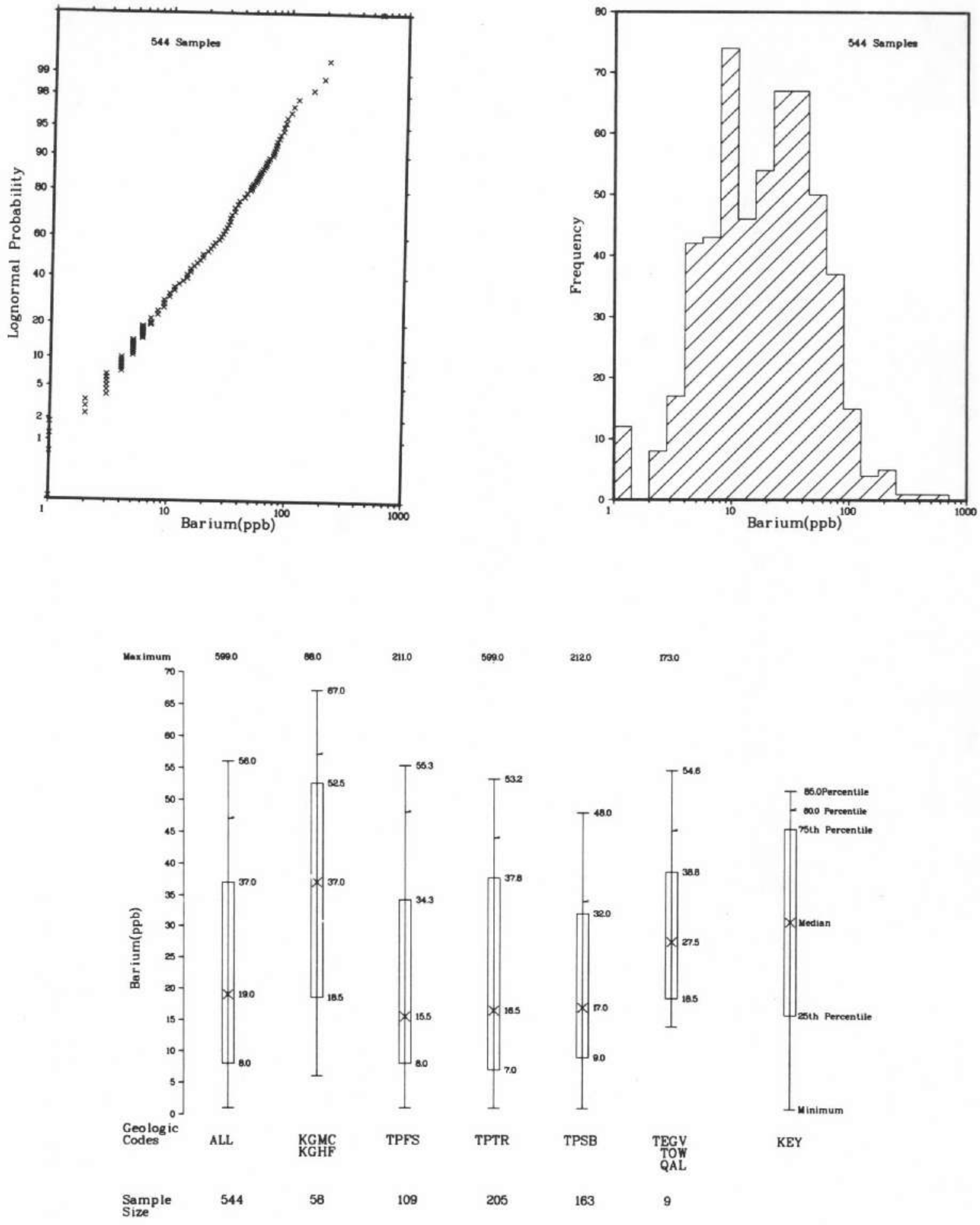


Figure A-4a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR BARIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

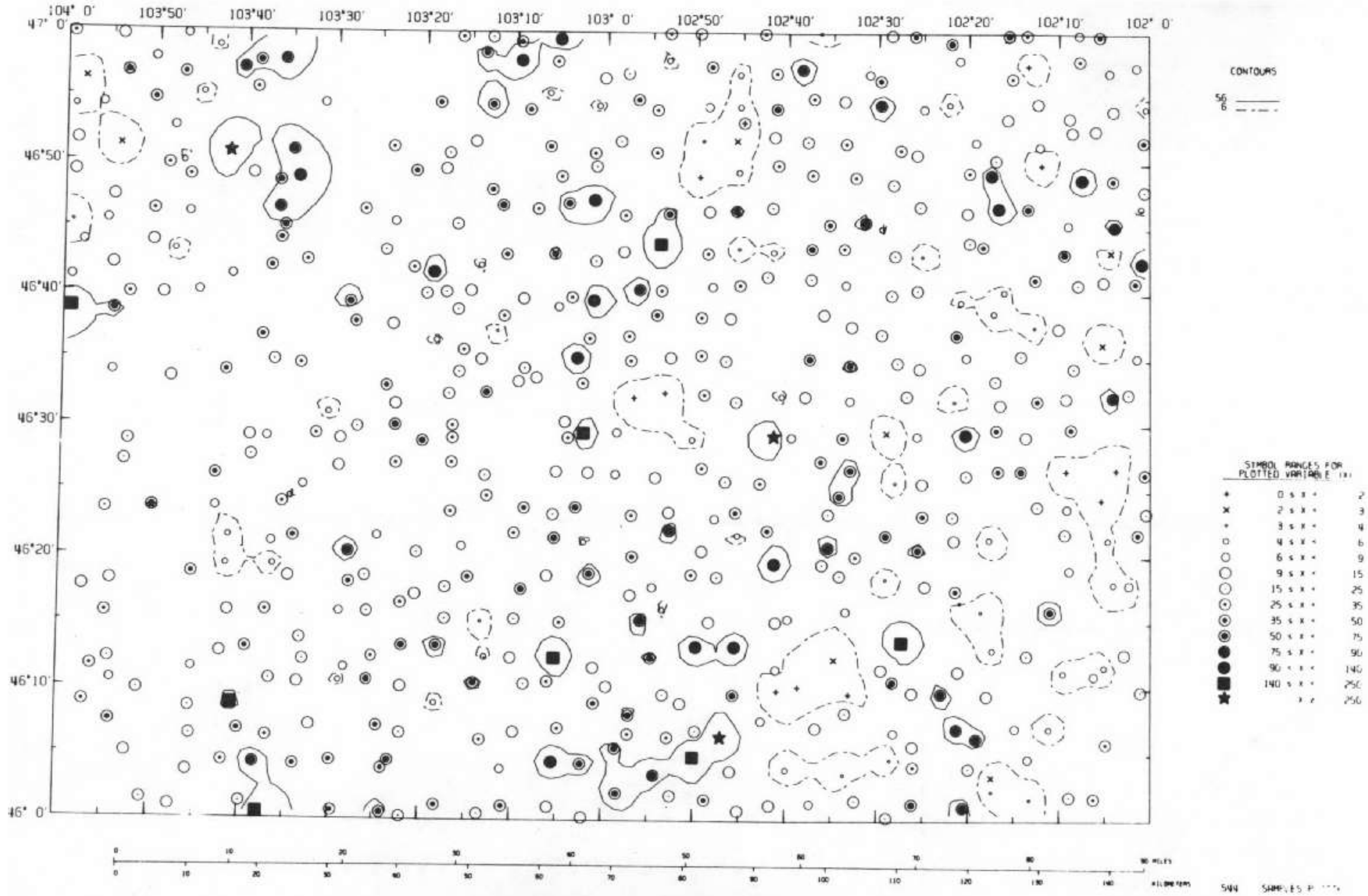


Figure A-4b

GEOCHEMICAL DISTRIBUTION OF BARIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

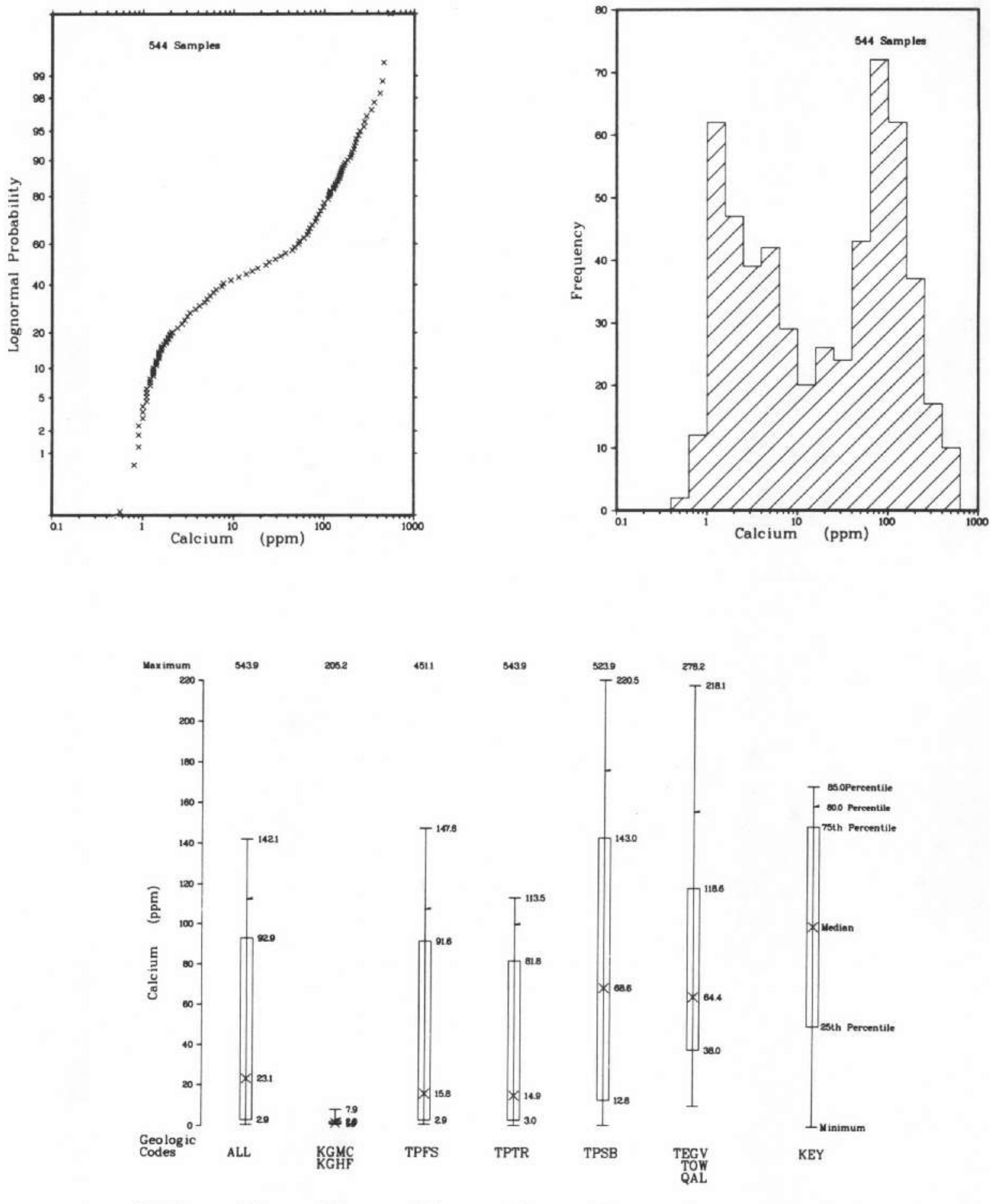


Figure A-5a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR CALCIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

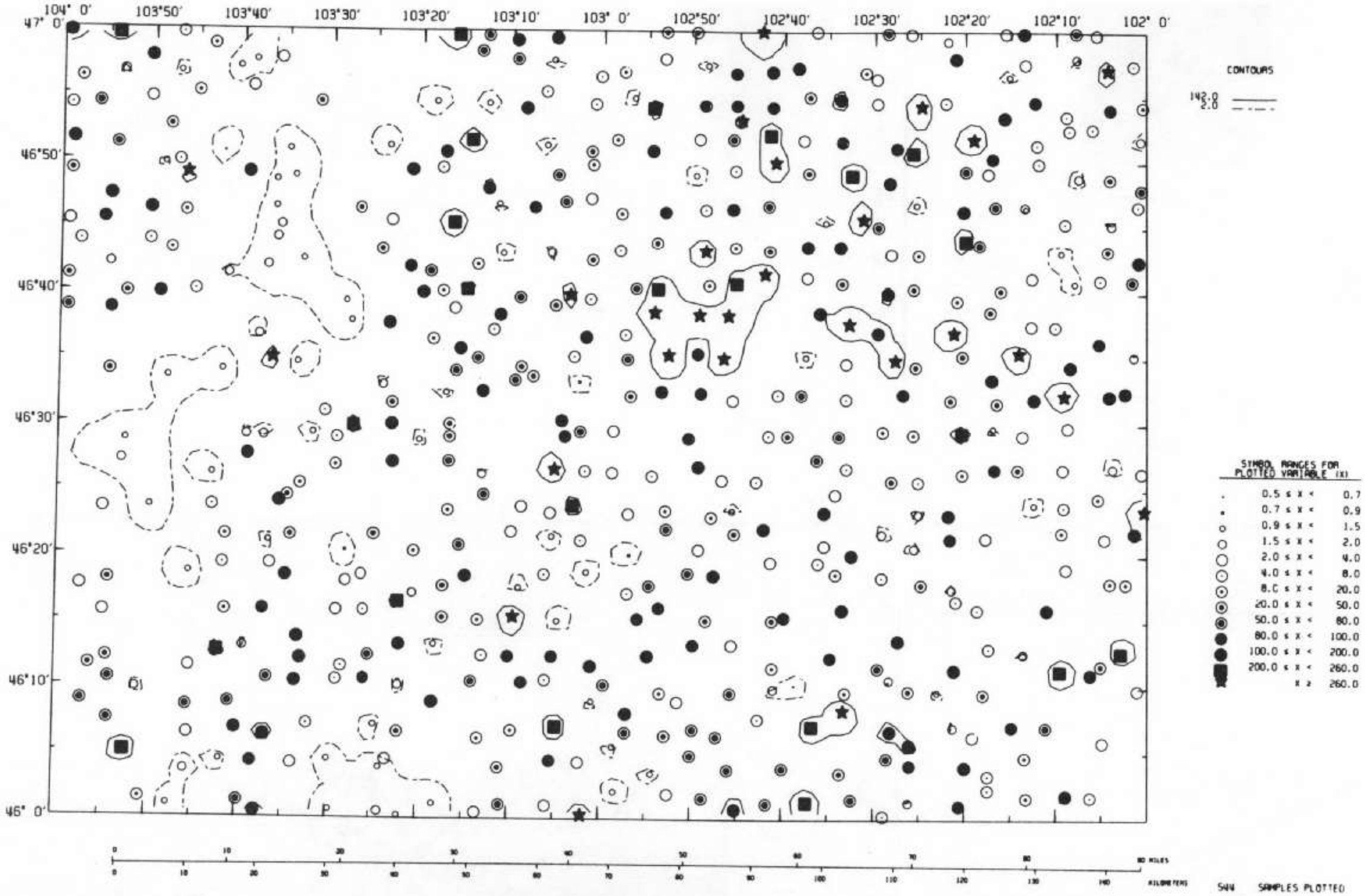


Figure A-5b

GEOCHEMICAL DISTRIBUTION OF CALCIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

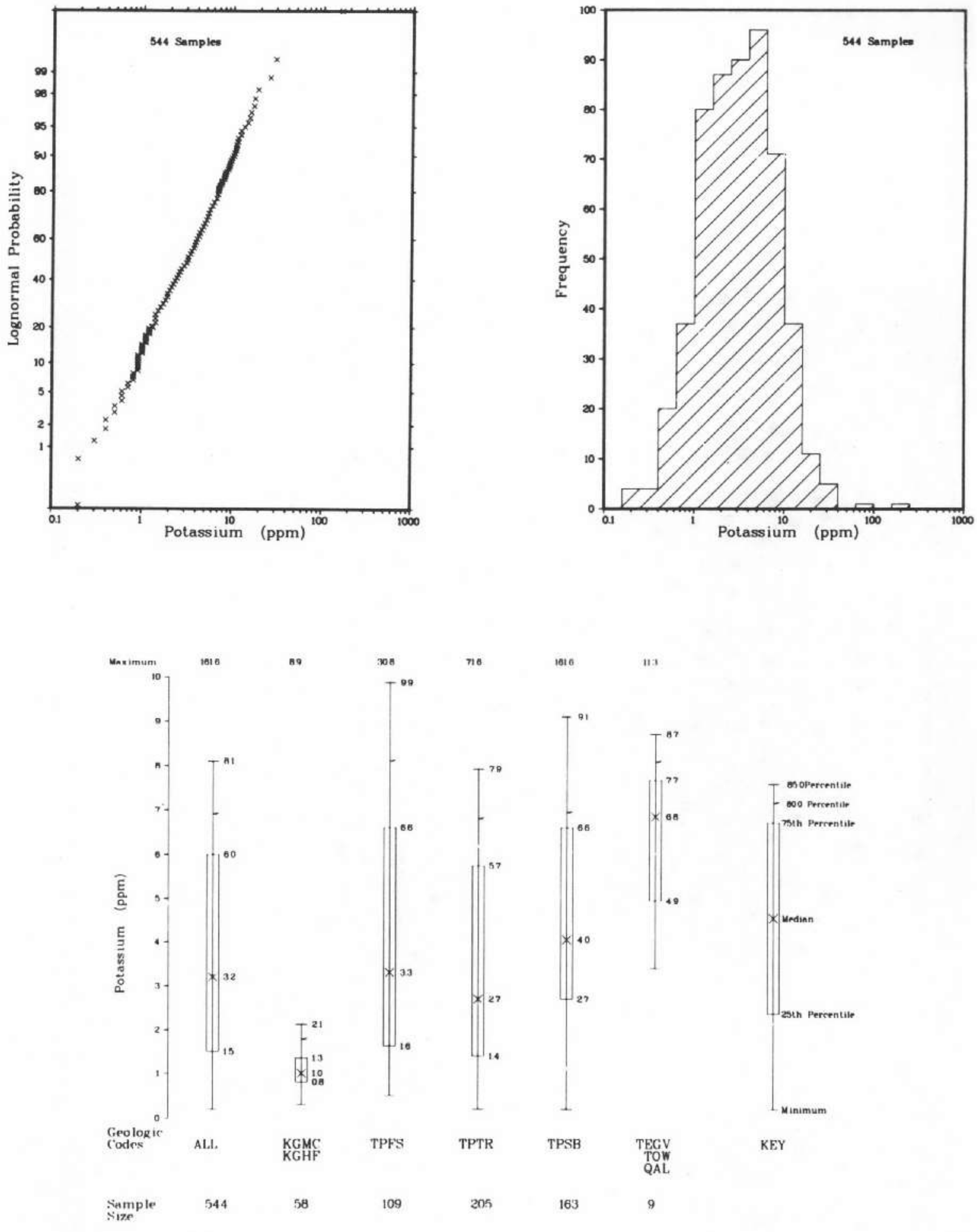


Figure A-6a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR POTASSIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

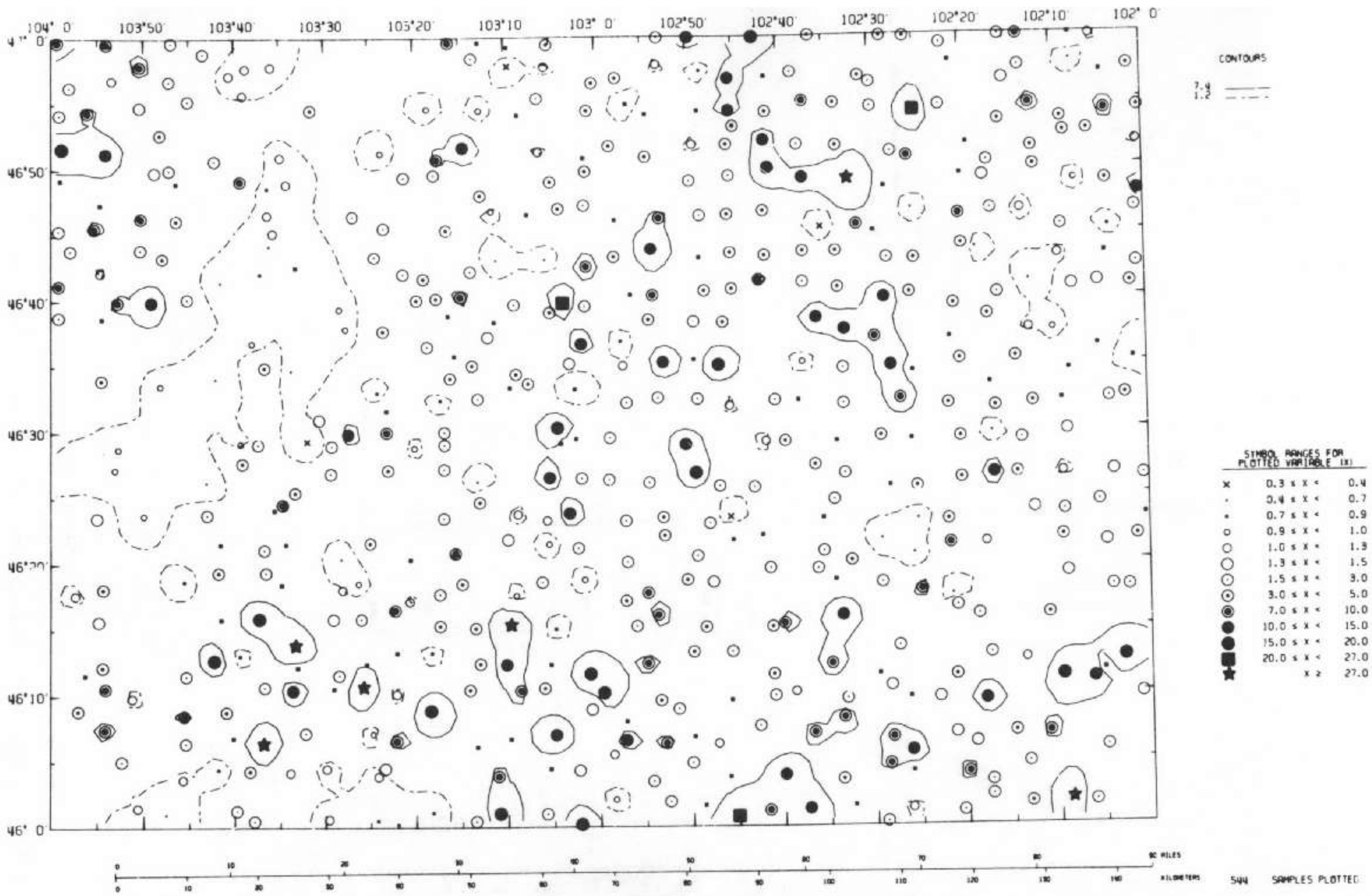


Figure A-6b

GEOCHEMICAL DISTRIBUTION OF POTASSIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

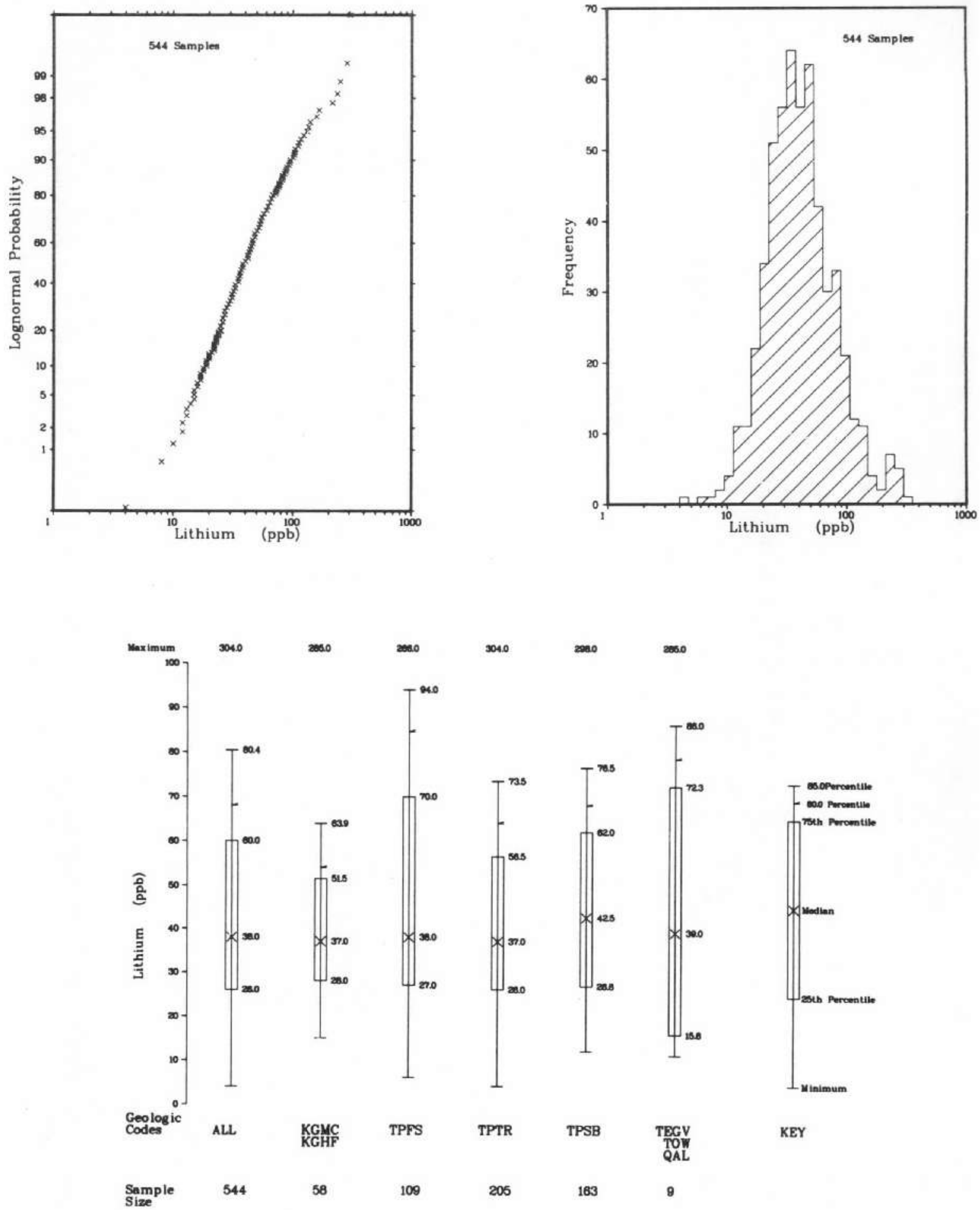


Figure A-7a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR LITHIUM (PPB)
IN GROUNDWATER OF THE DICKINSON QUADRANGLE

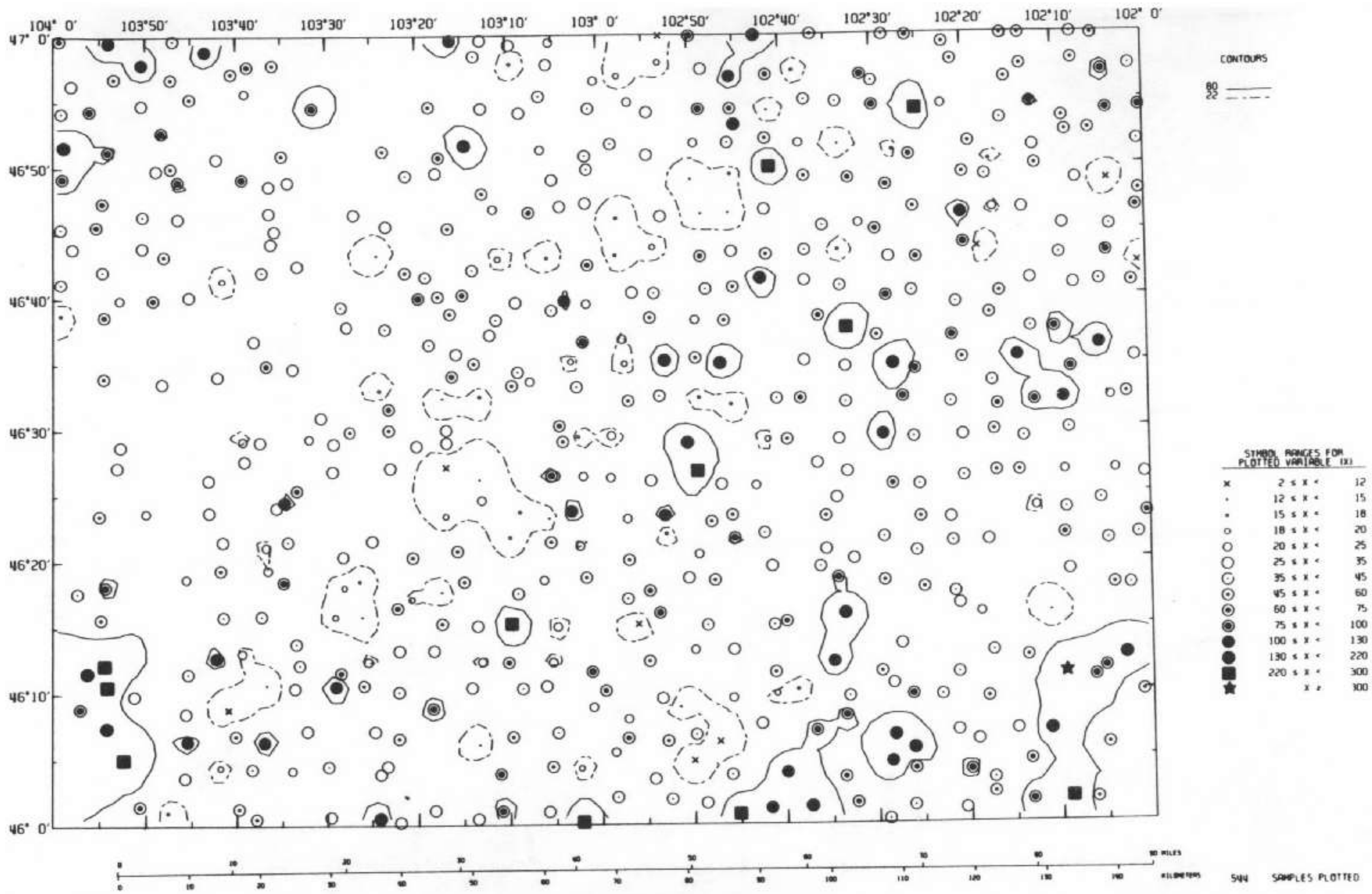
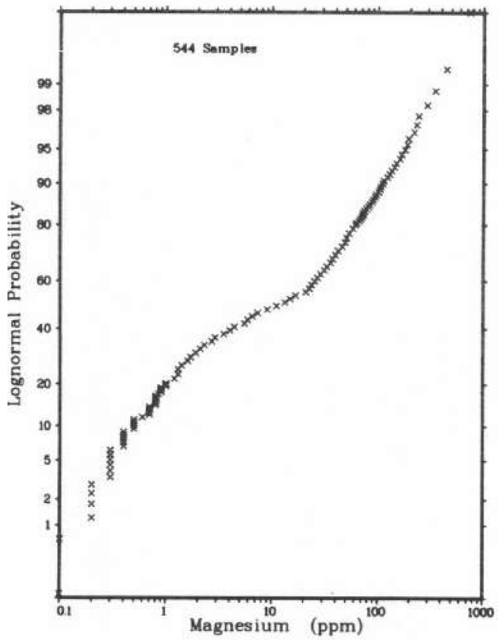
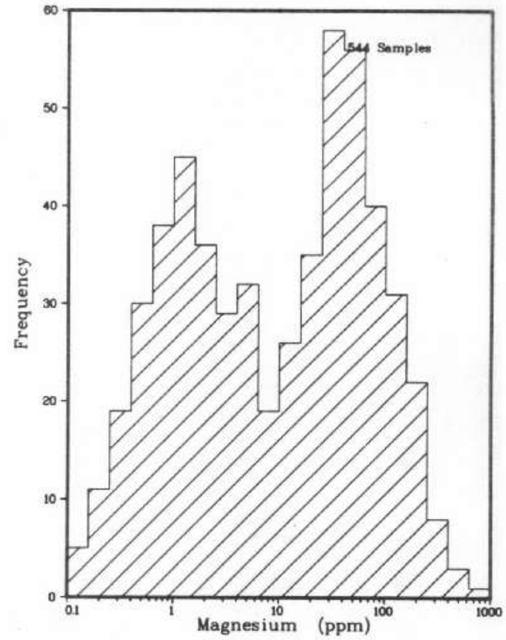


Figure A-7b

GEOCHEMICAL DISTRIBUTION OF LITHIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE





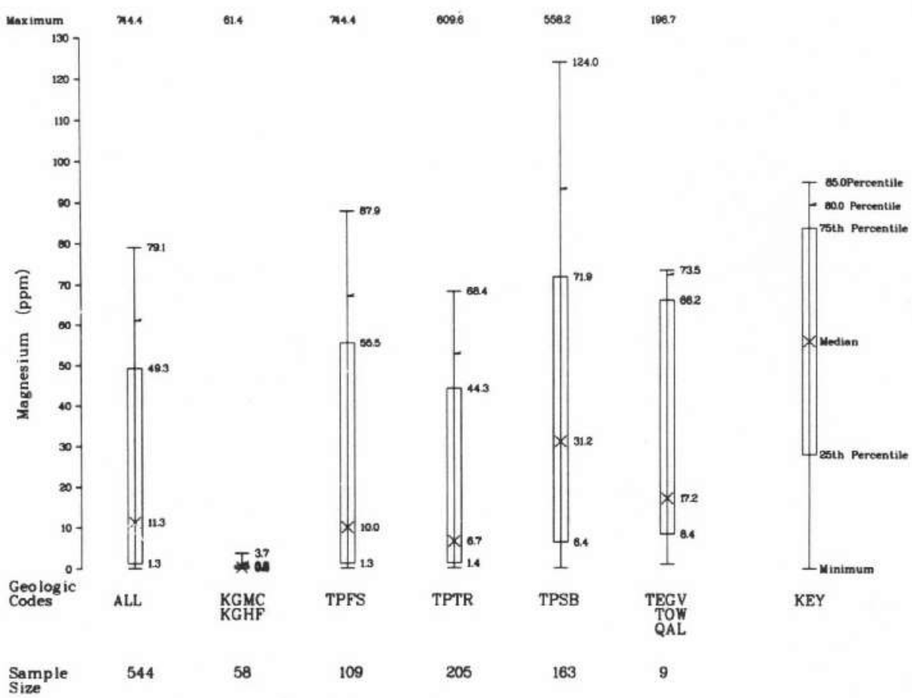


Figure A-8a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR MAGNESIUM (PPM)
IN GROUNDWATER OF THE DICKINSON QUADRANGLE

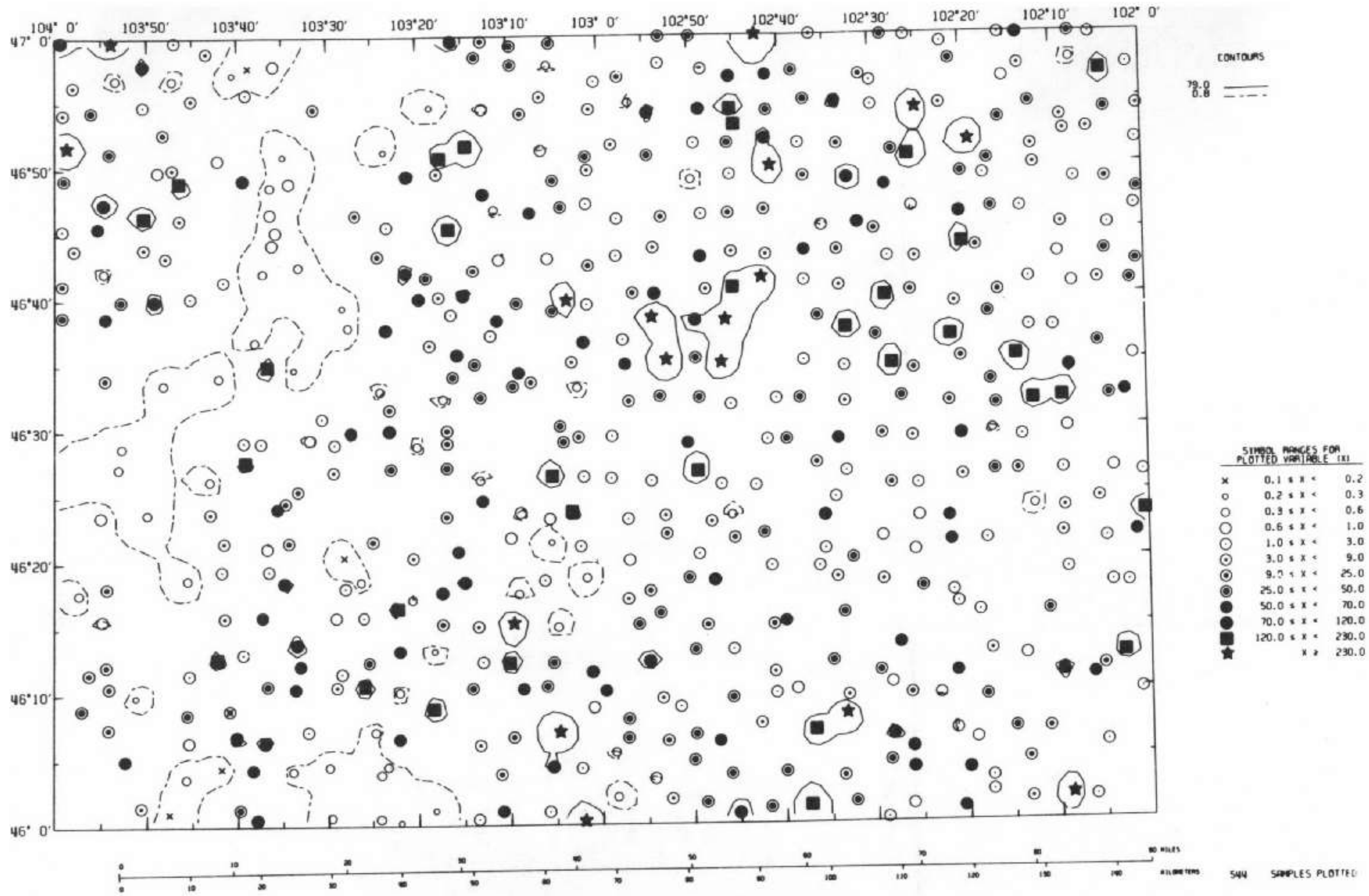
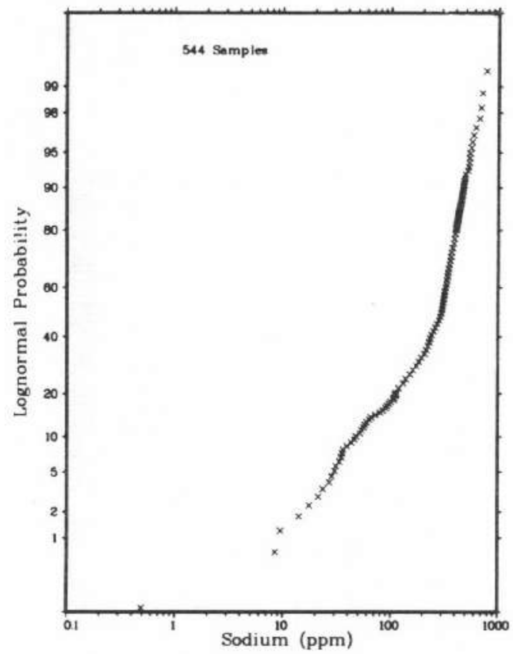
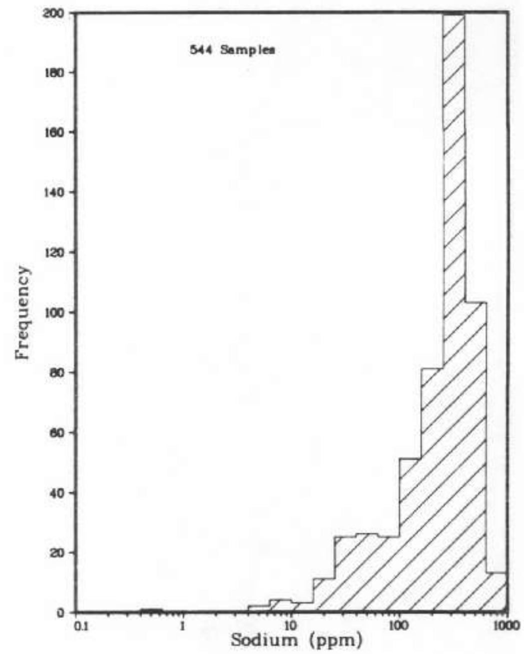


Figure A-8b

GEOCHEMICAL DISTRIBUTION OF MAGNESIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE





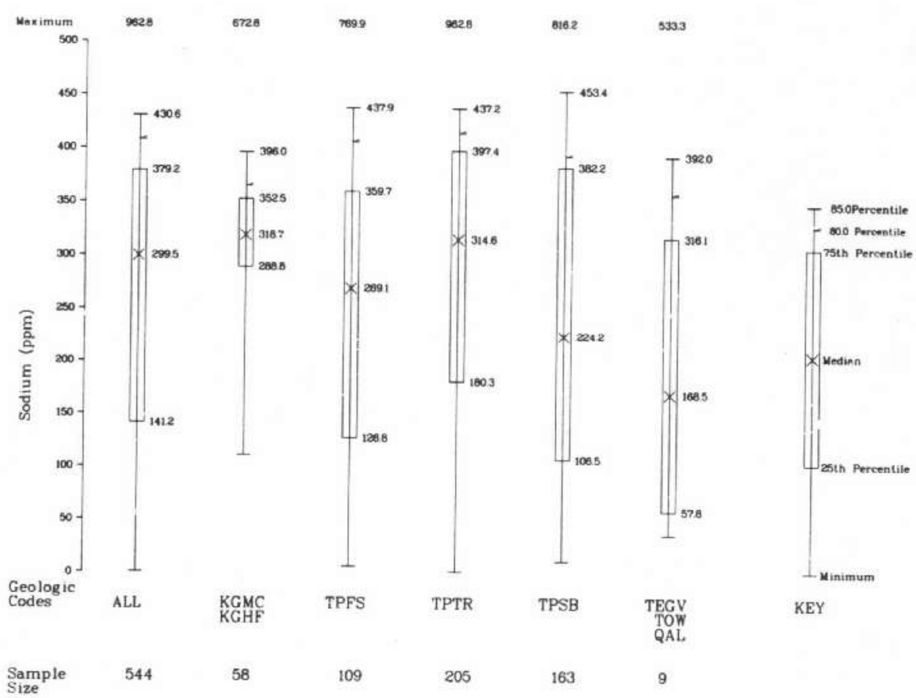


Figure A-9a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SODIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

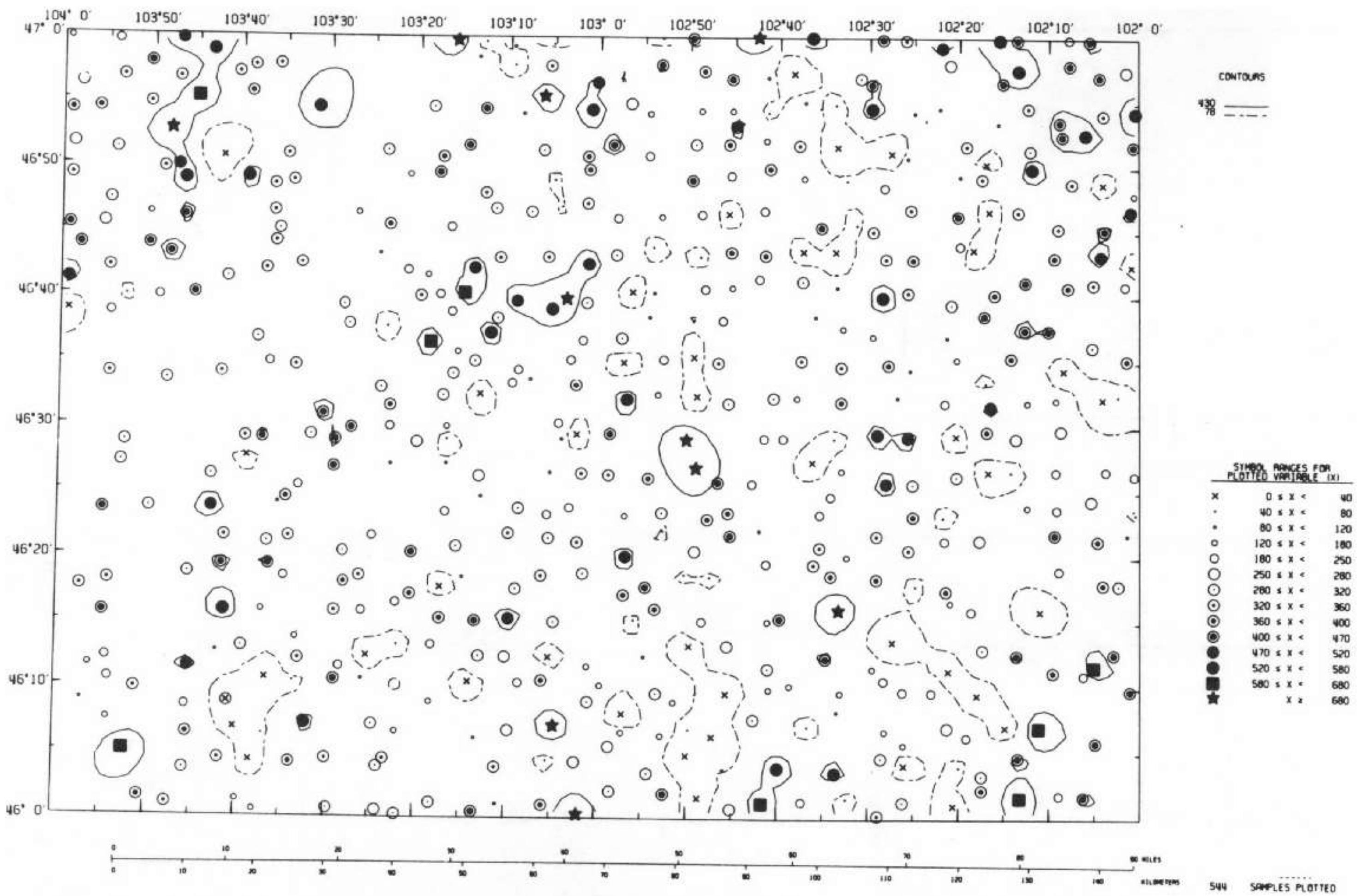
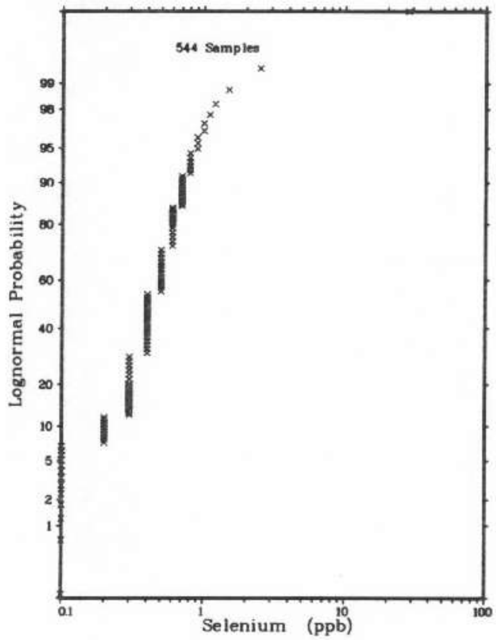
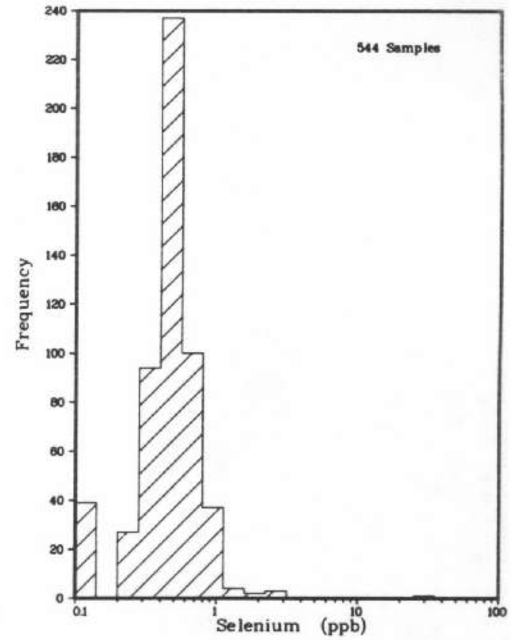


Figure A-9b

GEOCHEMICAL DISTRIBUTION OF SODIUM (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE





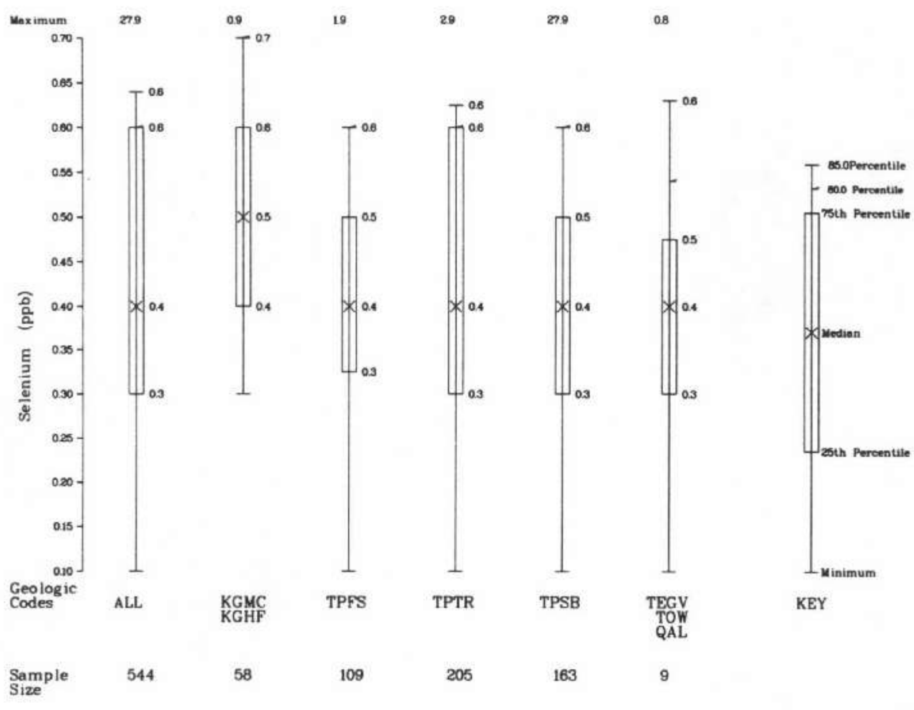


Figure A-10a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SELENIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

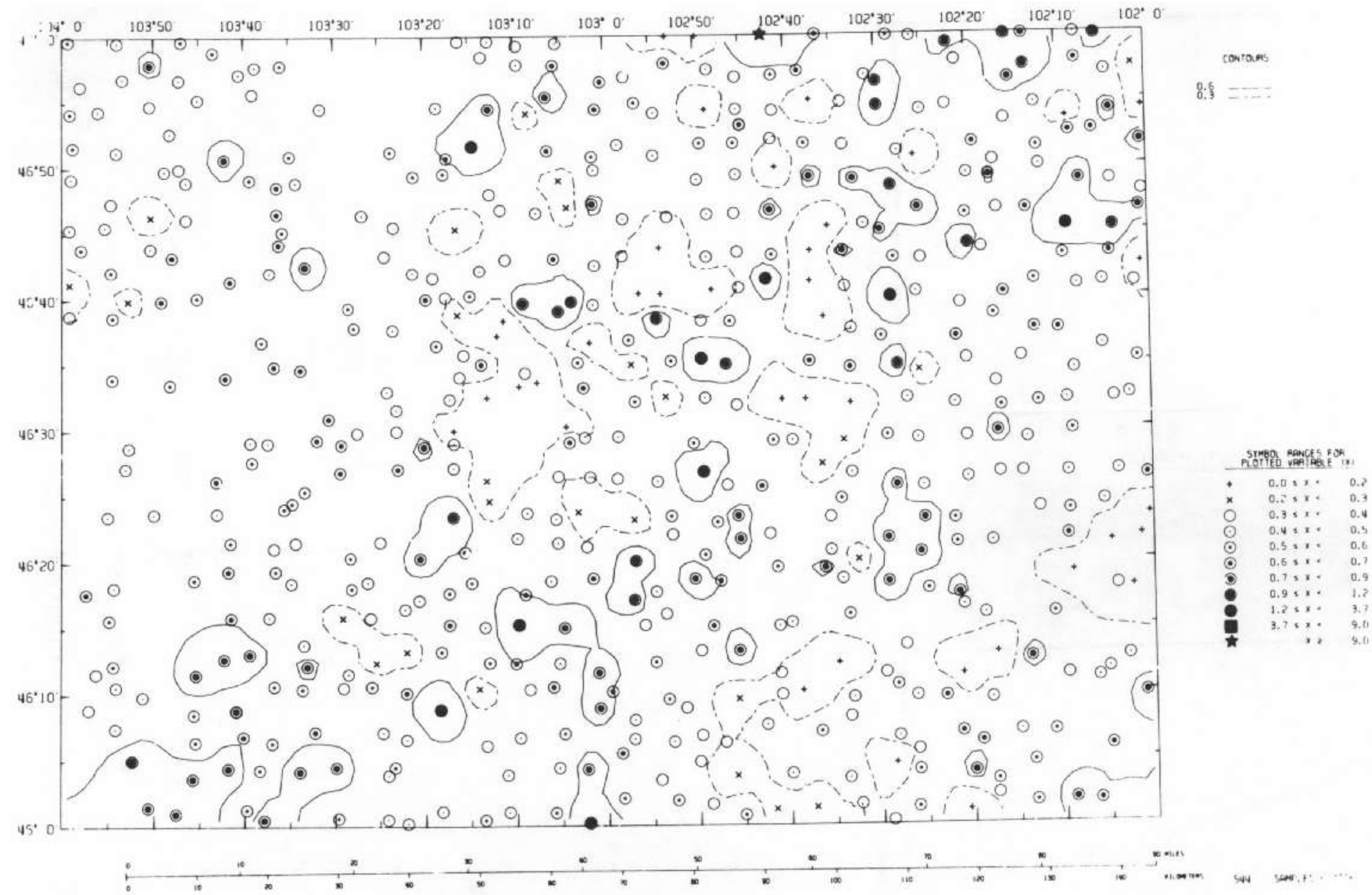


Figure A-10b

GEOCHEMICAL DISTRIBUTION OF SELENIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

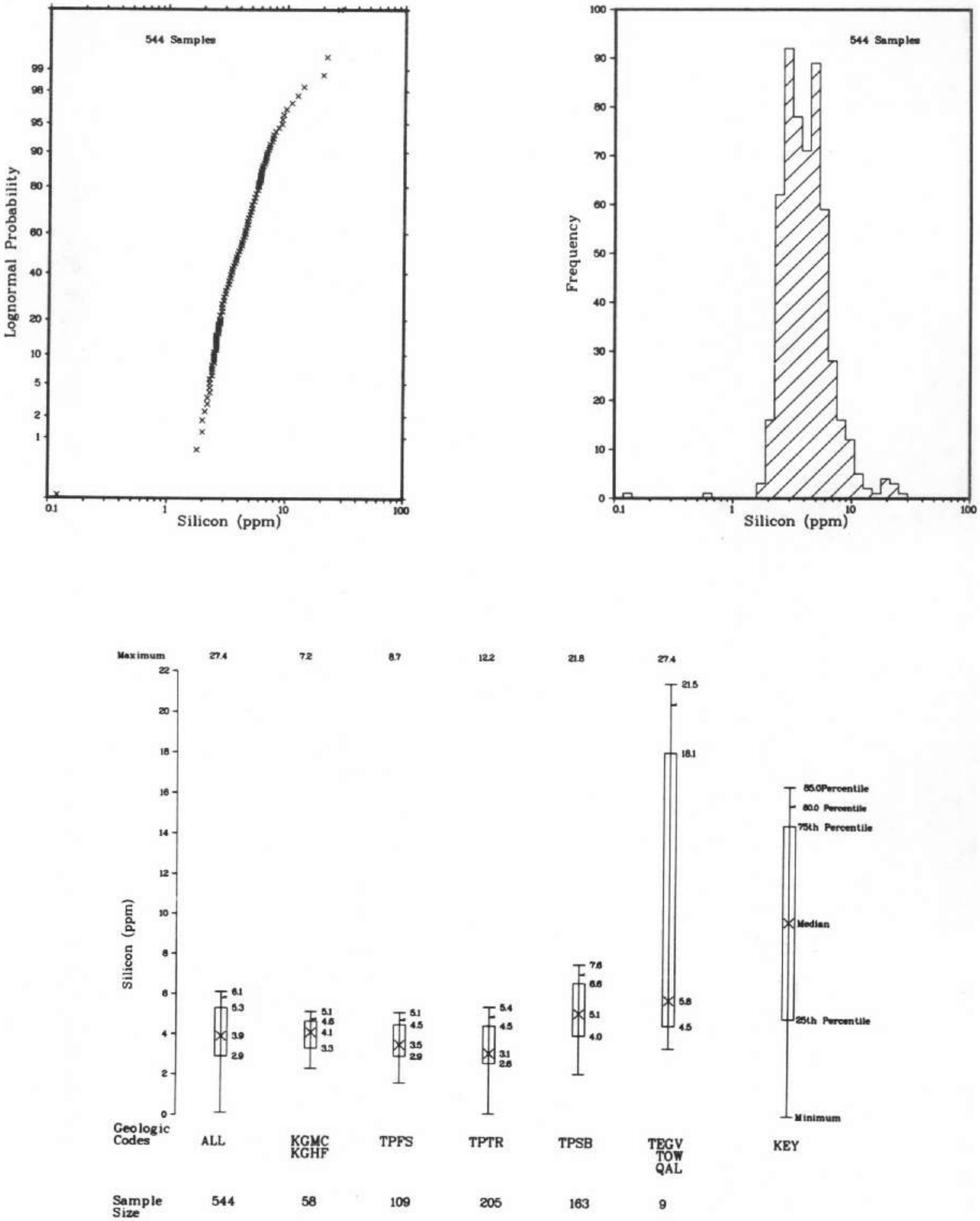


Figure A-11a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SILICON (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

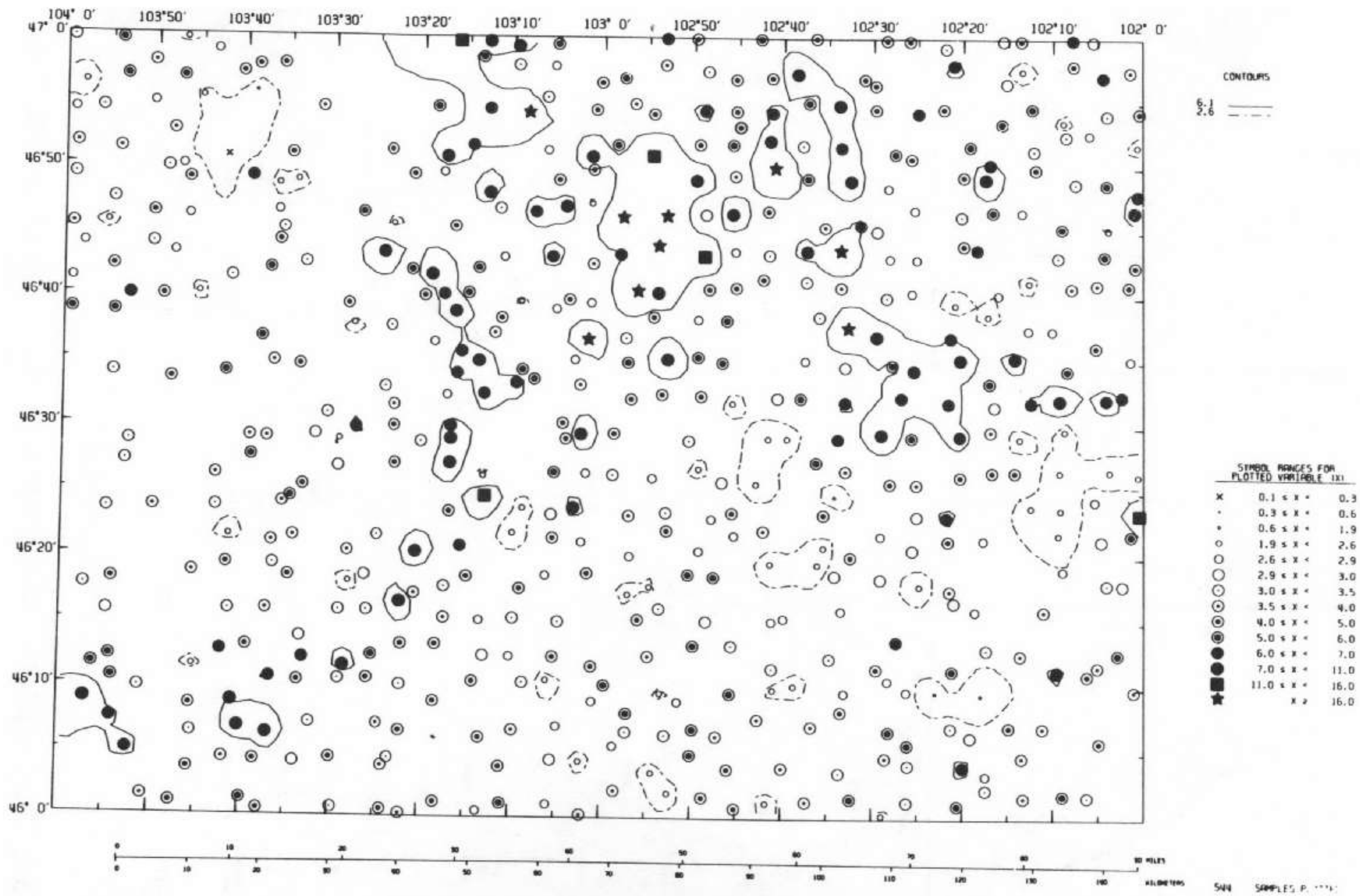


Figure A-11b

GEOCHEMICAL DISTRIBUTION OF SILICON (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

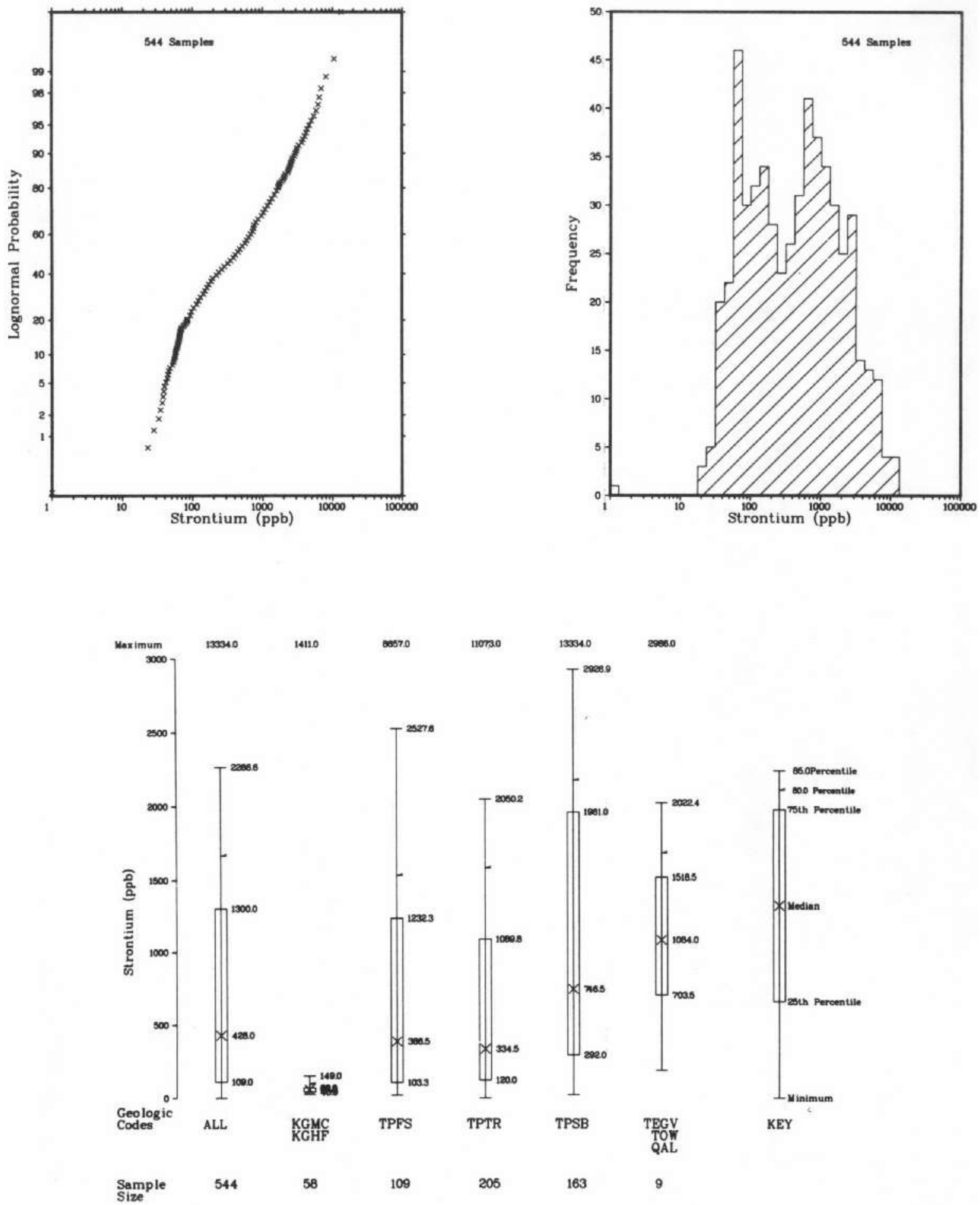


Figure A-12a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR STRONTIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

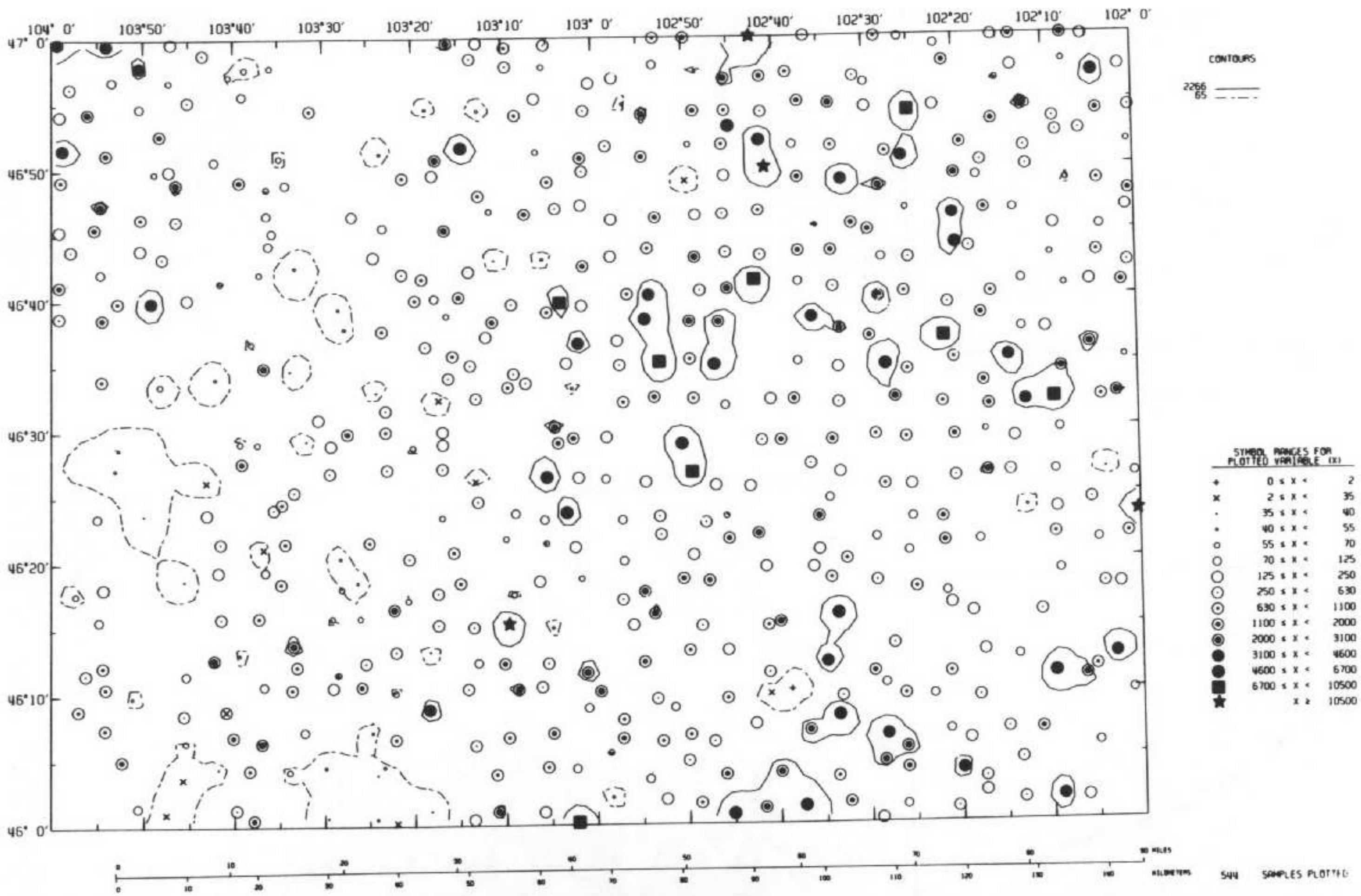
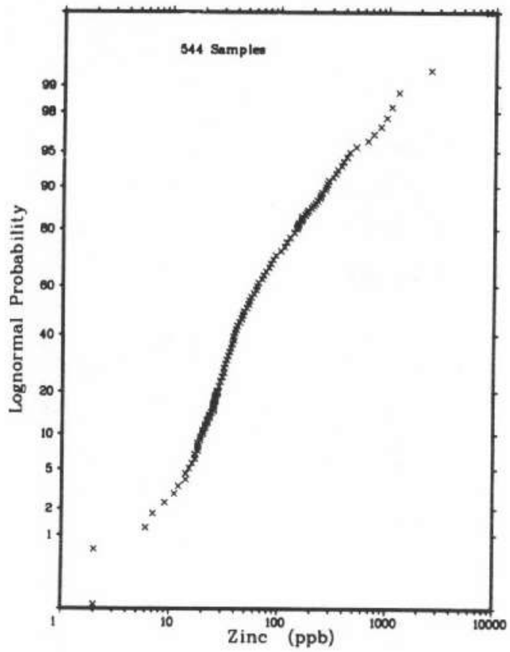
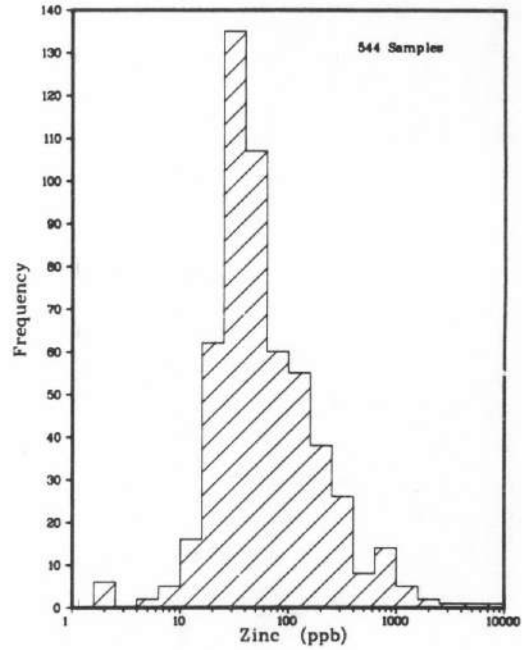


Figure A-12b

GEOCHEMICAL DISTRIBUTION OF STRONTIUM (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE





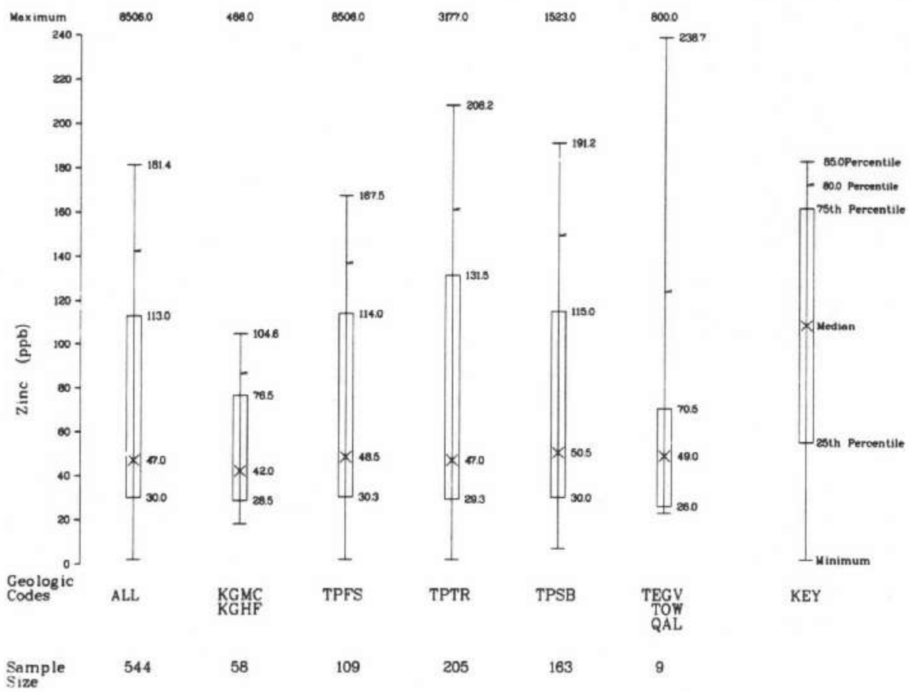


Figure A-13a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ZINC (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

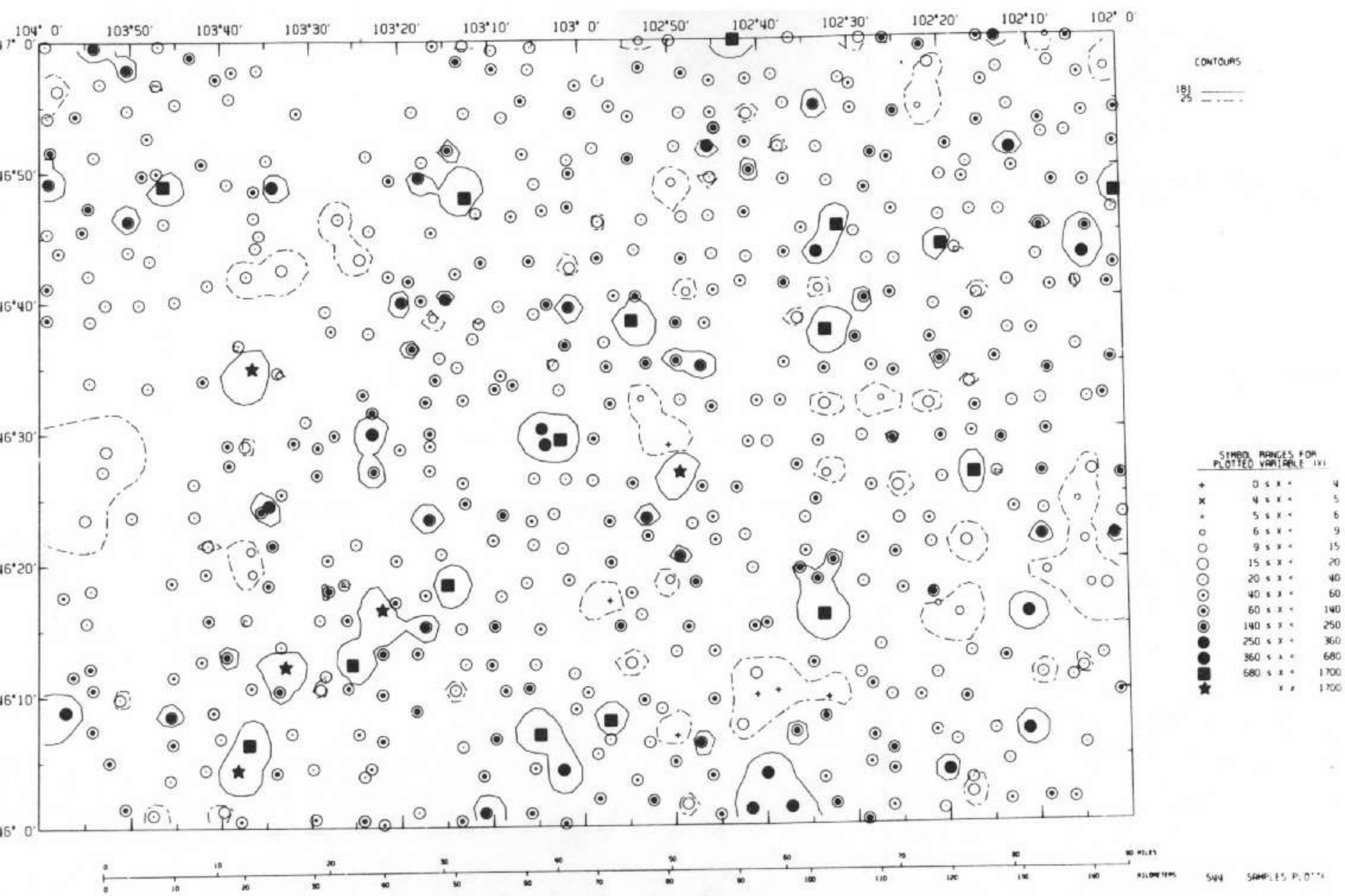


Figure A-13b

GEOCHEMICAL DISTRIBUTION OF ZINC (PPB) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

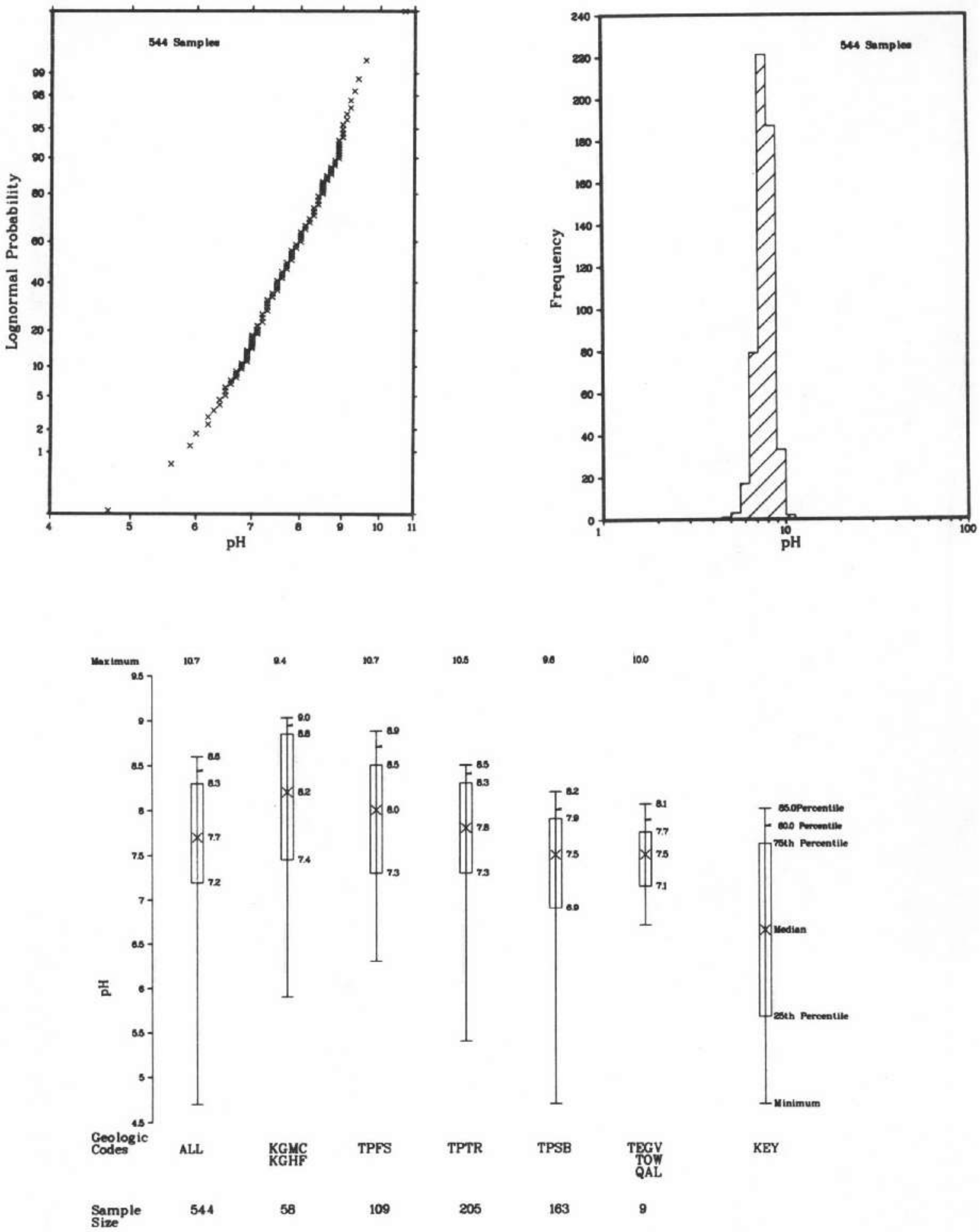


Figure A-14a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR pH
IN GROUNDWATER OF THE DICKINSON QUADRANGLE

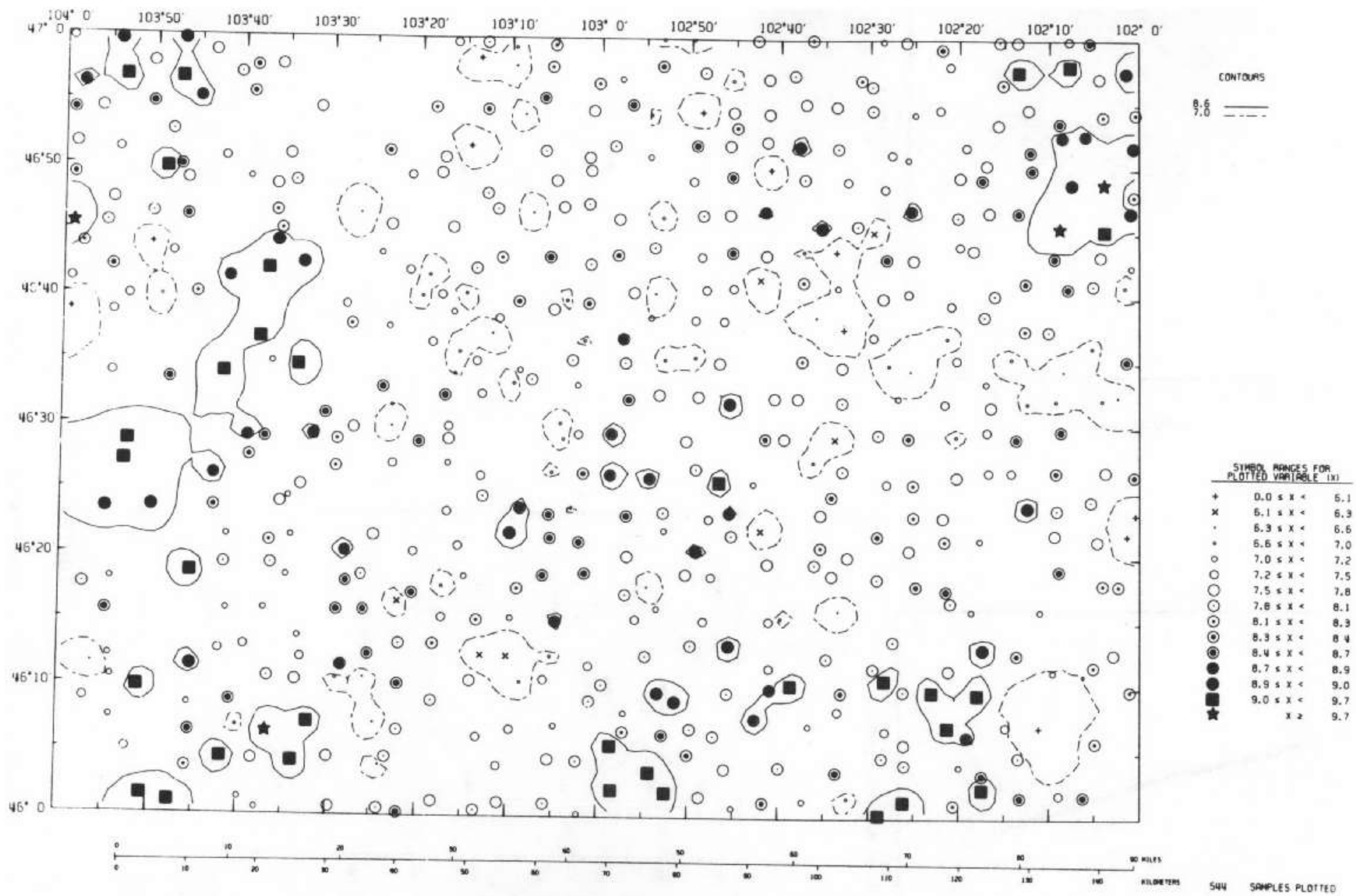


Figure A-14b

GEOCHEMICAL DISTRIBUTION OF pH IN GROUNDWATER OF THE DICKINSON QUADRANGLE

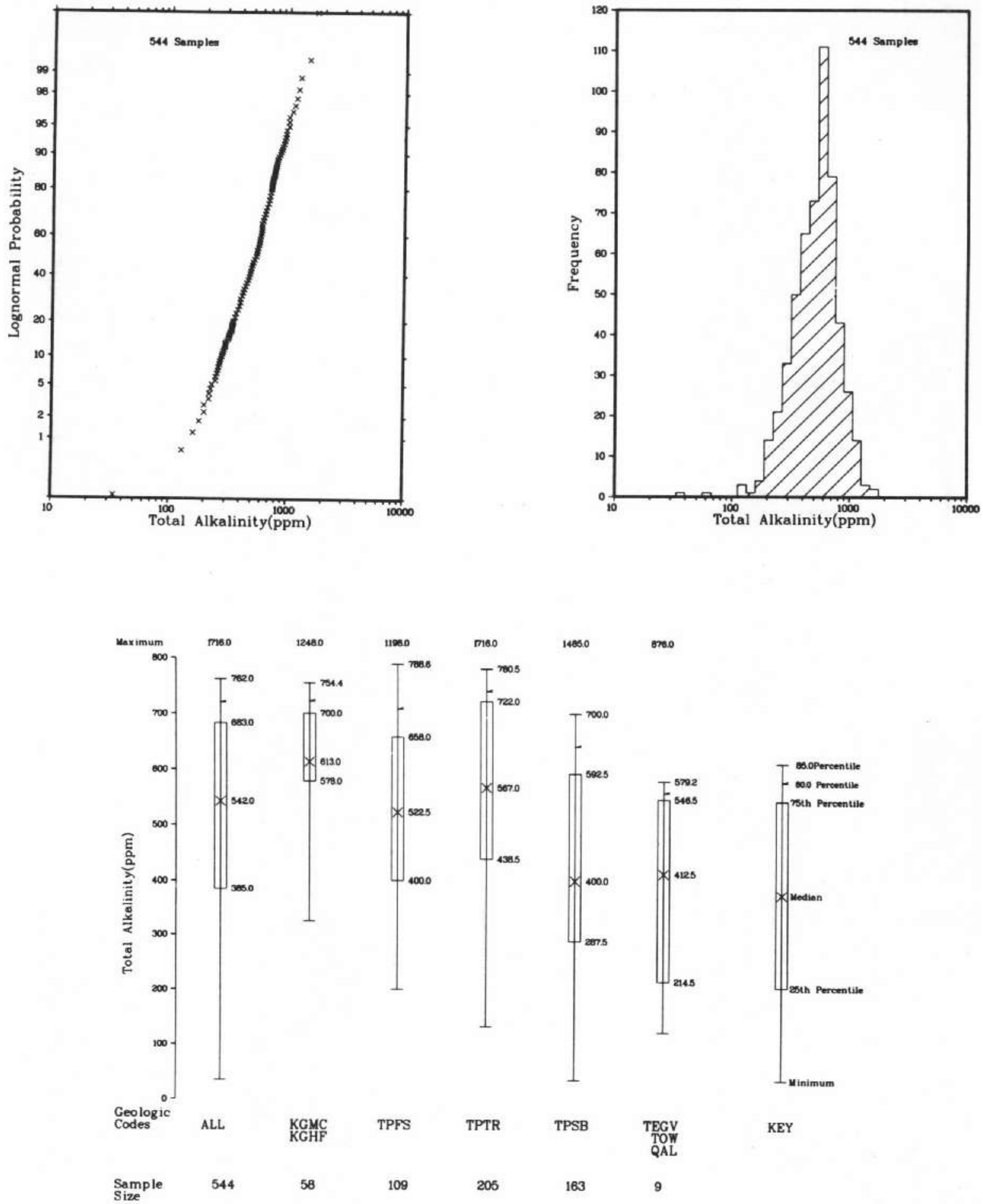


Figure A-15a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR TOTAL ALKALINITY (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

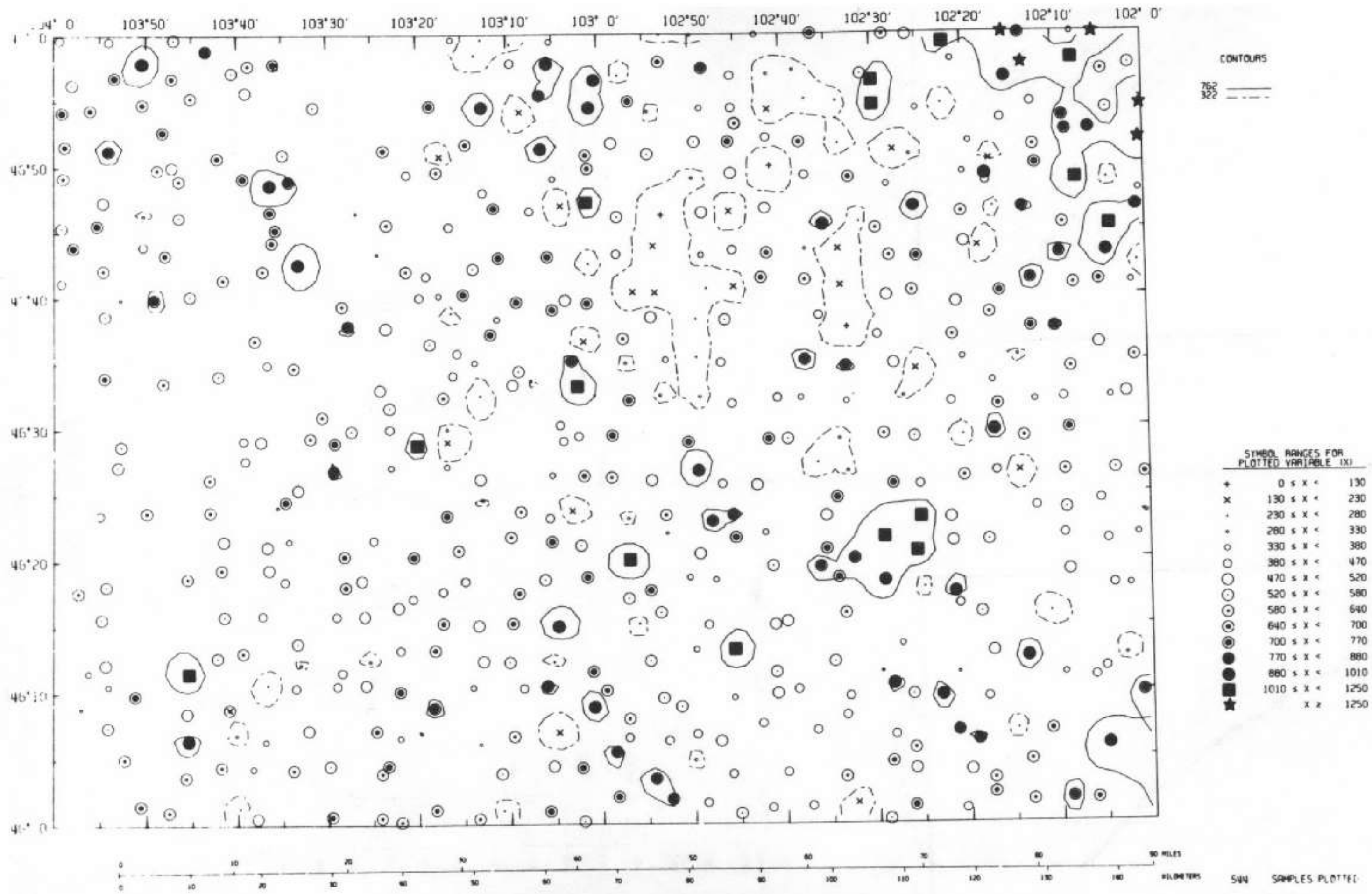


Figure A-15b

GEOCHEMICAL DISTRIBUTION OF TOTAL ALKALINITY (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

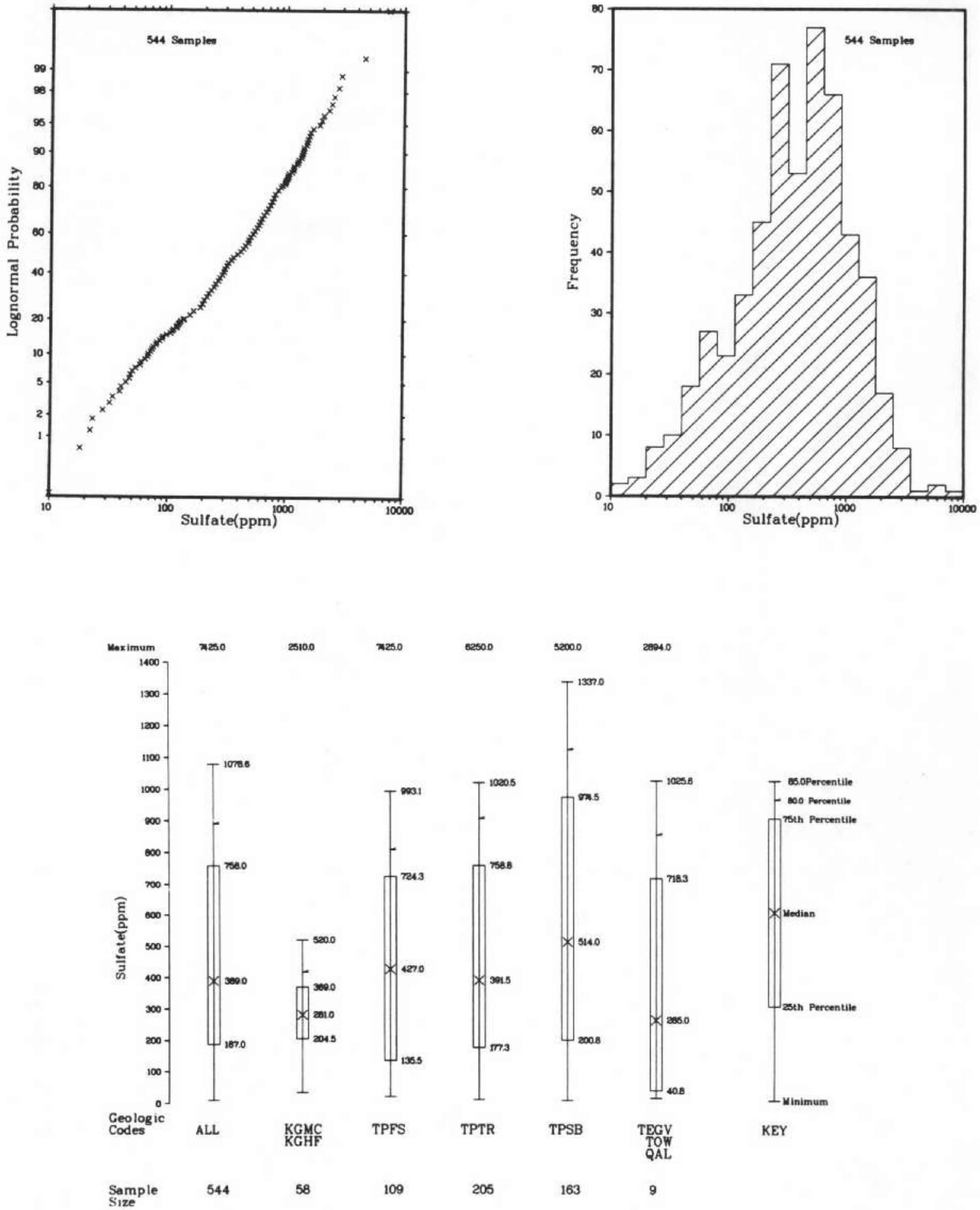


Figure A-16a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SULFATE (PPM)
IN GROUNDWATER OF THE DICKINSON QUADRANGLE

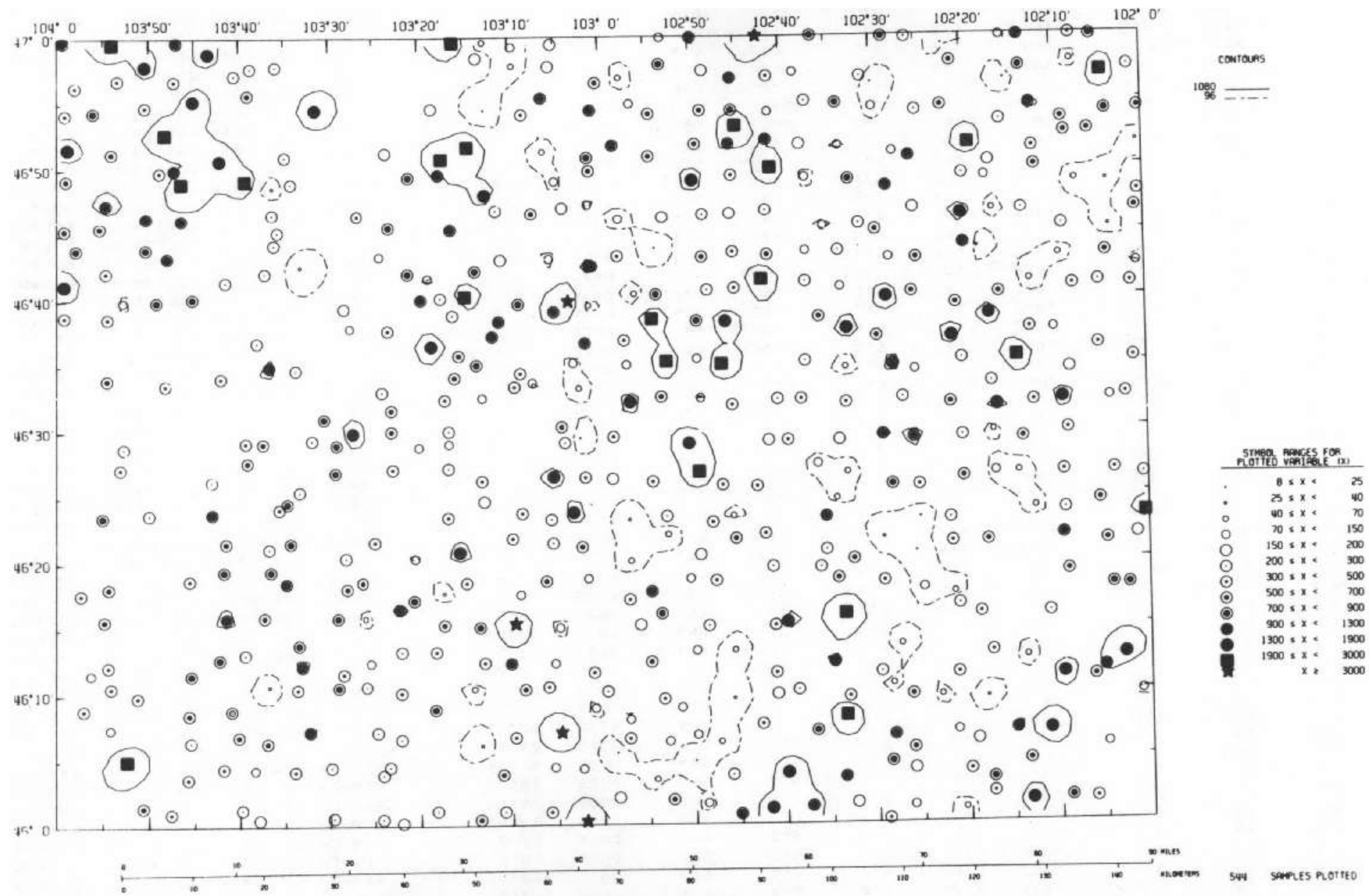


Figure A-16b

GEOCHEMICAL DISTRIBUTION OF SULFATE (PPM) IN GROUNDWATER OF THE DICKINSON QUADRANGLE

Table A-3

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	ST LAT	D. O. E. SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500255	38-46.737	-103.602	-3-03-	<0.02	1900	900	1.8	0.6	0.8	350.	4.0	81	8.9
500258	38-46.701	-103.619	-3-03-	<0.02	1900	670	1.5	0.8	0.3	330.	5.5	67	9.0
500261	38-46.613	-103.634	-3-03-	<0.02	1800	720	1.6	0.9	0.4	320.	5.1	61	9.1
500262	38-46.690	-103.692	-3-03-	0.73	1700	550	1.9	0.6	1.0	320.	3.4	64	8.8
500269	38-46.568	-103.701	-3-03-	<0.02	1900	650	1.3	0.5	0.3	340.	5.2	46	9.1
500272	38-46.582	-103.611	-3-03-	3.6	3500	760	260.	4.9	160.	210.	3.7	2300	7.1
500273	38-46.578	-103.562	-3-03-	0.32	1800	800	0.9	0.5	0.2	320.	4.7	36	9.1
500277	38-46.516	-103.510	-3-03-	<0.20	3200	400	4.8	1.3	2.5	460.	3.3	150	8.4
500279	38-46.709	-103.553	-3-03-	<0.20	1800	870	1.0	0.2	0.5	340.	3.1	45	8.9
500301	38-46.886	-102.748	-3-03-	<0.20	5100	600	17.	2.3	8.7	700.	3.6	600	8.0
500302	38-46.886	-102.748	-3-03-	10.	4500	330	280.	6.9	190.	360.	4.9	6200	6.7
500306	38-46.531	-102.760	-3-03-	0.30	1900	610	2.8	1.1	1.2	300.	2.4	82	8.9
500308	38-46.540	-102.818	-3-03-	2.6	840	50	89.	2.7	30.	35.	4.7	770	7.6
500310	38-46.542	-102.890	-3-03-	0.26	1800	110	130.	1.8	41.	160.	4.9	1200	7.6
500312	38-46.536	-102.947	-3-03-	<0.20	4700	640	23.	2.0	14.	570.	4.5	750	8.6
500316	38-46.583	-102.953	-3-03-	5.5	1000	91	70.	1.2	58.	16.	5.0	450	7.8
500318	38-46.587	-102.880	-3-03-	9.3	5800	540	390.	14.	280.	240.	9.3	8100	6.8
500321	38-46.590	-102.824	-3-03-	7.8	900	96	84.	6.3	29.	30.	5.8	730	6.8
500322	38-46.583	-102.779	-3-03-	14.	5000	230	300.	16.	240.	340.	5.2	6500	7.5
500323	38-46.637	-102.771	-3-03-	62.	4900	180	360.	4.1	230.	220.	5.4	2900	7.2
500324	38-46.638	-102.824	-3-03-	16.	2500	270	290.	2.0	88.	76.	2.8	2100	7.4
500326	38-46.641	-102.906	-3-03-	81.	4800	190	520.	3.8	230.	120.	4.7	5100	7.0
500327	38-46.614	-102.957	-3-03-	0.85	1900	630	6.1	0.7	2.2	290.	3.4	160	8.7
500331	38-46.672	-102.898	-3-03-	<0.20	2200	400	210.	7.0	72.	99.	8.3	4100	6.5
500332	38-46.673	-102.938	-3-03-	22.	760	33	69.	6.6	11.	38.	18.	720	7.6
500336	38-46.677	-102.804	-3-03-	<0.20	1200	290	13.	4.2	5.9	210.	4.0	360	7.2
500337	38-46.679	-102.754	-3-03-	14.	3800	120	250.	4.1	170.	150.	4.5	2100	7.3
500341	38-46.721	-102.968	-3-03-	0.26	1700	290	6.0	3.8	1.4	320.	6.0	130	8.3
500342	38-46.731	-102.900	-3-03-	26.	640	47	49.	11.	6.0	60.	27.	680	7.8
500344	38-46.719	-102.813	-3-03-	120.	2200	85	280.	6.9	74.	57.	12.	2300	7.3
500345	38-46.725	-102.756	-3-03-	<0.20	2200	260	18.	4.4	5.9	380.	2.8	470	8.4
500346	38-46.252	-102.807	-3-03-	0.80	1700	470	31.	3.9	15.	240.	2.9	560	7.2
500356	38-46.020	-102.695	-3-03-	<0.20	4400	1200	60.	9.9	32.	600.	2.3	2500	8.3
500358	38-46.022	-102.622	-3-03-	14.	3700	640	200.	12.	190.	230.	3.9	5700	7.1
500359	38-46.065	-102.666	-3-03-	<0.20	4500	960	73.	11.	33.	580.	3.8	2700	7.9
500364	38-46.026	-102.540	-3-03-	0.33	960	110	71.	5.5	30.	49.	5.5	1700	6.7
500365	38-46.127	-102.711	-3-03-	<0.20	1600	410	5.4	2.4	3.4	290.	3.5	210	8.8
500366	38-46.118	-102.612	-3-03-	2.1	2500	280	220.	8.1	140.	59.	3.6	2900	7.1
500368	38-46.059	-102.561	-3-03-	<0.20	3800	1400	23.	3.5	14.	540.	3.4	840	8.5
500372	38-46.137	-102.558	-3-03-	64.	4400	300	450.	9.5	230.	120.	4.6	5900	7.3
500373	38-46.161	-102.552	-3-03-	<0.20	2100	490	13.	2.4	6.2	170.	2.8	450	8.3
500377	38-46.170	-102.645	-3-03-	<0.20	1700	580	0.6	1.2	0.8	150.	2.4	<2	9.1
500379	38-46.165	-102.683	-3-03-	<0.20	1400	500	1.5	1.7	1.1	140.	2.5	20	8.7
500381	38-46.192	-102.685	-3-03-	0.48	1900	680	16.	4.1	8.4	310.	3.0	600	7.4
500384	38-46.205	-102.579	-3-03-	<0.20	3700	930	89.	9.7	49.	450.	3.3	3500	7.8
500388	38-46.309	-102.793	-3-03-	17.	2000	410	160.	1.4	90.	66.	5.7	1700	7.2
500391	38-46.312	-102.840	-3-03-	4.0	1000	190	74.	3.6	28.	65.	5.4	1300	7.5
500394	38-46.342	-102.821	-3-03-	0.43	1500	610	3.8	1.5	1.8	260.	2.7	150	8.9
500396	38-46.362	-102.756	-3-03-	9.8	3400	570	43.	5.9	23.	440.	2.7	1700	8.0
500397	38-46.391	-102.760	-3-03-	0.27	2200	1700	1.2	0.3	0.3	370.	4.3	62	8.8
500400	38-46.383	-102.798	-3-03-	0.22	2300	720	8.4	2.8	4.4	370.	2.8	370	7.3
500402	38-46.538	-102.677	-3-03-	<0.20	1800	430	4.9	1.8	1.7	290.	2.9	140	7.5
500403	38-46.538	-102.634	-3-03-	4.0	1700	170	64.	5.6	35.	180.	5.7	1300	7.5
500407	38-46.533	-102.552	-3-03-	<0.20	2300	820	7.9	2.9	3.0	370.	6.2	260	7.8
500409	38-46.578	-102.552	-3-03-	0.36	1900	460	3.0	2.0	1.8	330.	2.9	130	7.6

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500415	38-46.586	-102.626	-3-03-	0.33	78	730	1.3	0.9	1.0	350.	2.6	71	8.1
500418	38-46.627	-102.549	-3-03-	12.	4300	180	480.	10.	160.	130.	20.	2400	4.7
500419	38-46.642	-102.600	-3-03-	0.31	2000	230	150.	11.	42.	110.	3.4	4200	6.4
500422	38-46.680	-102.560	-3-03-	1.8	940	88	21.	4.6	6.2	91.	3.8	500	7.0
500426	38-46.726	-102.563	-3-03-	0.30	1200	240	150.	3.1	16.	22.	21.	1200	5.8
500427	38-46.726	-102.623	-3-03-	13.	1400	62	110.	4.7	51.	31.	7.0	1700	6.9
500428	38-46.687	-102.624	-3-03-	0.60	2000	540	2.8	1.5	1.7	310.	3.3	110	8.1
500429	38-46.690	-102.704	-3-03-	11.	6300	1300	460.	7.9	370.	230.	4.9	6800	6.2
500430	38-46.721	-102.693	-3-03-	0.20	3000	300	20.	4.3	7.1	390.	3.0	630	7.5
500432	38-46.673	-102.429	-3-03-	0.50	2500	450	24.	4.2	10.	320.	2.6	750	7.2
500435	38-46.716	-102.420	-3-03-	0.40	3100	400	16.	4.0	7.7	390.	2.6	550	7.7
500437	38-46.734	-102.333	-3-03-	38.	3700	280	230.	3.5	140.	200.	4.7	5200	7.2
500440	38-46.729	-102.308	-3-03-	5.4	720	64	51.	0.6	13.	20.	6.0	260	7.6
500442	38-46.671	-102.269	-3-03-	3.1	3300	640	23.	2.8	21.	370.	2.6	980	7.8
500444	38-46.658	-102.349	-3-03-	0.50	2500	350	12.	3.1	4.9	310.	2.2	370	7.4
500445	38-46.644	-102.288	-3-03-	13.	4600	510	38.	4.2	48.	440.	2.4	1600	7.9
500447	38-46.616	-102.357	-3-03-	6.3	4700	270	430.	5.3	180.	110.	6.2	6800	6.7
500450	38-46.588	-102.339	-3-03-	<0.20	1500	320	30.	3.4	12.	160.	7.6	730	7.3
500451	38-46.558	-102.285	-3-03-	3.4	1600	160	100.	5.6	46.	54.	5.3	1100	7.0
500453	38-46.528	-102.276	-3-03-	8.8	5000	770	47.	4.4	26.	490.	2.9	1700	7.7
500456	38-46.532	-102.361	-3-03-	0.32	2100	390	37.	3.5	19.	240.	6.8	880	7.4
500458	38-46.539	-102.448	-3-03-	<0.20	1400	140	87.	9.7	40.	90.	6.1	2300	7.0
500460	38-46.574	-102.425	-3-03-	0.26	940	490	46.	6.7	14.	110.	11.	970	6.3
500462	38-46.581	-102.465	-3-03-	0.30	4300	190	300.	10.	170.	390.	5.9	6300	6.9
500463	38-46.617	-102.494	-3-03-	24.	1900	94	170.	8.8	48.	170.	9.8	2000	7.3
500464	38-46.667	-102.476	-3-03-	77.	4700	500	160.	11.	150.	580.	3.0	4100	7.5
500465	38-46.717	-102.470	-3-03-	0.59	1700	340	2.7	2.3	1.5	350.	2.6	85	8.5
500468	38-46.210	-102.227	-3-03-	0.68	2100	1400	1.8	1.2	0.9	440.	3.6	75	8.3
500470	38-46.188	-102.160	-3-03-	<0.20	3700	2400	220.	16.	96.	360.	6.4	5400	7.0
500473	38-46.195	-102.085	-3-03-	0.50	4000	590	31.	6.1	10.	590.	3.5	1000	8.1
500477	38-46.211	-102.048	-3-03-	9.3	4300	540	230.	17.	130.	410.	5.3	4000	7.5
500479	38-46.164	-102.018	-3-03-	0.44	2300	1300	2.7	1.4	1.0	410.	3.9	100	8.2
500481	38-46.184	-102.104	-3-03-	0.22	2300	450	150.	11.	56.	190.	4.7	3100	6.9
500482	38-46.118	-102.248	-3-03-	7.1	1200	95	93.	3.8	40.	36.	4.2	480	7.3
500483	38-46.079	-102.224	-3-03-	1.5	3200	1400	16.	2.2	10.	460.	3.5	380	8.0
500485	38-46.117	-102.186	-3-03-	0.32	6000	880	53.	8.1	18.	670.	3.9	1700	7.5
500490	38-46.098	-102.082	-3-03-	0.65	2400	1300	3.1	1.5	2.1	430.	4.0	120	8.2
500495	38-46.029	-102.104	-3-03-	0.95	2600	1500	4.1	2.2	1.3	440.	3.4	140	8.5
500497	38-46.031	-102.149	-3-03-	85.	4700	400	150.	30.	300.	200.	5.1	4300	7.2
500500	38-46.028	-102.221	-3-03-	0.47	4200	1300	11.	4.0	4.2	630.	3.5	570	8.4
500503	38-46.908	-103.212	-3-03-	0.48	2200	630	1.0	0.9	0.6	430.	6.7	40	8.3
500506	38-46.994	-103.213	-3-03-	340.	1100	26	58.	5.3	24.	52.	7.5	220	8.0
500509	38-46.923	-103.106	-3-03-	0.71	4500	980	4.4	2.5	3.6	680.	3.3	160	8.5
500519	38-46.988	-103.160	-3-03-	760.	1500	28	110.	6.1	49.	90.	9.1	670	6.9
500521	38-46.998	-102.476	-3-03-	6.3	3200	540	73.	3.7	33.	420.	4.6	850	7.0
500523	38-46.997	-102.433	-3-03-	1.0	1900	570	3.2	3.6	2.8	220.	4.9	120	7.7
500524	38-46.966	-102.351	-3-03-	13.	2600	180	130.	6.8	46.	260.	6.7	1300	7.4
500532	38-46.909	-102.496	-3-03-	<0.20	3200	1200	2.1	1.8	1.3	560.	4.2	130	7.8
500533	38-46.940	-102.497	-3-03-	<0.20	2600	380	2.1	2.1	1.7	470.	4.1	110	8.0
500534	38-46.988	-102.366	-3-03-	0.26	2800	470	1.9	1.9	1.5	480.	3.2	92	8.3
500535	38-46.998	-102.259	-3-03-	0.28	3200	340	3.1	2.7	2.6	540.	2.9	180	7.9
500536	38-46.943	-102.253	-3-03-	0.32	2200	630	1.3	1.4	0.8	430.	2.9	58	8.1
500537	38-46.891	-102.262	-3-03-	6.4	1900	200	100.	4.4	45.	84.	5.0	1600	7.7
500538	38-46.910	-102.370	-3-01-	<0.20	1000	350	6.8	1.6	4.3	110.	4.2	180	7.2
500539	38-46.904	-102.417	-3-03-	24.	5500	540	420.	26.	350.	110.	6.0	8200	7.1

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. D. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500541	38-46.852	-102.460	-3-03-	3.7	1200	31	81.	1.8	26.	18.	5.6	750	7.3
500546	38-46.808	-102.473	-3-03-	9.3	2600	150	120.	5.9	62.	230.	2.6	2600	7.2
500547	38-46.780	-102.424	-3-03-	0.33	2400	790	1.1	0.6	0.7	350.	2.6	62	8.8
500550	38-46.772	-102.337	-3-03-	3.9	4500	820	110.	7.2	85.	440.	3.2	3800	8.0
500552	38-46.778	-102.279	-3-03-	3.3	800	19	69.	2.5	29.	25.	5.7	1100	7.7
500553	38-46.820	-102.292	-3-03-	0.27	2200	470	2.2	1.3	1.4	330.	9.4	120	8.5
500554	38-46.823	-102.333	-3-03-	<0.20	1200	420	67.	5.5	37.	120.	4.2	2000	7.5
500555	38-46.862	-102.321	-3-03-	37.	6600	360	340.	5.3	350.	340.	5.1	1700	7.3
500556	38-46.839	-102.284	-3-03-	5.3	950	73	93.	2.5	34.	24.	6.1	560	7.7
500557	38-46.496	-102.283	-3-03-	<0.20	2600	1900	1.4	0.5	0.4	360.	3.8	68	7.3
500558	38-46.444	-102.280	-3-03-	<0.20	1200	110	80.	11.	45.	29.	4.3	2700	7.3
500563	38-46.429	-102.469	-3-03-	<0.20	3800	710	25.	5.6	11.	490.	4.9	980	7.2
500566	38-46.387	-102.419	-3-03-	<0.20	2600	1300	1.6	0.4	0.8	380.	2.9	87	8.1
500568	38-46.362	-102.486	-3-03-	<0.20	2500	1100	1.6	0.5	0.8	360.	2.8	87	8.3
500569	38-46.307	-102.486	-3-03-	<0.20	2900	630	7.2	2.4	3.1	400.	2.9	270	7.9
500571	38-46.344	-102.427	-3-03-	<0.20	2400	1300	1.6	0.5	0.8	340.	2.9	86	7.6
500574	38-46.752	-102.494	-3-03-	<0.20	3000	520	52.	6.5	23.	340.	2.9	2000	6.2
500575	38-46.846	-102.430	-3-03-	25.	3700	69	210.	7.0	180.	110.	4.2	4000	7.0
500576	38-46.490	-102.340	-3-03-	37.	2300	130	200.	3.8	72.	36.	6.8	1600	6.9
500577	38-46.438	-102.339	-3-03-	<0.20	3100	1300	12.	3.3	5.6	300.	4.0	440	7.5
500582	38-46.277	-102.350	-3-03-	<0.20	1400	590	6.1	2.7	2.5	180.	2.9	170	7.9
500583	38-46.357	-102.296	-3-03-	0.25	2500	830	3.0	1.2	1.8	260.	2.6	110	7.0
500584	38-46.266	-102.311	-3-03-	<0.20	2300	640	5.8	1.6	2.3	240.	2.8	170	7.1
500585	38-46.292	-102.358	-3-03-	0.35	2200	1500	1.5	0.4	1.0	370.	3.5	98	8.4
500586	38-46.298	-102.414	-3-03-	0.29	140	110	26.	8.9	27.	52.	2.1	680	8.3
500588	38-46.356	-102.361	-3-03-	5.8	2400	390	90.	7.5	65.	220.	4.7	1100	8.1
500589	38-46.386	-102.364	-3-03-	0.21	1600	170	130.	3.6	53.	44.	6.7	1100	7.7
500590	38-46.492	-102.485	-3-03-	0.22	4000	1100	18.	4.6	9.1	520.	7.6	700	7.8
500591	38-46.488	-102.429	-3-03-	<0.20	4200	680	17.	5.1	8.7	480.	5.8	760	8.3
500592	38-46.428	-102.420	-3-03-	<0.20	2300	720	4.9	3.9	2.6	310.	3.7	190	8.2
500593	38-46.193	-103.475	-3-03-	<0.02	1700	230	5.1	2.1	2.0	200.	8.0	59	8.7
500594	38-46.207	-103.423	-3-03-	54.	1100	200	55.	6.6	29.	33.	5.7	320	8.4
500595	38-46.221	-103.367	-3-03-	27.	1900	210	100.	6.2	61.	43.	4.9	610	8.0
500596	38-46.221	-103.304	-3-03-	<0.02	1300	1000	1.0	0.8	0.2	240.	4.1	38	8.2
500597	38-46.148	-103.306	-3-03-	110.	3100	510	120.	16.	120.	150.	4.8	3100	8.0
500598	38-46.169	-103.368	-3-03-	0.66	2600	1500	1.5	1.0	0.4	260.	3.0	58	8.5
500601	38-46.904	-102.688	-3-03-	3.7	1100	70	87.	3.2	41.	62.	6.4	580	7.5
500604	38-46.949	-102.689	-3-03-	7.6	1600	120	120.	5.9	67.	92.	4.8	2000	7.6
500607	38-46.999	-102.710	-3-03-	98.	11000	420	460.	17.	450.	690.	5.5	13000	8.0
500608	38-46.954	-102.641	-3-03-	6.8	950	64	130.	2.0	40.	11.	9.3	850	7.8
500609	38-46.917	-102.620	-3-03-	0.39	930	330	46.	7.1	25.	110.	5.8	1400	7.6
500612	38-47.000	-102.607	-3-01-	<0.20	3200	740	6.8	3.8	6.5	540.	4.3	380	8.1
500618	38-46.868	-102.692	-3-03-	0.65	2700	330	240.	10.	100.	160.	7.2	5000	7.7
500620	38-46.832	-102.685	-3-03-	<0.20	5800	310	450.	18.	290.	380.	22.	11000	5.8
500628	38-46.817	-102.542	-3-03-	21.	2800	240	200.	160.	120.	79.	7.5	3900	7.4
500631	38-46.860	-102.560	-3-03-	8.7	670	62	82.	3.0	22.	17.	6.8	650	7.8
500634	38-46.914	-102.563	-3-03-	1.5	1800	190	190.	4.2	97.	54.	7.9	2100	7.5
500635	38-46.948	-102.517	-3-03-	0.39	1500	310	19.	4.1	13.	300.	4.4	480	8.2
500637	38-46.862	-102.631	-3-03-	1.1	1500	310	2.7	1.5	1.2	340.	3.4	93	8.9
500639	38-46.820	-102.622	-3-03-	0.65	800	250	31.	10.	18.	130.	5.8	1200	7.9
500640	38-46.757	-102.590	-3-03-	0.80	1800	840	0.9	0.3	0.6	420.	3.6	54	8.9
500641	38-46.760	-102.524	-3-03-	1.9	3300	41	370.	7.0	90.	41.	6.5	2000	8.0
500642	38-46.778	-102.695	-3-03-	9.5	1400	230	52.	3.8	24.	220.	4.1	770	8.7
500643	38-46.833	-102.199	-3-03-	0.89	2900	510	5.7	3.1	3.7	550.	4.3	250	8.4
500647	38-46.756	-102.151	-3-03-	1.3	4100	480	6.3	2.6	6.8	320.	5.8	200	11.

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500648	38-46.754	-102.065	-3-03-	0.47	2200	640	1.7	0.7	1.1	450.	2.5	84	9.0
500649	38-46.813	-102.068	-3-03-	0.62	340	56	36.	3.4	16.	36.	5.9	760	10.
500650	38-46.799	-102.010	-3-03-	1.6	1400	110	58.	10.	34.	170.	6.1	1600	8.2
500652	38-46.778	-102.016	-3-03-	0.88	3200	380	5.5	2.4	2.7	480.	7.2	180	8.9
500656	38-46.777	-102.225	-3-03-	0.72	2000	570	1.8	1.0	1.3	330.	2.6	100	8.5
500658	38-46.856	-102.203	-3-03-	<0.20	1700	390	7.4	3.9	4.0	310.	3.0	320	8.5
500659	38-46.911	-102.206	-3-03-	<0.20	3200	610	81.	9.5	38.	330.	5.1	3100	7.5
500660	38-46.959	-102.224	-3-03-	<0.20	4200	460	3.8	1.7	3.7	530.	2.1	220	9.6
500662	38-46.998	-102.226	-3-03-	13.	4100	350	130.	7.3	72.	420.	4.4	1500	7.5
500663	38-46.999	-102.130	-3-01-	<0.20	1500	340	72.	5.9	36.	190.	6.0	2400	7.3
500664	38-46.997	-102.092	-3-03-	<0.20	2900	380	2.4	1.0	1.7	460.	2.9	140	8.4
500669	38-46.814	-102.126	-3-03-	<0.20	1900	330	1.5	0.9	1.0	350.	3.1	58	8.9
500671	38-46.875	-102.143	-3-03-	<0.20	2900	450	4.7	3.2	3.1	460.	3.0	250	8.7
500675	38-46.877	-102.100	-3-03-	<0.20	3200	450	5.7	3.8	4.0	530.	2.7	300	8.7
500676	38-46.902	-102.067	-3-03-	5.6	2600	420	80.	9.2	50.	340.	3.4	1500	8.2
500677	38-46.893	-102.148	-3-03-	<0.20	3000	370	5.7	3.3	3.5	460.	2.4	300	8.5
500678	38-46.862	-102.011	-3-03-	<0.20	2400	650	1.5	1.1	1.0	400.	2.4	65	8.9
500679	38-46.905	-102.007	-3-03-	<0.20	3900	740	9.3	3.5	5.6	540.	4.8	450	8.2
500680	38-46.958	-102.024	-3-03-	<0.20	1500	390	4.8	3.2	2.1	260.	3.5	150	8.9
500681	38-46.951	-102.074	-3-03-	51.	5700	570	280.	6.9	210.	420.	6.1	5500	7.7
500682	38-46.966	-102.129	-3-03-	<0.20	2600	1800	1.6	0.5	0.3	410.	4.1	63	9.0
500684	38-46.192	-102.493	-3-03-	<0.20	1300	330	67.	5.2	31.	130.	4.1	1300	8.0
500686	38-46.078	-102.476	-3-03-	<0.20	2700	550	77.	7.9	36.	320.	3.8	2600	8.0
500687	38-46.005	-102.482	-3-03-	0.39	2300	870	4.3	1.9	1.6	340.	2.5	160	9.2
500688	38-46.022	-102.436	-3-03-	0.52	1700	1200	1.9	1.0	0.8	290.	3.0	88	9.1
500689	38-46.018	-102.343	-3-03-	13.	1100	58	98.	2.3	67.	23.	5.3	390	8.2
500690	38-46.038	-102.291	-3-03-	0.28	2300	1300	5.3	1.7	2.1	370.	3.0	220	9.1
500691	38-46.190	-102.353	-3-03-	1.4	1300	250	140.	3.2	70.	34.	5.1	1100	7.7
500692	38-46.217	-102.290	-3-03-	0.59	2000	780	6.4	1.9	3.6	310.	3.0	200	8.9
500694	38-46.163	-102.437	-3-03-	1.4	2000	360	29.	6.7	21.	220.	2.8	1100	8.0
500695	38-46.162	-102.384	-3-03-	0.26	1600	1400	1.4	1.3	0.7	210.	1.6	93	9.2
500701	38-46.965	-102.887	-3-03-	1.0	3500	970	2.3	1.1	1.3	450.	3.5	97	8.3
500704	38-46.948	-102.962	-3-03-	<0.20	5900	300	16.	3.3	11.	71.	5.8	190	7.0
500705	38-46.902	-102.908	-3-03-	0.70	3300	210	210.	6.5	110.	150.	4.1	2900	6.9
500707	38-46.915	-102.943	-3-03-	0.36	1800	840	0.9	0.2	0.5	270.	3.6	42	8.5
500710	38-46.862	-102.975	-3-03-	1.0	4000	480	12.	3.5	8.7	470.	5.9	520	7.8
500713	38-46.848	-102.909	-3-03-	37.	2600	200	110.	4.6	50.	230.	13.	1400	7.0
500717	38-46.906	-102.755	-3-03-	48.	4900	66	98.	11.	150.	130.	4.0	750	7.6
500718	38-46.768	-102.966	-3-03-	38.	1500	190	10.	6.6	1.2	210.	20.	190	7.6
500720	38-46.770	-102.885	-3-03-	2.0	1600	83	90.	7.8	19.	130.	22.	1400	6.7
500722	38-46.817	-102.829	-3-81-	<0.20	3700	440	1.0	2.3	0.4	430.	8.5	23	7.2
500723	38-46.773	-102.811	-3-03-	<0.20	1500	230	5.3	2.7	1.6	210.	2.9	140	7.9
500725	38-46.774	-102.761	-3-03-	6.8	1200	410	140.	4.2	24.	35.	9.2	480	7.5
500726	38-46.823	-102.757	-3-03-	0.35	1700	480	6.5	1.6	2.8	230.	3.9	190	8.4
500727	38-46.863	-102.823	-3-03-	0.31	2600	380	2.5	1.0	1.3	310.	4.8	66	8.6
500728	38-46.863	-102.761	-3-03-	0.39	3800	550	65.	3.1	40.	380.	5.1	640	7.6
500731	38-46.541	-102.040	-3-03-	4.1	1400	210	140.	4.0	64.	47.	6.0	2500	6.4
500734	38-46.537	-102.069	-3-03-	3.4	820	54	100.	1.7	36.	14.	6.7	950	6.7
500736	38-46.536	-102.155	-3-03-	0.33	3300	850	330.	5.2	140.	140.	9.3	7300	6.6
500737	38-46.533	-102.208	-3-03-	19.	2700	190	140.	4.1	130.	150.	6.2	3300	6.9
500738	38-46.590	-102.238	-3-03-	3.5	4500	950	280.	4.4	170.	380.	7.0	4500	6.7
500740	38-46.626	-102.213	-3-03-	0.44	2700	630	3.3	1.1	1.7	460.	2.6	120	8.2
500742	38-46.574	-102.141	-3-03-	10.	1600	76	120.	5.8	84.	34.	5.1	2300	6.4
500743	38-46.604	-102.088	-3-03-	<0.20	2200	1500	84.	5.0	47.	310.	4.1	2800	6.9
500745	38-46.587	-102.024	-3-03-	0.64	2000	930	1.9	0.2	0.9	380.	2.6	65	8.4

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500747	38-46.625	-102.169	-3-03-	0.21	2000	350	4.1	0.9	2.1	440.	2.8	130	7.9
500750	38-46.687	-102.212	-3-03-	0.43	2800	920	2.0	0.6	1.3	400.	2.5	95	8.3
500752	38-46.680	-102.133	-3-03-	<0.20	2100	1000	1.4	1.4	0.8	380.	3.5	67	8.4
500754	38-46.719	-102.158	-3-03-	0.33	2200	1000	1.3	1.1	0.9	390.	3.0	65	8.4
500755	38-46.721	-102.072	-3-03-	7.6	4000	370	34.	5.8	36.	490.	5.9	910	7.7
500757	38-46.684	-102.086	-3-03-	<0.20	2000	910	6.1	1.4	4.3	350.	3.7	190	7.8
500761	38-46.682	-102.027	-3-03-	0.39	1900	260	68.	3.9	37.	220.	4.0	1400	6.8
500762	38-46.707	-102.015	-3-03-	4.6	930	170	110.	1.5	25.	28.	4.5	320	7.1
500764	38-46.363	-102.023	-3-03-	48.	1800	390	150.	3.2	51.	91.	5.1	1000	5.6
500766	38-46.356	-102.078	-3-03-	0.49	2500	680	3.4	1.4	1.5	360.	2.9	120	7.7
500768	38-46.300	-102.068	-3-03-	0.39	3000	630	8.0	2.6	2.9	390.	3.0	260	8.2
500770	38-46.299	-102.039	-3-03-	0.29	2900	630	8.0	2.5	2.6	320.	2.9	250	8.2
500772	38-46.318	-102.149	-3-03-	0.53	2100	550	3.3	1.4	1.2	250.	2.6	93	8.4
500780	38-46.390	-102.007	-3-03-	0.20	4200	1700	540.	6.0	190.	72.	12.	11000	5.4
500786	38-46.445	-102.063	-3-03-	0.66	2000	740	1.5	1.3	0.9	190.	2.3	36	7.7
500788	38-46.407	-102.090	-3-03-	0.41	2700	800	14.	2.4	5.7	260.	2.7	410	8.0
500789	38-46.444	-102.155	-3-03-	0.85	2400	850	3.3	1.1	1.7	230.	2.0	73	8.3
500791	38-46.497	-102.146	-3-03-	0.73	2400	910	2.0	1.4	0.9	250.	2.3	110	8.5
500792	38-46.487	-102.229	-3-03-	0.35	2600	820	2.9	1.8	1.5	270.	2.0	140	8.5
500796	38-46.444	-102.238	-3-03-	0.62	58	79	27.	4.3	11.	51.	4.3	520	7.4
500798	38-46.399	-102.208	-3-03-	1.2	95	900	1.3	1.4	0.4	140.	2.2	44	8.9
500799	38-46.439	-102.010	-3-03-	0.37	1800	770	2.5	1.6	1.0	210.	2.0	110	8.3
500801	38-46.906	-102.813	-3-03-	0.50	1900	310	95.	6.8	81.	130.	6.6	1300	5.9
500803	38-46.957	-102.808	-3-03-	<0.20	1900	730	1.1	0.7	0.7	360.	3.0	49	8.0
500806	38-46.947	-102.756	-3-03-	4.6	3400	690	84.	11.	72.	420.	4.9	2700	6.8
500810	38-46.999	-102.829	-3-03-	<0.20	3300	350	41.	11.	40.	450.	4.7	1800	6.6
500813	38-46.999	-102.885	-3-03-	0.63	810	62	48.	2.7	33.	47.	6.1	630	6.9
500815	38-46.620	-103.199	-3-03-	0.32	3700	1300	6.0	1.3	2.7	540.	3.8	140	6.5
500817	38-46.639	-103.187	-3-03-	0.50	2900	450	120.	5.6	66.	310.	4.5	1800	7.2
500819	38-46.717	-103.183	-3-03-	<0.20	1900	580	1.1	0.4	0.7	330.	2.8	35	8.2
500823	38-46.661	-103.151	-3-03-	8.8	3500	300	75.	2.7	42.	480.	2.5	380	8.3
500827	38-46.703	-103.230	-3-03-	2.0	3000	680	15.	2.2	9.0	460.	5.2	190	7.8
500831	38-46.671	-103.248	-3-03-	63.	5500	130	200.	9.1	110.	610.	5.3	1400	6.8
500833	38-46.573	-103.148	-3-03-	8.5	2200	380	34.	3.5	54.	230.	5.2	320	7.1
500835	38-46.584	-103.228	-3-03-	6.6	2900	300	76.	3.3	36.	300.	7.4	390	7.2
500836	38-46.542	-103.218	-3-03-	6.4	1000	100	130.	2.9	38.	29.	6.6	530	7.4
500842	38-46.556	-103.159	-3-03-	3.3	1800	390	66.	5.0	31.	210.	6.6	750	6.6
500847	38-46.505	-103.073	-3-03-	0.47	3200	440	140.	17.	46.	210.	4.5	2900	6.8
500850	38-46.554	-103.041	-3-03-	<0.20	2400	1400	0.8	0.2	0.4	390.	3.5	52	7.1
500852	38-46.586	-103.051	-3-03-	1.1	1900	350	5.5	1.4	3.1	240.	2.6	130	7.9
500854	38-46.561	-103.126	-3-03-	<0.20	1200	270	29.	3.2	16.	100.	5.8	280	8.0
500855	38-46.611	-103.029	-3-03-	<0.20	3100	1200	170.	12.	92.	210.	17.	4400	6.9
500859	38-46.663	-103.062	-3-03-	130.	9300	400	340.	23.	560.	820.	4.2	8000	6.7
500860	38-46.651	-103.086	-3-03-	3.7	4100	620	23.	4.3	26.	570.	2.7	640	7.6
500861	38-46.659	-103.022	-3-03-	0.66	2000	390	5.3	2.4	2.3	310.	2.6	170	8.3
500862	38-46.709	-103.019	-3-03-	<0.20	3700	320	48.	9.7	21.	540.	3.7	1600	7.9
500866	38-46.718	-103.094	-3-03-	0.22	2000	550	1.7	0.6	0.9	320.	6.5	46	8.5
500869	38-46.428	-102.716	-3-03-	1.5	1900	590	4.2	1.5	2.6	210.	2.0	170	7.0
500871	38-46.486	-102.659	-3-03-	2.2	2200	1000	41.	4.8	28.	190.	2.0	1300	7.5
500872	38-46.486	-102.694	-3-03-	1.7	1600	850	6.7	1.0	2.0	190.	2.2	260	8.3
500877	38-46.368	-102.702	-3-03-	0.43	2200	270	110.	6.4	43.	93.	3.7	2400	6.2
500880	38-46.326	-102.689	-3-03-	1.3	1700	860	3.6	1.5	1.2	190.	2.3	130	7.5
500883	38-46.252	-102.686	-3-03-	<0.02	2000	540	40.	4.5	18.	160.	2.8	1000	7.2
500886	38-46.486	-102.565	-3-03-	8.5	2000	210	74.	6.0	50.	52.	6.1	1200	6.2
500887	38-46.456	-102.605	-3-03-	9.6	1200	89	53.	3.8	23.	28.	5.1	450	6.7

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
500889	38-46.412	-102.571	-3-03-	0.43	1800	640	2.4	1.6	1.4	190.	1.8	110	8.3
500890	38-46.389	-102.591	-3-03-	31.	3200	480	130.	6.8	84.	190.	4.2	2100	7.5
500892	38-46.347	-102.591	-3-03-	0.41	2300	610	3.2	1.8	1.3	320.	2.3	140	8.2
500893	38-46.335	-102.541	-3-03-	11.	2400	100	150.	3.6	41.	130.	4.4	1100	7.7
500895	38-46.311	-102.570	-3-03-	0.53	3000	840	18.	5.1	7.3	370.	2.9	780	7.5
500896	38-46.325	-102.602	-3-03-	0.67	2500	710	4.8	2.6	2.1	350.	2.2	230	8.0
500897	38-46.266	-102.558	-3-03-	0.75	7500	880	110.	12.	50.	700.	2.8	4900	6.4
500899	38-46.256	-102.664	-3-03-	8.1	4100	580	84.	9.1	56.	410.	2.6	2300	6.9
500901	38-46.445	-102.551	-3-03-	0.40	1000	160	6.0	1.9	2.6	150.	3.5	160	8.0
500902	38-46.218	-103.657	-3-03-	0.62	1900	500	1.6	0.8	1.4	300.	4.6	48	7.4
500903	38-46.212	-103.704	-3-03-	15.	2800	610	210.	15.	130.	84.	6.2	2600	7.3
500909	38-46.147	-103.682	-3-03-	4.6	990	36	51.	3.9	25.	9.5	7.8	250	6.8
500910	38-46.147	-103.682	-3-03-	0.67	1700	490	0.9	0.5	0.1	270.	4.7	27	8.4
500912	38-46.114	-103.669	-3-03-	53.	2000	220	160.	5.0	110.	39.	8.0	1300	6.6
500914	38-46.022	-103.663	-3-03-	2.4	13000	430	52.	2.9	26.	140.	5.4	390	7.0
500915	38-46.009	-103.631	-3-03-	22.	3300	270	170.	2.0	78.	170.	4.2	1200	7.1
500916	38-46.072	-103.639	-3-03-	11.	1200	100	85.	3.2	63.	35.	4.7	670	7.6
500917	38-46.070	-103.565	-3-03-	1.7	2500	1400	2.0	1.2	0.5	370.	2.9	56	9.2
500921	38-46.120	-103.537	-3-03-	1.1	3900	800	5.4	2.1	1.3	480.	3.3	120	9.0
500926	38-46.106	-103.616	-3-03-	100.	2900	56	200.	29.	100.	74.	8.7	2400	11.
500927	38-46.174	-103.560	-3-03-	19.	1400	380	110.	11.	56.	57.	4.0	870	7.7
500930	38-46.178	-103.612	-3-03-	110.	750	27	67.	2.1	32.	8.7	6.2	120	7.8
500931	38-46.074	-103.697	-3-03-	0.49	2300	430	1.0	0.7	0.1	340.	3.7	38	9.4
500932	38-46.203	-103.551	-3-03-	0.77	3400	710	100.	5.0	64.	330.	6.0	1000	7.2
500933	38-46.359	-103.692	-3-03-	0.20	2100	380	15.	5.3	8.2	360.	2.2	330	7.0
500935	38-46.352	-103.612	-3-03-	<0.20	1800	370	1.2	1.6	0.7	300.	3.8	28	8.1
500936	38-46.264	-103.691	-3-03-	0.21	4000	950	11.	5.6	4.8	570.	3.3	270	7.0
500937	38-46.323	-103.696	-3-03-	<0.20	2800	500	6.7	3.7	2.7	450.	4.5	130	7.8
500938	38-46.396	-103.717	-3-03-	<0.20	3300	310	6.1	1.9	3.2	480.	3.1	170	8.3
500941	38-46.437	-103.718	-3-03-	0.26	1700	860	1.0	0.4	0.4	310.	3.8	33	8.7
500942	38-46.486	-103.655	-3-03-	<0.20	2000	650	1.8	0.9	1.1	320.	3.7	57	8.7
500944	38-46.485	-103.623	-3-03-	0.26	2300	530	1.6	1.9	1.3	460.	3.5	67	8.6
500946	38-46.489	-103.532	-3-03-	0.57	1700	880	1.2	0.3	0.6	300.	2.9	38	8.7
500948	38-46.461	-103.652	-3-03-	<0.20	2300	1500	160.	4.5	120.	35.	5.2	1500	8.3
500949	38-46.402	-103.593	-3-03-	6.9	2100	120	110.	6.0	51.	100.	3.6	600	7.5
500950	38-46.424	-103.555	-3-03-	0.27	2200	320	19.	4.8	11.	230.	4.3	430	7.7
500952	38-46.323	-103.609	-3-03-	0.57	2800	410	3.6	1.5	1.5	460.	3.1	76	7.8
500955	38-46.308	-103.580	-3-03-	13.	2900	300	120.	5.3	110.	230.	4.1	740	7.1
500958	38-46.359	-103.572	-3-03-	0.75	2600	460	37.	5.1	23.	330.	3.8	690	7.1
500961	38-46.409	-103.578	-3-03-	<0.02	3200	460	47.	8.2	16.	390.	5.4	830	7.0
500963	38-46.265	-103.621	-3-03-	0.80	2400	300	96.	17.	54.	180.	3.5	1100	7.0
500965	38-46.230	-103.557	-3-03-	0.87	3100	900	150.	27.	100.	130.	2.9	3100	7.0
500966	38-46.364	-103.164	-3-03-	0.26	1800	530	2.3	1.3	0.9	330.	2.0	64	8.9
500967	38-46.411	-103.215	-3-03-	22.	1400	960	80.	3.4	59.	110.	14.	540	7.8
500968	38-46.964	-103.598	-3-03-	<0.02	2000	1100	2.1	1.0	0.8	340.	4.5	67	7.7
500971	38-46.953	-103.675	-3-03-	<0.02	2000	980	1.1	1.0	0.2	330.	4.5	61	8.0
500974	38-46.962	-103.645	-3-03-	<0.02	1900	1300	1.3	1.0	0.1	350.	4.6	57	8.3
500985	38-46.810	-103.605	-3-03-	<0.02	1900	900	1.0	0.8	0.3	330.	2.3	63	7.7
500986	38-46.776	-103.605	-3-03-	<0.02	2000	880	1.4	1.1	0.7	360.	2.7	87	8.2
500988	38-46.845	-103.702	-3-03-	0.31	4500	14	0.6	1.6	0.8	0.5	0.1	100	7.3
500993	38-46.928	-103.650	-3-03-	0.31	2200	630	2.6	1.2	1.2	370.	1.8	90	8.3
500995	38-46.849	-103.581	-3-03-	<0.02	1900	900	1.2	1.0	0.2	330.	4.4	61	7.5
500999	38-46.815	-103.570	-3-03-	0.45	2000	750	1.4	1.0	0.7	330.	2.5	85	8.0
501009	38-46.193	-103.938	-3-03-	0.38	1200	37	29.	5.4	14.	150.	5.5	330	6.5
501011	38-46.203	-103.907	-3-03-	6.1	2000	91	45.	4.4	16.	240.	5.7	760	7.1

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
501015	38-46.148	-103.951	-3-03-	8.4	1500	33	64.	3.0	46.	110.	7.2	910	7.4
501016	38-46.176	-103.902	-3-03-	<0.02	1800	140	53.	7.5	21.	230.	5.8	860	7.0
501017	38-46.124	-103.903	-3-01-	5.3	1600	48	53.	8.9	23.	180.	6.2	850	7.1
501024	38-46.084	-103.873	-3-03-	100.	7200	50	210.	1.7	61.	670.	6.3	1400	7.2
501026	38-46.142	-103.760	-3-03-	10.0	2300	430	66.	8.4	36.	250.	4.8	480	7.0
501028	38-46.192	-103.756	-3-03-	0.49	3800	830	3.0	1.9	1.2	480.	2.4	100	8.9
501029	38-46.164	-103.854	-3-03-	0.46	2100	98	1.5	1.0	0.2	340.	3.2	48	9.3
501032	38-46.107	-103.757	-3-03-	0.77	2600	330	2.4	2.8	0.8	400.	3.0	56	8.4
501034	38-46.061	-103.762	-3-03-	0.34	2200	520	1.5	1.1	0.4	310.	4.6	31	8.2
501035	38-46.017	-103.793	-3-03-	0.46	2000	120	1.1	0.4	0.1	320.	4.2	26	9.4
501036	38-46.025	-103.844	-3-03-	2.6	3000	75	11.	1.2	4.3	400.	3.8	93	9.0
501042	38-46.294	-103.956	-3-03-	0.42	2100	210	2.0	1.1	0.5	360.	3.1	57	8.0
501047	38-46.302	-103.906	-3-03-	6.0	2300	130	24.	3.1	11.	360.	4.6	240	7.1
501049	38-46.261	-103.914	-3-03-	0.36	2500	280	3.0	1.4	0.7	420.	2.9	95	8.4
501057	38-46.312	-103.759	-3-03-	0.21	1600	510	0.9	0.8	0.3	290.	3.7	35	9.0
501060	38-46.392	-103.917	-3-03-	0.33	2600	310	3.5	1.4	0.9	410.	3.3	110	8.9
501061	38-46.395	-103.833	-3-03-	<0.02	1600	460	1.2	0.9	0.3	280.	3.5	39	8.9
501063	38-46.453	-103.885	-3-03-	<0.02	1800	340	1.5	0.9	0.5	300.	3.2	45	9.0
501065	38-46.479	-103.879	-3-03-	0.26	1600	380	1.3	0.9	0.4	300.	3.4	45	9.1
501066	38-46.694	-103.316	-3-03-	26.	1800	210	63.	4.8	27.	180.	11.	870	6.6
501067	38-46.667	-103.329	-3-03-	21.	3500	930	130.	3.6	72.	340.	4.4	920	6.9
501068	38-46.669	-103.293	-3-03-	1.2	1400	730	8.6	4.6	5.1	220.	6.7	120	7.2
501072	38-46.647	-103.271	-3-01-	1.1	1100	400	3.9	5.0	1.4	190.	8.7	64	7.1
501073	38-46.596	-103.260	-3-03-	33.	2500	130	170.	5.0	78.	140.	6.5	650	6.7
501074	38-46.568	-103.268	-3-03-	11.	2500	200	68.	3.9	27.	280.	6.6	350	6.9
501075	38-46.540	-103.286	-3-03-	0.23	2000	890	0.9	0.7	0.3	310.	2.7	18	8.6
501076	38-46.550	-103.401	-3-03-	0.42	1700	790	1.6	0.8	0.5	290.	3.2	37	8.5
501080	38-46.500	-103.384	-3-03-	63.	2900	150	150.	7.2	70.	180.	4.2	1100	6.4
501081	38-46.527	-103.384	-3-03-	0.76	2800	560	34.	5.4	17.	360.	3.8	600	6.9
501083	38-46.631	-103.461	-3-03-	0.26	2000	1000	0.9	0.9	0.4	320.	2.4	53	8.2
501084	38-46.700	-103.353	-3-03-	30.	2900	870	96.	2.2	100.	220.	5.2	590	7.3
501085	38-46.722	-103.405	-3-01-	28.	1600	400	36.	1.9	24.	120.	9.1	210	7.1
501086	38-46.656	-103.472	-3-03-	<0.20	1800	780	1.0	0.9	0.2	300.	4.1	52	7.4
501087	38-46.628	-103.390	-3-03-	1.0	1900	370	120.	4.1	75.	46.	3.2	890	7.1
501088	38-46.608	-103.310	-3-03-	<0.20	5700	1100	13.	2.3	5.7	610.	2.6	330	7.3
501089	38-46.500	-103.279	-3-03-	20.	1600	220	33.	2.7	16.	160.	6.2	200	7.4
501101	38-46.396	-102.153	-3-03-	0.82	160	770	6.4	2.9	3.4	250.	2.2	220	7.8
501104	38-46.266	-102.184	-3-03-	0.36	84	130	110.	3.1	33.	9.5	3.7	490	7.1
501106	38-46.364	-102.157	-3-03-	<0.20	3200	830	15.	3.9	6.5	410.	2.3	670	7.6
501107	38-46.255	-103.289	-3-03-	0.25	2900	1300	28.	3.4	9.3	370.	3.8	430	7.3
501110	38-46.295	-103.289	-3-03-	5.8	860	170	23.	1.6	72.	28.	3.4	280	6.7
501111	38-46.286	-103.344	-3-03-	<0.20	2800	560	1.9	1.0	0.5	380.	3.6	61	8.6
501112	38-46.339	-103.342	-3-03-	0.42	3500	540	17.	5.3	6.8	420.	7.6	340	7.4
501113	38-46.347	-103.260	-3-03-	13.	3900	310	52.	7.9	51.	310.	6.0	760	7.3
501114	38-46.391	-103.281	-3-03-	150.	2100	370	20.	2.6	13.	230.	4.9	69	7.4
501117	38-46.453	-103.280	-3-03-	51.	1400	120	70.	2.0	39.	83.	7.7	600	7.1
501119	38-46.484	-103.279	-3-03-	79.	710	60	45.	2.5	24.	42.	7.5	190	7.5
501120	38-46.480	-103.334	-3-03-	<0.20	2400	1400	0.9	0.9	0.3	260.	3.4	58	8.4
501121	38-46.498	-103.456	-3-03-	170.	5000	1200	200.	10.	110.	400.	6.6	1900	7.5
501123	38-46.452	-103.382	-3-03-	85.	1700	140	100.	4.9	46.	110.	4.9	440	7.3
501124	38-46.275	-103.370	-3-03-	24.	4100	840	220.	8.4	150.	230.	10.	2400	6.2
501125	38-46.309	-103.438	-3-03-	<0.20	2400	620	2.4	0.9	0.5	340.	2.9	42	7.8
501127	38-46.264	-103.433	-3-03-	0.46	1300	280	7.4	2.6	1.5	220.	3.0	65	8.4
501128	38-46.264	-103.485	-3-03-	0.38	2900	620	2.9	1.3	0.8	350.	3.1	62	8.6
501131	38-46.301	-103.468	-3-03-	0.38	3000	560	2.7	1.2	1.1	370.	2.3	65	8.5

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

DR SAMPLE NUMBER	D. O. E. ST LAT	SAMPLE LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
501133	38-46.340	-103.470	-3-03-	0.36	2200	820	0.8	0.6	0.1	290.	3.7	43	8.6
501134	38-46.360	-103.415	-3-03-	0.38	2000	730	33.	3.2	17.	240.	3.3	740	7.7
501139	38-46.483	-103.487	-3-03-	0.60	3500	580	4.7	1.5	1.9	440.	2.5	150	8.2
501140	38-46.448	-103.489	-3-03-	0.75	3700	520	9.9	2.4	4.7	420.	2.9	300	8.1
501142	38-46.437	-103.219	-3-03-	1.0	2000	470	1.7	0.6	0.3	270.	2.4	33	7.3
501143	38-46.396	-103.146	-3-03-	1.0	2300	610	2.4	1.1	0.7	210.	2.3	70	8.7
501149	38-46.313	-103.026	-3-03-	0.33	2200	1600	1.2	0.9	0.3	320.	4.6	67	8.4
501153	38-46.441	-103.030	-3-03-	0.51	2500	570	4.3	1.7	2.0	330.	2.7	150	8.3
501154	38-46.491	-103.039	-3-03-	20.	840	36	76.	5.4	24.	21.	10.	1200	7.2
501155	38-46.485	-103.067	-3-03-	38.	1800	330	100.	6.9	50.	110.	4.7	1600	6.9
501156	38-46.442	-103.088	-3-03-	1.2	4000	660	340.	11.	190.	110.	5.7	6200	6.9
501157	38-46.358	-103.090	-3-03-	0.33	2300	1500	1.2	0.9	0.2	310.	4.7	63	8.5
501158	38-46.293	-103.150	-3-03-	0.38	2100	1300	1.1	0.9	0.3	300.	4.4	55	8.1
501159	38-46.310	-103.103	-3-03-	6.9	2700	270	5.3	2.1	1.6	360.	2.7	180	8.5
501161	38-46.353	-103.037	-3-03-	3.7	2700	290	5.0	1.8	1.4	350.	2.6	150	8.5
501162	38-46.388	-103.093	-3-03-	1.4	1700	510	3.0	1.2	0.5	240.	2.9	91	8.6
501163	38-46.397	-103.052	-3-03-	0.32	3900	640	250.	15.	130.	240.	7.1	6400	6.9
501166	38-46.308	-103.248	-3-03-	15.	1900	760	110.	3.1	89.	96.	4.7	730	7.1
501170	38-46.252	-103.224	-3-03-	0.57	3600	430	18.	3.0	6.1	410.	2.7	450	8.1
501172	38-46.255	-103.162	-3-03-	57.	11000	230	420.	72.	320.	500.	3.3	11000	7.1
501174	38-46.251	-103.079	-3-03-	0.49	2100	1300	0.9	0.8	0.3	290.	3.1	54	8.7
501176	38-46.296	-102.911	-3-03-	0.42	4100	440	58.	7.0	23.	410.	2.5	2200	6.5
501178	38-46.368	-102.880	-3-03-	8.0	840	100	55.	3.2	21.	63.	4.7	570	7.1
501179	38-46.335	-102.948	-3-03-	<0.20	2600	1400	0.8	2.0	0.8	450.	2.7	82	7.7
501180	38-46.286	-102.951	-3-03-	0.47	2100	530	7.7	4.0	4.1	380.	2.4	290	8.0
501181	38-46.254	-102.932	-3-03-	5.6	1000	120	81.	2.6	37.	56.	4.4	190	7.2
501183	38-46.268	-102.893	-3-03-	<0.20	3000	710	100.	9.0	49.	360.	3.3	2500	7.0
501186	38-46.430	-102.779	-3-03-	1.1	2300	500	2.8	1.8	1.3	430.	2.9	140	9.0
501188	38-46.447	-102.822	-3-03-	16.	8900	640	160.	15.	230.	960.	2.5	5900	7.8
501191	38-46.483	-102.840	-3-03-	<0.20	6400	490	92.	11.	53.	800.	3.2	4700	7.5
501192	38-46.492	-102.978	-3-03-	0.48	2200	450	3.2	2.9	1.9	410.	4.5	170	8.8
501193	38-46.439	-102.980	-3-03-	0.28	1600	410	2.3	2.0	1.3	330.	3.0	74	8.8
501194	38-46.435	-102.907	-3-03-	0.37	2100	510	4.5	2.4	1.9	400.	2.8	170	8.7
501198	38-46.387	-102.950	-3-03-	0.37	620	280	3.8	2.3	1.6	130.	3.5	120	8.5
501199	38-46.391	-102.882	-3-03-	0.28	2200	430	15.	3.9	6.6	290.	3.2	520	8.0
501201	38-46.095	-102.435	-3-03-	1.3	2000	460	170.	11.	74.	130.	5.6	3100	7.7
501202	38-46.117	-102.355	-3-03-	0.27	1700	1600	1.8	1.4	0.7	260.	3.0	110	9.0
501204	38-46.227	-102.456	-3-03-	9.7	1300	39	150.	1.8	68.	8.5	6.0	590	7.8
501205	38-46.177	-102.472	-3-03-	0.36	1500	1400	1.7	1.3	0.8	230.	2.8	100	9.6
501206	38-46.159	-102.300	-3-03-	0.73	810	140	41.	13.	26.	27.	0.6	290	9.2
501207	38-46.105	-102.319	-3-03-	0.22	1800	1400	2.4	1.4	0.8	230.	2.9	140	8.8
501209	38-46.056	-102.291	-3-03-	0.22	3000	1100	7.6	2.5	2.7	300.	2.7	410	8.5
501212	38-46.067	-102.333	-3-03-	1.4	1800	180	170.	9.2	77.	55.	6.9	3700	7.1
501214	38-46.069	-102.434	-3-03-	16.	1200	150	96.	6.3	82.	30.	3.3	1300	7.9
501215	38-46.112	-102.470	-3-03-	1.8	2800	620	190.	8.2	94.	150.	5.0	4300	7.4
501220	38-46.207	-102.913	-3-03-	510.	210	190	130.	8.2	110.	99.	3.8	1700	7.9
501222	38-46.134	-102.952	-3-03-	1.1	1100	65	150.	5.1	37.	12.	5.3	600	7.1
501223	38-46.063	-102.766	-3-03-	<0.20	1100	370	74.	6.3	29.	80.	4.7	1200	7.6
501225	38-46.105	-102.787	-3-03-	10.	770	49	69.	1.2	55.	5.2	3.7	400	7.9
501226	38-46.114	-102.830	-3-03-	16.	940	370	65.	5.6	29.	59.	5.0	1100	7.9
501230	38-46.149	-102.858	-3-03-	0.24	1100	370	3.2	2.2	1.2	150.	2.7	96	8.9
501231	38-46.160	-102.762	-3-03-	5.2	560	160	57.	5.2	25.	21.	5.5	980	8.0
501232	38-46.221	-102.760	-3-03-	<0.20	2100	1400	3.5	1.6	1.6	250.	3.1	130	8.9
501235	38-46.221	-102.830	-3-03-	42.	810	61	82.	4.6	39.	31.	5.0	690	7.9
501236	38-46.013	-102.752	-3-03-	4.8	3500	800	180.	21.	110.	250.	4.9	6200	7.0

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
501237	38-46.027	-102.812	-3-01-	0.34	700	220	62.	6.8	39.	23.	4.4	770	7.6
501240	38-46.032	-102.875	-3-03-	<0.20	3000	1400	3.9	2.8	4.1	410.	2.3	230	9.0
501242	38-46.035	-102.973	-3-03-	<0.20	1700	1200	1.2	0.9	0.3	290.	3.6	48	9.3
501245	38-46.170	-102.993	-3-03-	2.5	1500	290	62.	16.	52.	140.	5.4	2000	7.9
501246	38-46.160	-102.890	-3-03-	0.65	2000	420	12.	4.2	6.2	310.	2.5	400	8.9
501247	38-46.106	-102.881	-3-03-	<0.20	980	770	29.	8.5	14.	140.	3.2	810	8.4
501248	38-46.081	-102.834	-3-03-	7.7	470	45	53.	2.1	27.	5.7	5.1	390	8.3
501249	38-46.058	-102.905	-3-03-	0.37	1600	1500	1.4	1.7	0.7	300.	2.4	79	9.2
501251	38-46.092	-102.976	-3-03-	0.25	1600	1600	1.2	1.2	0.5	270.	2.8	59	9.4
501252	38-46.110	-102.953	-3-03-	0.98	1400	780	59.	12.	31.	150.	3.0	1600	8.2
501253	38-46.938	-103.967	-3-03-	<0.20	2100	560	9.4	2.6	5.7	300.	2.2	290	8.7
501255	38-46.995	-103.989	-3-03-	0.49	2800	470	190.	9.1	110.	180.	3.4	3600	7.2
501257	38-46.993	-103.900	-3-03-	54.	4400	280	240.	7.5	240.	240.	5.3	3500	8.9
501258	38-46.965	-103.840	-3-03-	0.64	4500	1000	150.	9.5	110.	400.	3.5	3200	7.5
501259	38-46.995	-103.782	-3-03-	0.30	3400	520	5.3	1.8	2.7	470.	2.5	150	8.9
501260	38-46.921	-103.751	-3-03-	<0.02	5300	640	14.	2.4	6.9	610.	2.5	440	8.7
501261	38-46.903	-103.985	-3-03-	0.32	2300	550	7.5	2.5	5.6	370.	2.7	250	8.5
501262	38-46.860	-103.980	-3-03-	27.	4400	350	120.	15.	290.	250.	3.5	3800	7.6
501263	38-46.820	-103.983	-3-03-	<0.02	2300	880	28.	6.3	26.	340.	3.2	1100	8.3
501264	38-46.756	-103.986	-3-03-	<0.02	2500	590	2.9	1.9	1.9	410.	3.5	130	8.0
501265	38-46.759	-103.922	-3-03-	<0.02	2400	300	84.	8.2	61.	250.	2.4	1800	7.9
501268	38-46.772	-103.838	-3-03-	27.	2700	140	130.	7.5	160.	180.	4.5	720	7.9
501269	38-46.769	-103.773	-3-03-	0.39	3100	480	11.	3.7	5.8	450.	2.6	380	8.6
501271	38-46.816	-103.773	-3-03-	9.3	7000	2200	270.	6.8	200.	530.	4.9	3000	7.5
501272	38-46.946	-103.786	-3-03-	<0.02	1900	890	1.4	1.5	0.3	340.	5.3	65	9.0
501276	38-46.913	-103.840	-3-03-	<0.02	1900	390	2.0	1.4	1.3	340.	2.8	84	8.5
501277	38-46.878	-103.803	-3-03-	<0.02	7500	1100	50.	4.3	23.	760.	3.5	1200	8.0
501279	38-46.833	-103.786	-3-03-	<0.02	3400	670	7.4	2.0	3.8	480.	2.6	230	8.6
501280	38-46.830	-103.813	-3-03-	<0.02	1800	750	1.3	1.3	0.8	330.	3.4	62	9.2
501283	38-46.789	-103.911	-3-03-	2.4	3600	550	150.	6.9	110.	310.	3.2	2500	7.5
501284	38-46.854	-103.901	-3-03-	<0.02	2600	1100	69.	11.	43.	310.	3.9	1800	7.2
501285	38-46.906	-103.934	-3-03-	<0.02	3100	800	71.	8.4	49.	370.	3.0	2100	7.7
501286	38-46.947	-103.890	-3-03-	<0.02	2000	950	1.6	1.2	0.3	340.	5.2	70	9.1
501287	38-46.861	-103.242	-3-03-	74.	6100	240	230.	12.	220.	430.	6.1	4600	5.9
501290	38-46.776	-103.126	-3-03-	29.	3000	77	96.	6.6	60.	280.	6.8	1200	6.3
501291	38-46.780	-103.191	-3-03-	0.33	1900	790	1.2	0.9	0.5	310.	3.1	66	8.0
501303	38-46.177	-103.431	-3-03-	86.	3200	320	87.	31.	180.	110.	4.4	1400	6.3
501305	38-46.176	-103.484	-3-03-	4.0	3000	470	7.7	5.0	5.5	410.	3.4	160	6.6
501308	38-46.075	-103.498	-3-03-	<0.02	1900	900	1.4	1.1	0.4	330.	4.4	40	7.7
501310	38-46.009	-103.402	-3-03-	0.56	1800	900	1.5	0.8	0.4	280.	4.0	40	7.8
501316	38-46.119	-103.411	-3-03-	0.36	1900	1100	1.1	0.9	0.3	290.	3.8	40	6.4
501317	38-46.075	-103.389	-3-03-	1.2	2200	1600	2.0	1.3	0.4	320.	3.3	52	7.9
501322	38-46.019	-103.303	-3-03-	0.30	1900	1200	1.0	0.8	0.2	290.	4.0	38	7.7
501323	38-46.004	-103.366	-3-03-	0.19	1900	1000	1.1	0.7	0.2	280.	3.9	30	8.4
501325	38-46.110	-103.368	-3-03-	19.	1800	370	45.	9.8	53.	150.	4.3	740	7.8
501326	38-46.065	-103.401	-3-03-	0.40	1900	1000	1.4	1.0	0.3	280.	3.9	39	6.5
501327	38-46.174	-103.235	-3-03-	38.	1100	120	66.	4.8	33.	36.	4.6	580	7.6
501329	38-46.102	-103.222	-3-03-	1.2	800	540	9.0	5.5	4.9	110.	4.5	280	7.2
501330	38-46.008	-103.225	-3-03-	0.95	3100	1600	2.5	2.0	1.0	410.	2.7	150	7.8
501331	38-46.018	-103.181	-3-03-	<0.02	1700	140	68.	19.	61.	94.	5.1	2500	7.7
501333	38-46.065	-103.184	-3-03-	0.31	2600	950	26.	7.6	12.	340.	4.2	860	7.3
501338	38-46.112	-103.161	-3-03-	0.64	2200	1400	20.	6.7	15.	280.	3.7	600	7.4
501340	38-46.074	-103.090	-3-03-	52.	1900	170	81.	6.2	91.	58.	2.9	990	7.5
501341	38-46.017	-103.097	-3-03-	0.34	2700	1500	3.2	2.5	1.6	370.	2.6	190	7.8
501344	38-46.004	-103.035	-3-03-	88.	1700	640	280.	17.	740.	770.	3.6	8700	7.0

Table A-3, Continued

PARTIAL DATA LISTING FOR GROUNDWATER OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPB)	SP UMHOS/CM	B (PPB)	CA (PPM)	K (PPM)	MG (PPM)	NA (PPM)	SI (PPM)	SR (PPB)	PH
501348	38-46.206	-103.168	-3-03-	120.	3600	580	87.	12.	130.	280.	2.6	1600	6.1
501351	38-46.206	-103.088	-3-03-	310.	1300	46	87.	5.1	39.	33.	4.1	520	6.9
501352	38-46.173	-103.143	-3-03-	6.6	2200	650	82.	8.1	53.	180.	3.3	2700	6.8
501355	38-46.176	-103.100	-3-03-	41.	3000	1400	7.5	3.4	28.	360.	2.1	320	7.2
501356	38-46.194	-103.017	-3-03-	230.	2500	350	110.	15.	78.	140.	4.7	3100	7.2
501357	38-46.149	-103.015	-3-03-	0.79	2200	1500	1.3	1.4	0.6	310.	2.6	77	7.8
501359	38-46.117	-103.080	-3-03-	15.	6400	930	230.	14.	610.	720.	2.6	1400	7.0
501361	38-46.072	-103.038	-3-03-	1.8	1800	1600	2.9	1.4	1.9	260.	2.5	100	8.0
501362	38-46.207	-103.216	-3-03-	7.5	2100	460	4.3	3.5	1.2	290.	2.9	120	6.1
501367	38-46.774	-103.446	-3-03-	11.	1500	540	47.	2.7	22.	160.	5.6	200	6.3
501368	38-46.759	-103.388	-3-03-	0.31	3100	740	3.5	1.5	1.7	390.	2.4	120	7.5
501373	38-46.823	-103.351	-3-03-	19.	2400	340	150.	2.1	95.	120.	4.2	770	7.4
501375	38-46.846	-103.290	-3-03-	0.65	4700	900	150.	9.1	160.	390.	9.0	2400	7.5
501376	38-46.826	-103.296	-3-03-	3.1	3600	830	5.1	1.7	4.9	420.	2.7	170	7.5
501377	38-46.756	-103.274	-3-03-	12.	3800	900	230.	4.9	140.	220.	4.8	2000	7.5
501378	38-46.910	-103.308	-3-03-	<0.20	3000	980	1.0	0.9	0.2	310.	5.5	54	8.1
501380	38-46.800	-103.211	-3-03-	23.	3800	1500	180.	3.9	83.	330.	7.5	760	7.8
501381	38-46.994	-103.268	-3-03-	10.	8000	4200	230.	7.1	95.	690.	11.	2600	7.3
501382	38-46.011	-103.494	-3-03-	0.59	1900	1200	1.4	1.1	0.3	310.	3.3	38	7.7
501383	38-46.854	-103.393	-3-03-	0.27	2000	930	1.1	0.9	0.2	300.	4.8	46	8.3
501384	38-46.974	-103.225	-3-03-	130.	1600	160	67.	2.7	50.	110.	3.8	450	6.0
501385	38-46.964	-103.159	-3-03-	12.	1200	120	61.	0.3	38.	46.	3.0	480	6.5
501386	38-46.902	-103.142	-3-03-	0.94	1600	430	110.	6.2	21.	110.	21.	750	6.5
501388	38-46.963	-103.092	-3-03-	0.30	2300	620	1.1	1.0	0.5	350.	2.6	66	8.1
501389	38-46.991	-103.087	-3-03-	7.3	1300	88	110.	3.2	34.	44.	5.0	390	8.2
501390	38-46.942	-103.005	-3-03-	<0.20	3600	860	4.0	3.2	2.2	470.	4.6	230	8.1
501391	38-46.907	-103.015	-3-03-	0.59	4300	730	7.7	3.5	6.2	520.	4.8	390	7.7
501393	38-46.847	-103.022	-3-03-	0.37	3000	420	28.	5.3	28.	390.	9.1	1600	7.5
501394	38-46.830	-103.019	-3-03-	0.33	2900	950	8.2	3.7	6.9	390.	4.9	460	7.5
501395	38-46.787	-103.022	-3-03-	0.41	2300	330	2.9	2.3	2.0	350.	2.5	160	7.8
501397	38-46.783	-103.069	-3-03-	220.	1200	110	72.	4.5	31.	68.	7.0	620	7.5
501398	38-46.817	-103.083	-3-03-	4.0	930	120	52.	3.7	29.	64.	4.7	680	7.5
501399	38-46.855	-103.104	-3-03-	0.25	2100	620	1.2	1.1	0.7	320.	2.6	69	8.0
501403	38-46.732	-103.839	-3-03-	1.0	3300	440	6.5	2.4	3.5	420.	3.2	230	5.9
501404	38-46.721	-103.799	-3-03-	0.67	3600	600	20.	4.7	8.7	460.	2.7	540	7.3
501407	38-46.665	-103.819	-3-03-	1.0	3000	1300	140.	13.	100.	190.	4.3	4500	6.6
501409	38-46.669	-103.753	-3-03-	0.46	3000	520	4.8	1.9	2.9	420.	2.5	180	8.1
501410	38-46.665	-103.880	-3-03-	1.7	820	120	44.	8.0	26.	63.	6.0	1100	7.3
501412	38-46.702	-103.911	-3-03-	<0.20	2400	570	1.9	1.1	0.5	340.	4.6	78	8.3
501414	38-46.646	-103.986	-3-03-	720.	890	130	61.	2.2	43.	39.	5.3	450	5.4
501416	38-46.559	-103.803	-3-03-	0.38	2000	480	1.3	0.9	0.4	300.	4.3	57	8.4
501419	38-46.644	-103.908	-3-03-	36.	2700	290	99.	5.8	62.	230.	5.7	1300	7.3
501421	38-46.566	-103.909	-3-03-	0.44	2600	610	25.	4.7	16.	330.	3.0	750	7.4
501424	38-46.686	-103.986	-3-03-	0.73	4700	510	44.	7.5	21.	500.	2.7	1600	7.3
501425	38-46.731	-103.965	-3-03-	0.58	3100	460	6.1	2.2	3.9	410.	2.8	250	8.1
501427	38-46.909	-103.524	-3-03-	<0.02	4500	940	24.	4.0	13.	530.	3.8	1000	7.5
501429	38-46.753	-103.595	-3-03-	0.28	2000	810	1.6	1.1	0.7	320.	3.1	95	8.2
501432	38-46.981	-103.723	-3-03-	0.21	4600	880	9.3	1.9	4.7	540.	2.6	330	7.5
501433	38-46.819	-103.655	-3-01-	9.3	5400	1300	100.	7.5	72.	540.	6.0	1700	7.1

APPENDIX B

STREAM SEDIMENT

APPENDIX B

STREAM SEDIMENT

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES, Continued

LIST OF FIGURES, Continued

Table B-1

STATISTICAL SUMMARY FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

	NO. SAMPLES ANALYZED									COEFFICIENT	LN TRANSFORMATION			
		BELOW											ROBUST	
ELEMENT	MEASURABLE VALUES	DETECTION LIMIT	DETECTION LIMIT	MINIMUM VALUE	MAXIMUM VALUE	MEAN	MEDIAN	MODE	STANDARD DEVIATION	OF VARIATION	MEAN	S. D.	MEAN	S. D.
U-FL	532			1.00	17.53	2.83	2.54	2.56	1.315	0.465	0.97	0.34	0.95	0.33
U-NT	520			1.40	23.60	3.27	2.90	2.81	1.453	0.445	1.13	0.29	1.11	0.27
TH	509	23	<2	<2	15	6	6	5	2.6	0.4	1.79	0.44	1.79	0.45
U/TU	520			0.45	1.85	0.85	0.86	0.91	0.155	0.179	-0.16	0.18	-0.16	0.18
TH/U	520			0.14	5.60	2.09	2.00	1.98	1.008	0.482	0.58	0.62	0.63	0.62
AG	4	528	<2	<2	2	2	<2	<2	0.0	0.0	0.69	0.00		
AL	532			1.09	7.16	4.90	5.01	5.26	0.866	0.176	1.57	0.20	1.59	0.18
AS	532			0.3	34.4	4.7	4.2	4.0	3.01	0.64	1.42	0.49	1.42	0.45
B	453	79	<10	<10	81	24	20	15	10.9	0.4	3.13	0.41	3.01	0.55
BA	532			334	7192	772	696	627	447.1	0.6	6.58	0.33	6.56	0.29
BE	519	13	<1	<1	5	1	<1	<1	0.9	0.5	0.42	0.47		
CA	532			0.17	7.72	1.35	0.99	0.46	1.052	0.781	0.03	0.74	0.03	0.72
CE	532			16	116	63	60	48	19.0	0.3	4.10	0.32	4.11	0.30
CO	531	1	<4	<4	49	13	13	14	4.6	0.3	2.59	0.30	2.59	0.30
CR	532			7	74	46	48	49	10.3	0.2	3.82	0.26	3.83	0.23
CU	532			3	571	25	24	23	26.2	1.0	3.13	0.45	3.14	0.39
FE	532			0.89	10.20	2.53	2.35	2.27	0.949	0.375	0.87	0.33	0.87	0.31
K	532			0.39	2.30	1.62	1.62	1.62	0.231	0.143	0.47	0.17	0.48	0.13
LI	532			5	54	26	27	27	6.0	0.2	3.25	0.25	3.27	0.22
MG	532			0.31	10.40	1.02	0.90	0.73	0.567	0.556	-0.06	0.39	-0.07	0.40
MN	532			115	13592	601	461	364	695.2	1.2	6.20	0.57	6.18	0.57
MO	152	380	<4	<4	11	4	<4	<4	1.3	0.3	1.57	0.22		
NA	532			0.18	2.48	0.81	0.78	0.79	0.338	0.418	-0.30	0.42	-0.29	0.43
NB	528	4	<4	<4	29	10	10	10	3.4	0.3	2.30	0.31	2.30	0.31
NI	532			5	44	20	20	16	6.9	0.3	2.96	0.36	2.97	0.35
P	532			182	3499	562	507	428	286.9	0.5	6.26	0.35	6.24	0.34
SC	532			3	16	8	8	8	2.3	0.3	2.06	0.30	2.07	0.29
SE	506	26	<0.1	<0.1	5.2	0.8	0.7	0.6	0.49	0.63	-0.41	0.60	-0.47	0.73
SR	532			64	1081	194	168	147	109.4	0.6	5.17	0.42	5.15	0.43
TI	532			878	7611	2354	2234	2241	728.4	0.3	7.72	0.28	7.72	0.26
V	532			10	178	72	70	73	22.2	0.3	4.24	0.32	4.25	0.30
Y	532			7	27	14	14	12	3.3	0.2	2.62	0.23	2.62	0.23
ZN	528	4	<2	<2	577	68	66	65	31.5	0.5	4.15	0.40	4.16	0.37
ZR	532			30	114	62	62	62	14.6	0.2	4.11	0.24	4.11	0.23

NOTE: Refer to Table 1, Page 22 and Table C-1, Page C-4 for concentration units and symbol definitions.

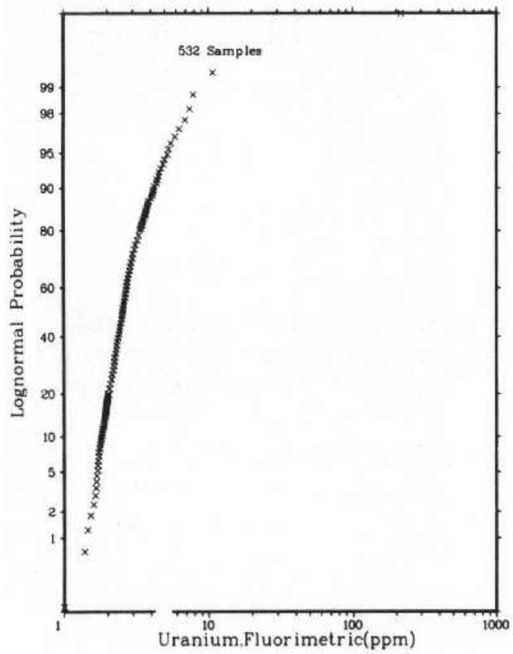
Table B-2

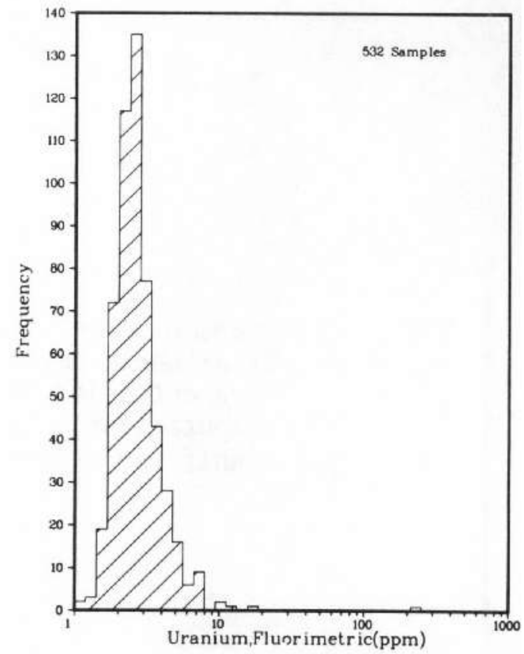
CORRELATION MATRIX FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

	L-U	LUNT	L-SC	L-V	L-AL	L-CR	L-CU	L-CO	L-FE	L-NI	L-ZN	L-Y	L-ZR
L-U	1.00 (532)												
LUNT	0.86*** 0.76*** (520)	1.00 (520)											
L-SC	0.26*** 0.31*** (532)	0.20*** 0.23*** (520)	1.00 (532)										
L-V	0.18*** 0.21*** (532)	0.18*** 0.19*** (520)	0.79*** 0.76*** (532)	1.00 (532)									
L-AL	0.17*** 0.28*** (532)	0.16*** 0.23*** (520)	0.73*** 0.76*** (532)	0.71*** 0.64*** (532)	1.00 (532)								
L-CR	0.22*** 0.32*** (532)	0.21*** 0.28*** (520)	0.68*** 0.66*** (532)	0.72*** 0.64*** (532)	0.92*** 0.88*** (532)	1.00 (532)							
L-CU	0.22*** 0.31*** (532)	0.24*** 0.30*** (520)	0.51*** 0.54*** (532)	0.53*** 0.50*** (532)	0.55*** 0.56*** (532)	0.62*** 0.69*** (532)	1.00 (532)						
L-CO	0.22*** 0.26*** (531)	0.22*** 0.23*** (519)	0.67*** 0.66*** (531)	0.68*** 0.64*** (531)	0.50*** 0.50*** (531)	0.61*** 0.62*** (531)	0.48*** 0.55*** (531)	1.00 (531)					
L-FE	0.29*** 0.36*** (532)	0.28*** 0.31*** (520)	0.78*** 0.80*** (532)	0.61*** 0.59*** (532)	0.50*** 0.58*** (532)	0.55*** 0.59*** (532)	0.44*** 0.48*** (532)	0.81*** 0.79*** (531)	1.00 (532)				
L-NI	0.26*** 0.29*** (532)	0.22*** 0.22*** (520)	0.76*** 0.73*** (532)	0.71*** 0.65*** (532)	0.67*** 0.66*** (532)	0.73*** 0.72*** (532)	0.51*** 0.58*** (532)	0.75*** 0.74*** (531)	0.74*** 0.74*** (532)	1.00 (532)			
L-ZN	0.31*** 0.33*** (528)	0.26*** 0.27*** (516)	0.58*** 0.65*** (528)	0.52*** 0.56*** (528)	0.43*** 0.49*** (528)	0.48*** 0.55*** (528)	0.44*** 0.54*** (528)	0.57*** 0.72*** (527)	0.56*** 0.64*** (528)	0.52*** 0.55*** (528)	1.00 (528)		
L-Y	0.23*** 0.26*** (532)	0.13*** 0.21*** (520)	0.84*** 0.85*** (532)	0.69*** 0.68*** (532)	0.56*** 0.61*** (532)	0.44*** 0.42*** (532)	0.34*** 0.32*** (532)	0.54*** 0.59*** (531)	0.65*** 0.66*** (532)	0.61*** 0.57*** (532)	0.46*** 0.51*** (528)	1.00 (532)	
L-ZR	0.19*** 0.24*** (532)	0.14*** 0.19*** (520)	0.75*** 0.74*** (532)	0.62*** 0.61*** (532)	0.47*** 0.50*** (532)	0.32*** 0.29*** (532)	0.26*** 0.23*** (532)	0.42*** 0.37*** (531)	0.54*** 0.53*** (532)	0.46*** 0.42*** (532)	0.42*** 0.43*** (528)	0.38*** 0.37*** (532)	1.00 (532)
L-TI	0.16*** 0.21*** (532)	0.18*** 0.20*** (520)	0.72*** 0.75*** (532)	0.62*** 0.60*** (532)	0.66*** 0.72*** (532)	0.57*** 0.59*** (532)	0.29*** 0.35*** (532)	0.49*** 0.47*** (531)	0.61*** 0.65*** (532)	0.69*** 0.70*** (532)	0.54*** 0.57*** (528)	0.70*** 0.71*** (532)	0.64*** 0.60*** (532)
L-NB	0.09** 0.10** (528)	0.10** 0.11** (516)	0.34*** 0.36*** (528)	0.31*** 0.28*** (528)	0.29*** 0.30*** (528)	0.23*** 0.24*** (528)	0.14** 0.10** (528)	0.23*** 0.21*** (527)	0.25*** 0.27*** (528)	0.22*** 0.22*** (528)	0.19*** 0.22*** (524)	0.44*** 0.44*** (528)	0.43*** 0.43*** (528)
L-TH	0.13*** 0.14*** (509)	0.14*** 0.18*** (497)	0.38*** 0.40*** (509)	0.26*** 0.26*** (509)	0.18*** 0.22*** (509)	0.12*** 0.13*** (509)	0.13*** 0.13*** (509)	0.21*** 0.22*** (509)	0.25*** 0.25*** (505)	0.22*** 0.20*** (505)	0.26*** 0.32*** (506)	0.51*** 0.50*** (509)	0.46*** 0.46*** (509)
L-MN	0.05 0.08* (532)	0.08* 0.06 (520)	0.37*** 0.38*** (532)	0.23*** 0.29*** (532)	0.09** 0.12*** (532)	0.19*** 0.23*** (532)	0.21*** 0.26*** (532)	0.67*** 0.68*** (531)	0.59*** 0.59*** (532)	0.45*** 0.46*** (532)	0.30*** 0.40*** (528)	0.23*** 0.28*** (532)	0.14*** 0.14*** (532)
L-P	0.23*** 0.25*** (532)	0.24*** 0.22*** (520)	0.51*** 0.57*** (532)	0.38*** 0.40*** (532)	0.37*** 0.41*** (532)	0.40*** 0.45*** (532)	0.33*** 0.36*** (532)	0.56*** 0.59*** (531)	0.76*** 0.68*** (532)	0.46*** 0.50*** (532)	0.48*** 0.66*** (528)	0.41*** 0.45*** (532)	0.26*** 0.30*** (532)
L-AS	0.27*** 0.30*** (532)	0.27*** 0.30*** (520)	0.41*** 0.41*** (532)	0.42*** 0.37*** (532)	0.27*** 0.30*** (532)	0.38*** 0.43*** (532)	0.37*** 0.42*** (532)	0.63*** 0.61*** (531)	0.64*** 0.61*** (532)	0.45*** 0.46*** (532)	0.32*** 0.39*** (528)	0.33*** 0.30*** (532)	0.20*** 0.15*** (532)
L-CA	-0.21*** -0.21*** (532)	-0.19*** -0.18*** (520)	-0.26*** -0.28*** (532)	-0.21*** -0.21*** (532)	-0.47*** -0.52*** (532)	-0.36*** -0.38*** (532)	-0.16*** -0.17*** (532)	-0.18*** -0.15*** (531)	-0.15*** -0.15*** (532)	-0.20*** -0.19*** (532)	-0.22*** -0.27*** (526)	-0.28*** -0.29*** (532)	-0.31*** -0.31*** (532)
L-MG	-0.02 -0.02 (532)	-0.05 -0.04 (520)	-0.04 -0.07 (532)	-0.09* -0.05 (532)	-0.36*** -0.35*** (532)	-0.24*** -0.21*** (532)	0.00 0.04 (532)	-0.03 0.01 (531)	-0.06 -0.07 (532)	-0.08* -0.08* (532)	0.03 0.01 (528)	-0.07* -0.10** (532)	-0.09** -0.12*** (532)
L-CE	0.01 -0.00 (532)	-0.01 -0.06 (520)	0.29*** 0.23*** (532)	0.41*** 0.39*** (532)	0.34*** 0.28*** (532)	0.27*** 0.21*** (532)	0.22*** 0.18*** (532)	0.12*** 0.08* (531)	0.02 -0.02 (532)	0.06* 0.01 (532)	0.16*** 0.15*** (528)	0.33*** 0.30*** (532)	0.27*** 0.23*** (532)
L-SE	0.16*** 0.12*** (506)	0.17*** 0.14*** (496)	0.28*** 0.25*** (506)	0.35*** 0.29*** (506)	0.28*** 0.23*** (506)	0.27*** 0.23*** (506)	0.22*** 0.19*** (506)	0.24*** 0.20*** (505)	0.25*** 0.22*** (506)	0.22*** 0.18*** (506)	0.17*** 0.24*** (502)	0.26*** 0.23*** (506)	0.19*** 0.15*** (506)
L-K	0.05 0.17*** (532)	0.04 0.13*** (520)	0.16*** 0.14*** (532)	0.13*** 0.07 (532)	0.59*** 0.41*** (532)	0.60*** 0.44*** (532)	0.41*** 0.39*** (532)	0.03 0.04 (531)	0.01 0.02 (532)	0.15*** 0.06 (532)	0.12*** 0.10** (528)	0.07 0.05 (532)	0.01 -0.01 (532)
L-LI	0.13*** 0.22*** (532)	0.10** 0.17*** (520)	0.40*** 0.33*** (532)	0.49*** 0.37*** (532)	0.66*** 0.48*** (532)	0.67*** 0.52*** (532)	0.49*** 0.48*** (532)	0.28*** 0.24*** (531)	0.21*** 0.17*** (532)	0.22*** 0.20*** (532)	0.26*** 0.31*** (528)	0.26*** 0.22*** (532)	0.19*** 0.18*** (532)
L-BA	0.04 0.05 (532)	0.07 0.08* (520)	0.30*** 0.37*** (532)	0.41*** 0.38*** (532)	0.24*** 0.29*** (532)	0.23*** 0.23*** (532)	0.16*** 0.17*** (532)	0.38*** 0.34*** (531)	0.43*** 0.42*** (532)	0.50*** 0.54*** (532)	0.16*** 0.13*** (528)	0.40*** 0.42*** (532)	0.35*** 0.37*** (532)
L-NA	-0.12*** -0.10** (532)	-0.10** -0.11** (520)	-0.16*** -0.18*** (532)	0.05 0.00 (532)	0.08* -0.00 (532)	0.07 0.01 (532)	-0.10** -0.13*** (532)	-0.06 -0.06 (531)	-0.14*** -0.16*** (532)	0.16*** 0.16*** (532)	-0.12*** -0.22*** (528)	-0.09* -0.10** (532)	-0.12*** -0.13*** (532)
L-SR	-0.04 -0.06 (532)	-0.02 -0.07 (520)	0.14*** 0.15*** (532)	0.15*** 0.14*** (532)	-0.00 -0.02 (532)	-0.01 -0.01 (532)	-0.02 -0.04 (532)	0.22*** 0.23*** (531)	0.26*** 0.28*** (532)	0.25*** 0.31*** (532)	0.08* 0.06 (528)	0.16*** 0.16*** (532)	0.09** 0.10** (532)

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-TI	L-NE	L-TH	L-MN	L-F	L-AS	L-CA	L-MG	L-CL	L-SE	L-K	L-LI	L-BA	L-NA	L-SR
L-TI	1.00 (532)														
L-NE	0.44*** 0.45*** (528)	1.00 (528)													
L-TH	0.25*** 0.27*** (509)	0.42*** 0.43*** (506)	1.00 (509)												
L-MN	0.20*** 0.24*** (532)	0.03 0.03 (528)	0.03 0.01 (509)	1.00 (532)											
L-F	0.27*** 0.33*** (532)	0.14*** 0.16*** (528)	0.19*** 0.21*** (509)	0.53*** 0.50*** (532)	1.00 (532)										
L-AS	0.24*** 0.25*** (532)	0.11** 0.07 (528)	0.07 0.08* (509)	0.51*** 0.51*** (532)	0.44*** 0.38*** (532)	1.00 (532)									
L-CA	-0.36*** -0.36*** (532)	-0.16*** -0.13*** (528)	-0.10** -0.11** (509)	0.22*** 0.20*** (532)	-0.16*** -0.20*** (532)	-0.05 -0.03 (532)	1.00 (532)								
L-MG	-0.28*** -0.29*** (532)	-0.08* -0.06 (528)	0.09** 0.08* (509)	0.15*** 0.15*** (532)	-0.10** -0.11** (532)	0.05 0.07* (532)	0.75*** 0.77*** (532)	1.00 (532)							
L-CL	0.01 0.02 (532)	0.03 0.03 (528)	0.20*** 0.15*** (509)	-0.07* -0.06 (532)	0.00 -0.03 (532)	0.16*** 0.11*** (532)	-0.13*** -0.12*** (532)	-0.00 0.00 (532)	1.00 (532)						
L-SE	0.15*** 0.15*** (506)	0.07* 0.01 (502)	0.01 -0.01 (485)	0.09** 0.07 (506)	0.26*** 0.24*** (506)	0.36*** 0.32*** (506)	-0.13*** -0.14*** (506)	-0.14*** -0.14*** (506)	0.35*** 0.32*** (506)	1.00 (506)					
L-K	0.09** 0.05 (532)	-0.00 -0.02 (528)	-0.03 -0.03 (509)	-0.16*** -0.16*** (532)	0.03 0.02 (532)	0.06 0.14*** (532)	-0.25*** -0.28*** (532)	-0.10** -0.03 (532)	0.25*** 0.23*** (532)	0.10** 0.08* (506)	1.00 (532)				
L-LI	0.10** 0.02 (532)	0.06 0.03 (528)	0.02 0.05 (509)	-0.01 -0.03 (532)	0.17*** 0.15*** (532)	0.25*** 0.27*** (532)	-0.08* -0.07 (532)	0.02 0.10** (532)	0.46*** 0.41*** (532)	0.30*** 0.28*** (506)	0.69*** 0.58*** (532)	1.00 (532)			
L-BA	0.57*** 0.62*** (532)	0.25*** 0.20*** (528)	0.04 0.12*** (509)	0.29*** 0.33*** (532)	0.12*** 0.16*** (532)	0.34*** 0.24*** (532)	-0.06* -0.09** (532)	-0.12*** -0.11*** (532)	-0.02 -0.07* (532)	0.14*** 0.01 (506)	-0.09** -0.16*** (532)	-0.11*** -0.27*** (532)	1.00 (532)		
L-NA	0.21*** 0.17*** (532)	0.06 0.05 (528)	-0.19*** -0.23*** (509)	0.02 0.04 (532)	-0.11*** -0.13*** (532)	-0.14*** -0.15*** (532)	-0.05 -0.02 (532)	-0.16*** -0.11** (532)	-0.10** -0.08* (532)	-0.08* -0.09** (506)	0.04 -0.13*** (532)	-0.21*** -0.31*** (532)	0.37*** 0.43*** (532)	1.00 (532)	
L-SR	0.22*** 0.26*** (532)	0.08* 0.09** (528)	-0.08* -0.08* (509)	0.44*** 0.45*** (532)	0.24*** 0.22*** (532)	0.11** 0.07 (532)	0.31*** 0.30*** (532)	0.02 0.04 (532)	-0.16*** -0.20*** (532)	0.06 0.04 (506)	-0.36*** -0.45*** (532)	-0.15*** -0.23*** (532)	0.34*** 0.41*** (532)	0.37*** 0.43*** (532)	1.00 (532)





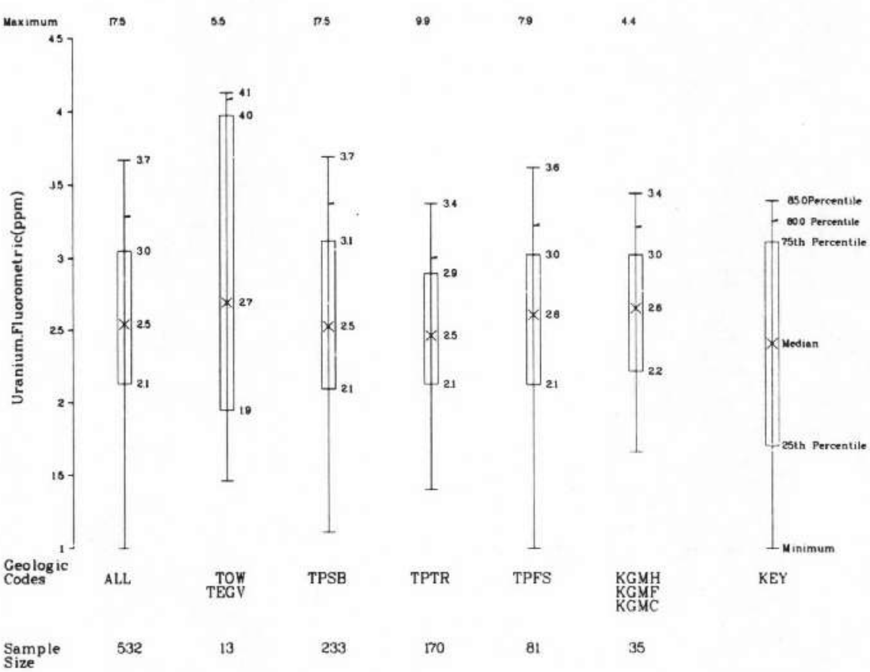


Figure B-1a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SOLUBLE URANIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

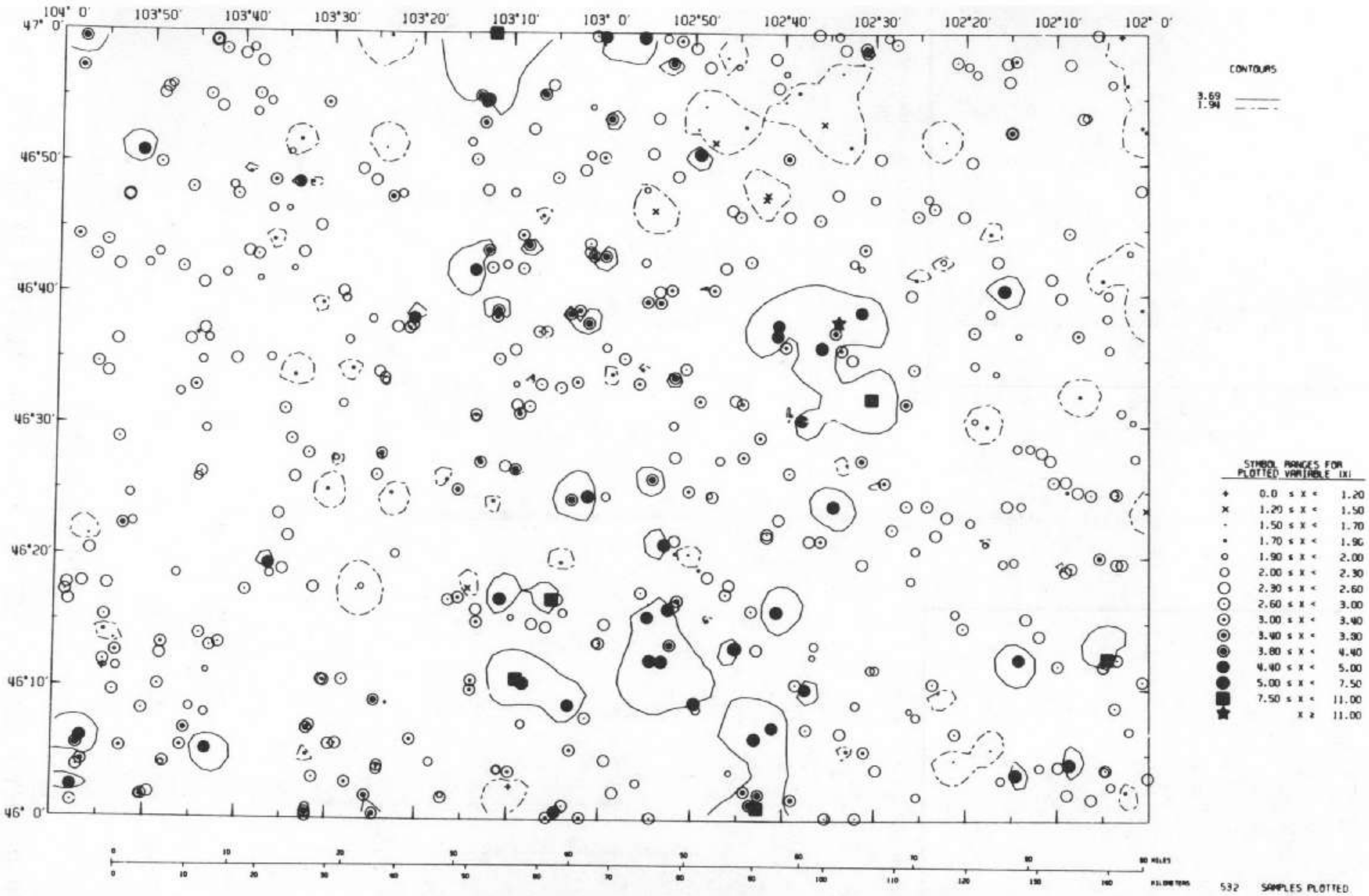


Figure B-1b

GEOCHEMICAL DISTRIBUTION OF SOLUBLE URANIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

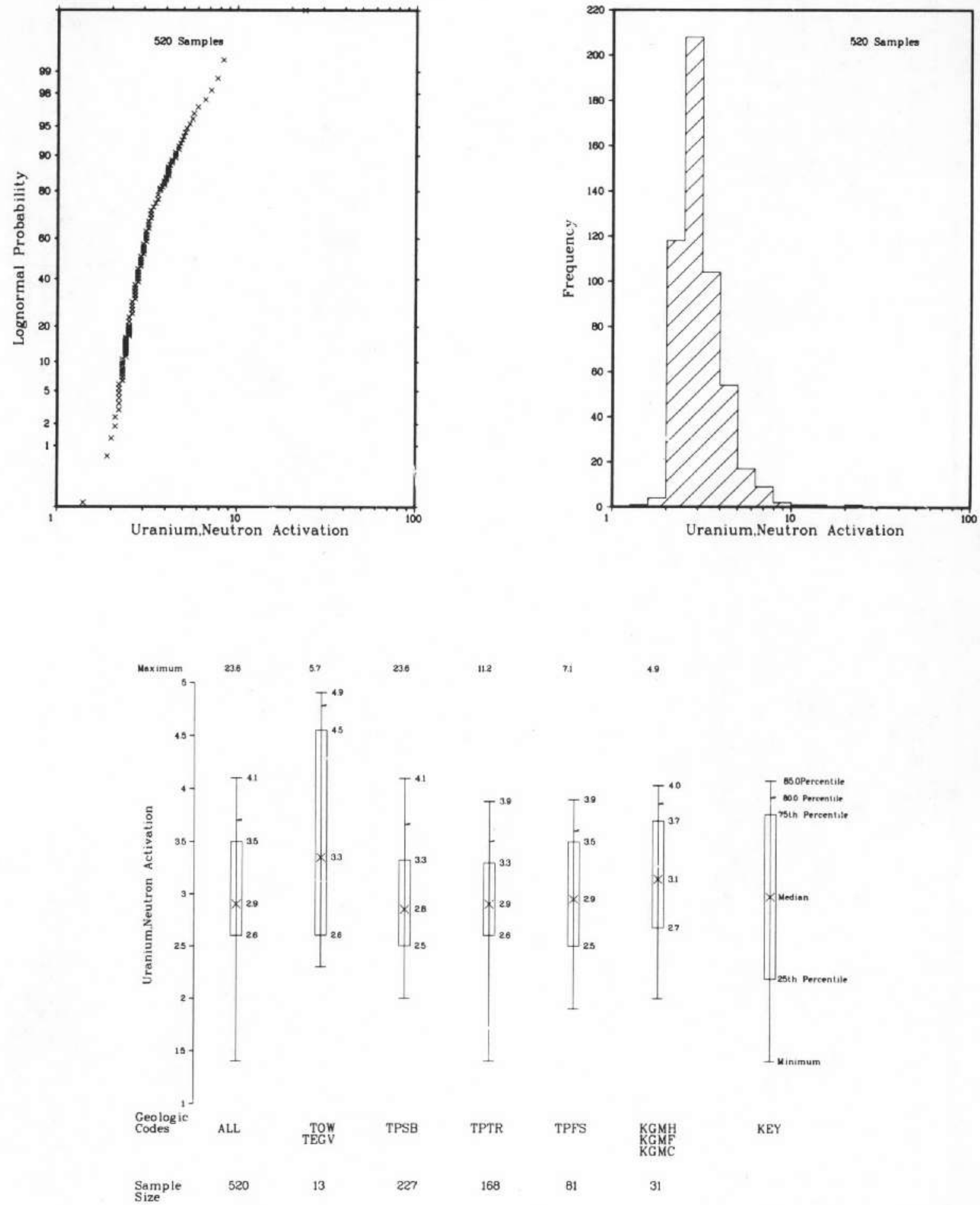


Figure B-2a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR URANIUM BY NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

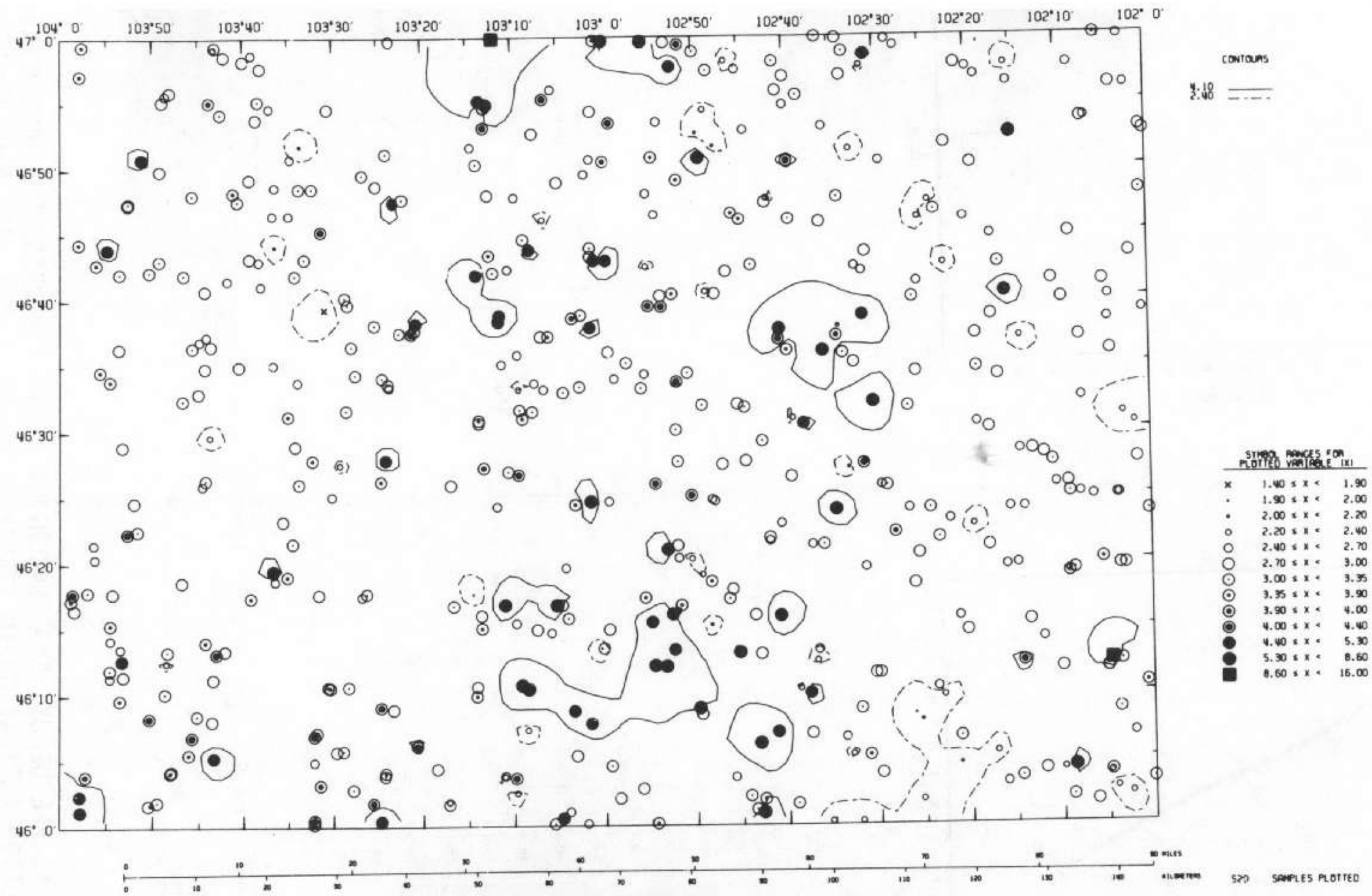


Figure B-2b

GEOCHEMICAL DISTRIBUTION OF URANIUM BY NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

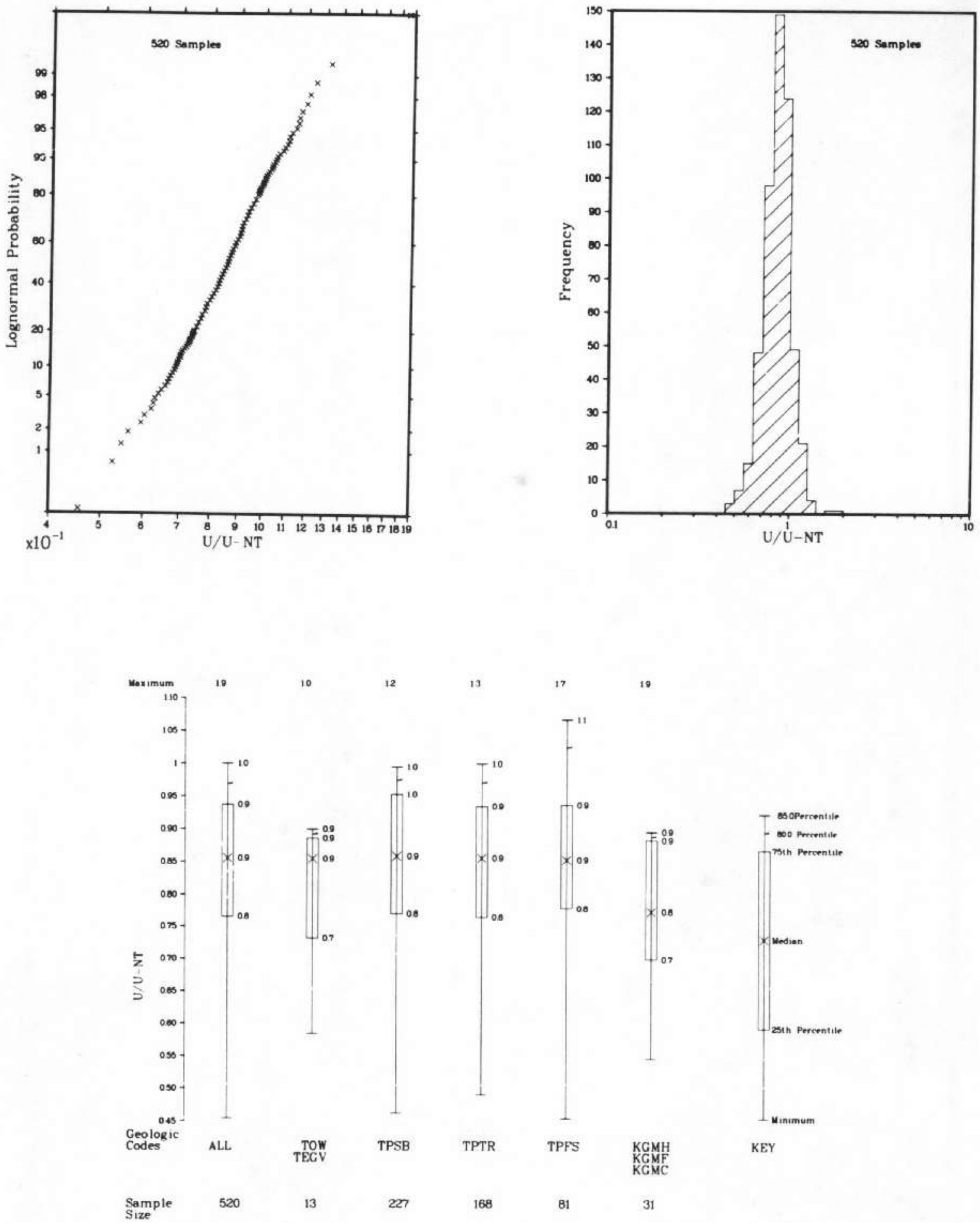


Figure B-3a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR URANIUM FLUOROMETRIC/ URANIUM NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

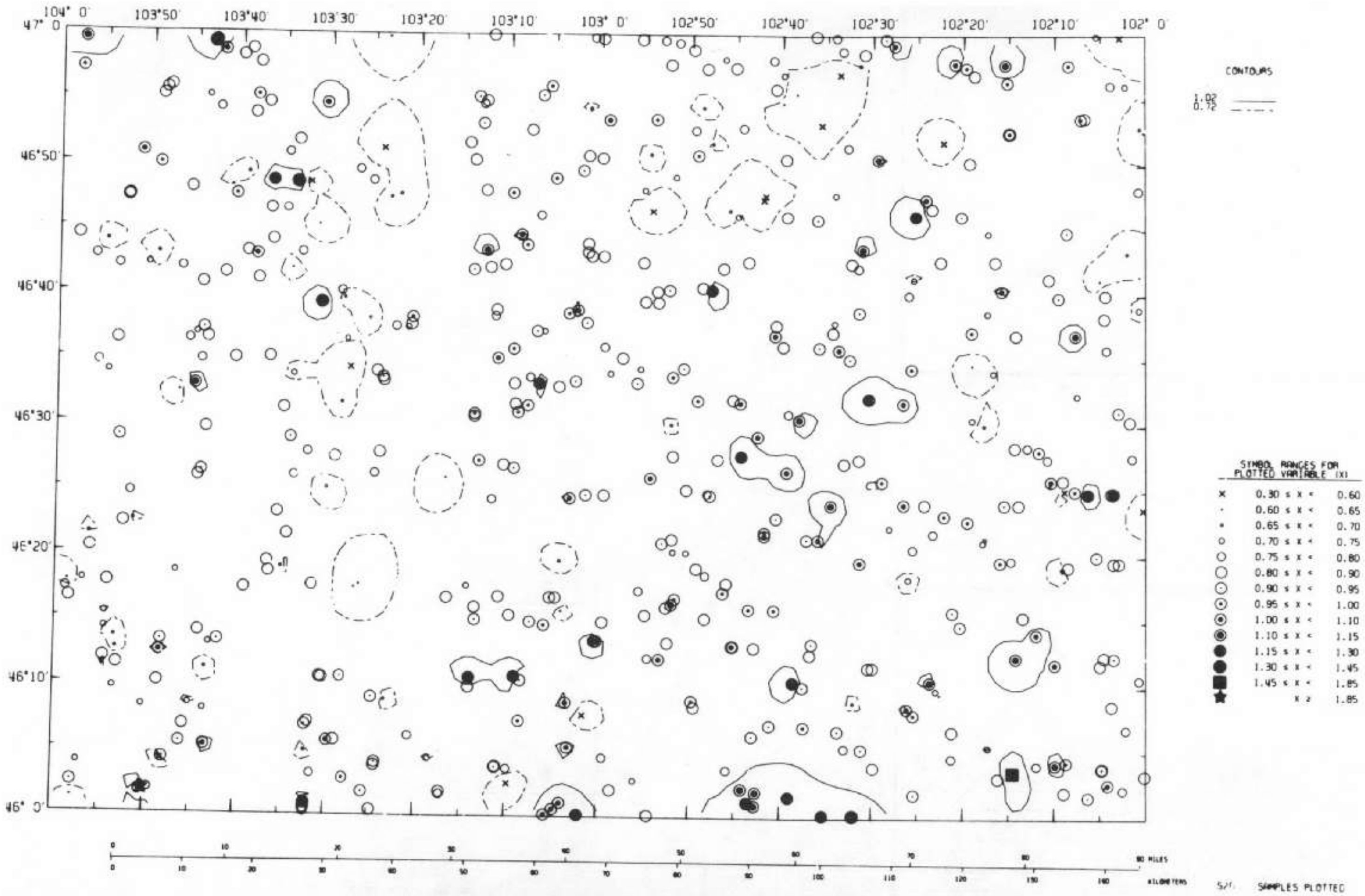
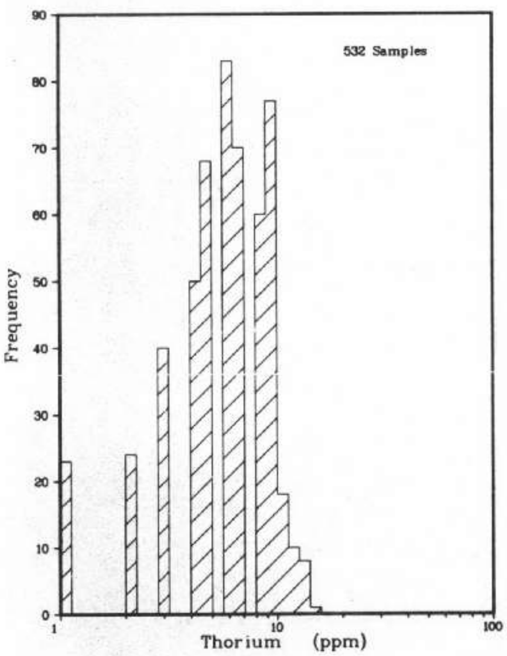
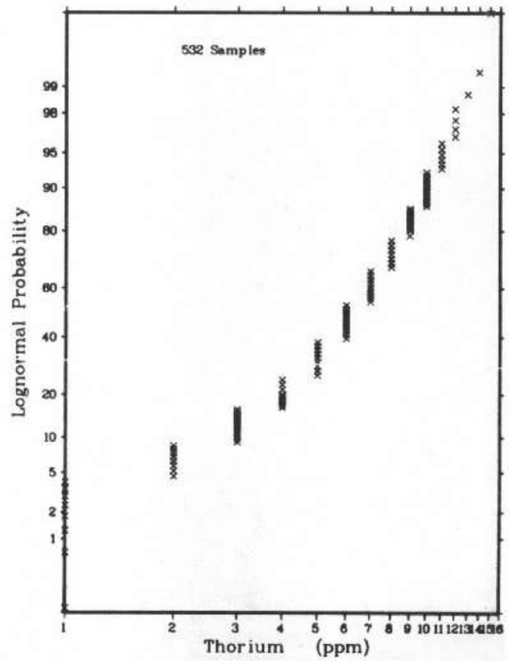


Figure B-3b

GEOCHEMICAL DISTRIBUTION OF URANIUM FLUOROMETRIC/URANIUM NEUTRON ACTIVATION IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE





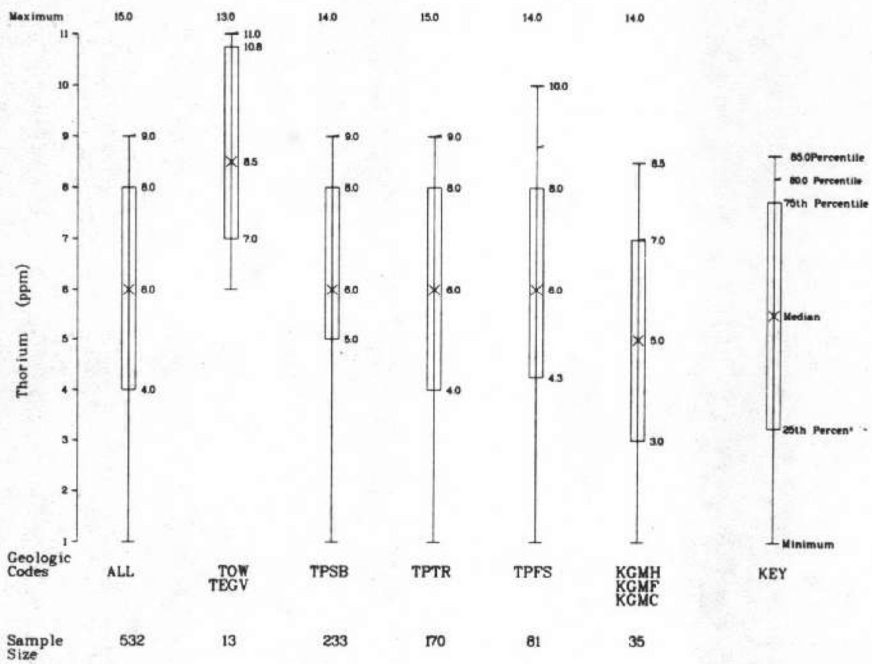


Figure B-4a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR THORIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

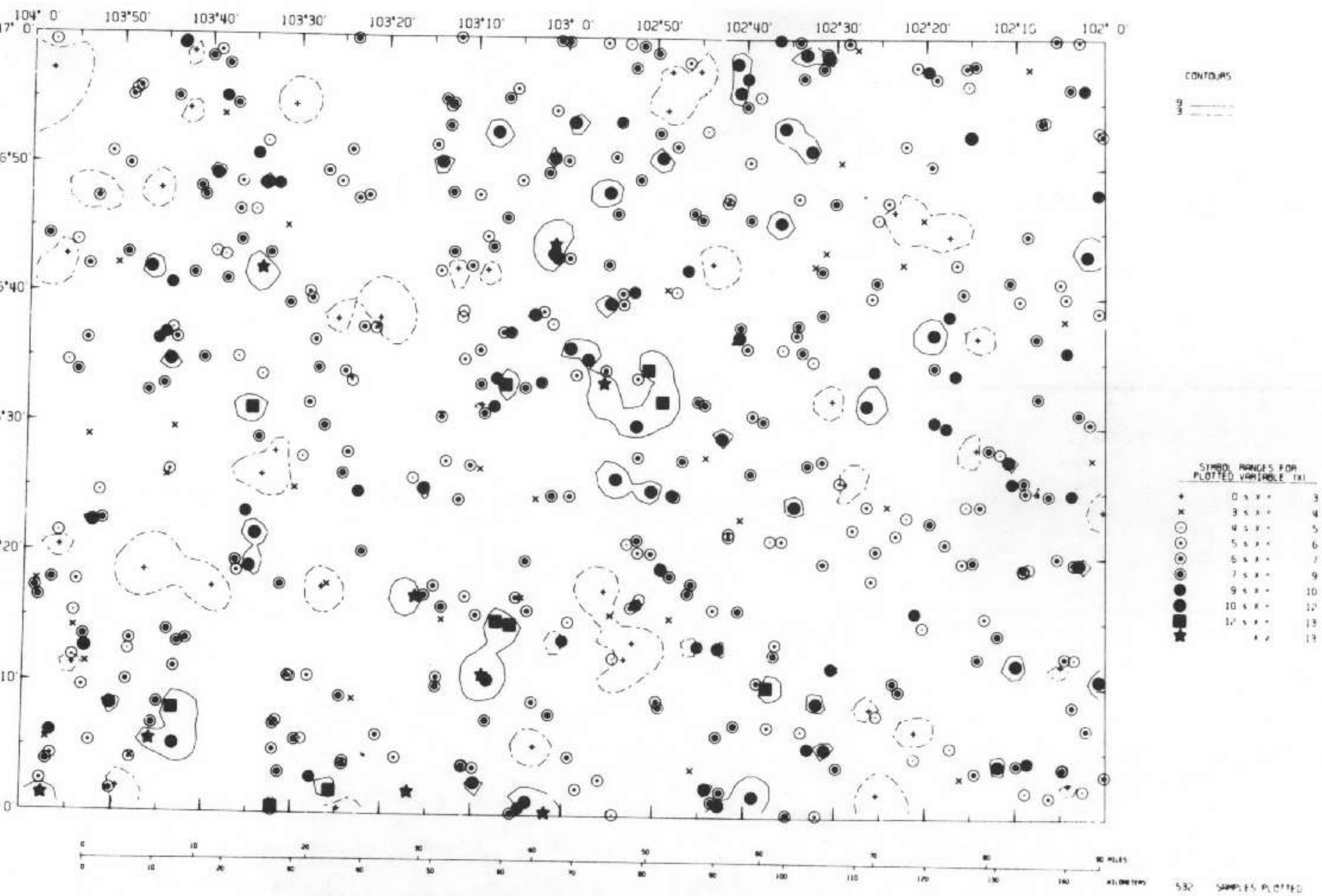


Figure B-4b

GEOCHEMICAL DISTRIBUTION OF THORIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

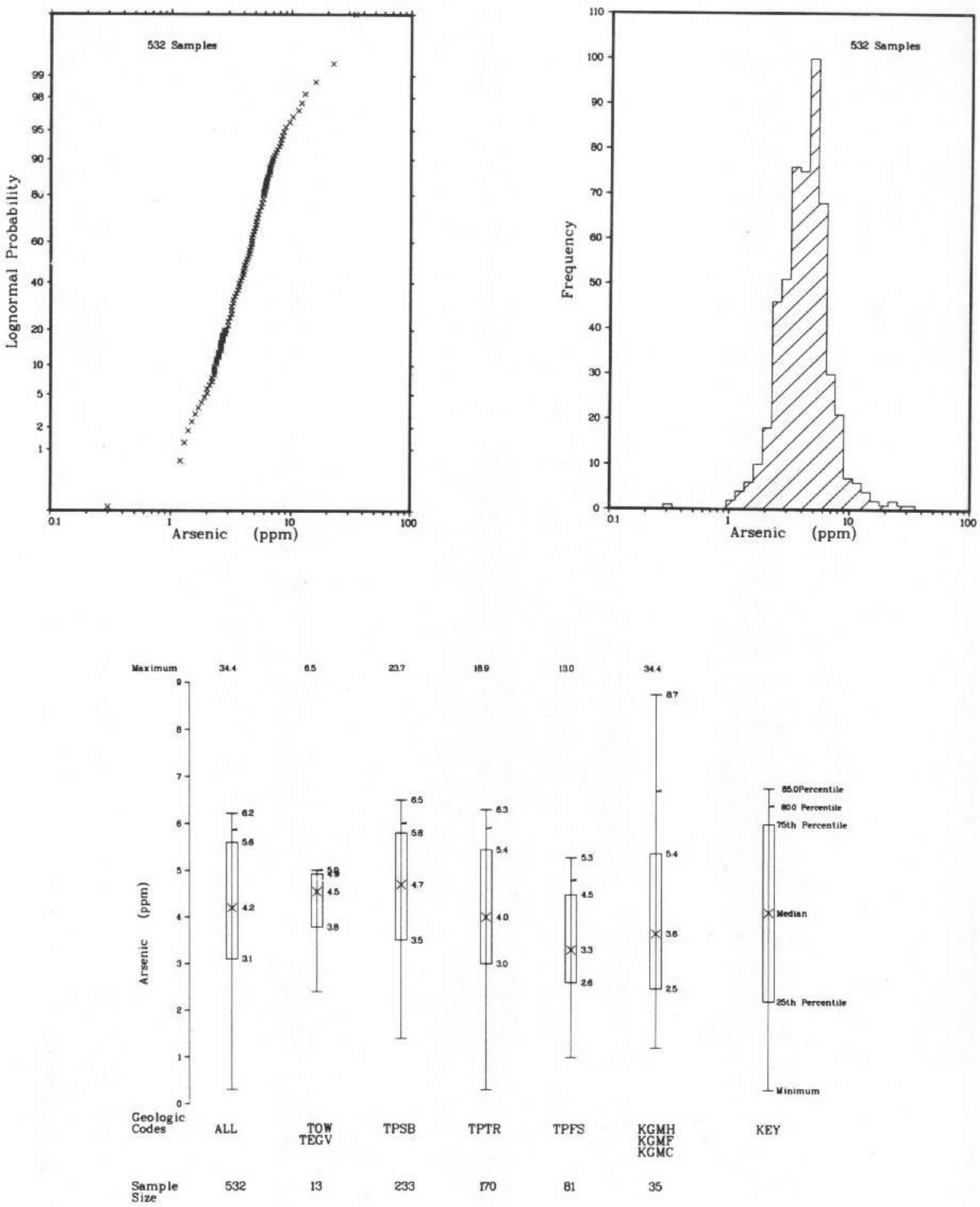


Figure B-5a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ARSENIC (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

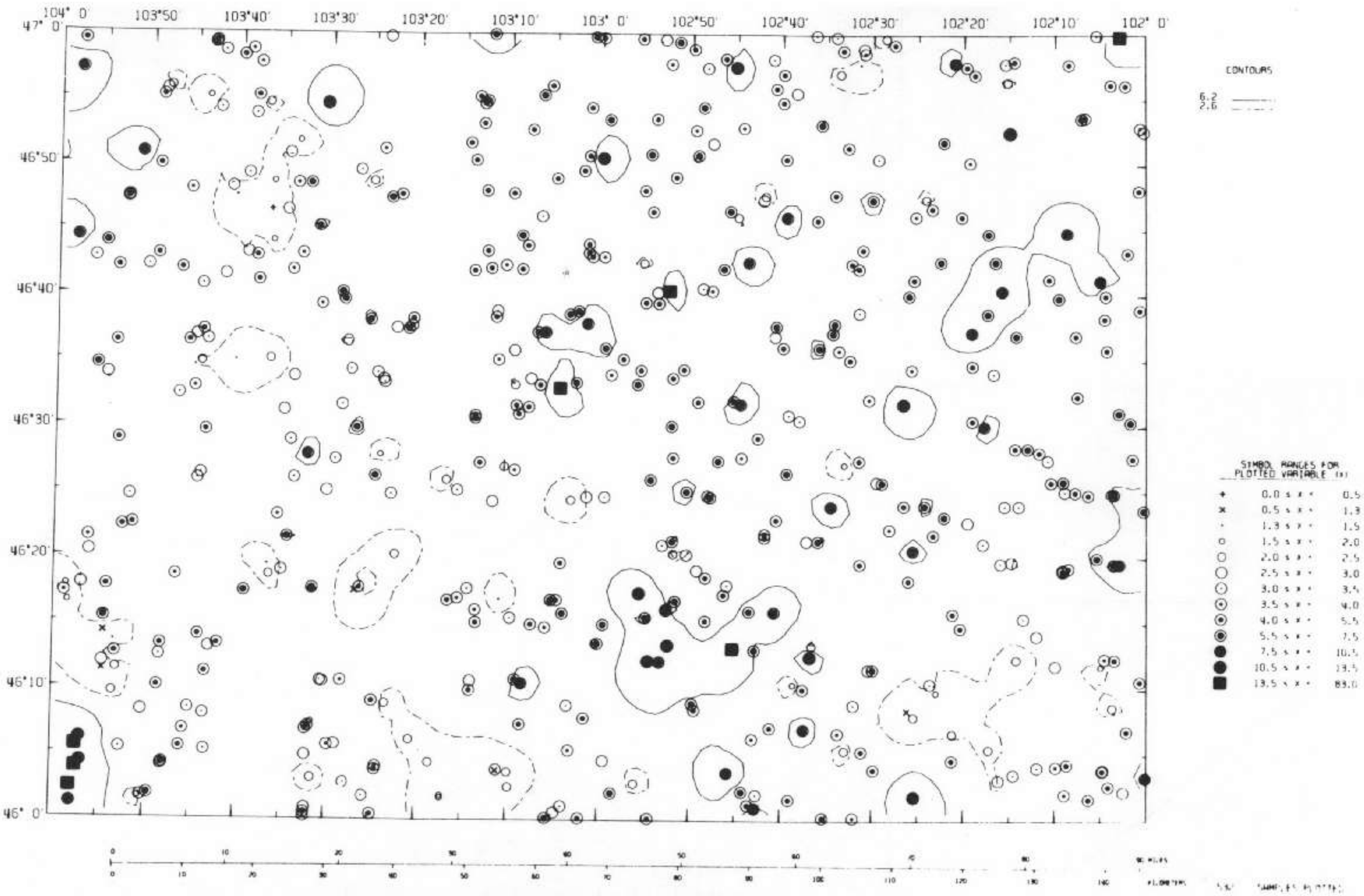


Figure B-5b

GEOCHEMICAL DISTRIBUTION OF ARSENIC (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

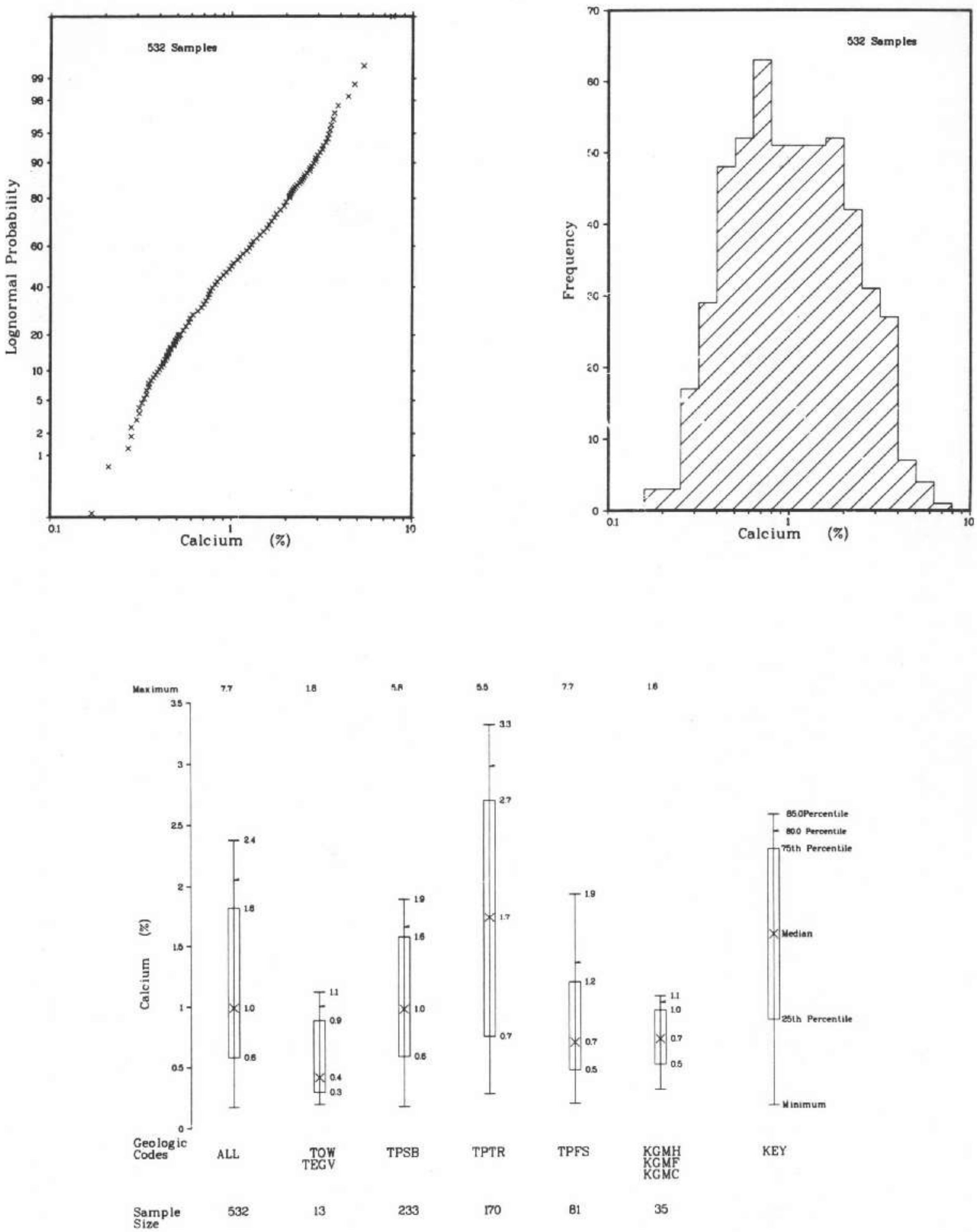


Figure B-6a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR CALCIUM (%) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

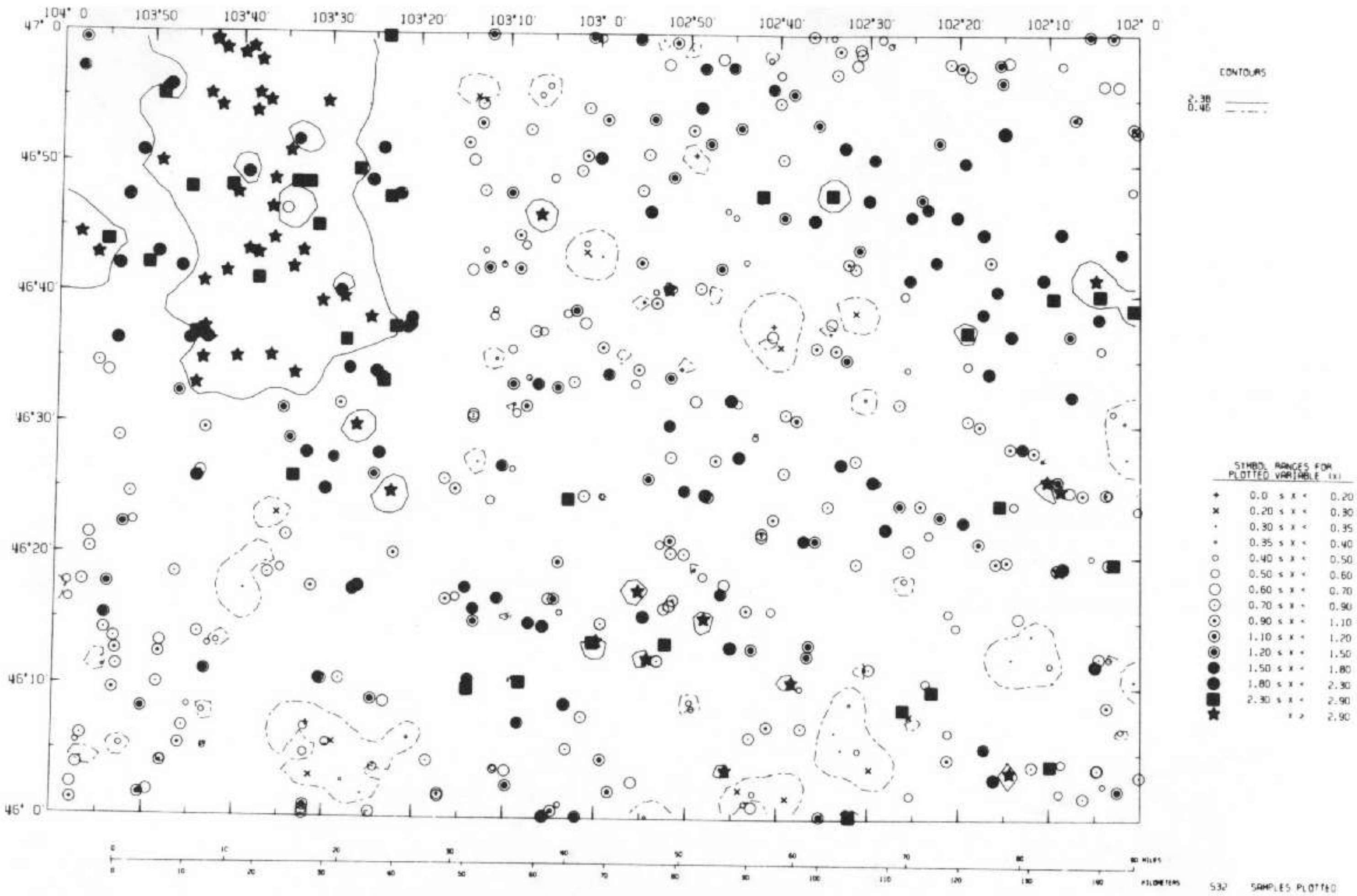


Figure B-6b

GEOCHEMICAL DISTRIBUTION OF CALCIUM (%) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

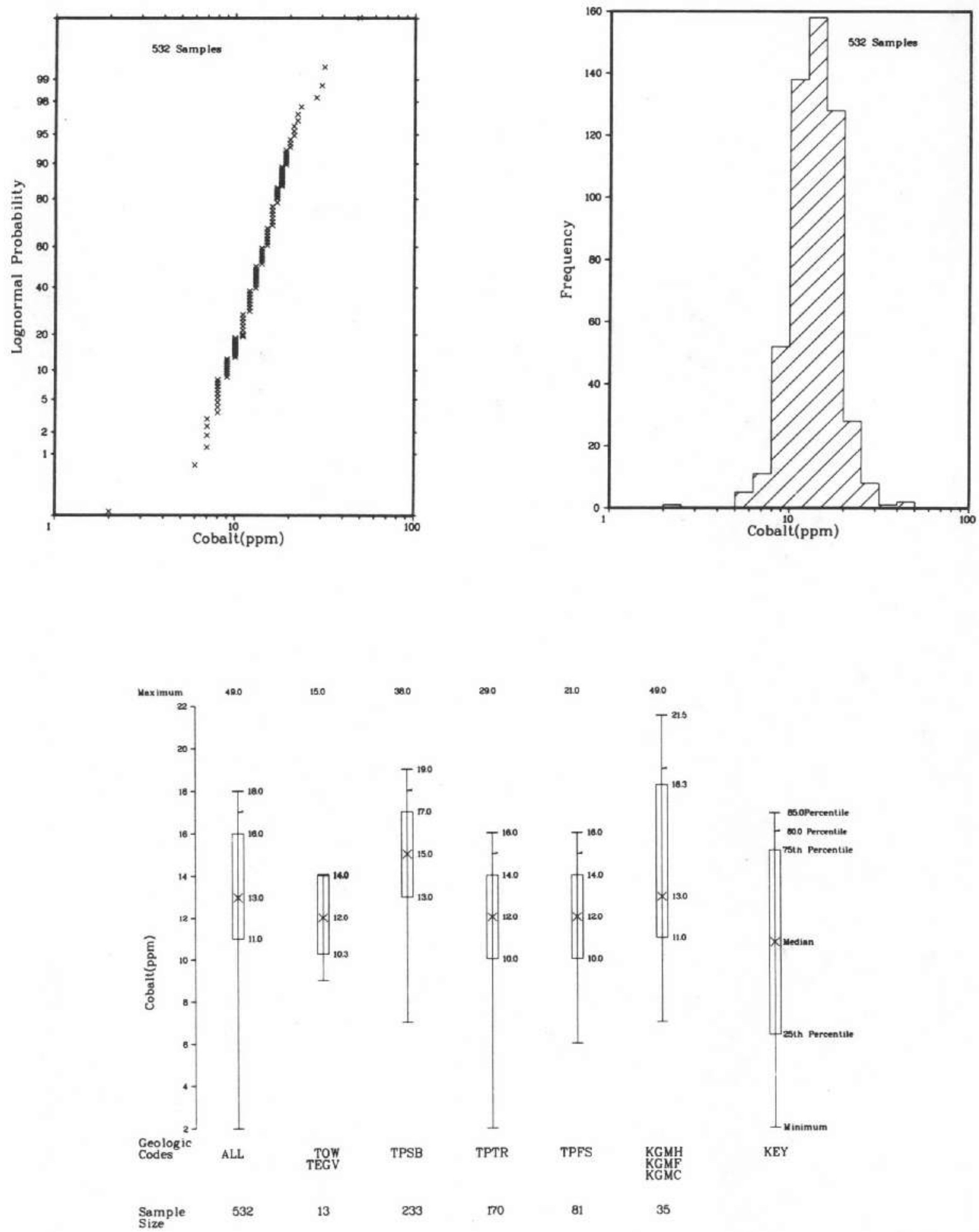


Figure B-7a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR COBALT (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

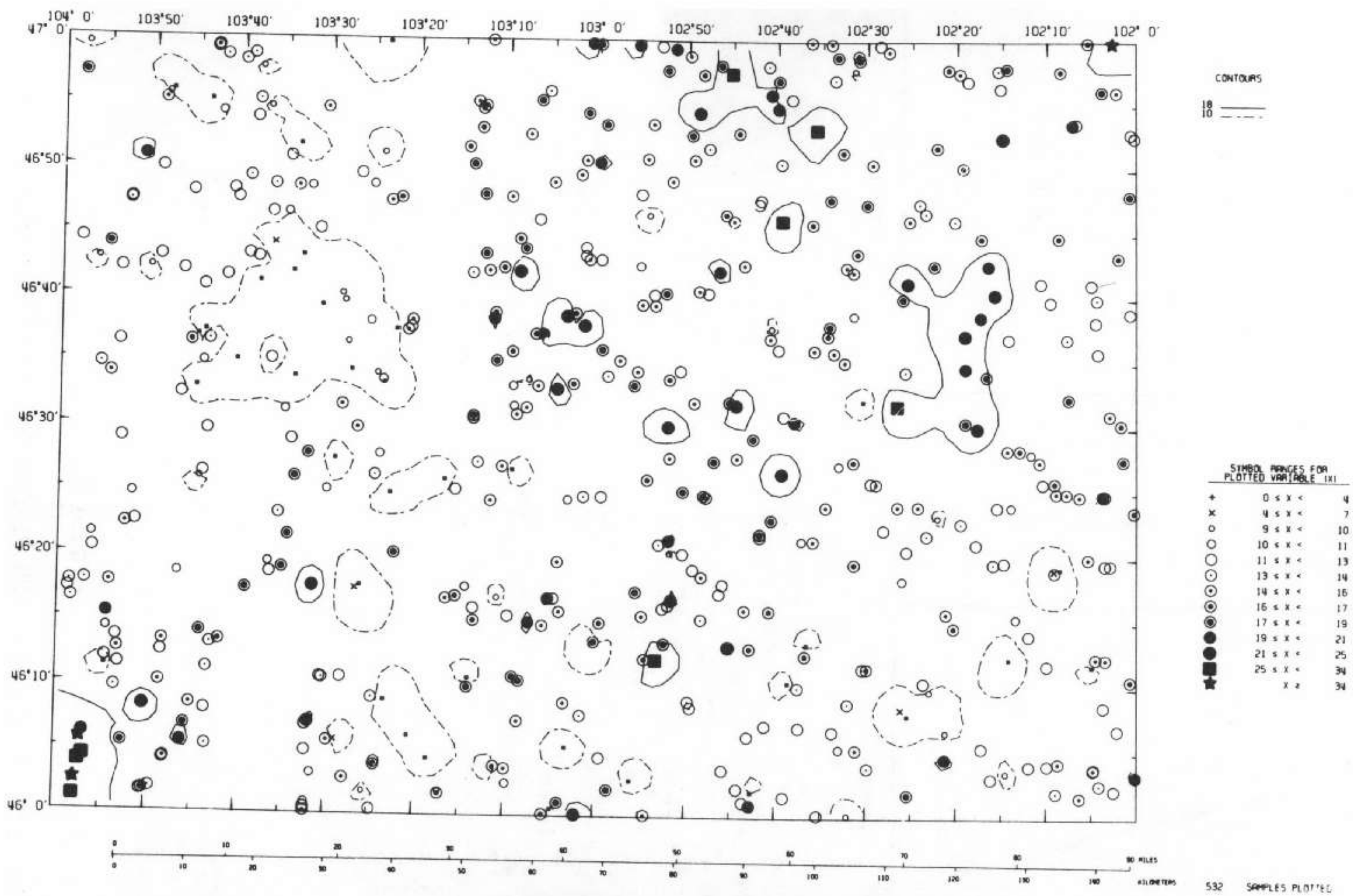


Figure B-7b

GEOCHEMICAL DISTRIBUTION OF COBALT (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

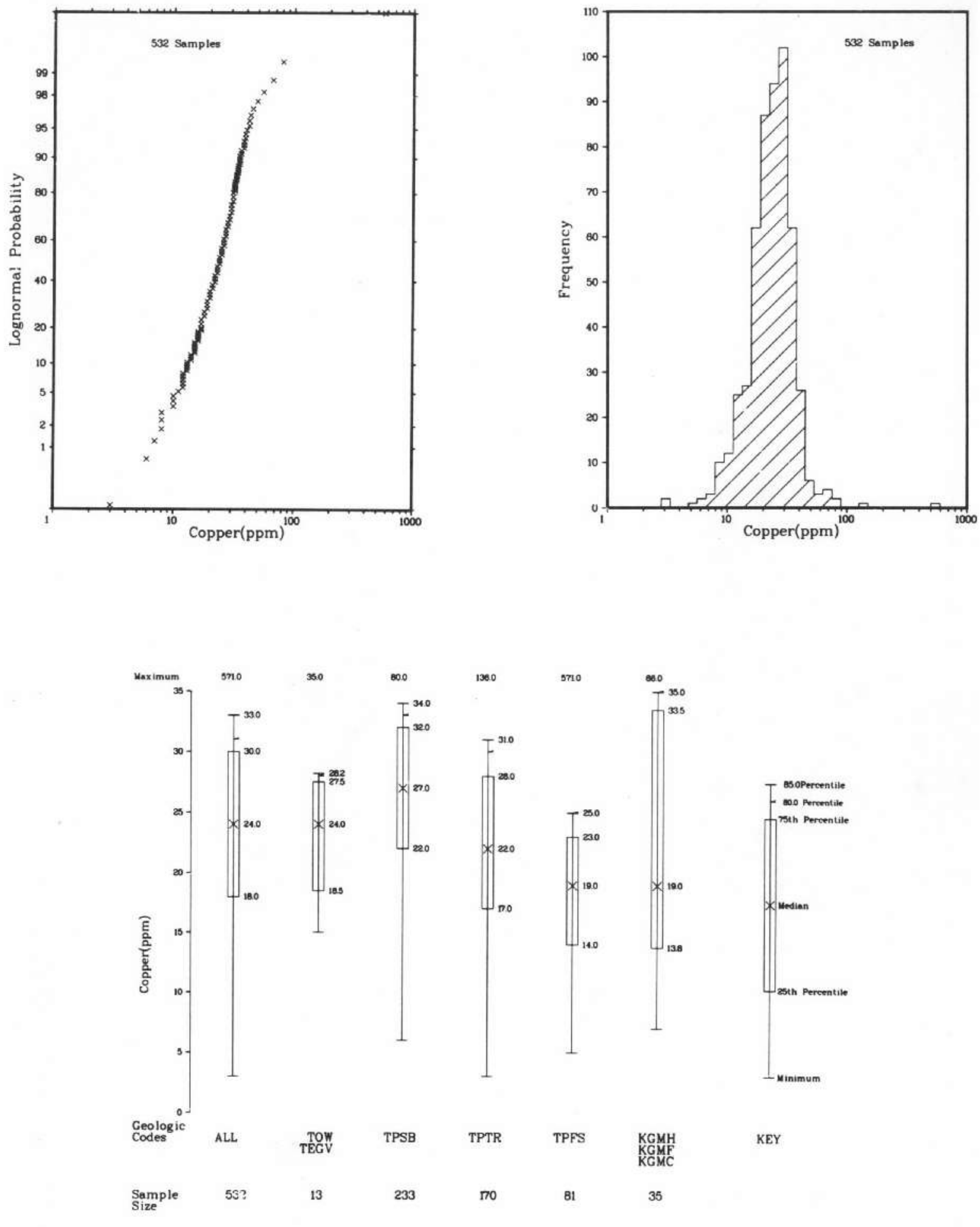


Figure B-8a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR COPPER (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

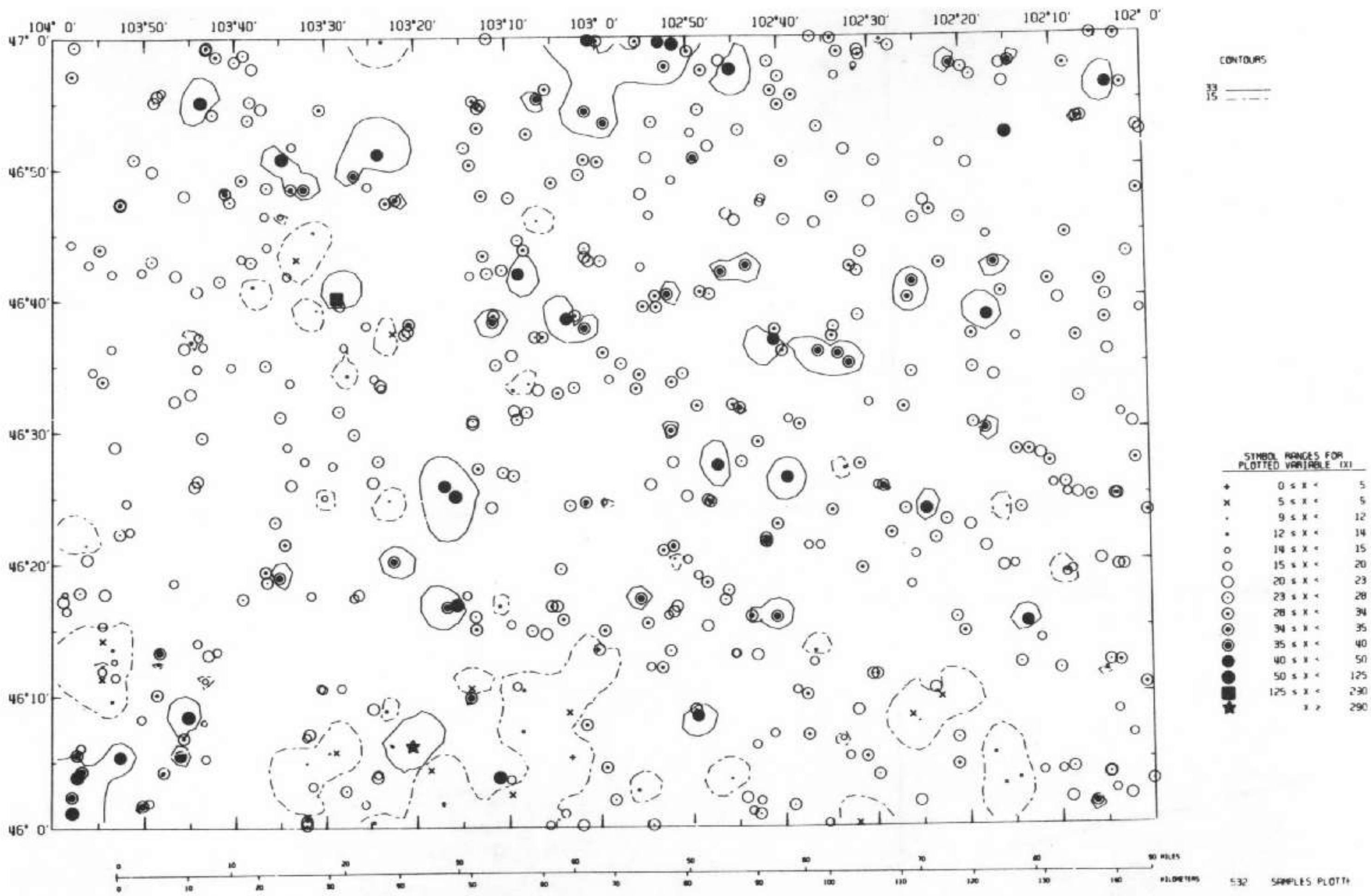
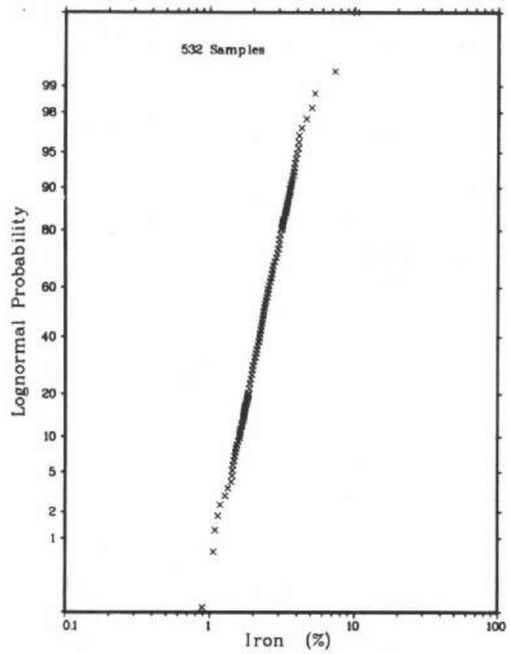
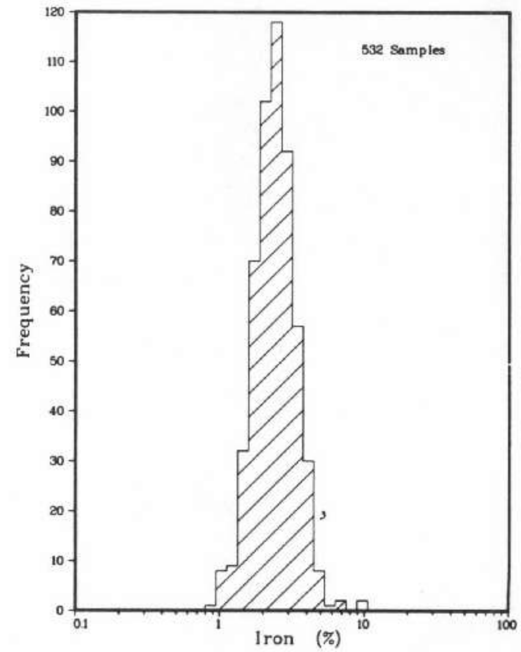


Figure B-8b

GEOCHEMICAL DISTRIBUTION OF COPPER (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE





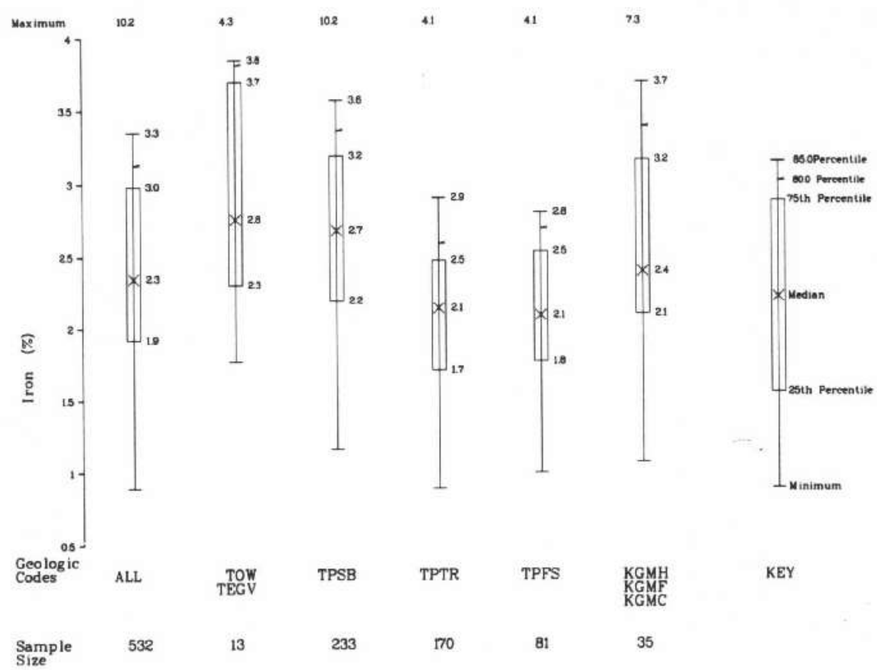


Figure B-9a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR IRON (%) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

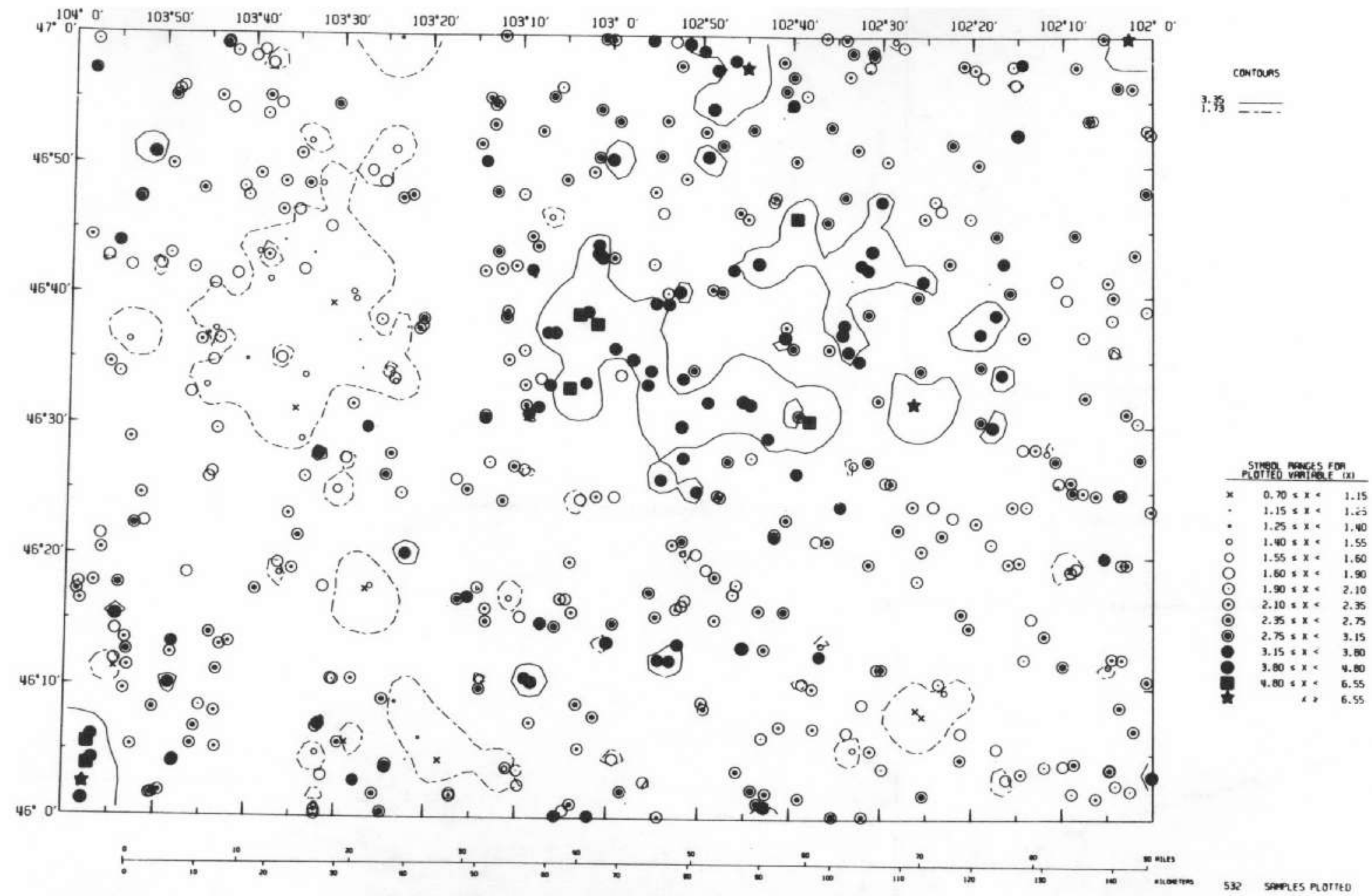


Figure B-9b

GEOCHEMICAL DISTRIBUTION OF IRON (%) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

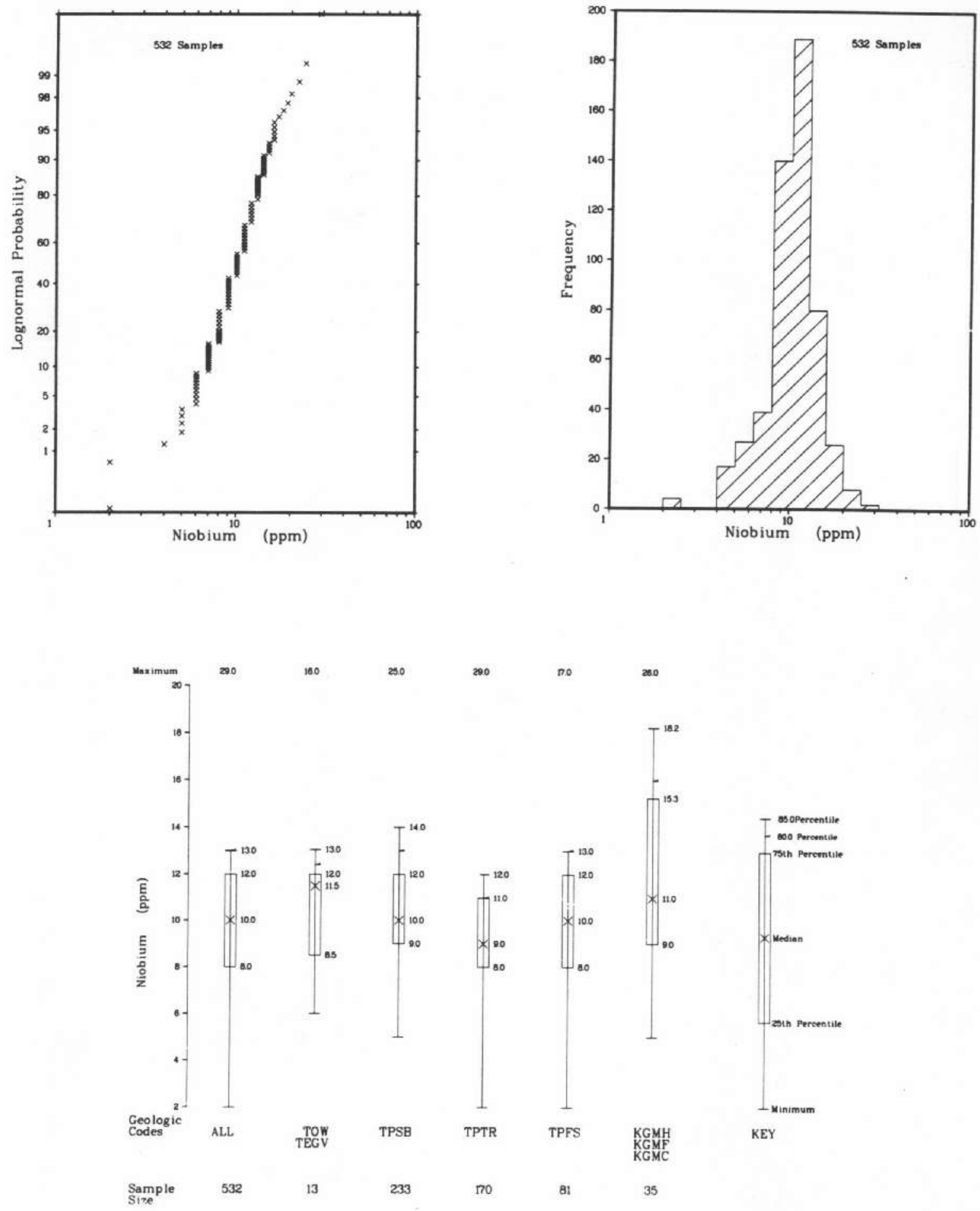


Figure B-10a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR NIOBIUM (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

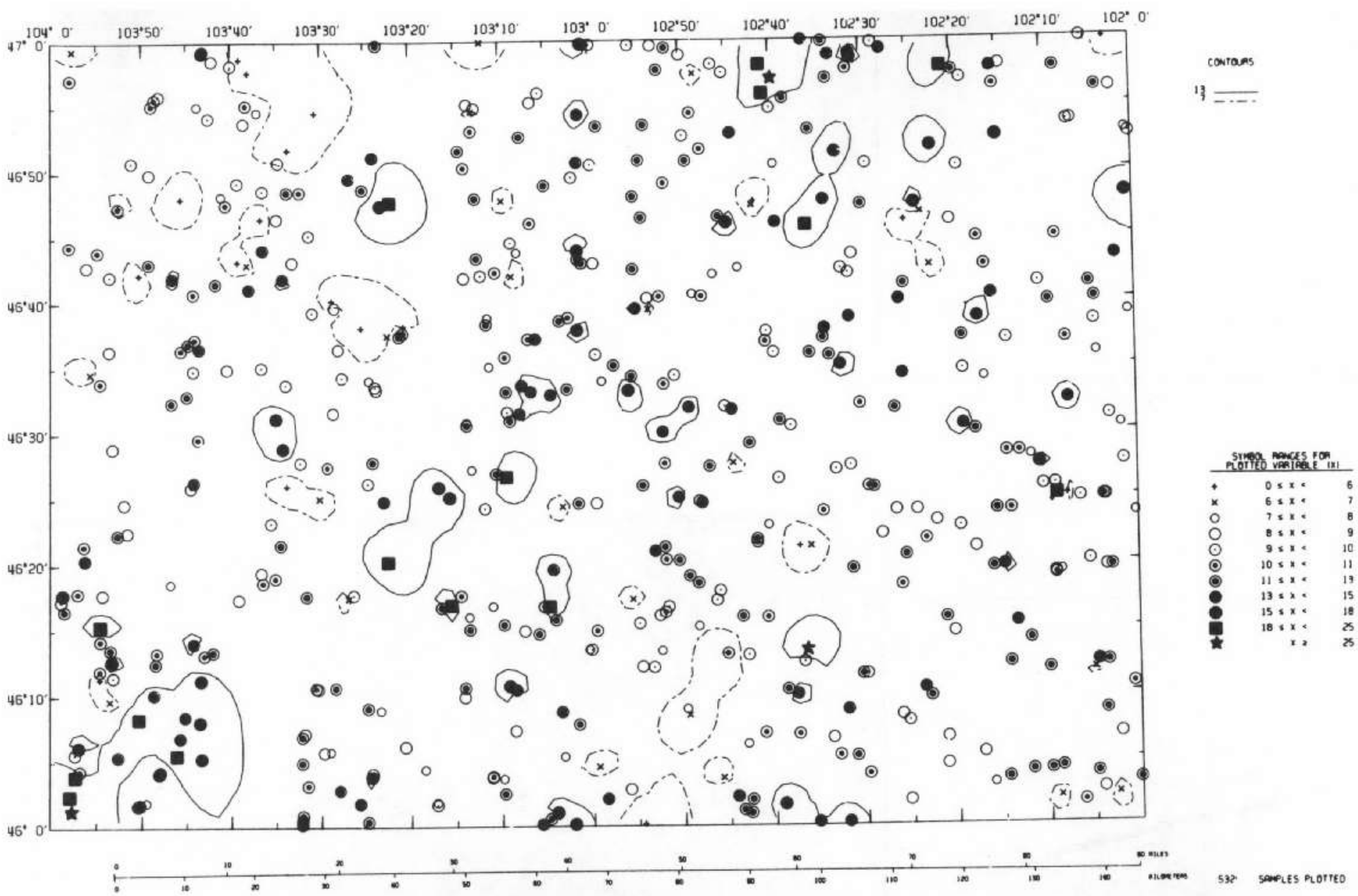


Figure B-10b

GEOCHEMICAL DISTRIBUTION OF NIOBIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

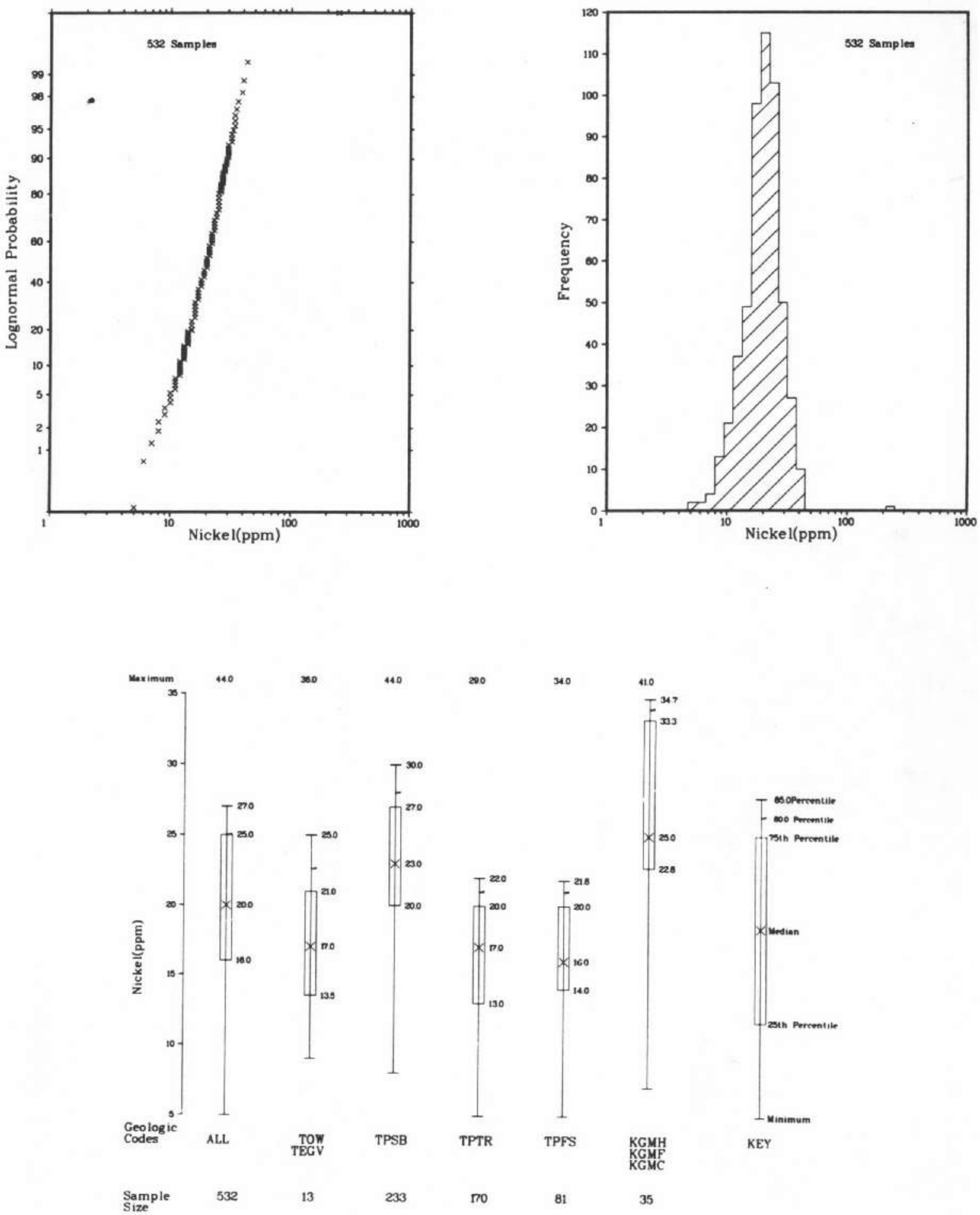


Figure B-11a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR NICKEL (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

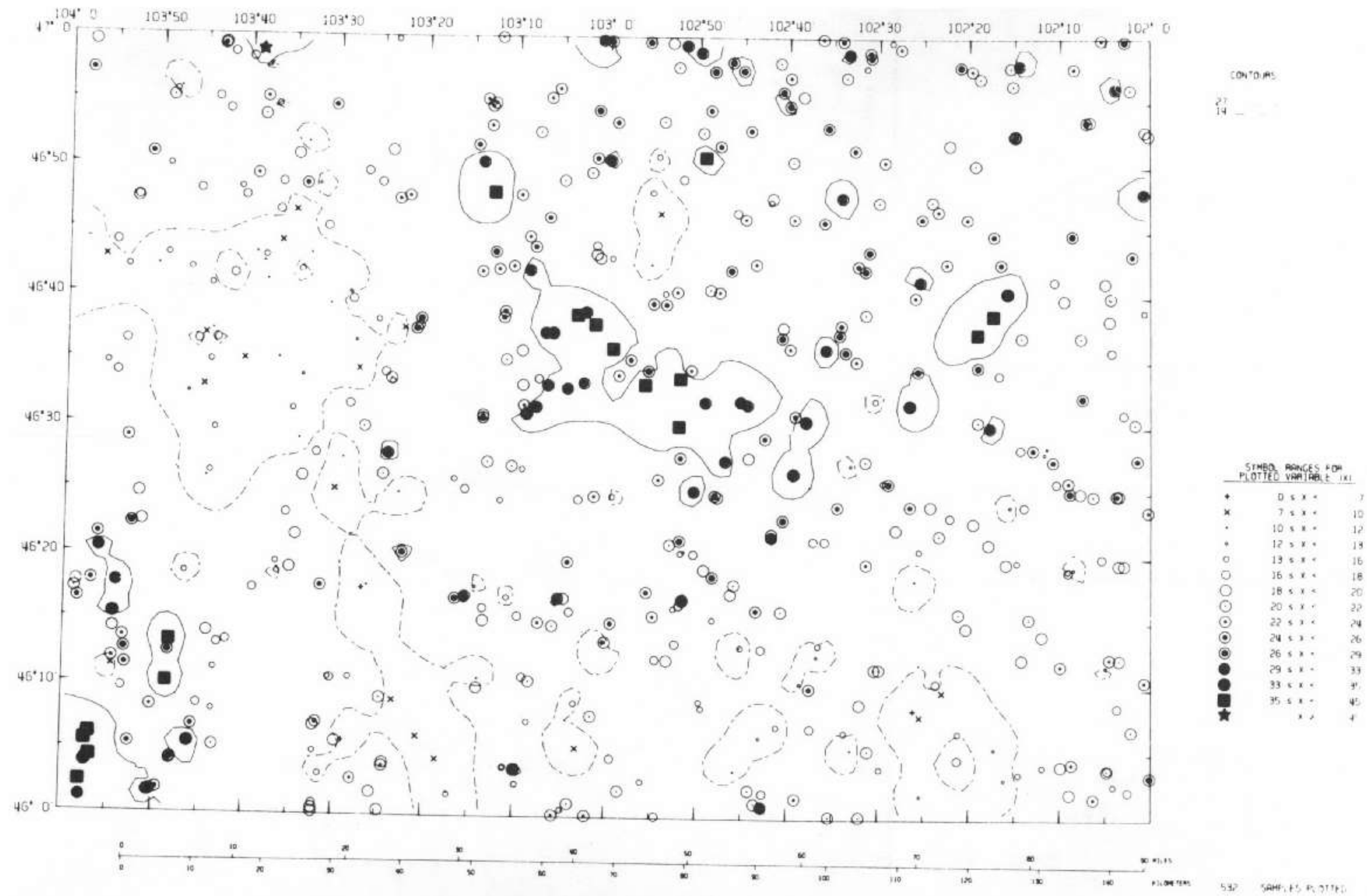


Figure B-11b

GEOCHEMICAL DISTRIBUTION OF NICKEL (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

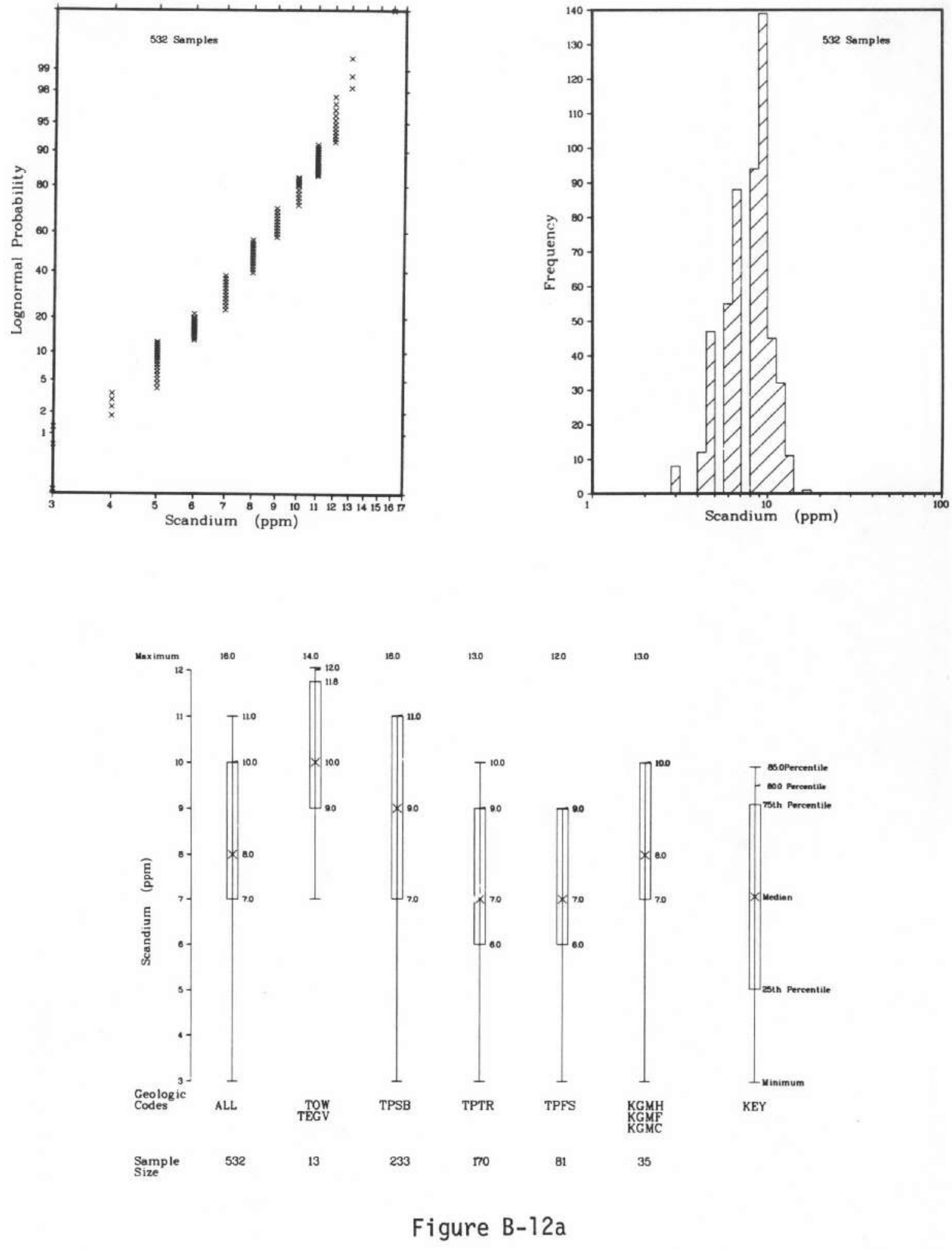


Figure B-12a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR SCANDIUM (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

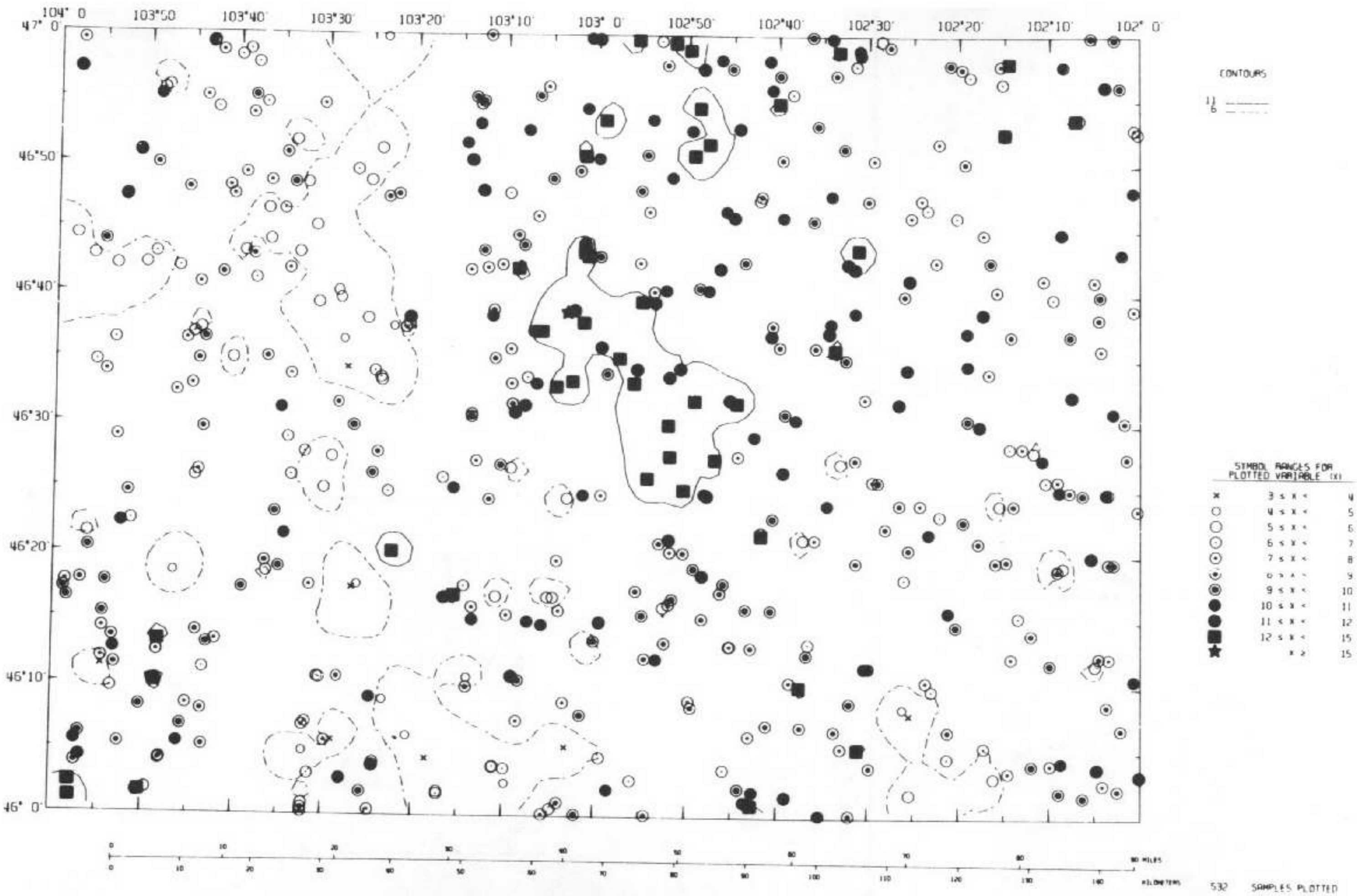
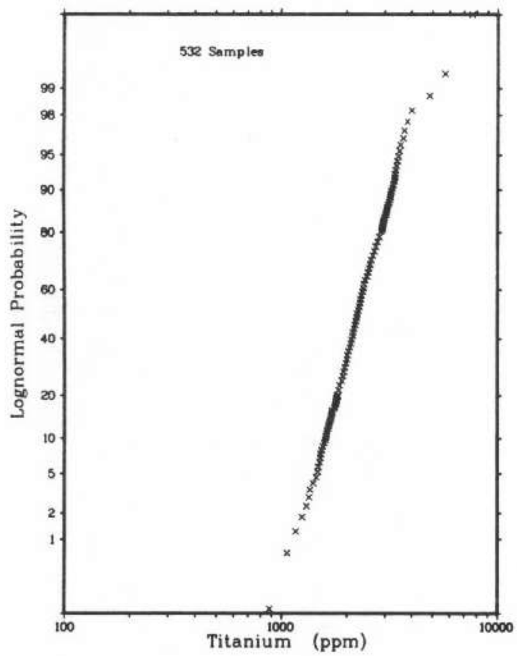
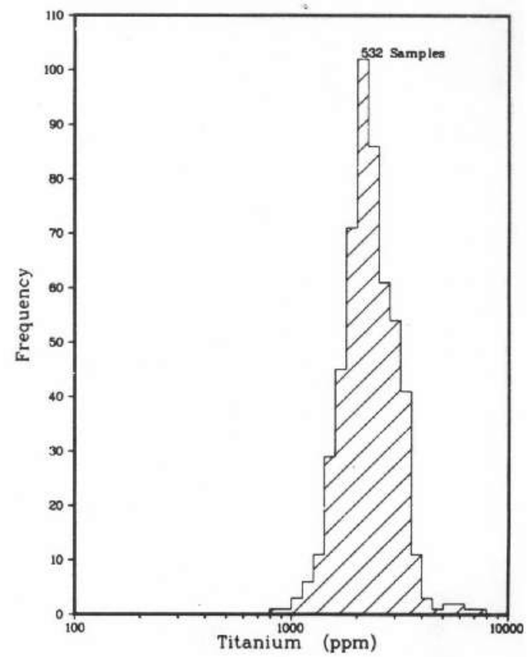


Figure B-12b

GEOCHEMICAL DISTRIBUTION OF SCANDIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE





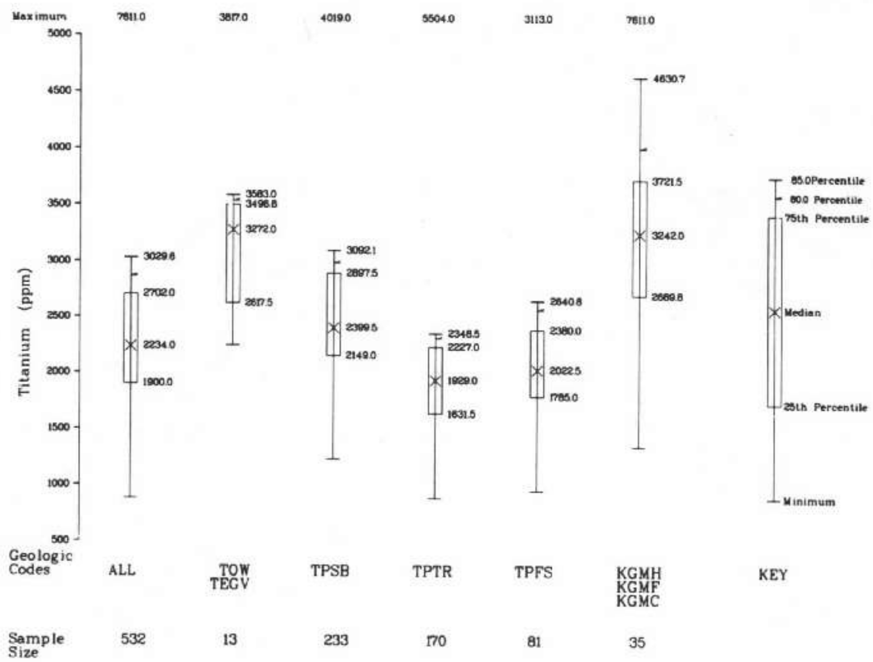


Figure B-13a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR TITANIUM (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

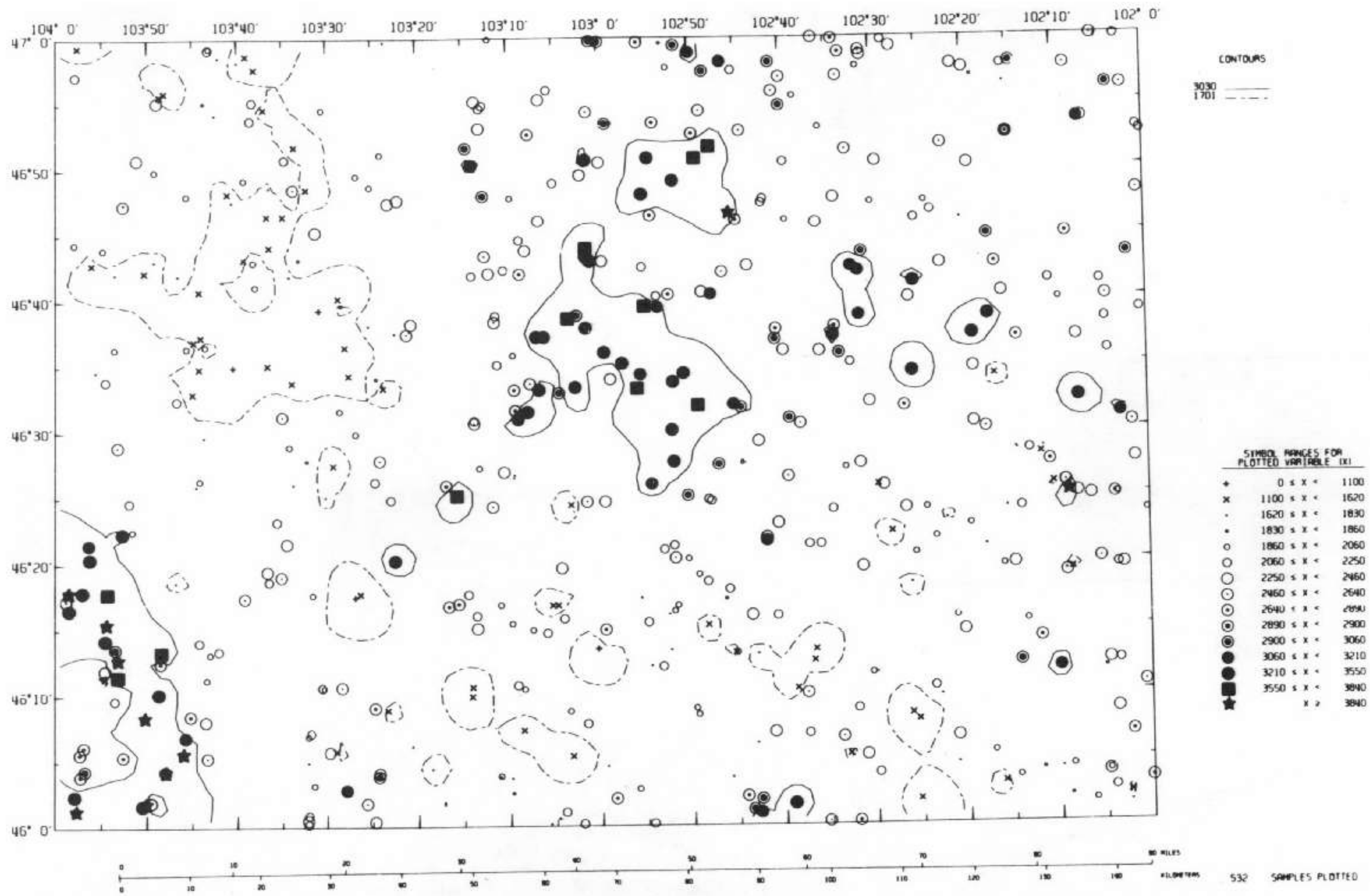


Figure B-13b

GEOCHEMICAL DISTRIBUTION OF TITANIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

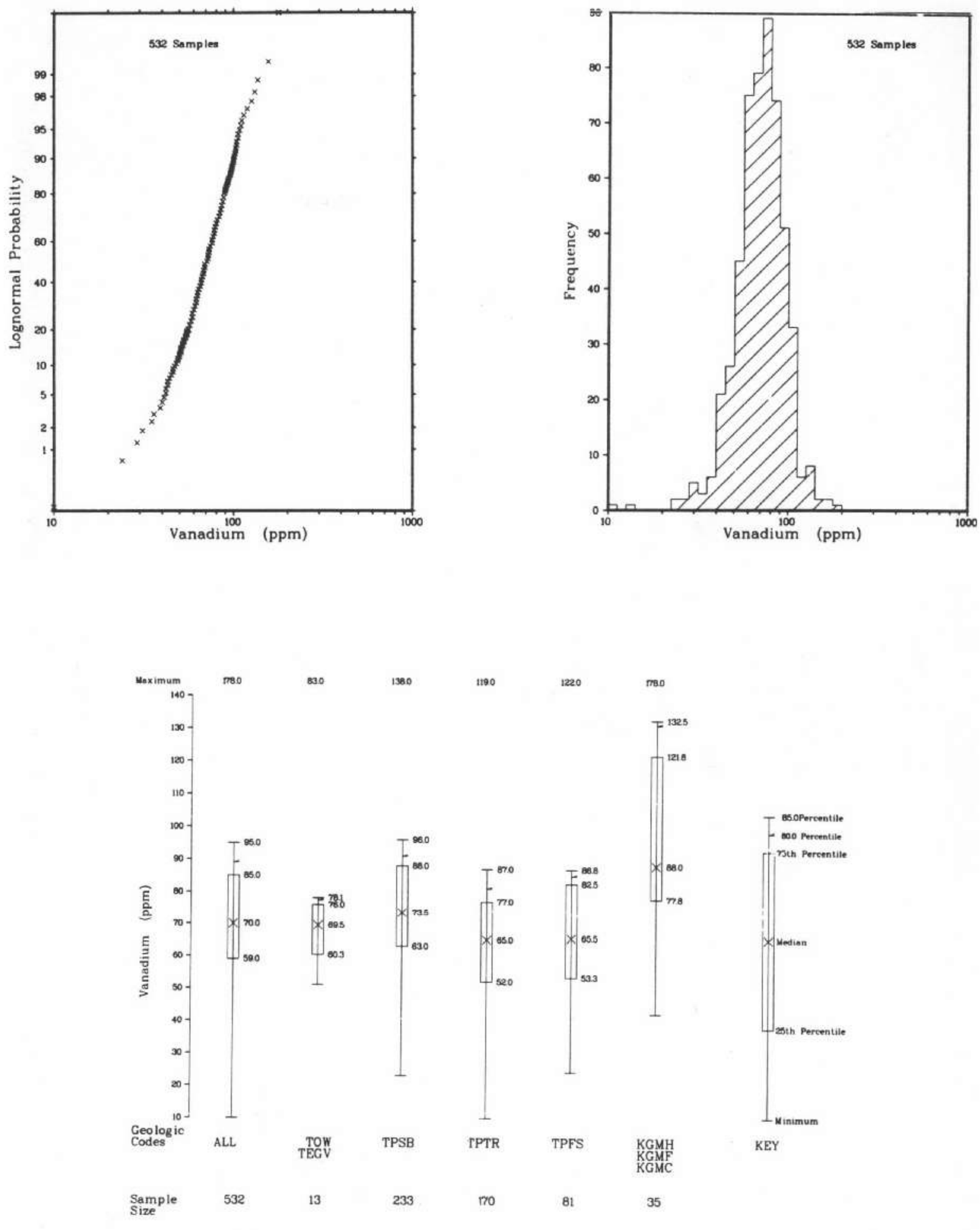


Figure B-14a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR VANADIUM (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

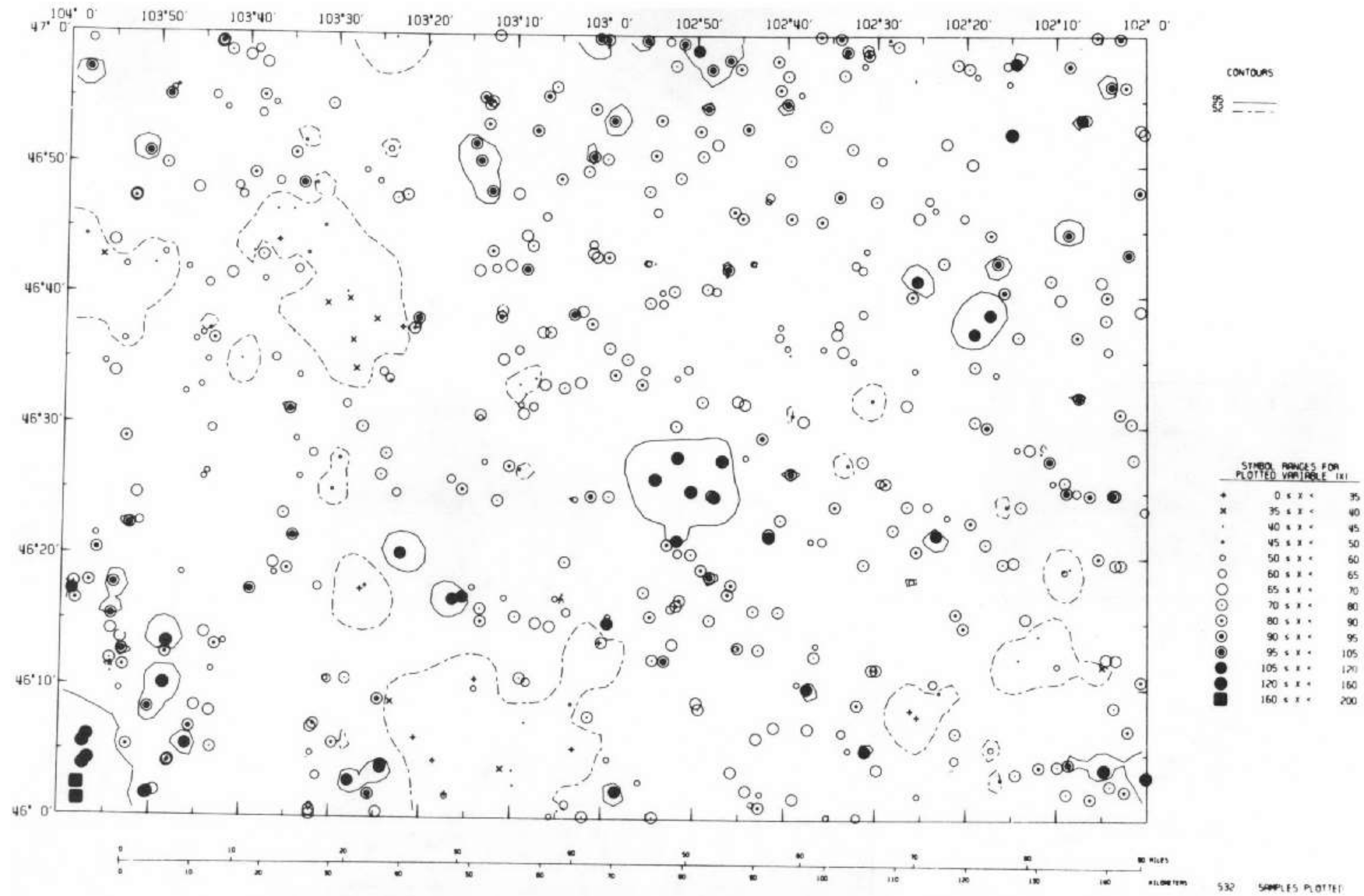


Figure B-14b

GEOCHEMICAL DISTRIBUTION OF VANADIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

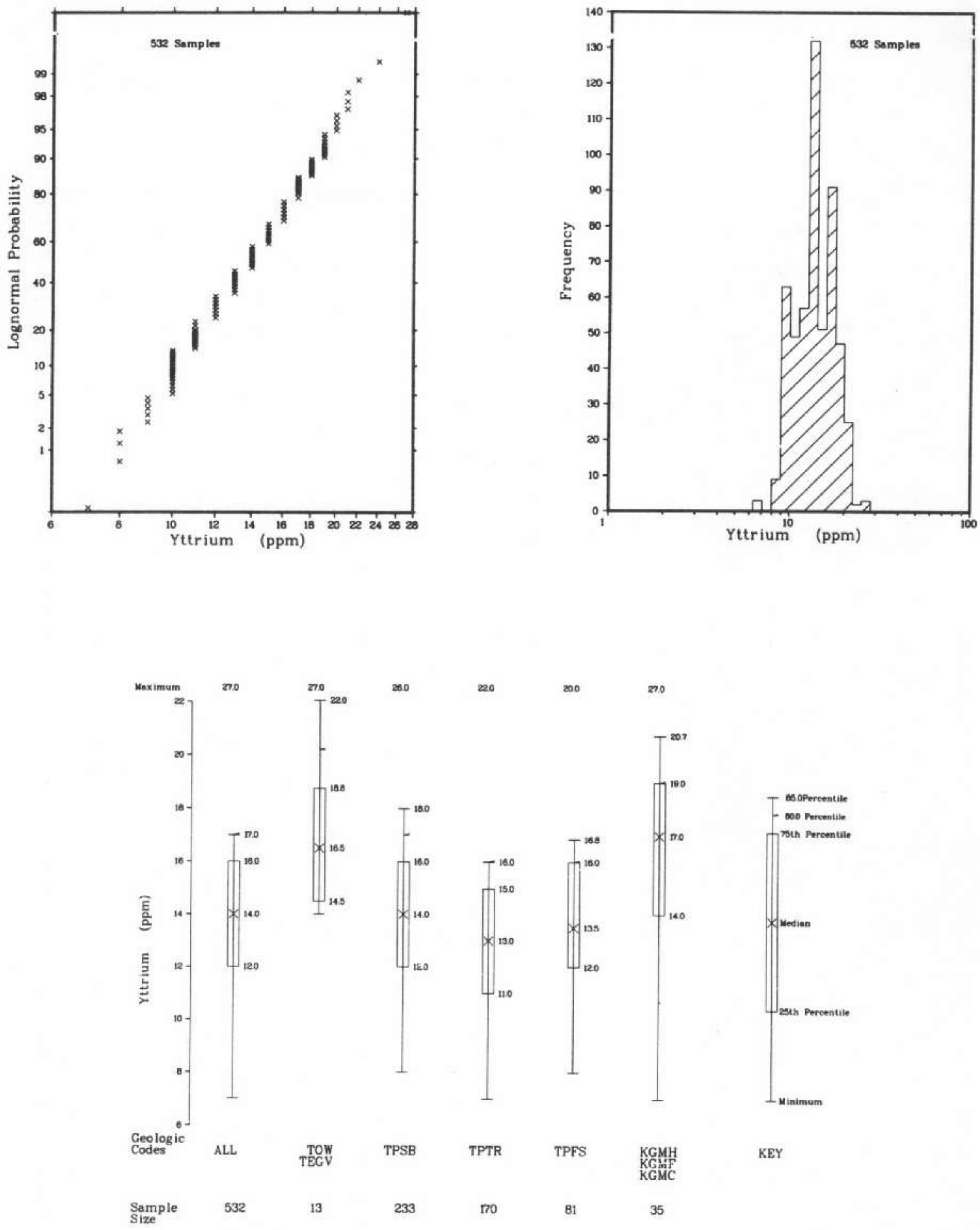


Figure B-15a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR YTTRIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

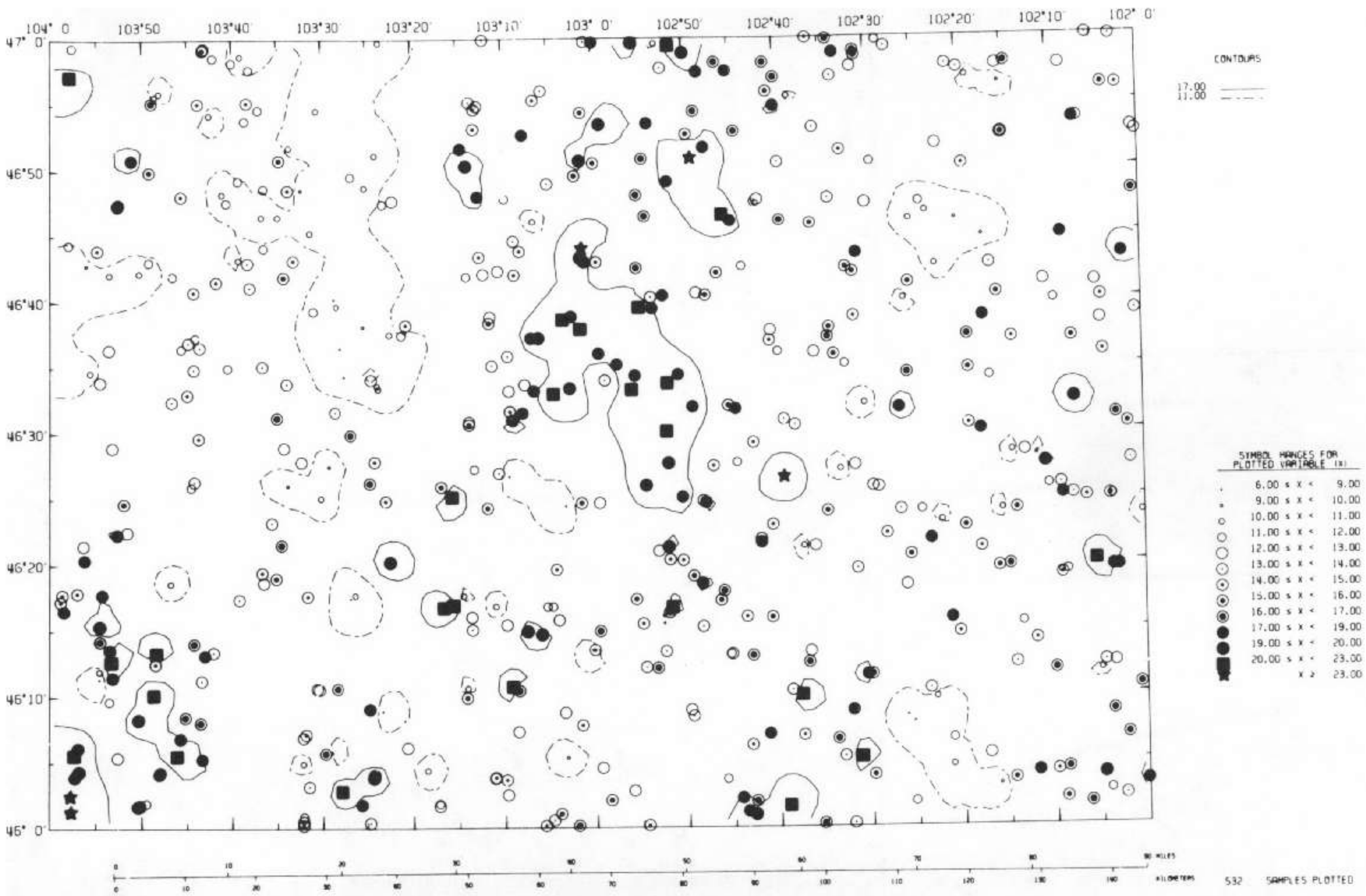
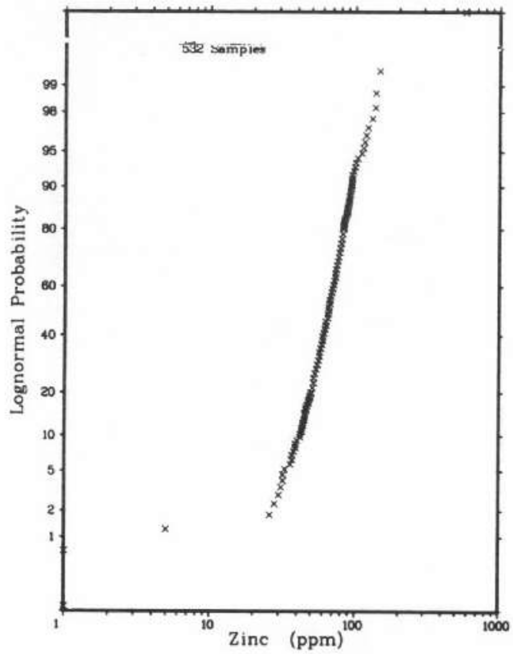
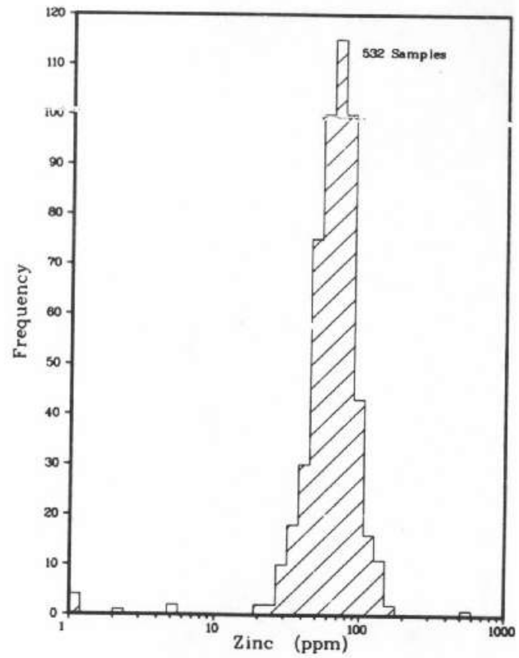


Figure B-15b

GEOCHEMICAL DISTRIBUTION OF YTTRIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE





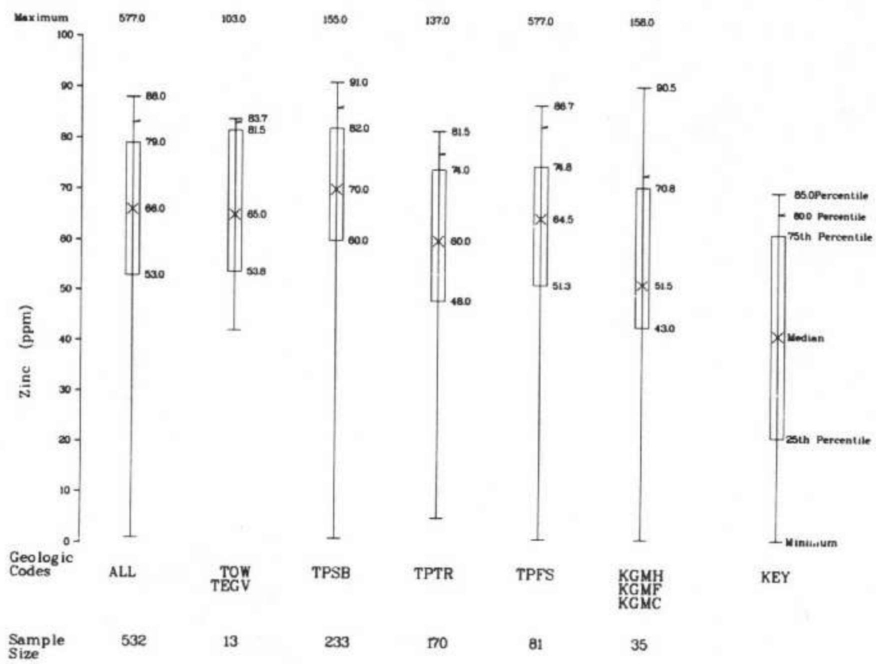


Figure B-16a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ZINC (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

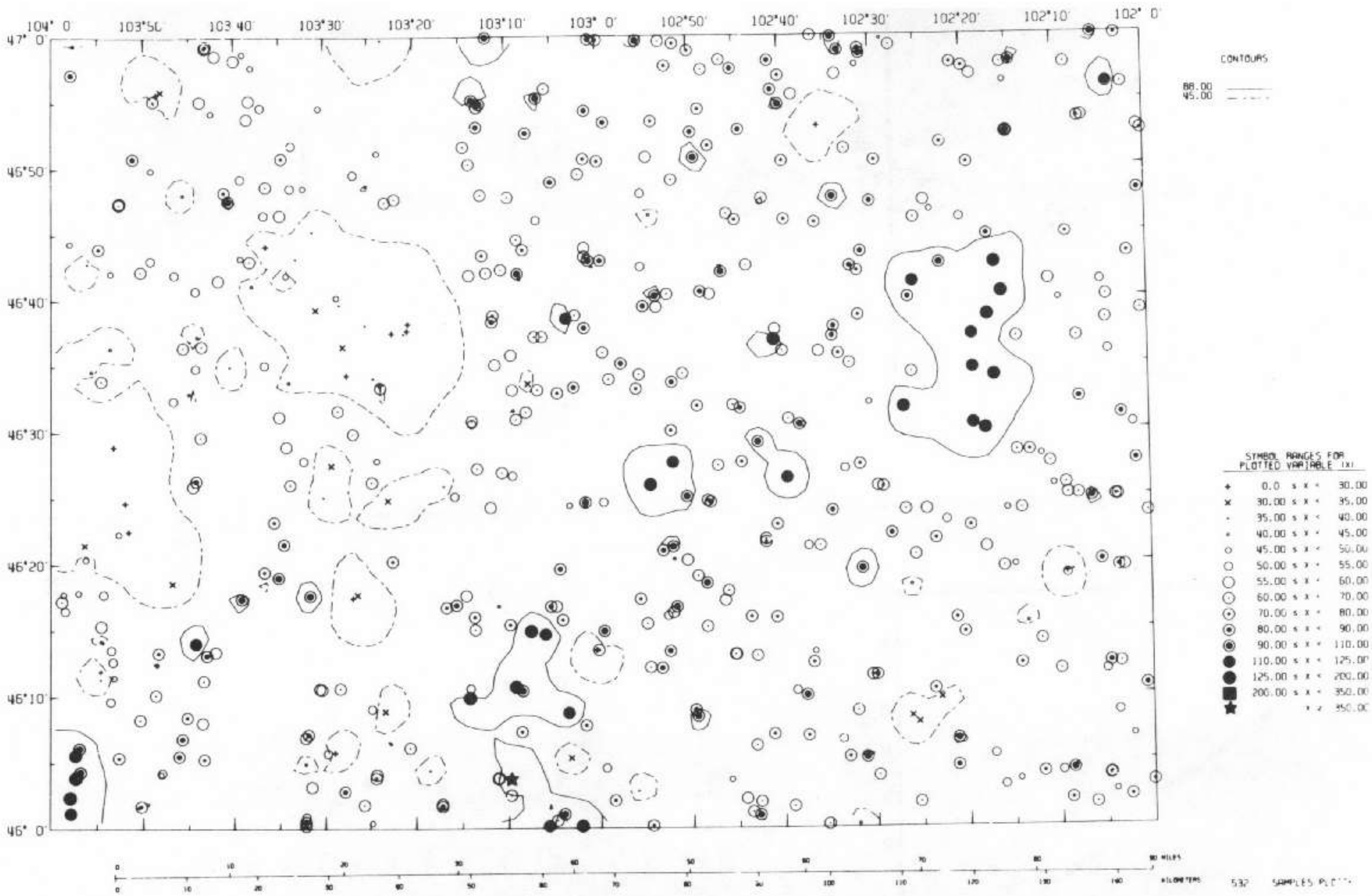


Figure B-16b

GEOCHEMICAL DISTRIBUTION OF ZINC (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

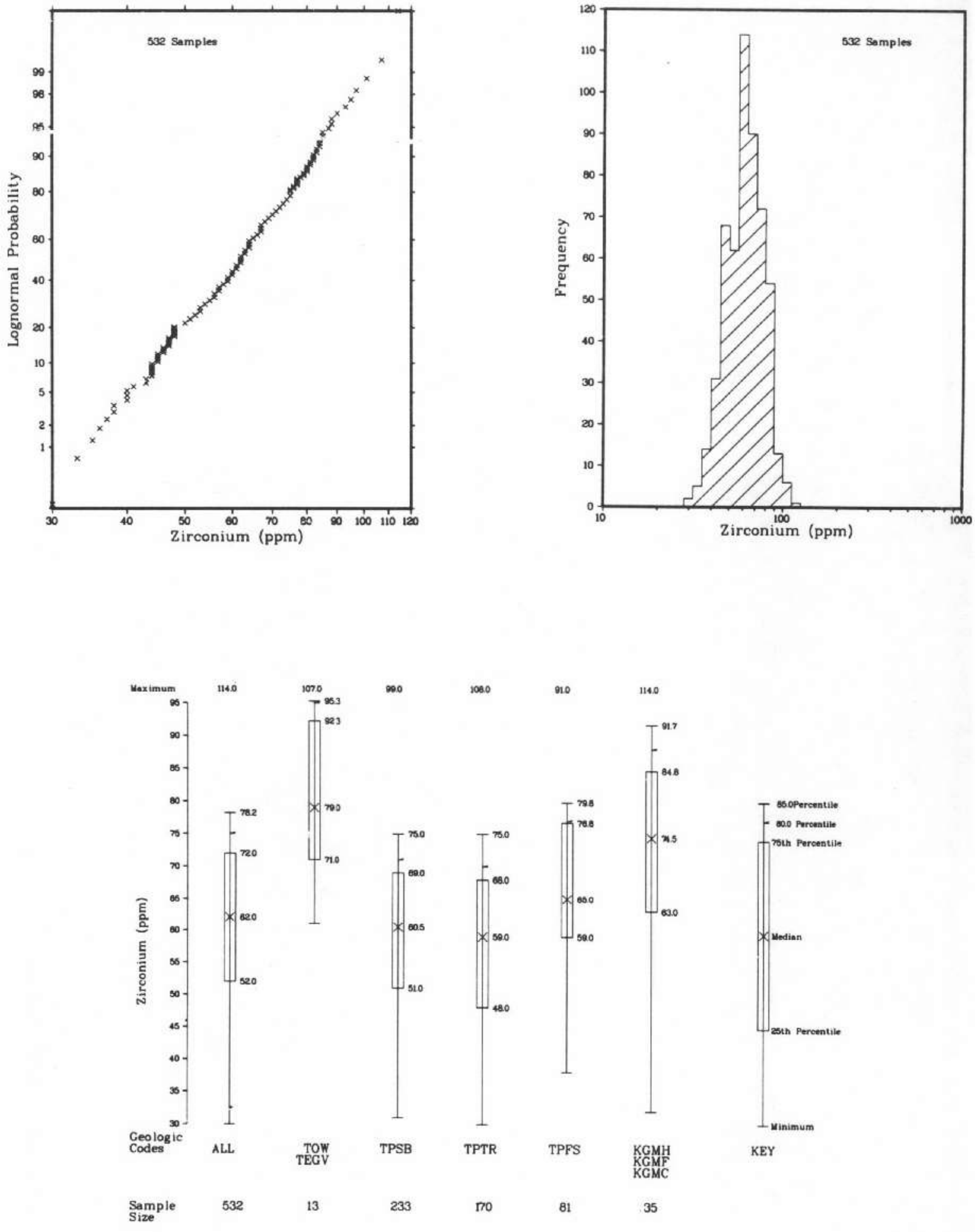


Figure B-17a

PROBABILITY, FREQUENCY, AND PERCENTILE PLOTS FOR ZIRCONIUM (PPM)
IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

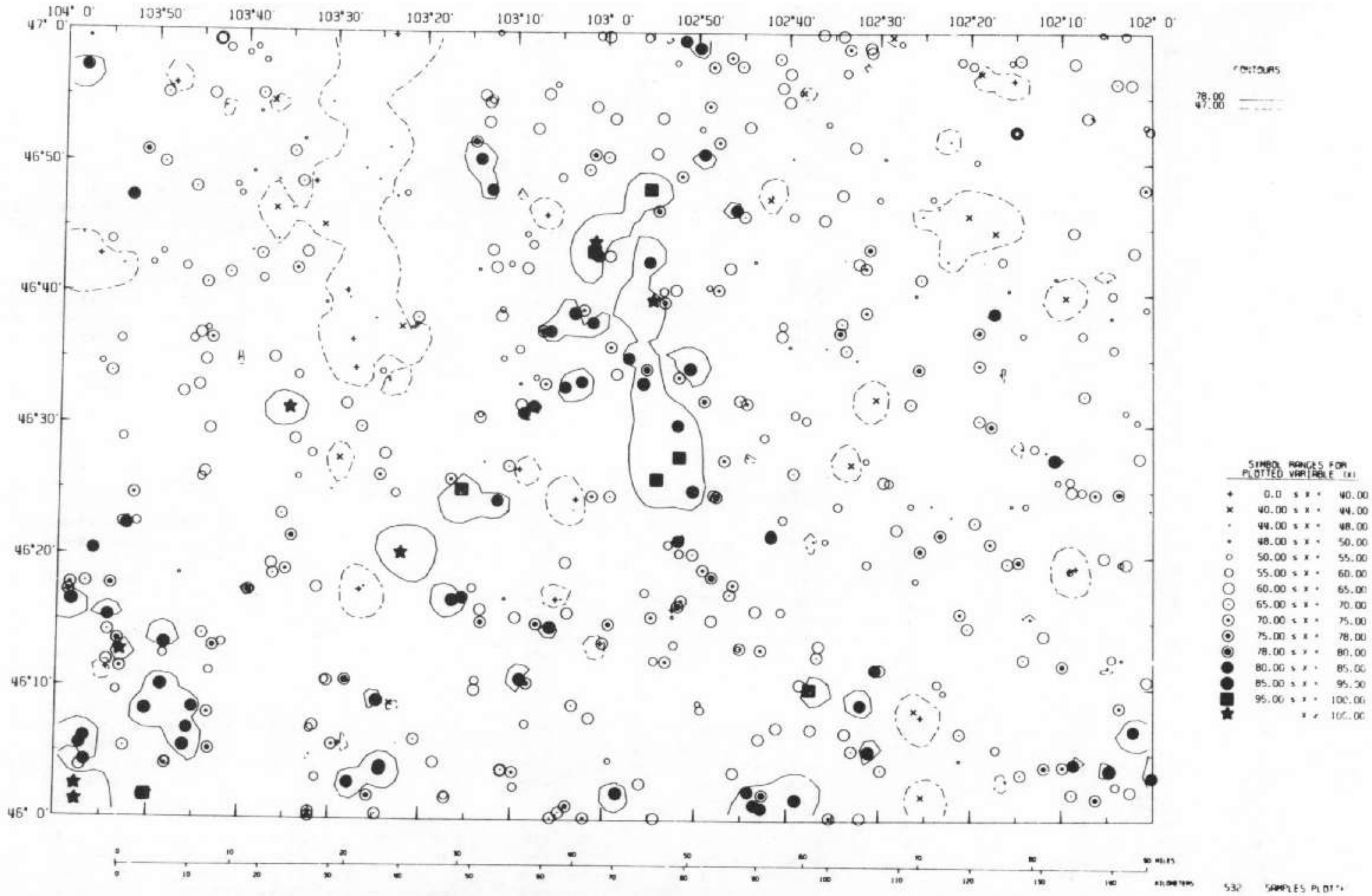


Figure B-17b

GEOCHEMICAL DISTRIBUTION OF ZIRCONIUM (PPM) IN STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

Table B-3

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

DR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500254	38-46.716	-103.637	-3-15-	2.7	2.5	4	4.8	3.1	12	27	2.1	15	8	61
500256	38-46.735	-103.607	-3-15-	1.8	2.1	8	1.8	5.4	6	17	1.2	8	5	27
500257	38-46.698	-103.570	-3-12-	1.9	3.0	15	3.6	4.7	8	16	1.7	15	7	48
500259	38-46.685	-103.633	-3-12-	2.0	2.4	7	4.1	2.9	8	12	1.5	11	6	41
500263	38-46.692	-103.695	-3-15-	2.3	2.6	7	2.6	3.4	11	23	1.9	16	8	55
500264	38-46.679	-103.737	-3-12-	2.4	2.7	9	3.2	3.3	11	20	1.7	14	7	52
500265	38-46.615	-103.747	-3-15-	1.8	2.4	9	2.5	2.8	8	12	1.3	8	6	36
500266	38-46.621	-103.734	-3-15-	2.3	2.5	4	4.0	3.6	8	15	1.4	10	5	42
500267	38-46.609	-103.726	-3-15-	2.3	2.7	6	3.2	2.1	13	19	2.1	16	9	64
500268	38-46.581	-103.737	-3-15-	2.2	2.9	10	2.4	3.4	10	19	1.7	13	8	52
500270	38-46.583	-103.674	-3-12-	2.4	2.8	8	1.3	7.7	7	15	1.3	9	5	39
500271	38-46.585	-103.610	-3-12-	2.0	2.5	4	2.4	4.5	11	23	1.6	11	8	52
500274	38-46.549	-103.749	-3-15-	3.3	2.9	8	3.6	2.9	8	20	1.4	9	7	44
500275	38-46.520	-103.583	-3-15-	2.9	3.5	12	2.8	1.3	10	24	1.1	14	10	38
500276	38-46.563	-103.565	-3-15-	1.8	2.5	4	2.6	4.8	8	19	1.5	12	7	43
500278	38-46.655	-103.515	-3-15-	1.9	1.4	7	3.7	4.3	7	10	1.1	11	5	30
500280	38-46.719	-103.552	-3-15-	2.5	3.2	7	3.9	3.4	7	8	1.1	11	5	35
500303	38-46.861	-102.795	-3-15-	1.4	2.1	6	2.7	1.2	13	20	3.0	25	12	77
500304	38-46.846	-102.822	-3-15-	5.5	5.7	11	6.5	0.19	15	35	4.3	36	13	100
500305	38-46.533	-102.755	-3-15-	2.3	2.7	7	5.9	2.2	17	29	4.3	32	11	63
500307	38-46.532	-102.820	-3-15-	3.2	3.3	12	5.2	0.64	15	29	3.8	32	13	73
500309	38-46.501	-102.868	-3-15-	2.2	3.1	10	6.0	1.5	22	34	4.3	44	13	75
500311	38-46.554	-102.931	-3-15-	3.1	3.3	14	5.6	0.54	18	32	3.8	35	12	76
500313	38-46.566	-102.980	-3-12-	1.8	2.4	5	3.6	1.6	13	18	1.9	23	9	61
500314	38-46.572	-102.925	-3-12-	1.8	2.5	6	4.7	1.0	14	28	3.4	26	11	65
500315	38-46.600	-102.991	-3-12-	2.1	2.7	10	6.9	1.0	18	29	3.7	36	11	63
500317	38-46.586	-102.958	-3-15-	2.6	3.1	11	4.7	0.33	14	26	4.0	24	12	83
500319	38-46.562	-102.866	-3-12-	4.1	4.2	5	4.9	1.5	16	29	3.2	44	11	88
500320	38-46.573	-102.846	-3-15-	2.8	3.0	12	4.3	0.36	12	24	2.9	22	11	60
500328	38-46.658	-102.917	-3-15-	3.7	4.1	11	4.0	0.37	14	32	3.8	25	14	83
500329	38-46.657	-102.893	-3-15-	3.5	4.0	6	4.5	0.93	14	28	2.3	25	11	56
500330	38-46.671	-102.895	-3-15-	2.4	2.7	6	2.7	0.46	12	30	2.0	15	7	110
500333	38-46.673	-102.873	-3-15-	3.4	3.7	9	16.	3.5	17	38	3.9	23	10	60
500334	38-46.676	-102.812	-3-15-	1.8	2.2	3	3.3	0.82	15	30	2.5	20	9	83
500335	38-46.673	-102.795	-3-12-	3.3	2.8	4	3.7	0.34	12	23	2.8	22	10	56
500338	38-46.701	-102.774	-3-15-	2.4	2.8	9	6.1	1.2	20	35	3.4	26	11	90
500339	38-46.708	-102.921	-3-15-	2.0	2.3	7	2.4	1.1	10	18	1.9	10	7	53
500340	38-46.716	-102.994	-3-15-	4.1	4.9	6	3.7	0.34	12	24	2.6	15	9	83
500347	38-46.254	-102.805	-3-12-	1.8	2.1	3	4.5	3.2	13	20	2.2	14	8	61
500348	38-46.272	-102.866	-3-15-	2.5	2.3	9	3.4	0.62	13	22	1.9	17	8	65
500349	38-46.279	-102.860	-3-15-	3.5	3.6	4	5.9	0.93	22	27	2.0	34	9	93
500350	38-46.004	-102.534	-3-12-	2.9	2.2	5	3.5	2.8	9	8	2.4	21	8	40
500351	38-46.004	-102.589	-3-12-	2.6	2.2	7	4.0	1.3	11	17	3.0	20	10	62
500352	38-46.016	-102.713	-3-12-	7.9	7.1	11	8.5	0.63	20	24	4.1	30	12	95
500353	38-46.020	-102.726	-3-12-	3.8	3.1	8	5.3	0.45	12	17	3.1	20	10	65
500354	38-46.037	-102.737	-3-12-	3.8	3.3	10	5.6	0.21	11	20	2.9	21	9	59
500355	38-46.033	-102.711	-3-12-	4.3	3.8	8	3.4	0.40	8	17	2.5	16	10	66
500357	38-46.027	-102.651	-3-15-	3.5	3.0	11	5.1	0.27	11	26	2.7	23	11	62
500360	38-46.104	-102.718	-3-12-	6.8	7.4	7	3.9	0.81	11	17	2.0	12	7	66
500361	38-46.118	-102.686	-3-12-	4.5	4.8	8	4.2	0.98	11	17	2.3	13	8	70
500362	38-46.116	-102.624	-3-15-	2.7	2.8	5	8.2	0.78	11	30	2.1	17	8	70
500363	38-46.111	-102.562	-3-15-	2.4	2.6	4	3.8	0.33	11	14	1.8	14	8	52
500369	38-46.089	-102.550	-3-15-	1.8	2.3	9	2.0	0.32	10	16	1.4	10	7	72
500370	38-46.088	-102.519	-3-15-	3.2	3.4	10	4.2	0.43	14	31	2.2	20	12	91
500371	38-46.147	-102.534	-3-15-	2.2	3.2	10	3.3	0.35	13	22	1.9	18	9	67

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500375	38-46.192	-102.507	-3-15-	2.2	2.7	9	3.4	0.36	13	27	2.1	20	10	74
500376	38-46.167	-102.626	-3-15-	4.6	5.0	12	4.1	0.43	13	33	2.2	24	12	90
500378	38-46.173	-102.644	-3-12-	2.8	2.3	6	1.7	3.7	8	17	1.6	12	7	54
500380	38-46.217	-102.715	-3- -	2.4	2.9	10	6.0	1.4	16	22	2.5	17	8	63
500382	38-46.208	-102.613	-3-12-	2.0	2.3	8	12.	1.3	16	19	3.5	12	9	72
500383	38-46.222	-102.610	-3-12-	2.2	2.4	5	2.3	1.4	8	12	1.5	14	6	46
500385	38-46.287	-102.772	-3-15-	2.9	3.0	7	4.2	1.5	12	24	1.9	18	8	58
500386	38-46.299	-102.766	-3-12-	2.4	2.8	7	3.0	0.64	11	24	2.0	20	9	67
500389	38-46.309	-102.805	-3-12-	2.6	3.4	7	4.5	0.59	15	31	2.4	28	11	90
500390	38-46.318	-102.821	-3-15-	1.9	2.2	10	2.8	0.39	12	19	1.9	18	9	66
500392	38-46.339	-102.864	-3-15-	1.8	2.4	5	2.2	0.72	9	10	1.5	13	7	43
500393	38-46.338	-102.840	-3-15-	1.7	2.3	6	2.5	0.72	11	17	1.8	16	8	57
500395	38-46.355	-102.866	-3-15-	2.4	2.8	7	7.2	1.1	20	34	3.1	27	11	97
500398	38-46.411	-102.797	-3-15-	2.4	2.6	7	5.6	0.84	15	34	2.6	22	11	82
500399	38-46.413	-102.802	-3-12-	2.0	2.5	9	4.7	2.0	17	28	2.5	26	10	73
500401	38-46.529	-102.742	-3-12-	3.2	3.2	7	8.3	0.59	21	34	4.6	32	12	86
500404	38-46.515	-102.654	-3-12-	1.7	2.2	6	3.2	0.85	12	18	2.9	25	9	67
500405	38-46.508	-102.634	-3-12-	5.0	4.5	7	3.3	1.1	19	30	5.1	33	10	90
500408	38-46.535	-102.507	-3-12-	7.6	6.6	2	3.9	0.38	8	17	2.5	13	7	45
500410	38-46.585	-102.542	-3-12-	2.5	2.7	4	4.7	1.3	14	35	3.2	23	9	65
500411	38-46.597	-102.562	-3-12-	3.3	3.2	7	3.9	0.95	15	38	3.5	27	12	79
500412	38-46.600	-102.598	-3-15-	7.4	8.2	4	6.7	0.97	15	36	2.7	29	8	57
500413	38-46.601	-102.664	-3-15-	3.0	3.6	6	5.3	0.27	12	32	3.0	22	8	66
500414	38-46.615	-102.679	-3-12-	4.5	4.3	10	2.8	0.68	14	42	3.8	26	11	160
500416	38-46.628	-102.677	-3-12-	4.5	5.4	8	6.6	0.17	9	29	2.2	19	8	57
500417	38-46.619	-102.573	-3-15-	3.4	3.9	6	5.7	0.31	16	30	3.9	27	11	81
500420	38-46.631	-102.570	-3-15-	18.	24.	7	6.0	0.60	18	26	3.6	25	10	81
500421	38-46.645	-102.525	-3-15-	4.7	5.0	8	3.2	0.24	10	26	2.9	21	10	77
500423	38-46.701	-102.526	-3-12-	2.0	2.6	8	4.7	0.78	14	27	3.4	27	11	72
500424	38-46.707	-102.539	-3-12-	2.2	2.6	3	4.5	0.91	15	28	3.6	25	11	81
500425	38-46.725	-102.519	-3-12-	3.1	2.8	3	4.8	1.2	16	26	4.1	26	12	35
500431	38-46.709	-102.728	-3-12-	2.9	3.3	<2	8.2	0.48	15	35	3.9	23	9	60
500433	38-46.687	-102.425	-3-12-	1.8	2.6	8	4.7	1.8	21	35	3.8	30	11	120
500434	38-46.667	-102.434	-3-12-	2.4	3.1	5	6.3	0.57	17	34	3.0	22	8	88
500436	38-46.710	-102.376	-3-12-	1.9	2.3	3	5.8	1.7	17	30	2.7	22	7	94
500439	38-46.746	-102.289	-3-12-	1.8	2.5	2	5.5	2.1	16	18	2.9	24	7	82
500441	38-46.710	-102.276	-3-12-	2.6	3.0	5	7.0	0.97	20	36	3.3	25	9	140
500443	38-46.673	-102.264	-3-15-	5.7	5.5	6	7.6	1.6	22	31	2.8	34	7	140
500446	38-46.644	-102.290	-3-12-	2.1	2.8	9	7.4	1.6	19	40	3.8	35	11	150
500448	38-46.620	-102.319	-3-15-	2.8	2.9	11	8.4	2.9	24	32	3.6	39	10	120
500449	38-46.578	-102.318	-3-12-	2.0	3.2	8	5.0	0.57	19	27	3.1	26	10	120
500452	38-46.568	-102.279	-3-12-	1.9	2.7	9	3.4	2.0	18	20	3.5	17	7	140
500454	38-46.508	-102.318	-3-12-	1.9	2.6	9	4.0	0.70	18	24	3.0	21	9	110
500455	38-46.501	-102.296	-3-12-	1.8	2.7	9	7.7	1.0	23	37	4.0	32	11	140
500459	38-46.529	-102.444	-3-12-	3.5	3.3	11	12.	0.77	28	28	7.4	34	11	130
500461	38-46.573	-102.429	-3-12-	2.8	2.8	9	3.5	0.47	13	25	3.0	27	11	65
500467	38-46.235	-102.200	-3-12-	2.5	2.4	7	2.7	0.30	11	18	2.5	18	8	60
500469	38-46.205	-102.237	-3-12-	4.9	4.3	8	2.3	0.31	8	23	2.1	19	7	76
500471	38-46.197	-102.166	-3-12-	2.8	2.8	10	2.7	0.40	12	23	3.1	23	9	69
500474	38-46.196	-102.083	-3-12-	2.4	2.9	2	1.9	2.0	8	13	1.5	12	5	50
500475	38-46.206	-102.076	-3-12-	9.9	11.	6	3.7	0.74	14	20	2.3	22	8	86
500476	38-46.205	-102.058	-3-12-	2.7	3.0	4	4.9	0.40	14	31	2.1	21	7	62
500478	38-46.177	-102.012	-3-15-	2.8	3.6	11	4.9	0.34	16	32	2.6	23	10	88
500480	38-46.144	-102.062	-3-12-	2.6	3.0	6	2.3	0.91	12	15	2.4	17	8	52
500484	38-46.068	-102.199	-3-12-	2.0	2.7	10	3.3	0.83	12	15	2.0	15	9	72

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500486	38-46.069	-102.165	-3-12-	2.6	2.3	8	3.6	2.5	11	15	1.8	18	7	52
500487	38-46.072	-102.145	-3-12-	5.6	5.6	9	4.1	0.59	14	26	2.4	23	10	90
500488	38-46.064	-102.080	-3-15-	2.1	2.3	8	4.0	0.84	15	23	2.3	20	10	77
500489	38-46.065	-102.079	-3-15-	2.7	3.0	5	3.2	0.61	13	23	2.2	16	9	70
500491	38-46.114	-102.036	-3-15-	2.0	2.6	6	4.9	0.44	12	16	2.7	21	8	49
500492	38-46.055	-102.002	-3-12-	2.5	3.0	6	8.1	0.71	19	25	4.1	26	11	77
500493	38-46.037	-102.042	-3-12-	1.7	2.2	4	2.8	1.2	12	20	2.0	16	8	74
500494	38-46.044	-102.069	-3-12-	2.3	2.2	2	4.5	0.48	13	16	2.0	14	7	48
500496	38-46.028	-102.105	-3-12-	2.5	2.7	5	4.6	0.84	14	37	2.1	22	9	66
500499	38-46.034	-102.149	-3-12-	2.6	3.1	4	3.7	0.52	13	22	2.1	19	9	72
500501	38-46.886	-103.218	-3-15-	3.7	4.1	7	5.0	1.1	16	32	2.7	23	10	83
500502	38-46.907	-103.212	-3-12-	2.3	3.0	6	5.4	0.79	16	32	2.4	22	8	75
500504	38-46.915	-103.212	-3-12-	6.6	7.9	8	5.6	0.37	16	33	2.6	23	9	92
500505	38-46.920	-103.226	-3-12-	4.1	4.5	7	4.0	0.28	15	31	2.6	22	9	95
500507	38-46.999	-103.200	-3-12-	11.	13.	6	6.7	1.3	15	26	2.6	21	8	92
500508	38-46.934	-103.093	-3-15-	2.3	2.4	5	5.2	0.44	13	28	2.1	22	7	61
500510	38-46.922	-103.108	-3-12-	3.8	4.1	7	6.1	0.41	18	35	3.1	23	9	94
500511	38-46.779	-103.191	-3-12-	2.3	2.4	5	4.4	1.3	14	23	2.0	22	6	63
500512	38-46.768	-103.110	-3-15-	1.8	2.3	8	3.0	5.8	11	9	1.5	24	7	54
500514	38-46.816	-103.083	-3-15-	2.8	2.8	5	4.4	0.54	15	32	2.6	20	9	81
500515	38-46.826	-103.033	-3-15-	2.4	2.6	8	5.0	0.74	15	26	2.3	20	8	64
500516	38-46.845	-103.023	-3-15-	2.1	2.5	10	4.3	0.90	15	32	2.8	25	12	78
500518	38-46.878	-103.128	-3-15-	2.5	2.8	10	4.6	0.83	15	28	2.4	21	10	80
500520	38-46.987	-102.461	-3-15-	2.6	2.4	3	4.8	0.45	14	25	2.1	22	8	61
500522	38-46.995	-102.477	-3-15-	2.2	2.4	6	2.1	0.52	11	13	1.5	14	5	44
500525	38-46.964	-102.350	-3-12-	2.9	2.7	5	7.9	0.75	16	38	2.4	27	9	74
500526	38-46.959	-102.329	-3-15-	2.3	2.4	9	4.0	1.1	15	24	2.2	22	8	70
500527	38-46.949	-102.314	-3-12-	2.2	2.5	6	4.0	0.76	11	23	1.7	20	6	57
500528	38-46.963	-102.258	-3-12-	2.5	2.3	6	3.4	1.2	13	21	2.0	20	7	63
500529	38-46.940	-102.254	-3-15-	2.5	2.6	4	2.4	1.2	11	21	1.6	21	6	46
500530	38-46.837	-102.323	-3-15-	2.3	2.7	6	3.7	1.7	16	21	2.6	21	8	79
500540	38-46.841	-102.491	-3-12-	2.6	2.5	3	3.3	1.7	14	23	2.2	22	7	79
500542	38-46.768	-102.422	-3-12-	2.8	2.3	4	3.8	1.5	14	23	2.2	24	7	63
500543	38-46.790	-102.403	-3-12-	2.2	2.2	5	2.2	1.3	13	21	2.0	21	7	57
500545	38-46.863	-102.371	-3-12-	1.6	2.9	5	6.1	1.2	16	16	3.0	18	7	71
500549	38-46.778	-102.392	-3-12-	2.7	3.0	<2	4.0	1.6	13	28	1.8	23	6	49
500551	38-46.768	-102.338	-3-12-	2.4	2.6	3	5.1	2.0	13	24	2.0	22	6	53
500559	38-46.400	-102.259	-3-12-	2.4	2.6	4	3.1	2.7	11	11	2.2	12	5	46
500560	38-46.386	-102.369	-3-15-	2.5	2.6	4	6.0	1.3	9	24	1.8	16	6	54
500561	38-46.400	-102.405	-3-15-	2.6	3.1	3	6.6	1.0	14	42	1.8	19	7	55
500562	38-46.400	-102.443	-3-12-	2.6	2.6	5	4.2	1.3	14	27	2.2	25	8	69
500564	38-46.429	-102.483	-3-15-	3.1	3.1	<2	6.6	0.49	15	38	2.6	28	9	73
500565	38-46.430	-102.493	-3-12-	1.5	2.5	5	2.9	2.1	11	17	2.0	15	7	58
500567	38-46.370	-102.469	-3-12-	2.9	3.9	5	3.6	2.0	12	28	2.4	18	8	88
500570	38-46.305	-102.434	-3-15-	2.0	2.9	5	4.1	0.42	10	18	1.9	11	6	42
500572	38-46.343	-102.426	-3-15-	2.0	2.7	6	7.5	0.72	12	16	2.3	15	8	68
500573	38-46.363	-102.389	-3-15-	2.6	3.2	5	5.1	0.58	13	23	2.4	20	10	75
500578	38-46.379	-102.326	-3-15-	2.1	2.2	7	2.6	1.6	13	21	2.3	19	9	71
500579	38-46.352	-102.298	-3-15-	1.9	2.7	6	3.1	1.2	12	22	2.0	19	8	56
500580	38-46.327	-102.266	-3-12-	2.3	2.4	5	3.0	0.99	13	20	2.2	19	8	65
500581	38-46.263	-102.353	-3-12-	2.2	2.4	9	4.1	0.56	15	23	2.4	20	10	76
500600	38-46.148	-103.389	-3-15-	1.9	2.8	3	2.1	0.68	7	12	1.3	8	4	32
500602	38-46.913	-102.666	-3-12-	1.7	2.6	8	5.3	0.76	19	32	3.5	28	12	92
500603	38-46.949	-102.665	-3-12-	1.9	2.7	9	5.4	0.55	18	24	3.1	23	9	75
500605	38-46.931	-102.679	-3-12-	2.5	2.9	11	4.7	1.6	19	30	2.9	28	10	88

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE NUMBER ST LAT	LONG	L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500606	38-46.968	-102.684	-3-12-	2.5	3.3	10	3.2	0.41	13	26	2.4	21	10	85
500610	38-46.925	-102.641	-3-12-	1.9	3.0	4	2.6	1.4	12	28	2.0	18	6	58
500611	38-46.999	-102.605	-3-12-	2.4	3.0	9	3.2	0.90	15	25	2.3	23	9	67
500613	38-46.997	-102.568	-3-15-	2.2	2.9	8	3.3	0.42	14	29	2.7	24	10	92
500614	38-46.980	-102.556	-3-15-	2.4	3.2	11	5.0	1.1	18	32	3.1	30	12	93
500615	38-46.962	-102.524	-3-15-	1.5	2.2	7	1.4	0.67	9	14	1.7	15	6	49
500616	38-46.976	-102.516	-3-15-	4.2	4.7	11	3.6	0.74	17	33	3.0	28	10	94
500617	38-46.982	-102.518	-3-12-	3.7		8	2.5	0.68	16	26	2.8	24	10	81
500619	38-46.841	-102.660	-3-15-	3.5	4.3	5	4.7	0.75	13	28	2.6	21	8	70
500621	38-46.794	-102.698	-3-12-	1.3	2.2	5	2.0	2.6	12	16	2.6	18	8	67
500622	38-46.789	-102.701	-3-15-	1.4	2.7	6	2.7	0.42	12	19	2.0	14	6	49
500623	38-46.767	-102.748	-3-15-	2.6	3.6	7	2.3	0.47	15	21	2.3	22	11	79
500624	38-46.767	-102.658	-3-12-	2.6	3.2	8	8.8	1.4	28	27	5.2	23	10	74
500626	38-46.763	-102.602	-3-12-	2.6	2.9	11	4.0	2.3	16	22	3.0	25	9	73
500627	38-46.789	-102.501	-3-12-	2.1		7	6.8	2.2	17	21	3.6	20	8	82
500629	38-46.795	-102.569	-3-15-	2.4	3.3	5	5.3	2.9	18	30	3.0	31	10	97
500630	38-46.856	-102.546	-3-12-	1.8	2.3	10	4.1	2.1	16	20	2.5	25	9	67
500632	38-46.881	-102.739	-3-12-	1.9	2.5	4	3.8	1.4	16	23	2.8	25	11	84
500633	38-46.885	-102.595	-3-15-	1.4	2.5	10	6.3	1.5	31	24	3.0	27	9	2
500636	38-46.947	-102.517	-3-12-	1.6	2.8	7	2.3	0.82	13	18	2.3	21	8	56
500644	38-46.787	-102.159	-3-12-	2.6	3.1	7	4.1	1.8	14	24	2.4	25	8	61
500645	38-46.787	-102.152	-3-12-	2.9	3.6	9	5.0	1.6	14	22	2.3	24	8	91
500646	38-46.778	-102.168	-3-12-	3.5	4.1	8	5.0	0.93	16	21	2.7	25	9	69
500651	38-46.801	-102.013	-3-12-	2.4	3.1	9	5.3	0.53	17	29	3.0	29	10	82
500653	38-46.881	-102.011	-3-12-	1.9	2.7	5	3.6	1.1	13	23	2.3	21	7	55
500654	38-46.876	-102.004	-3-12-	1.7	2.8	6	3.8	1.2	13	22	2.2	18	7	72
500657	38-46.779	-102.224	-3-12-	1.8	2.6	5	2.6	1.5	14	16	2.7	21	8	60
500661	38-46.966	-102.242	-3-12-	3.1		7	5.0	0.65	18	38	3.4	32	12	99
500665	38-46.999	-102.091	-3-15-	2.5	3.6	6	3.0	1.2	16	30	2.7	23	9	90
500666	38-46.997	-102.048	-3-12-	1.1	2.4	5	24.	1.2	38	29	10.	27	9	74
500667	38-46.935	-102.038	-3-12-	1.9	2.6	9	4.7	0.66	14	28	2.5	20	9	68
500668	38-46.936	-102.065	-3-15-	2.2	2.8	8	4.4	0.60	17	40	3.0	30	11	110
500670	38-46.809	-102.153	-3-15-	3.2	3.4	5	6.1	1.9	19	35	3.3	27	12	76
500672	38-46.893	-102.119	-3-12-	2.6	2.7	8	6.2	1.1	19	34	2.9	27	12	79
500674	38-46.894	-102.112	-3-12-	2.2	2.5	5	4.7	0.49	13	31	2.0	21	8	57
500683	38-46.962	-102.142	-3-12-	2.4	2.5	3	4.3	0.51	16	29	2.4	23	10	68
500685	38-46.192	-102.499	-3-12-	2.2	2.7	3	6.2	0.81	16	28	3.0	20	10	81
500693	38-46.245	-102.339	-3-12-	2.7	2.9	4	5.2	0.59	16	29	2.5	18	9	77
500696	38-46.163	-102.383	-3-12-	1.6	2.3	7	1.6	2.5	9	5	1.5	9	6	31
500697	38-46.174	-102.394	-3-12-	2.8	2.5	7	3.0	0.56	12	20	2.0	16	7	74
500699	38-46.140	-102.436	-3-12-	2.0	1.9	2	1.0	2.4	6	8	1.1	6	4	32
500700	38-46.132	-102.424	-3-12-	2.0	2.1	4	2.3	0.28	8	10	1.1	8	3	33
500702	38-46.994	-102.926	-3-12-	5.2	6.0	5	4.7	1.5	19	32	3.2	26	12	91
500703	38-46.995	-102.998	-3-15-	4.8	5.4	7	5.1	0.57	17	30	2.6	26	11	76
500708	38-46.891	-102.986	-3-12-	4.1	4.1	10	5.7	1.1	17	35	2.9	25	12	87
500709	38-46.892	-102.899	-3-12-	2.3	2.4	9	4.4	1.3	15	25	2.6	21	10	73
500711	38-46.842	-102.998	-3-15-	3.4	3.9	6	11.	1.8	19	30	4.6	29	10	74
500712	38-46.847	-102.909	-3-12-	2.6	3.8	6	5.6	0.77	15	22	3.0	13	9	57
500716	38-46.801	-102.920	-3-15-	1.9	2.6	11	4.7	0.74	11	20	2.3	13	9	53
500719	38-46.774	-102.905	-3-12-	1.5	2.5	7	5.1	1.8	9	15	1.8	9	7	42
500721	38-46.818	-102.863	-3-12-	2.5	3.5	7	5.0	1.5	15	18	2.3	16	10	62
500724	38-46.775	-102.763	-3-15-	2.5	3.7	7	6.5	0.48	16	20	2.7	16	10	61
500730	38-46.878	-102.827	-3-12-	1.7	2.1	8	3.9	0.98	17	15	2.4	20	10	81
500732	38-46.506	-102.029	-3-15-	2.0	2.3	6	5.7	0.35	16	21	2.0	21	8	54
500733	38-46.518	-102.050	-3-15-	2.1	2.2	7	5.6	0.45	14	16	2.7	17	10	81

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE NUMBER ST LAT LONG L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500735	38-46.539 -102.126 -3-15-	1.8	2.4	8	4.7	1.7	18	25	2.7	26	11	81
500739	38-46.616 -102.238 -3-12-	1.9	2.2	2	5.6	1.8	12	17	2.3	20	8	65
500741	38-46.616 -102.129 -3-12-	3.2	2.9	7	4.7	1.3	13	30	2.1	21	9	66
500744	38-46.598 -102.072 -3-12-	2.0	2.7	9	4.6	0.54	11	20	1.7	16	7	51
500746	38-46.638 -102.076 -3-12-	2.1	2.5	3	5.2	1.7	11	30	2.0	18	8	65
500748	38-46.664 -102.160 -3-12-	2.4	2.7	5	5.9	2.4	11	22	1.8	19	6	49
500751	38-46.688 -102.178 -3-12-	2.5	2.9	7	5.4	2.1	11	33	1.8	17	7	55
500753	38-46.747 -102.145 -3-12-	2.6	2.8	6	7.5	1.9	16	29	2.8	27	11	77
500756	38-46.667 -102.074 -3-12-	2.1	2.5	5	4.7	2.7	13	25	2.4	23	9	69
500758	38-46.686 -102.084 -3-12-	1.7	2.8	5	8.4	3.0	12	28	2.3	18	7	52
500759	38-46.721 -102.034 -3-12-	1.9	2.8	10	5.0	1.7	16	26	2.7	25	10	78
500760	38-46.649 -102.012 -3-12-	1.7	2.4	5	4.7	2.7	11	18	2.0	14	7	60
500767	38-46.326 -102.059 -3-12-	2.9	3.3	8	5.9	1.1	11	25	2.3	18	8	84
500769	38-46.326 -102.049 -3-12-	3.0	3.3	10	8.0	2.6	13	27	2.4	18	9	59
500771	38-46.334 -102.090 -3-12-	3.5	3.8	6	6.6	0.43	14	21	3.5	16	11	83
500773	38-46.321 -102.142 -3-12-	2.7	3.3	4	5.1	2.2	8	15	1.7	12	5	38
500774	38-46.317 -102.152 -3-12-	2.3	3.4	4	5.8	3.0	12	16	2.3	17	8	51
500775	38-46.319 -102.153 -3-12-	1.5	2.3	7	3.2	1.0	6	12	1.1	13	4	29
500776	38-46.400 -102.233 -3-12-	2.2	2.6	6	3.0	0.54	10	26	1.9	16	8	69
500777	38-46.430 -102.174 -3-12-	2.7	2.6	9	4.2	3.6	12	18	1.6	16	6	48
500778	38-46.431 -102.152 -3-12-	2.4	2.9	7	6.1	1.4	16	25	2.5	23	7	67
500779	38-46.418 -102.149 -3-12-	1.8	3.3	6	3.2	3.6	15	15	2.9	27	10	66
500781	38-46.394 -102.005 -3-12-	1.5	3.0	2	7.4	0.51	16	30	2.3	22	7	66
500783	38-46.415 -102.059 -3-12-	2.9	2.5	2	6.8	0.56	16	32	2.4	21	7	66
500784	38-46.415 -102.063 -3-12-	2.1	2.4	9	5.8	0.90	20	30	2.8	25	10	79
500785	38-46.414 -102.106 -3-12-	2.8	2.4	7	4.6	0.94	15	31	2.4	21	9	99
500787	38-46.460 -102.025 -3-15-	2.1	2.8	3	5.3	0.33	18	31	2.8	25	8	86
500793	38-46.473 -102.217 -3-15-	2.2	2.8	8	5.6	1.6	16	29	2.2	25	7	78
500794	38-46.473 -102.240 -3-12-	2.2	2.5	<2	4.2	1.0	14	29	1.8	17	6	69
500795	38-46.468 -102.196 -3-12-	2.6	2.7	4	5.1	0.99	10	21	1.4	12	5	45
500800	38-46.417 -102.130 -3-12-	2.5	2.5	2	4.1	0.75	14	23	2.3	18	8	66
500802	38-46.907 -102.813 -3-12-	1.5	2.3	<2	6.2	2.0	23	27	4.4	25	12	78
500804	38-46.957 -102.806 -3-12-	2.6	3.2	2	3.2	1.6	16	31	3.2	26	11	69
500805	38-46.969 -102.773 -3-12-	1.6	2.2	5	4.6	0.69	18	22	3.3	27	10	60
500807	38-46.958 -102.753 -3-12-	2.0	2.4	<2	12.	1.6	31	65	9.3	28	9	88
500809	38-46.981 -102.831 -3-15-	2.5	3.1	8	4.1	0.32	15	33	3.4	29	12	77
500811	38-46.990 -102.858 -3-15-	3.1	4.0	8	5.8	1.2	19	55	3.9	30	13	74
500812	38-46.993 -102.884 -3-12-	2.2	2.8	4	2.5	0.30	12	48	1.9	18	6	60
500814	38-46.962 -102.873 -3-15-	4.2	5.1	8	3.5	0.61	17	34	2.4	20	9	75
500816	38-46.639 -103.192 -3-15-	3.6	4.7	4	4.9	0.58	19	39	3.1	25	10	82
500818	38-46.647 -103.190 -3-15-	4.1	4.9	4	3.0	0.49	16	32	2.5	24	8	72
500822	38-46.700 -103.145 -3-15-	2.8		2	5.4	1.1	21	43	3.5	30	12	91
500824	38-46.705 -103.175 -3-12-	2.1	2.5	6	3.5	0.43	16	27	2.3	22	7	61
500825	38-46.701 -103.202 -3-15-	2.7	3.0	<2	4.7	1.4	14	23	2.3	23	7	60
500826	38-46.698 -103.233 -3-12-	4.8	5.2	5	5.0	0.61	13	19	2.1	22	7	58
500828	38-46.730 -103.135 -3-15-	4.4	4.5	7	4.5	0.55	17	33	2.5	25	9	76
500829	38-46.743 -103.146 -3-15-	3.1	3.0	5	6.0	1.0	16	27	2.4	22	8	64
500830	38-46.723 -103.209 -3-15-	4.0	3.6	7	5.2	0.48	18	31	2.9	26	9	77
500832	38-46.597 -103.158 -3-15-	2.3	2.4	6	2.9	0.57	16	22	2.1	18	7	56
500834	38-46.585 -103.187 -3-12-	2.7	2.6	5	3.6	0.38	17	27	2.3	20	8	59
500838	38-46.514 -103.229 -3-15-	3.4	3.5	3	4.3	0.82	17	23	2.5	23	8	68
500839	38-46.511 -103.229 -3-15-	2.2	2.7	6	5.9	0.70	15	22	3.2	26	9	51
500840	38-46.527 -103.154 -3-15-	2.6	3.0	2	4.4	0.38	10	22	2.7	23	8	44
500841	38-46.553 -103.156 -3-12-	2.0	2.3	7	2.4	1.3	10	13	2.2	18	7	39
500843	38-46.561 -103.127 -3-15-	1.8	2.4	9	2.9	0.43	9	9	1.8	17	6	33

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500844	38-46.553	-103.110	-3-12-	2.8	2.4	12	4.8	1.6	14	22	3.3	32	10	61
500845	38-46.525	-103.131	-3-12-	3.0	3.0	9	4.7	1.1	14	25	3.3	32	11	60
500846	38-46.516	-103.149	-3-12-	3.6	3.6	8	4.8	0.53	15	25	3.5	33	11	67
500848	38-46.549	-103.074	-3-15-	2.8	3.2	8	16.	1.3	23	30	3.3	30	12	72
500849	38-46.556	-103.044	-3-15-	3.1	3.3	9	5.5	0.87	16	27	3.8	30	12	82
500856	38-46.631	-103.024	-3-15-	4.2	4.6	4	8.6	0.67	21	36	5.5	35	14	81
500857	38-46.647	-103.041	-3-15-	3.5	3.3	5	5.8	1.2	16	29	2.5	29	11	65
500858	38-46.643	-103.057	-3-15-	3.9	3.9	10	5.9	0.58	22	49	4.9	43	16	120
500863	38-46.716	-103.016	-3-15-	4.1	4.7	10	5.0	0.34	14	26	4.0	21	12	93
500864	38-46.721	-103.023	-3-15-	2.7	3.2	10	4.6	0.27	12	24	2.8	18	12	70
500865	38-46.732	-103.023	-3-15-	2.7	3.1	13	4.4	0.45	12	24	3.4	16	11	59
500867	38-46.620	-103.115	-3-15-	2.6	2.9	6	5.8	0.72	16	27	3.7	30	11	65
500868	38-46.620	-103.101	-3-15-	2.8	3.8	9	8.2	0.50	20	33	4.1	34	12	68
500870	38-46.441	-102.657	-3-15-	2.9	2.7	8	5.8	0.85	21	40	3.2	34	11	110
500874	38-46.486	-102.710	-3-15-	3.2	3.2	10	5.3	0.44	18	29	3.7	24	10	96
500875	38-46.461	-102.740	-3-15-	3.2	2.7	3	3.8	2.1	15	24	1.9	18	7	70
500876	38-46.382	-102.676	-3-15-	2.3	2.5	3	4.6	1.1	17	33	2.5	26	9	75
500878	38-46.364	-102.697	-3-15-	2.6	2.7	5	4.9	0.93	18	29	2.3	22	8	64
500879	38-46.360	-102.697	-3-15-	2.5	2.5	5	4.5	0.88	15	33	3.3	29	12	78
500881	38-46.266	-102.725	-3-15-	2.9	2.9	5	7.0	0.92	15	34	2.4	24	9	73
500882	38-46.265	-102.679	-3-15-	6.0	6.2	7	9.6	0.59	16	29	3.0	21	9	77
500884	38-46.355	-102.620	-3-12-	2.4	2.5	4	2.9	1.8	10	16	1.8	16	5	52
500885	38-46.457	-102.525	-3-15-	3.7	4.3	6	4.6	0.83	16	30	3.0	20	8	76
500888	38-46.399	-102.576	-3-15-	6.3	5.7	10	8.6	0.71	15	31	3.4	25	10	62
500891	38-46.355	-102.599	-3-12-	3.2	3.1	5	6.5	1.2	14	19	2.7	16	7	60
500894	38-46.326	-102.523	-3-15-	2.5	2.5	6	4.5	0.74	16	28	2.4	23	8	100
500900	38-46.452	-102.552	-3-12-	1.7	2.0	8	1.6	1.9	10	12	1.6	12	5	51
500905	38-46.223	-103.701	-3-15-	2.6	2.9	7	4.8	0.41	16	17	2.1	16	7	59
500906	38-46.219	-103.717	-3-12-	3.0	4.1	8	2.9	0.46	13	22	2.2	16	9	83
500907	38-46.234	-103.737	-3-15-	2.8	3.4	8	5.2	0.74	17	19	2.7	19	6	120
500908	38-46.187	-103.723	-3-12-	1.9	2.8	6	4.5	1.6	13	14	2.7	15	6	69
500911	38-46.134	-103.725	-3-15-	2.2	2.9	12	3.4	0.42	11	14	2.1	15	8	56
500913	38-46.088	-103.722	-3-12-	4.9	4.7	11	3.1	0.45	13	13	2.3	21	8	75
500918	38-46.015	-103.535	-3-12-	2.2	1.9	3	2.6	1.3	10	8	1.4	17	5	50
500919	38-46.009	-103.536	-3-12-	4.0	4.3	12	5.7	0.63	12	23	2.3	19	8	94
500920	38-46.004	-103.536	-3-15-	2.7	3.6	6	3.3	0.81	14	25	2.0	19	7	72
500922	38-46.053	-103.525	-3-12-	2.9	3.9	7	2.0	0.28	10	15	1.7	13	6	59
500923	38-46.082	-103.536	-3-12-	1.7	2.5	6	2.9	0.52	12	10	1.5	14	4	40
500924	38-46.115	-103.536	-3-12-	3.7	4.1	8	4.5	0.56	13	17	1.9	19	7	69
500925	38-46.119	-103.531	-3-15-	3.2	3.9	6	7.2	0.19	21	21	4.1	25	7	87
500928	38-46.177	-103.510	-3-12-	3.0	3.4	6	3.1	1.7	11	15	1.9	15	6	57
500929	38-46.176	-103.506	-3-15-	3.0	3.5	5	2.6	0.69	13	17	2.0	17	6	59
500939	38-46.432	-103.742	-3-12-	2.0	2.5	3	3.2	2.0	9	25	1.9	11	6	66
500940	38-46.439	-103.736	-3-12-	2.9	3.2	5	3.3	0.75	12	25	1.8	14	7	84
500943	38-46.494	-103.728	-3-15-	2.0	2.3	3	4.8	1.0	12	25	2.0	14	8	63
500945	38-46.482	-103.570	-3-12-	2.6	2.9	7	3.3	1.3	12	18	1.4	11	6	56
500947	38-46.464	-103.538	-3-12-	2.7	3.6	2	9.8	2.2	18	19	3.9	17	6	50
500951	38-46.434	-103.563	-3-15-	2.3	3.0	<2	3.3	2.4	17	20	1.9	18	6	62
500953	38-46.324	-103.611	-3-15-	4.6	5.3	8	1.4	0.31	10	31	1.7	15	8	76
500954	38-46.311	-103.608	-3-12-	2.1	2.6	5	2.1	0.83	11	23	1.4	13	5	37
500956	38-46.317	-103.585	-3-12-	2.4	3.5	11	3.0	0.55	17	39	2.3	16	9	92
500957	38-46.294	-103.527	-3-12-	2.3	2.8	7	6.4	1.1	22	15	1.9	25	7	130
500959	38-46.359	-103.575	-3-15-	2.5	3.0	10	6.6	0.71	17	32	2.7	19	10	67
500960	38-46.387	-103.593	-3-15-	2.5	2.9	9	3.7	0.29	13	23	2.3	16	9	78
500962	38-46.418	-103.502	-3-12-	1.7	2.6	3	2.6	2.3	10	14	1.3	9	5	37

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE NUMBER ST LAT	LONG	L TY REP	J (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
500964	38-46.290	-103.653	-3-15-	2.9	3.5	<2	5.8	0.30	17	27	2.5	16	5	92
500972	38-46.962	-103.634	-3-15-	2.4	2.8	8	2.7	4.0	9	21	1.6	12	6	45
500973	38-46.979	-103.650	-3-12-	2.1	2.4	5	3.6	5.5	6	17	1.8	14	5	70
500975	38-46.971	-103.666	-3-15-	2.4	2.8	8	4.2	3.9	13	23	1.8	17	6	56
500976	38-46.977	-103.701	-3-12-	2.8	2.8	<2	3.1	3.3	13	28	1.9	17	7	57
500977	38-46.989	-103.718	-3-12-	3.0	3.0	7	5.2	3.0	14	32	2.3	21	3	76
500978	38-46.987	-103.720	-3-12-	2.9	2.2	9	5.8	4.8	13	25	2.8	24	9	74
500979	38-46.910	-103.509	-3-12-	3.1	2.8	2	13.	3.5	14	33	3.1	25	7	48
500981	38-46.793	-103.676	-3-12-	3.0	3.1	7	1.4	2.9	12	26	1.9	17	7	95
500982	38-46.804	-103.684	-3-15-	2.2	3.4	7	2.8	2.7	12	34	1.9	15	7	75
500983	38-46.821	-103.654	-3-12-	1.9	2.8	10	3.2	1.9	13	33	2.1	22	7	54
500984	38-46.811	-103.607	-3-12-	3.0	2.5	5	1.7	3.9	13	24	2.1	17	7	66
500987	38-46.775	-103.611	-3-12-	2.3	2.6	6	0.3	4.4	12	18	2.3	16	5	52
500989	38-46.897	-103.642	-3-12-	2.3	2.8	3	3.1	3.5	12	25	2.0	20	7	58
500990	38-46.904	-103.708	-3-12-	2.5	3.2	2	3.1	3.6	10	23	1.8	17	6	46
500991	38-46.911	-103.617	-3-15-	2.2	2.6	8	2.3	5.0	9	20	1.9	13	6	50
500994	38-46.919	-103.729	-3-15-	2.9	3.9	8	1.7	5.4	8	73	2.1	16	7	58
500996	38-46.847	-103.578	-3-15-	1.9	2.5	9	2.7	3.4	11	53	2.2	18	8	72
500997	38-46.863	-103.560	-3-15-	1.7	2.1	4	1.6	1.8	7	18	1.4	11	5	50
500998	38-46.920	-103.638	-3-15-	2.9	3.0	9	4.4	3.1	13	27	2.5	22	9	57
501000	38-46.809	-103.562	-3-15-	4.2	3.2	10	3.7	2.6	14	34	2.6	25	9	53
501001	38-46.059	-102.242	-3-12-	5.3	3.1	6	3.3	3.2	9	12	2.2	15	7	45
501002	38-46.169	-103.811	-3-12-	2.8	3.1	6	5.1	0.89	15	33	3.7	39	12	68
501003	38-46.208	-103.808	-3-12-	2.4	2.2	4	3.4	0.98	12	13	2.1	27	7	43
501004	38-46.222	-103.806	-3-15-	3.1	3.3	6	4.2	0.65	15	35	3.2	40	13	70
501005	38-46.191	-103.886	-3-15-	2.2	2.7	3	2.3	0.81	12	15	2.1	25	8	45
501006	38-46.211	-103.888	-3-12-	3.0	4.5	10	4.1	1.1	14	14	3.0	27	10	54
501007	38-46.237	-103.909	-3-12-	1.7	2.4	3	1.2	0.76	10	7	1.8	19	7	41
501008	38-46.226	-103.891	-3-15-	1.7	2.4	7	1.4	0.79	11	13	2.2	23	8	53
501010	38-46.199	-103.910	-3-12-	2.9	3.3	4	2.5	0.31	11	19	1.7	22	7	43
501012	38-46.189	-103.910	-3-15-	1.7	2.5	2	1.2	0.39	7	8	1.1	7	3	37
501013	38-46.161	-103.892	-3-12-	2.7	3.7	5	2.4	0.95	13	12	2.3	17	6	51
501018	38-46.102	-103.948	-3-12-	4.4		9	9.6	0.74	19	19	3.4	39	9	93
501019	38-46.093	-103.955	-3-12-	4.0		3	22.	0.49	49	35	5.0	40	10	110
501020	38-46.072	-103.946	-3-12-	3.7		5	9.4	0.31	28	35	3.7	35	10	99
501021	38-46.065	-103.954	-3-12-	2.9	3.9	7	30.	0.61	30	54	5.3	34	8	140
501022	38-46.040	-103.964	-3-12-	4.4	4.9	5	34.	0.65	40	39	7.3	41	12	160
501023	38-46.020	-103.963	-3-12-	3.0	4.7	14	10.	1.0	30	66	4.4	29	12	110
501025	38-46.090	-103.877	-3-12-	3.2		5	3.2	0.41	17	42	2.2	24	8	73
501027	38-46.141	-103.753	-3-12-	2.1	3.0	8	3.2	0.48	14	84	2.0	16	7	70
501030	38-46.138	-103.839	-3-15-	2.9	4.0	10	2.6	1.3	22	19	2.7	23	9	68
501031	38-46.114	-103.762	-3-12-	3.7	4.1	7	3.5	0.70	18	30	2.6	25	9	85
501033	38-46.092	-103.768	-3-12-	3.3	3.7	14	4.4	1.1	20	43	2.6	34	10	83
501037	38-46.071	-103.799	-3-12-	2.9	3.3	3	6.2	0.51	15	30	3.2	28	8	52
501038	38-46.069	-103.801	-3-12-	1.9	3.5	5	3.7	0.92	11	12	2.4	25	7	45
501039	38-46.032	-103.825	-3-12-	2.3	3.0	<2	6.7	0.61	13	17	2.4	25	5	43
501040	38-46.029	-103.837	-3-12-	3.7	2.0	6	3.4	0.45	18	35	3.1	34	13	73
501041	38-46.028	-103.841	-3-12-	2.2	2.8	3	1.5	1.2	11	11	1.9	23	8	43
501043	38-46.298	-103.950	-3-15-	2.4	3.2	7	2.7	0.70	13	23	2.2	25	8	46
501044	38-46.296	-103.977	-3-15-	2.5	4.1	3	1.6	0.58	13	14	2.0	21	7	45
501045	38-46.287	-103.980	-3-12-	2.6	3.4	7	3.7	0.30	12	22	2.5	20	9	63
501046	38-46.275	-103.974	-3-15-	2.4	2.7	7	1.9	0.50	13	15	2.3	24	9	51
501048	38-46.296	-103.905	-3-15-	2.5	2.8	5	4.2	1.3	14	21	3.0	29	9	53
501050	38-46.256	-103.909	-3-15-	2.6	3.7	4	6.8	1.6	19	17	3.9	33	9	56
501052	38-46.340	-103.937	-3-15-	2.3	2.6	2	2.8	0.74	12	21	2.3	29	9	49

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE NUMBER ST LAT	LONG	L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
501053	38-46.358	-103.939	-3-12-	1.7	2.4	4	3.6	0.68	10	10	1.8	24	5	30
501056	38-46.310	-103.780	-3-12-	2.1	2.9	<2	3.6	0.76	10	19	1.9	13	4	34
501058	38-46.372	-103.878	-3-12-	3.5	4.2	10	4.0	1.4	15	25	2.8	28	10	49
501059	38-46.375	-103.860	-3-12-	2.2	3.1	7	4.1	0.59	11	19	1.8	18	6	5
501062	38-46.411	-103.866	-3-12-	2.2	2.8	4	3.3	0.79	10	15	2.2	19	8	<2
501064	38-46.482	-103.887	-3-15-	2.6	2.9	3	4.2	0.82	12	20	2.3	22	7	<2
501069	38-46.637	-103.344	-3-15-	4.6	4.7	<2	4.7	1.6	14	34	2.9	27	11	<2
501070	38-46.628	-103.346	-3-15-	2.6	3.0	2	4.1	1.9	11	21	1.7	17	5	<2
501071	38-46.624	-103.352	-3-15-	3.1	4.3	5	7.1	1.6	15	26	2.7	26	7	39
501077	38-46.556	-103.395	-3-12-	2.1	2.6	4	3.1	2.4	8	16	1.5	14	5	60
501078	38-46.560	-103.397	-3-12-	2.7	3.0	2	2.6	1.9	10	22	1.8	20	6	29
501079	38-46.568	-103.408	-3-12-	2.4	3.0	6	3.0	2.1	9	19	1.8	16	6	36
501102	38-46.458	-102.180	-3-12-	2.5	3.2	11	3.1	0.37	15	31	2.8	25	10	66
501103	38-46.329	-102.246	-3-12-	2.0	2.6	8	2.5	1.0	12	17	2.3	15	8	48
501105	38-46.257	-102.224	-3-12-	2.5	2.9	5	3.2	0.65	10	42	1.9	21	6	42
501108	38-46.282	-103.259	-3-12-	3.3		7	3.6	0.57	16	55	3.5	29	12	88
501109	38-46.279	-103.277	-3-12-	2.8	3.1	14	4.2	0.99	15	39	3.1	26	11	74
501115	38-46.419	-103.261	-3-15-	3.8		10	3.1	0.97	12	80	2.7	16	10	53
501116	38-46.432	-103.281	-3-12-	1.7	2.8	4	2.3	0.89	8	48	1.8	14	6	39
501118	38-46.358	- 96.363	-3-12-	2.1	3.0	8	7.0	3.2	15	26	3.2	21	9	66
501122	38-46.464	-103.402	-3-12-	3.8	4.4	6	1.9	2.1	10	26	2.4	30	8	48
501126	38-46.291	-103.447	-3-12-	1.7	2.6	2	1.0	2.1	6	17	0.99	6	3	19
501130	38-46.295	-103.438	-3-12-	1.9	3.0	3	4.0	1.9	7	22	1.5	10	4	31
501135	38-46.337	-103.374	-3-12-	2.1		8	2.2	0.97	18	30	3.6	28	13	71
501136	38-46.414	-103.382	-3-12-	1.7		9	3.0	3.4	8	11	2.0	10	6	32
501137	38-46.437	-103.411	-3-12-	2.7	3.5	7	6.2	1.5	13	22	2.9	20	9	63
501138	38-46.458	-103.487	-3-12-	1.9	2.3	4	3.0	1.6	8	19	1.6	10	5	31
501141	38-46.454	-103.220	-3-12-	3.7	3.9	5	5.3	0.34	13	28	1.9	20	7	61
501144	38-46.445	-103.156	-3-12-	3.8	4.1	3	3.9	0.46	8	24	1.6	15	5	52
501145	38-46.280	-103.088	-3-12-	7.5	8.3	6	6.7	0.84	20	29	2.3	32	5	80
501146	38-46.280	-103.078	-3-12-	2.7	3.3	3	4.9	1.3	12	27	1.6	18	5	56
501147	38-46.263	-103.067	-3-12-	2.0	3.2	6	5.9	0.46	14	30	2.2	17	7	71
501151	38-46.407	-103.053	-3-12-	3.8	3.7	3	2.0	2.5	10	24	1.6	16	5	48
501152	38-46.411	-103.024	-3-15-	5.3	5.7	8	2.6	0.73	13	34	2.3	23	10	95
501160	38-46.327	-103.071	-3-12-	1.7	2.6	8	4.0	1.1	15	26	2.2	24	7	61
501164	38-46.449	-103.175	-3-12-	2.6	3.1	6	2.4	1.5	14	27	2.4	20	9	67
501165	38-46.405	-103.196	-3-12-	1.8	2.4	6	2.6	0.50	14	20	2.5	14	8	57
501167	38-46.294	-103.241	-3-12-	1.4	1.9	6	3.1	1.8	10	16	1.7	12	6	55
501168	38-46.281	-103.182	-3-12-	6.9	7.7	5	1.4	1.6	9	13	1.4	13	5	44
501169	38-46.267	-103.226	-3-12-	2.3	2.7	8	3.9	1.6	12	23	2.1	17	7	73
501171	38-46.251	-103.225	-3-12-	3.3	3.6	3	5.0	1.4	16	30	2.5	18	10	61
501173	38-46.257	-103.162	-3-12-	1.9	2.4	6	3.2	0.36	12	18	1.8	16	7	78
501175	38-46.289	-102.926	-3-15-	2.8	3.6	<2	11.	3.4	17	38	3.0	24	8	75
501177	38-46.350	-102.884	-3-15-	6.0	6.5	4	3.3	0.52	13	29	2.2	20	8	89
501182	38-46.258	-102.914	-3-15-	4.4	5.2	3	5.9	1.9	14	31	2.5	22	9	66
501184	38-46.268	-102.876	-3-12-	5.5	6.0	6	12.	0.78	12	18	2.2	15	5	51
501187	38-46.457	-102.783	-3-15-	2.3	2.7	7	5.9	1.0	18	45	3.0	30	12	63
501189	38-46.418	-102.840	-3-15-	3.3	4.0	10	7.0	1.8	18	20	3.7	30	12	94
501190	38-46.461	-102.865	-3-12-	2.5	3.1	6	5.1	0.87	15	20	3.2	24	13	110
501195	38-46.433	-102.906	-3-15-	4.2	4.1	11	5.7	1.3	16	22	3.6	23	13	140
501197	38-46.411	-102.991	-3-15-	2.1	2.4	6	3.3	0.44	11	14	1.8	13	7	51
501200	38-46.720	-103.654	-3-12-	2.3	2.9	4	2.5	3.3	11	19	1.5	11	5	45
501203	38-46.111	-102.353	-3-12-	2.7	3.0	2	2.4	0.51	9	26	1.8	14	8	91
501208	38-46.091	-102.287	-3-12-	1.6	2.3	4	2.4	1.7	11	12	1.8	12	6	54
501210	38-46.052	-102.269	-3-12-	2.1	2.5	3	2.5	2.1	11	12	1.6	12	5	53

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
501211	38-46.077	-102.354	-3-12-	1.7	2.1	4	5.0	0.90	19	28	2.4	16	6	84
501213	38-46.031	-102.423	-3-12-	2.1	2.3	2	13.	0.58	18	20	2.9	12	5	66
501216	38-46.065	-102.497	-3-15-	2.3	2.9	7	4.5	0.28	13	23	1.9	15	8	67
501217	38-46.249	-102.992	-3-15-	2.3	2.7	4	6.2	0.71	16	32	2.8	24	11	91
501218	38-46.223	-102.873	-3-12-	4.2	5.0	<2	13.	2.4	18	25	3.4	16	8	89
501219	38-46.202	-102.888	-3-15-	7.3	7.1	<2	10.	0.81	29	31	3.6	19	10	87
501221	38-46.203	-102.909	-3-12-	5.9	7.5	4	13.	3.1	16	17	3.4	17	8	63
501224	38-46.061	-102.764	-3-15-	2.0	2.5	3	9.7	2.9	11	11	2.4	11	6	47
501227	38-46.149	-102.828	-3-15-	5.3	5.4	6	6.4	0.42	13	27	2.3	15	7	81
501229	38-46.141	-102.824	-3-15-	2.2	2.7	7	5.3	0.46	13	45	2.4	15	8	94
501233	38-46.219	-102.753	-3-12-	2.8	3.1	9	4.6	1.9	12	18	2.1	13	7	55
501234	38-46.219	-102.755	-3-15-	5.2	5.2	<2	19.	1.4	21	16	4.1	11	6	60
501241	38-46.003	-102.907	-3-15-	2.8	3.4	4	4.0	0.35	14	23	2.3	17	8	74
501243	38-46.035	-102.975	-3-15-	2.4	2.7	5	5.6	1.1	18	23	3.0	21	10	73
501244	38-46.076	-102.990	-3-15-	2.3	3.0	6	2.7	1.1	11	32	1.6	16	6	53
501250	38-46.047	-102.933	-3-12-	2.0	2.8	5	2.2	0.68	8	12	1.7	14	6	38
501254	38-46.953	-103.964	-3-15-	3.6	3.7	<2	8.1	1.6	17	31	3.3	24	11	86
501256	38-46.990	-103.960	-3-12-	3.8	3.4	4	5.2	1.4	9	25	1.9	18	7	44
501266	38-46.789	-103.877	-3-15-	2.3	2.7	6	5.4	1.3	13	30	2.9	19	10	65
501267	38-46.791	-103.876	-3-15-	2.6	3.1	<2	6.3	1.4	12	28	2.3	17	7	59
501270	38-46.801	-103.760	-3-12-	2.8	3.3	2	3.7	2.6	11	21	2.4	16	8	40
501273	38-46.932	-103.801	-3-12-	2.2	2.7	6	2.2	2.2	7	16	1.8	10	5	33
501274	38-46.928	-103.809	-3-12-	2.3	2.6	4	2.8	1.7	9	20	1.6	13	5	26
501275	38-46.920	-103.815	-3-12-	2.3	2.8	6	4.4	2.9	15	27	3.0	20	10	64
501281	38-46.832	-103.819	-3-12-	2.7	2.7	6	4.4	3.8	11	22	2.3	15	8	45
501282	38-46.847	-103.852	-3-12-	4.4	4.4	5	8.7	2.1	20	27	4.0	25	11	84
501288	38-46.835	-103.248	-3-12-	2.6	3.2	10	5.2	0.69	18	29	3.3	30	11	69
501289	38-46.839	-103.249	-3-12-	2.0	2.5	6	4.0	0.97	16	27	2.7	25	10	69
501292	38-46.796	-103.162	-3-12-	2.3	2.9	7	4.5	0.76	17	31	3.0	42	11	66
501302	38-46.151	-103.412	-3-12-	3.8	4.1	8	4.4	1.5	13	21	2.4	20	10	54
501304	38-46.177	-103.472	-3-12-	2.8	3.0	5	3.7	0.72	12	17	2.1	14	8	66
501306	38-46.095	-103.495	-3-12-	2.7	2.7	8	3.7	0.51	14	10	2.7	19	7	51
501307	38-46.096	-103.482	-3-15-	2.7	3.1	4	2.8	0.22	6	8	1.0	5	3	21
501309	38-46.047	-103.464	-3-15-	3.1	3.2	9	3.2	0.35	15	25	3.2	23	11	80
501311	38-46.007	-103.412	-3-12-	3.8	4.6	<2	4.7	0.86	11	13	2.8	18	7	48
501312	38-46.030	-103.427	-3-12-	3.7	4.1	12	3.2	0.32	9	18	2.5	18	9	68
501313	38-46.064	-103.405	-3-15-	2.7	3.0	7	5.4	0.57	17	20	3.2	23	11	73
501314	38-46.068	-103.404	-3-12-	3.3	3.6	5	3.8	0.34	13	15	2.5	19	8	59
501318	38-46.073	-103.308	-3-12-	2.0	2.8	5	2.4	0.76	8	6	1.1	7	3	36
501320	38-46.028	-103.286	-3-12-	2.4	3.1	13	1.8	0.77	16	11	2.1	14	6	84
501321	38-46.031	-103.286	-3-15-	1.9	2.3	3	1.6	1.1	9	13	1.9	10	5	63
501324	38-46.102	-103.344	-3-12-	3.3	4.2	6	2.3	0.37	8	570	1.3	7	4	63
501328	38-46.165	-103.235	-3-12-	3.0	3.5	8	4.8	2.5	18	38	2.9	19	8	130
501332	38-46.042	-103.162	-3-12-	1.0	2.2	10	2.0	1.3	10	8	1.7	15	4	67
501335	38-46.064	-103.184	-3-12-	2.1	2.4	6	2.6	0.48	11	70	1.7	15	6	62
501336	38-46.063	-103.185	-3-12-	2.1	2.3	7	1.2	0.51	8	7	1.5	14	5	55
501337	38-46.061	-103.164	-3-12-	3.2	4.1	6	2.0	0.60	14	16	1.9	34	6	580
501339	38-46.122	-103.142	-3-12-	2.2	2.2	8	4.0	1.5	14	12	2.3	14	7	79
501342	38-46.018	-103.066	-3-15-	2.8	2.6	11	3.1	0.46	17	18	2.7	20	8	99
501343	38-46.003	-103.034	-3-12-	3.0	2.5	14	4.0	1.7	21	20	3.3	23	9	140
501345	38-46.010	-103.079	-3-12-	4.9	4.5	9	2.6	1.1	8	10	1.9	13	5	67
501346	38-46.003	-103.094	-3-15-	3.2	3.1	8	6.7	2.0	16	15	3.7	22	7	120
501347	38-46.177	-103.234	-3-12-	3.3	2.8	6	2.7	1.7	7	8	1.5	10	4	50
501349	38-46.249	-103.124	-3-12-	2.4	2.7	12	4.3	1.7	20	26	3.5	22	10	140
														120

Table B-3, Continued

PARTIAL DATA LISTING FOR STREAM SEDIMENT OF THE DICKINSON QUADRANGLE

OR SAMPLE NUMBER	D. O. E. SAMPLE ST LAT	LONG	NUMBER L TY REP	U (PPM)	U-NT (PPM)	TH (PPM)	AS (PPM)	CA (%)	CO (PPM)	CU (PPM)	FE (%)	NI (PPM)	SC (PPM)	ZN (PPM)
501353	38-46.174	-103.140	-3-12-	5.5	6.0	10	8.9	2.8	17	12	3.8	20	9	100
501354	38-46.179	-103.152	-3-12-	7.9	6.8	13	5.6	0.35	18	15	3.6	17	11	130
501358	38-46.146	-103.057	-3-12-	4.7	4.5	6	3.1	1.9	14	7	2.5	13	7	110
501360	38-46.089	-103.053	-3-12-	3.0	2.9	<2	3.9	0.73	7	3	2.3	7	3	31
501363	38-46.225	-103.006	-3-12-	2.1	1.9	<2	2.3	2.4	<4	3	0.69	5	3	5
501364	38-46.225	-103.002	-3-12-	2.7	2.7	9	6.3	3.3	18	24	4.1	23	9	71
501365	38-46.130	-103.026	-3-15-	3.0	5.0	8	4.3	0.73	13	32	2.5	21	9	77
501366	38-46.795	-103.368	-3-12-	2.2	3.3	6	4.3	1.8	16	34	2.6	22	8	68
501369	38-46.791	-103.286	-3-15-	3.4	4.9	6	6.3	2.3	15	31	2.6	22	8	66
501370	38-46.812	-103.419	-3-12-	2.3	2.9	5	2.1	2.3	10	17	1.7	17	5	44
501371	38-46.826	-103.444	-3-15-	2.4	3.1	6	3.4	2.5	11	39	1.7	17	6	51
501372	38-46.853	-103.400	-3-15-	1.7	3.0	6	3.6	2.1	9	42	1.6	18	5	45
501379	38-46.996	-103.392	-3-12-	1.7	2.8	7	2.8	2.4	8	13	1.3	15	4	37
501387	38-46.996	-103.013	-3-15-	2.8	3.6	8	5.6	1.3	19	43	3.1	32	10	83
501392	38-46.906	-103.020	-3-12-	2.0	2.8	5	4.9	0.76	17	38	2.9	27	10	81
501401	38-46.739	-103.966	-3-12-	3.3	3.7	7	7.7	3.2	12	17	2.2	13	5	49
501402	38-46.732	-103.914	-3-12-	3.0	4.5	4	5.7	2.5	18	31	3.2	17	9	78
501405	38-46.717	-103.820	-3-15-	2.0	3.0	8	4.5	2.0	12	23	1.9	14	6	52
501406	38-46.699	-103.776	-3-12-	2.6	3.3	10	4.2	1.9	12	21	2.1	13	6	53
501408	38-46.703	-103.838	-3-12-	2.3	3.1	3	3.3	2.3	9	17	1.7	11	5	63
501411	38-46.701	-103.892	-3-12-	2.4	3.1	6	4.9	2.2	11	16	1.8	14	5	47
501413	38-46.713	-103.934	-3-12-	2.7	3.6	<2	3.2	3.5	9	19	1.7	9	5	37
501415	38-46.607	-103.760	-3-15-	2.5	3.2	9	4.5	1.7	16	20	2.3	16	7	65
501420	38-46.606	-103.893	-3-15-	2.6	2.9	6	4.1	2.2	12	19	1.5	16	6	42
501422	38-46.565	-103.909	-3-15-	2.6	3.5	7	2.5	0.69	14	28	1.9	16	7	60
501423	38-46.577	-103.927	-3-12-	3.0	3.8	4	5.5	0.78	13	16	2.3	14	6	43
501426	38-46.540	-103.778	-3-15-	2.0	3.2	8	3.2	1.3	11	21	1.9	12	7	53
501428	38-46.754	-103.521	-3-15-	2.6	4.1	3	6.6	2.7	11	12	1.7	16	5	38
501430	38-46.775	-103.581	-3-15-	1.9	2.6	4	2.7	0.61	10	14	1.6	9	6	58
501431	38-46.809	-103.538	-3-15-	1.8	3.0	9	6.2	2.5	10	38	1.4	12	5	46
501438	38-46.670	-103.477	-3-15-	2.4	3.2	5	5.6	2.0	9	140	1.4	12	5	45
501439	38-46.661	-103.472	-3-15-	2.1	3.2	6	6.1	2.9	9	24	1.5	17	5	37
501440	38-46.635	-103.422	-3-15-	2.2	3.3	2	6.6	3.1	10	19	2.1	15	5	39
501442	38-46.625	-103.374	-3-15-	2.4	3.1	6	2.6	2.8	7	6	1.2	9	4	26
501443	38-46.608	-103.465	-3-12-	2.3	3.1	6	2.5	2.7	9	15	1.2	12	4	32
501444	38-46.572	-103.458	-3-15-	1.8	3.3	7	3.0	2.1	8	13	1.2	8	3	28
501445	38-46.527	-103.475	-3-15-	2.2	3.2	6	3.0	1.1	14	24	2.1	16	8	66

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
Uraniun Measured by Fluorometry[b]	U-FL	Thorium	TH
		Titanium	TI
Uranium Measured by Mass Spectrometry[b]	U-MS	Vanadium	V
		Yttrium	Y
Uranium Measured by Neutron Activation	U-NT	Zinc	ZN
Arsenic	AS	Zirconium	ZR
Selenium	SE	Sulfate (ppm)	SO, SO_4
Silver	AG	Chloride (ppm)	CL
Aluminum	AL	Conductivity from Lab (μmhos/cm)	CT-L
Boron	B	Conductivity from Field (μmhos/cm)	CT-F
Barium	BA	Dissolved Oxygen (ppm)	DO
Beryllium	BE	Temperature (°C)	TP, TEMP
Calcium	CA	pH	PH
Cerium	CE	pH Measured by Lo Ion Paper	PH-P
Cobalt	CO	Total Alkalinity (ppm)	T-AK
Chromium	CR	M Alkalinity (ppm)	T-AK
Copper	CU	P Alkalinity (ppm)	P-AK, LIP
Iron	FE	Carbonate (ppm)	CB
Potassium	K	$CB = \begin{cases} 0 & \text{if pH} \le 8.3 \\ \dfrac{3.42 \times \text{M-AK}}{5.61 + 10^{(11-\text{pH})}} & \text{if pH} > 8.3 \end{cases}$	
Lithium	LI		
Magnesium	MG		
Manganese	MN	Bicarbonate (ppm)	BC
Molybdenum	MO	$BC = \begin{cases} \dfrac{2.62 \times \text{M-AK}}{4.3 + 10^{(7-\text{pH})}} & \text{if pH} \le 8.3 \\ 0.61 \times \text{M-AK} - \text{CB} & \text{if pH} > 8.3 \end{cases}$	
Sodium	NA		
Niobium	NB		
Nickel	NI		
Phosphorus	P	U-NT/U-FL	U/U, TUU
Lead	PB	U-FL/U-NT	U/TU
Platinum	PT	TH/U-NT	TH/U
Scandium	SC	1,000·U/SP	U/SP
Silicon	SI	1,000·U/B	U/B
Strontium	SR	1,000·U/SO	U/SO, USO

(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.

Table C-2

OAK RIDGE GEOCHEMICAL SAMPLING FORM
SHOWING FIELD DATA RECORDED ON MICROFICHE

OAK RIDGE GEOCHEMICAL SAMPLING FORM

1 | 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		Day		Month		Year	
20	21	22	23	24	25	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)

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			Noun	
72	73	74	75	76

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

Odor of Sampled Material (77)

N	None
S	H_2S
Ø	Other

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

1 | 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)

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)

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)

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-11982
(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 (55)

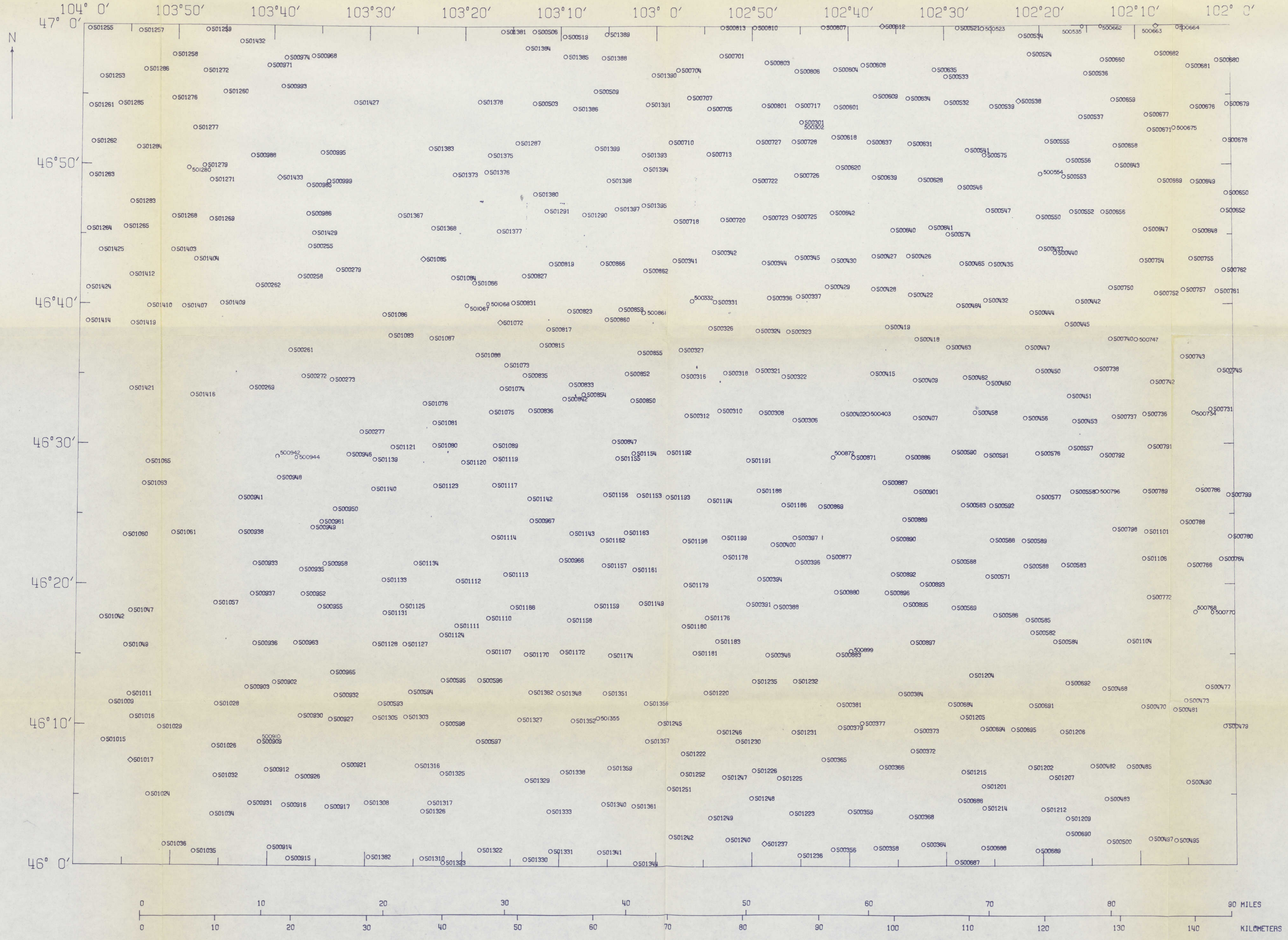
- N Natural
- M Manmade

Lake Area (56 57 58 59) (sq km)

REMARKS (Card 4)

MICROFICHE OF FIELD AND LABORATORY DATA

CONTENTS



LEGEND

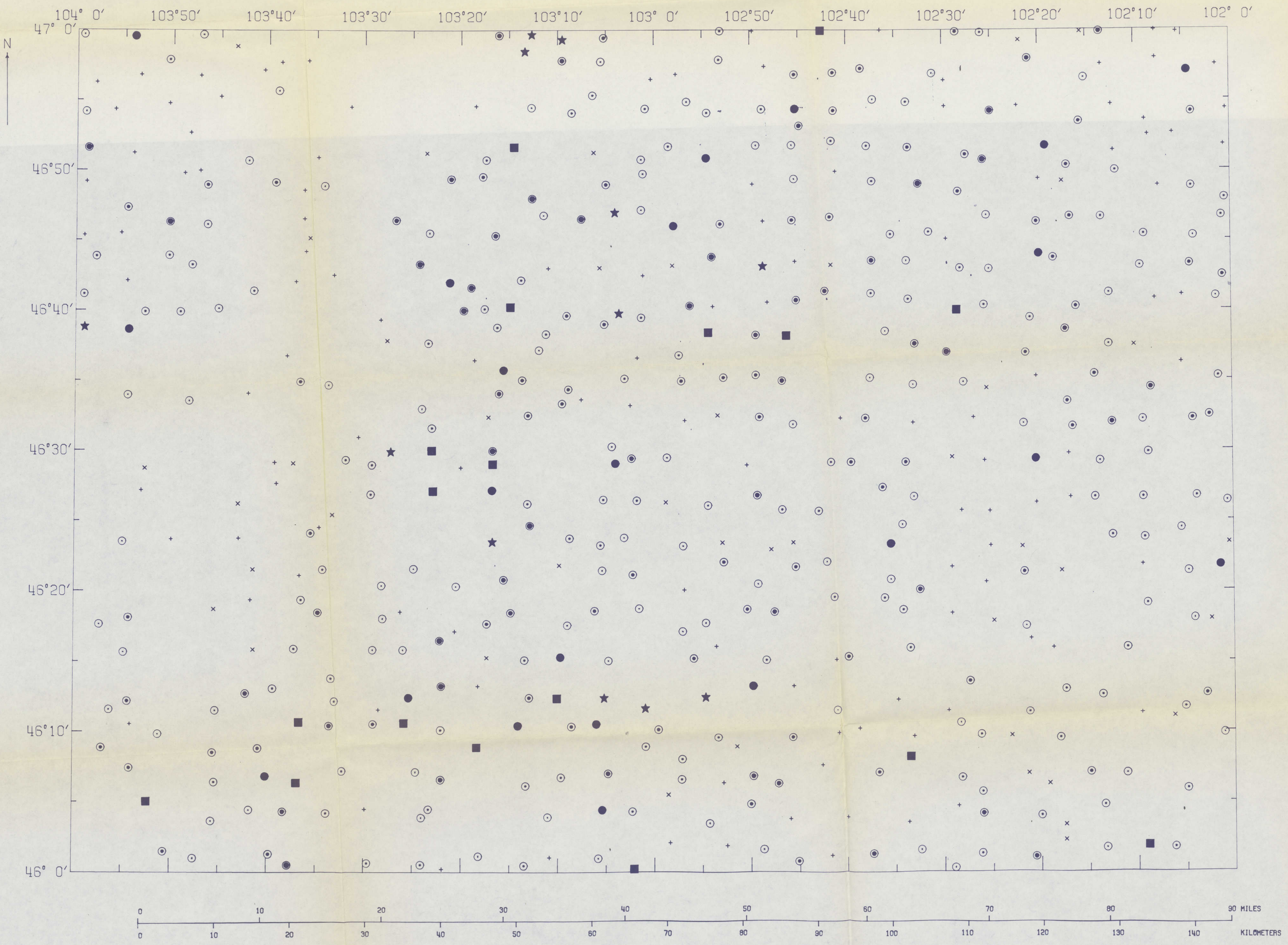
○ WELL WATER

◇ SPRING WATER

PLATE 1
DICKINSON QUADRANGLE
GROUNDWATER SAMPLE
LOCATION MAP

SCALE 1: 250000

544 SAMPLES PLOTTED



SYMBOL RANGES FOR PLOTTED VARIABLE (X)

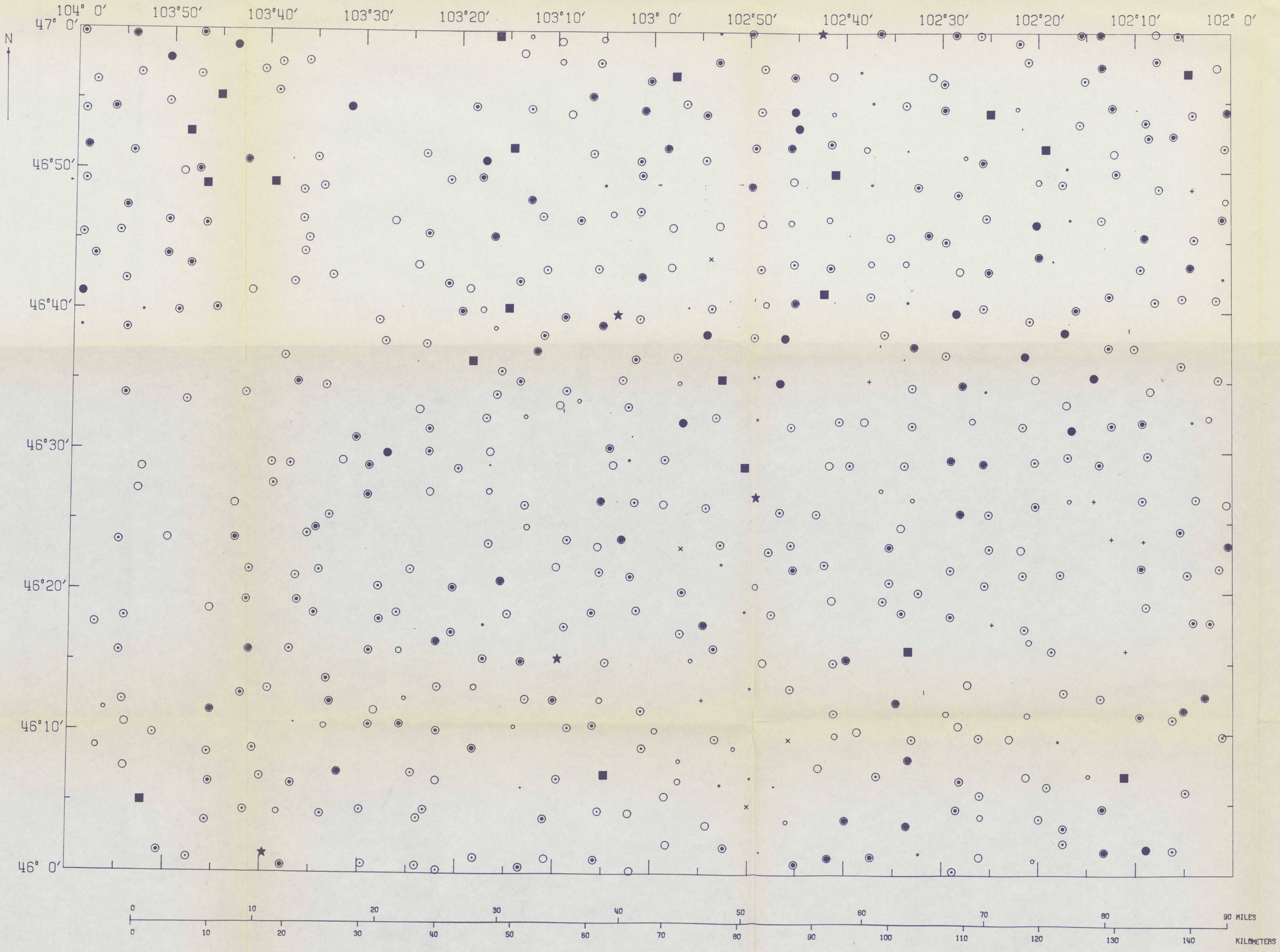
+	0.0 ≤ X < 0.20
×	0.20 ≤ X < 0.30
⊙	0.30 ≤ X < 0.50
⊙	0.50 ≤ X < 2.00
◉	2.00 ≤ X < 10.00
◉	10.00 ≤ X < 20.00
◉	20.00 ≤ X < 30.00
●	30.00 ≤ X < 60.00
■	60.00 ≤ X < 120.00
★	X ≥ 120.00

PLATE 2
DICKINSON QUADRANGLE
SYMBOL PLOT
GROUNDWATER

URANIUM (PPB)

SCALE 1: 250000

544 SAMPLES PLOTTED



SYMBOL RANGES FOR PLOTTED VARIABLE (X)

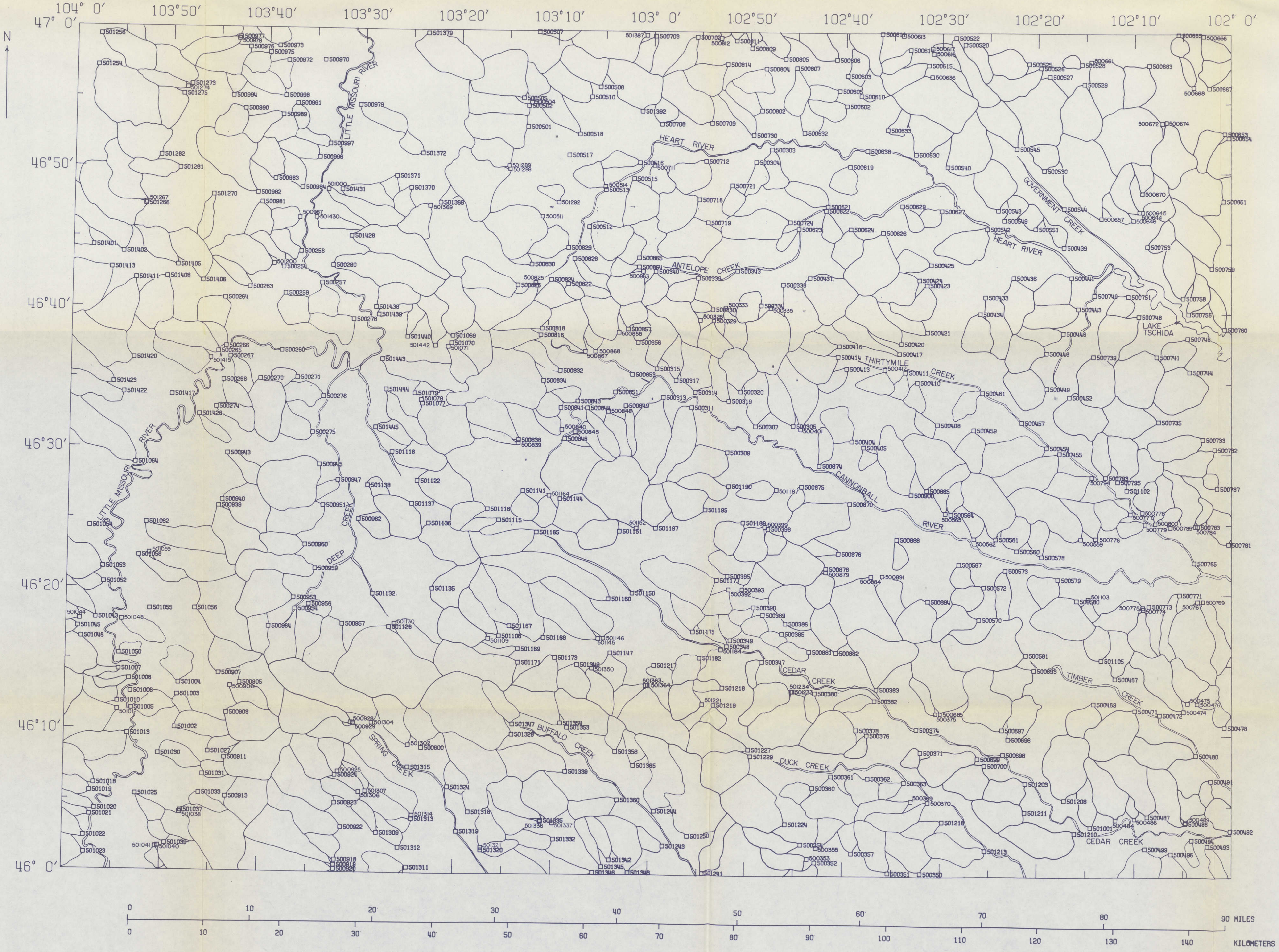
Symbol	Range
+	0 ≤ X < 400
×	400 ≤ X < 650
·	650 ≤ X < 800
∘	800 ≤ X < 1000
○	1000 ≤ X < 1200
○	1200 ≤ X < 1500
○	1500 ≤ X < 1800
⊙	1800 ≤ X < 2100
⊙	2100 ≤ X < 2600
◉	2600 ≤ X < 3100
◉	3100 ≤ X < 3700
◉	3700 ≤ X < 4500
●	4500 ≤ X < 5300
■	5300 ≤ X < 8200
★	X ≥ 8200

PLATE 3
DICKINSON QUADRANGLE
SYMBOL PLOT
GROUNDWATER

SPECIFIC CONDUCTANCE (UMHOS/CM)

SCALE 1: 250000

544 SAMPLES PLOTTED



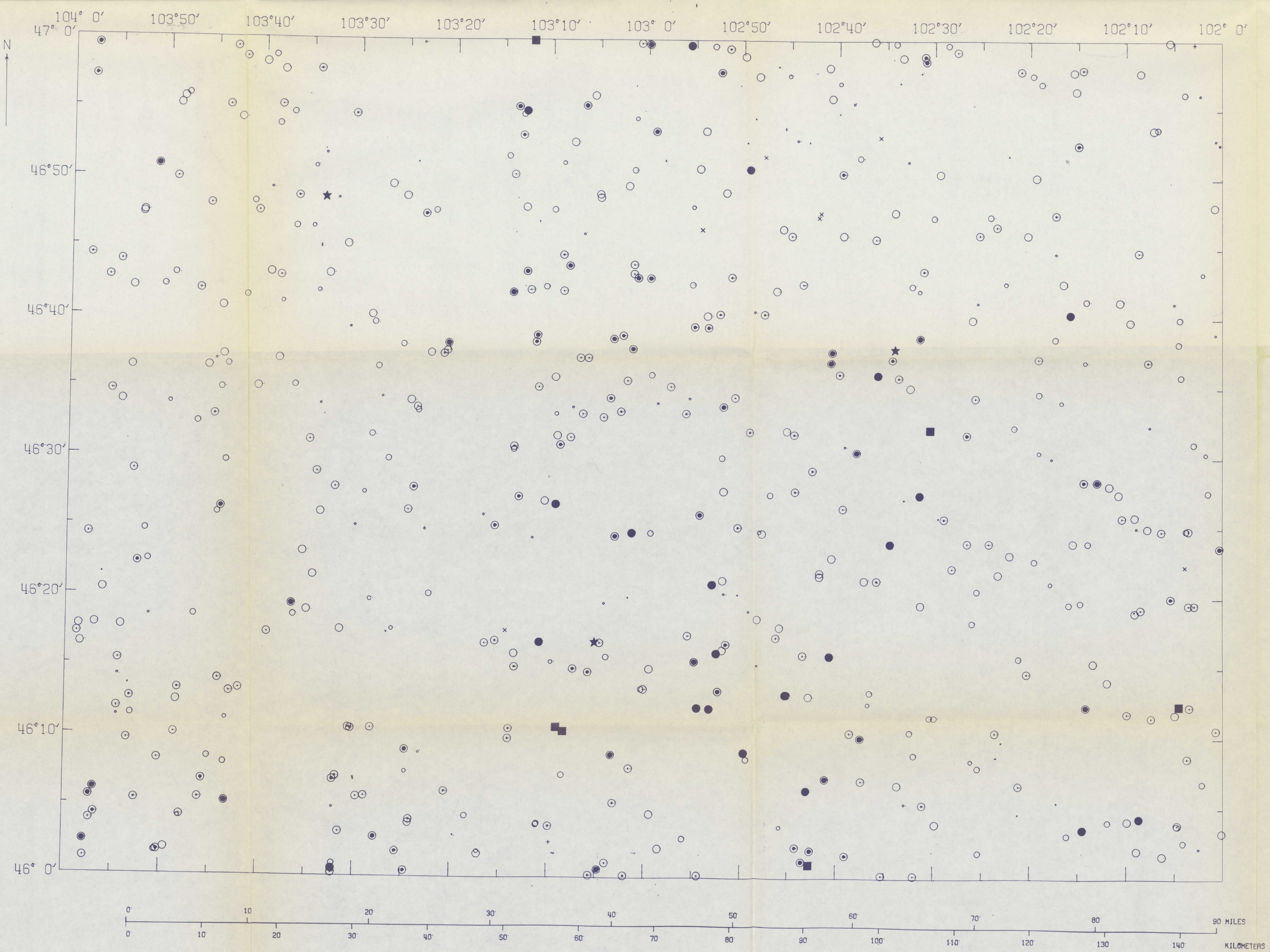
LEGEND

□ STREAM SEDIMENT

PLATE 4
DICKINSON QUADRANGLE
STREAM SEDIMENT LOCATION AND DRAINAGE BASIN MAP

SCALE 1: 250000

554 SAMPLES PLOTTED

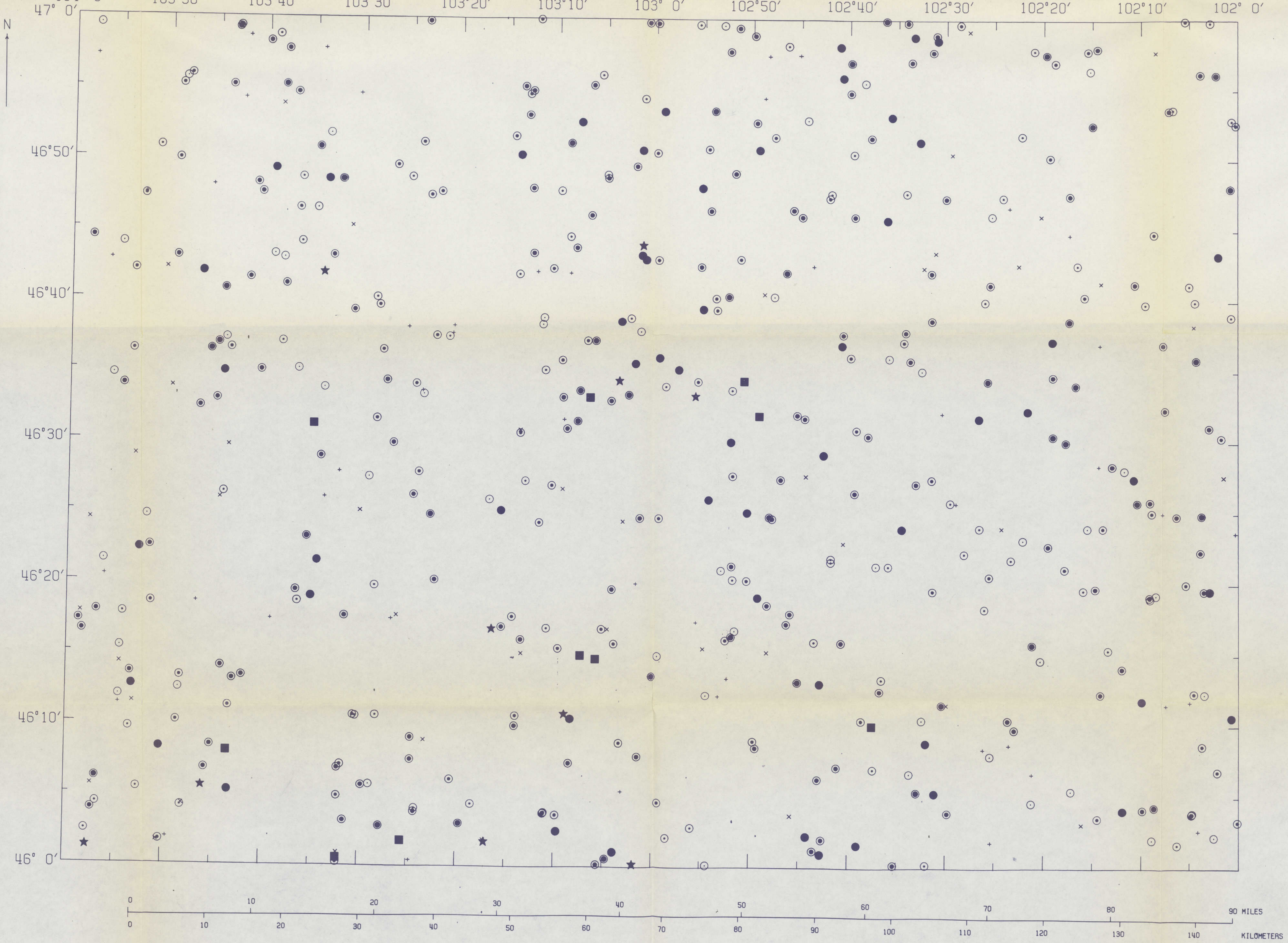


SYMBOL RANGES FOR
PLOTTED VARIABLE (X)

+	0.0 ≤ X < 1.20
×	1.20 ≤ X < 1.50
·	1.50 ≤ X < 1.70
•	1.70 ≤ X < 1.90
○	1.90 ≤ X < 2.00
○	2.00 ≤ X < 2.30
○	2.30 ≤ X < 2.60
⊙	2.60 ≤ X < 3.00
⊙	3.00 ≤ X < 3.40
⊙	3.40 ≤ X < 3.80
◉	3.80 ≤ X < 4.40
◉	4.40 ≤ X < 5.00
●	5.00 ≤ X < 7.50
■	7.50 ≤ X < 11.00
★	X ≥ 11.00

PLATE 5
DICKINSON QUADRANGLE
SYMBOL PLOT
STREAM SEDIMENT
URANIUM FLUOROMETRIC (ppm)

SCALE 1: 250000
551 SAMPLES PLOTTED

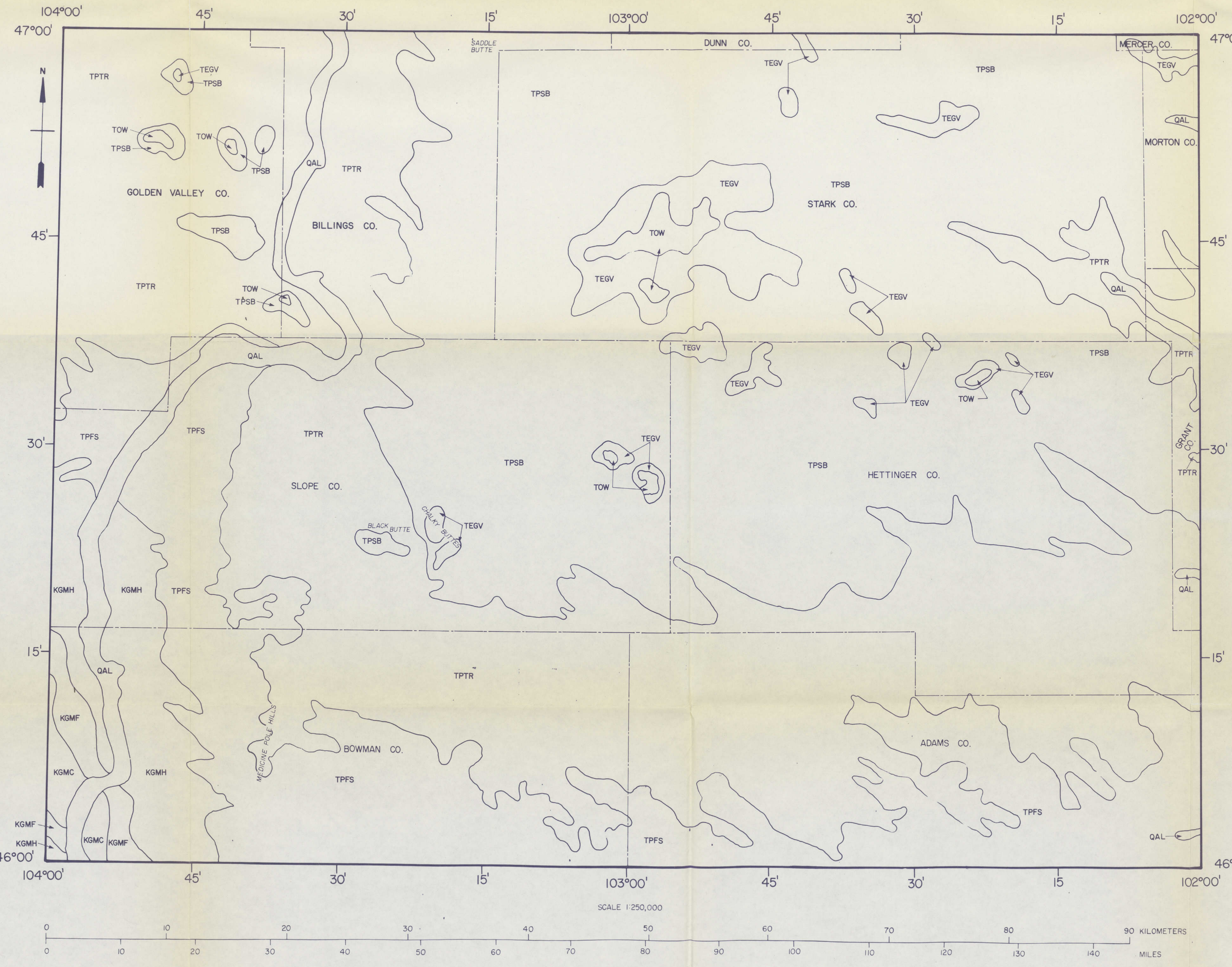


SYMBOL RANGES FOR PLOTTED VARIABLE (X)

+	0 ≤ X < 3
×	3 ≤ X < 4
⊙	4 ≤ X < 5
⊙	5 ≤ X < 6
⊙	6 ≤ X < 7
⊙	7 ≤ X < 9
⊙	9 ≤ X < 10
●	10 ≤ X < 12
■	12 ≤ X < 13
★	X ≥ 13

PLATE 6
DICKINSON QUADRANGLE
SYMBOL PLOT
STREAM SEDIMENT
THORIUM (PPM)

SCALE 1: 250000
554 SAMPLES PLOTTED



STRATIGRAPHIC COLUMN FOR THE DICKINSON QUADRANGLE

ERA	SYSTEM	SERIES	GEOLOGIC UNIT CODE		GEOLOGIC UNIT		MAXIMUM THICKNESS METERS	MAXIMUM THICKNESS FEET
CENOZOIC	QUATERNARY	HOLOCENE	QAL		ALLUVIUM		33	110
	TERTIARY	MIOCENE	TAR		ARIKAREE FORMATION		41	135
		OLIGOCENE	TOW		WHITE RIVER GROUP	BRULE FORMATION	20	65
						CHADRON FORMATION	56	185
		EOCENE	TEGV		GOLDEN VALLEY FORMATION		53	175
		PALEOCENE	TPSB TPTR TPFS		FORT UNION GROUP	SENTINEL BUTTE FORMATION TONGUE RIVER FORMATION CANNONBALL LUDLOW FORMATIONS	290 198 183	950 650 600
MESOZOIC	CRETACEOUS	UPPER CRETACEOUS	KGMH	KGHF	HELL CREEK FORMATION		175	575
			KGMF		FOX HILLS FORMATION		119	391
			KGMC		PIERRE SHALE		702	2,300

SOURCES OF GEOLOGY

1. CVANCARA, A. M., "GEOLOGY OF THE CANNONBALL FORMATION (PALEOCENE) IN THE WILLISTON BASIN, WITH REFERENCE TO URANIUM POTENTIAL NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 56, p 22 (1976a).
2. CVANCARA, A. M., "GEOLOGY OF THE FOX HILLS FORMATION (LATE CRETACEOUS) IN THE WILLISTON BASIN, WITH REFERENCE TO URANIUM POTENTIAL," NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 55, p 16 (1976b).
3. DENSON, N. M. AND GILL, J. R., "URANIUM BEARING LIGNITE AND CARBONACEOUS IN THE SOUTHWESTERN PART OF THE WILLISTON BASIN," U.S. GEOLOGICAL SURVEY, PROFESSIONAL PAPER NO. 463, p 75 (1965).
4. MOORE, W. L., "THE STRATIGRAPHY AND ENVIRONMENTS OF DEPOSITION OF THE CRETACEOUS HELL CREEK FORMATION (RECONNAISSANCE) AND THE PALEOCENE LUDLOW FORMATION (DETAILED), SOUTHWESTERN NORTH DAKOTA," NORTH DAKOTA GEOLOGICAL SURVEY, REPORT OF INVESTIGATIONS NO. 56, p 40 (1976).

LEGEND

COUNTY LINE ——-——-——

GEOLOGIC CONTACT ————

PLATE 7

GENERALIZED GEOLOGIC MAP DICKINSON QUADRANGLE, NORTH DAKOTA