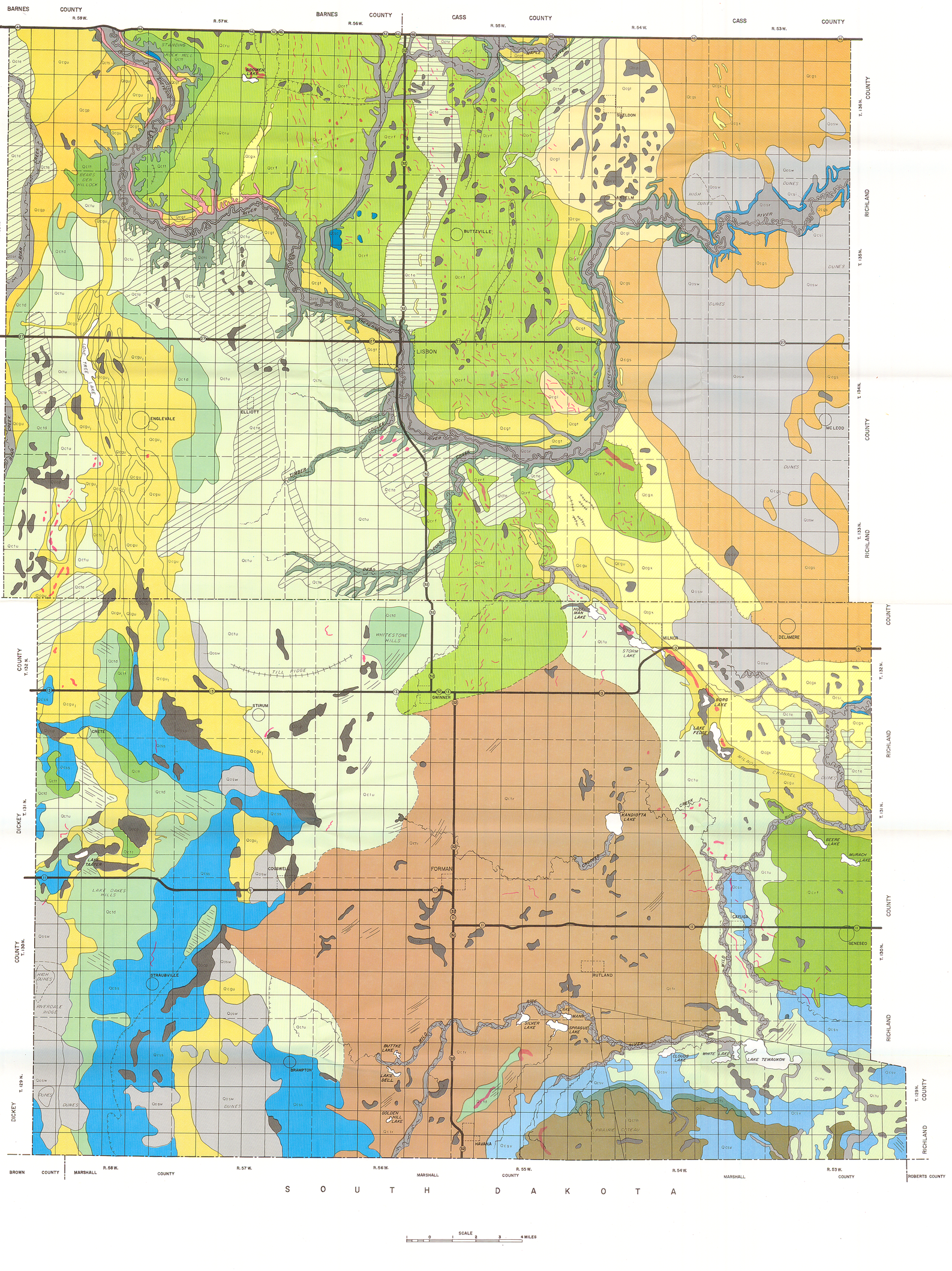
PART 1 PLATE 1
COUNTY GROUNDWATER STUDIES 31
BULLETIN 69

PLATE 1 GEOLOGIC MAP OF RANSOM AND SARGENT COUNTIES

NORTH DAKOTA GEOLOGICAL SURVEY
NORTH DAKOTA STATE WATER COMMISSION



LEGEND

See text for a more complete explanation of map units.

ROCK UNITS		DESCRIPTION
FORMATION AND FACIES		
	Symbol	Texture, color, topography or landform, and origin
OAHE FORMATION		Clay, sand, silt, and gravel with dispersed organic material; lake, river, and windblown sediment.
Clay Facies		
	Qcup	Clay and silt with some fine sand; gray to black; finely to obscurely bedded; flat topography; modern pond and slough sediment.
Sand and Silt Facies		
	Qosr	Sand, sandy silt, clayey silt, or silty clay; dark-brown, gray, or black; flat to gently rolling topography; obscurely bedded, fine-grained deposits (river overbank sediment) and cross-bedded sand (river channel sediment); modern and premodern river sediment.
	Qosw	Well-sorted, fine sand and black, sandy silt with obscure bedding and weak paleosols; commonly knobby topography consisting of both inactive and active transverse and longitudinal dunes (dune symbol) or a nearly flat sheet of windblown sediment.
COLEHARBOR GROUP		Stony, sandy, silty clay with limestone, dolomite, granite, gneiss, schist, and basalt pebbles and associated bedded clay, silt, sand, and gravel; glacial, river, lake, and windblown sediment.
Silt and Clay Facies		Silty clay, clayey silt, and fine sand; yellowish-brown to dark-gray in exposures depending on weathering intensity; laminated; lake sediment.
	Qcsv	Largely flat topography that may be rolling in areas where lake sediments are too thin to cover the underlying topography; veneer of proglacial, nearshore lake deposits.
	Qcsr	Rolling to hilly topography; nearshore and offshore lake sediments that were deposited on top of stagnant glacial ice.
	Qcsl	Rolling to steep slopes along the Sheyenne and Wild Rice Rivers; incised and eroded, interbedded lake and river sediment.
	Qcss	Flat plains covered by interbedded lake silt and some fluvial sand deposited in glacial Lake Dakota.
Sand and Gravel Facies		Poorly sorted to moderately well-sorted, cross-bedded sand and plane-bedded gravel and some sandy silt; river and lake shore sediment.
	Qcgs	Nearly level to undulating, mainly fluvial, sand plain deposited on the Sheyenne delta of glacial Lake Agassiz; relief less than 5 feet.
	Qcgx	Nearly level to undulating sand plain deposited by wave action along a lake shore; relief mainly less than 5 feet except on beach ridges where it is greater; fluvial sand reworked by waves.
	Qcgl	Mainly level to rolling plains of faulted and contorted shore sediments that were deposited on discontinuous areas of stagnant glacial ice; relief of 5 to 20 feet.
	Qcgu Qcgt	Level plains (Qcgu) commonly with braided channel scars ($Qcgu_1$) and river terraces or bars (Qcgt); river flood-plain sediments; relief of 3 to 10 feet.
	Qcgp	Mainly level to rolling plains of faulted and contorted river flood-plain sediments that were deposited on discontinuous areas of stagnant glacial ice; relief of 10 to 25 feet.
		Eskers and kames. Rolling to hilly areas of faulted and contorted river flood-plain sediments that were deposited in cracks and crevices in the stagnant glacial ice; relief up to 50 feet locally; individual esker ridges are shown as red lines on the map.
Silt-Till Facies		Mainly an unsorted, unbedded mixture of angular, subangular, and rounded blocks of rock, gravel, and sand in a loose, silty matrix; contains inclusions of contorted, bedded silt and clay; generally yellowish-brown to tan in exposures; glacial and lake sediment; 10 to 30 feet of local relief.
	Qcrf Qcru	Flat (Qcrf) to rolling (Qcru) topography; largely nearshore, with some offshore lake sediment that was deposited on glacial sediment that was partly covered by stagnant glacial ice.
Till Facies		Unsorted, unbedded mixture of angular, subangular, and rounded blocks of rock, gravel, and sand in a stiff matrix of silt and clay; yellowish-brown to olive-gray in exposures depending on weathering intensity; contains discontinuous lenses of gravel and sand.
		Areas of collapsed glacial sediment consisting mainly of till; collapsed supraglacial glacial sediment that consists mainly of mudflow deposits; relief is in direct proportion to the thickness of the collapsed glacial sediment.
	Qctu	Gently undulating to undulating surface with poorly integrated drainage; thin (3 to 12 feet) layer of till of the latest glacial advance; relief generally less than 10 feet.
	Qctr	Rolling surface with kettles, nonintegrated drainage, and numerous ice-disintegration features; few linear trends; moderately thick (10 to 25 feet) layer of the latest till; relief of 30 to 60 feet locally.
	Qcth	Hilly surface with numerous kettles, nonintegrated drainage, and abundant ice-disintegration features; linear trends absent; thick (25 to 100 feet) layer of till; relief of 60 to 150 feet locally.
	Qctd	Areas covered by a thin layer of till that only slightly modifies the pre-existing (underlying) topography; local relief up to 100 feet.
	Qctt	Hilly areas with intense internal linearity; layers of till draped over glacial or preglacial sediment or rock that has been sheared up into thrust slabs or folds near the ice margin; local concentrations of gravel or boulders; local relief up to 150 feet.
	Qcte	Mainly flat surface on till that has been eroded by stream erosion or lakeshore wave action; patches of sand and gravel common and abundant boulders in places; local relief less than 5 feet in most places.
	Qcts	Rugged slopes in till along the sides of valleys such as the Sheyenne and Maple Rivers; areas that have been eroded by slopewash and other hillslope processes; relief of 50 to 100 feet locally.
PIERRE AND NIOBRARA FORMATIONS		Marine shale. Both formations form rugged slopes in near-continuous exposures along the Sheyenne River in northwestern Ransom County; relief of 10 to 50 feet.
	Kp	Pierre: shale, dark-gray, fissile, highly jointed with iron-stained joint faces; bentonitic clay lenses.
	Kn	Niobrara: shale, light-gray, weathers to yellowish-brown to pale orange, blocky, hard, calcareous, earthy to crystalline gypsum in bedding planes and fractures.

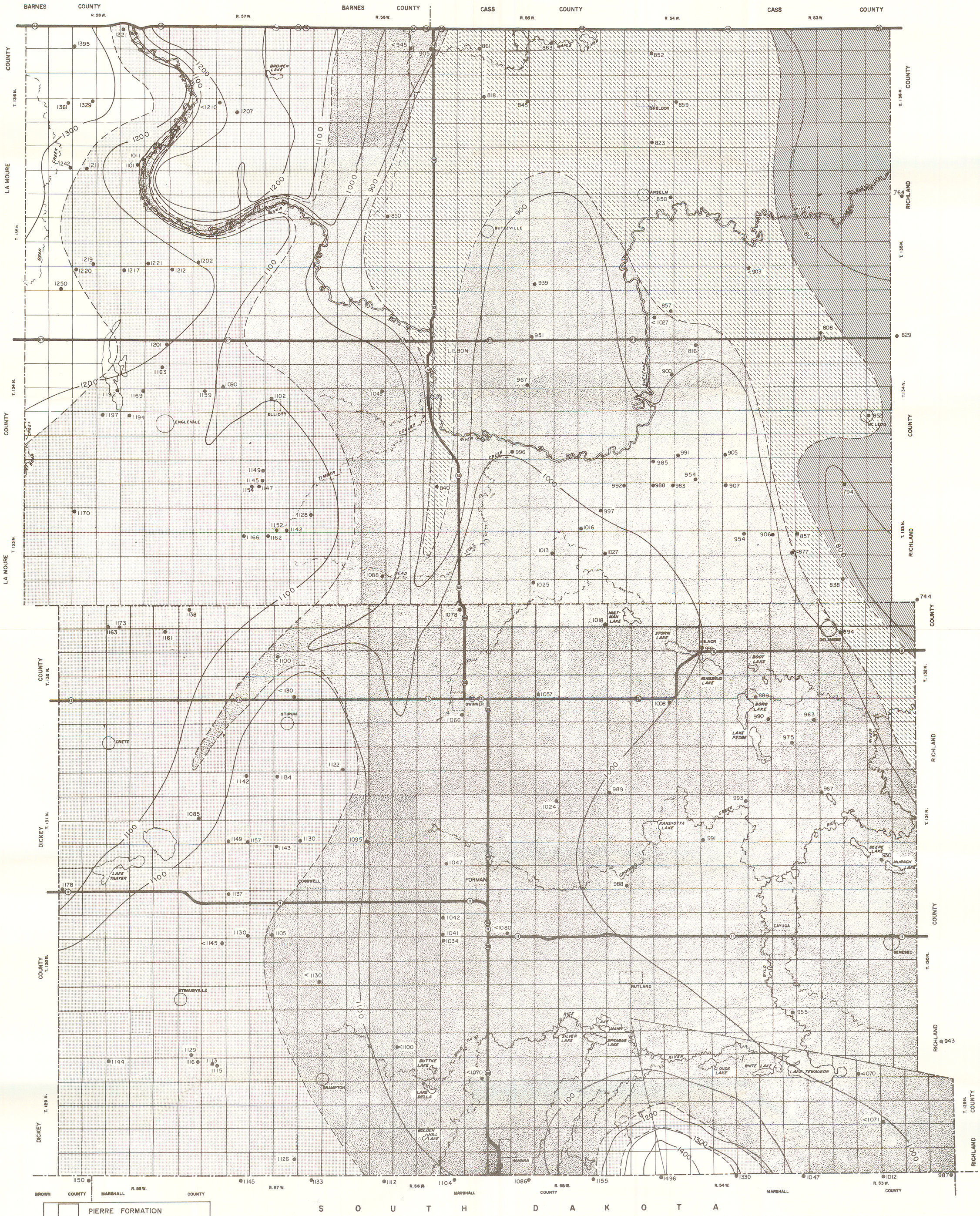
Map Symbols

- Ridges in areas of till. In areas of gently undulating to undulating collapsed moraine (Qctu), lines represent washboard ridges. In areas of thrust moraine (Qctt), lines represent linearity along thrust slabs.
- Till surface that has been washed by running water; many of the larger areas also carry the designation Qcte.
- Till surface that has been washed by waves at a lakeshore; many of the larger areas also carry the designation Qcte.
- Kettle chain.
- Scarp. Lower side corresponds to the tic-marked side of the line.
- Crest of ridge.
- Geologic contacts; dashed where approximate.
- Ponds and lakes.
- Roads.

PART 1 PLATE 2
COUNTY GROUNDWATER STUDIES 31
BULLETIN 69

PLATE 2 - MAP OF THE BEDROCK SURFACE IN RANSOM AND SARGENT COUNTIES

NORTH DAKOTA GEOLOGICAL SURVEY
NORTH DAKOTA STATE WATER COMMISSION



PIERRE FORMATION
NIOBRARA FORMATION
CARLILE FORMATION
GREENHORN FORMATION
BELLE FOURCHE FORMATION