

State Highway Commission of Kansas
Location and Design Concepts Department
Planning and Development Department

MATERIALS INVENTORY OF NEMAHA COUNTY, KANSAS

by

Gerald D. Hargadine, Geologist
assisted by
Dale P. Mahan
Photo Interpretation Section

Prepared in Cooperation with the
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Federal Highway Administration
Bureau of Public Roads

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Materials Inventory Report No. 19

the **Why ?**

What ?

& How ?

of this Report

This report was compiled for use as a guide when prospecting for construction material in Nemaha County.

Construction material includes all granular material, binder material, and mineral filler suitable for use in highway construction.

Known open sites, prospective sites, both sampled and unsampled, and all geologic units considered to be a source of construction material are described and mapped.

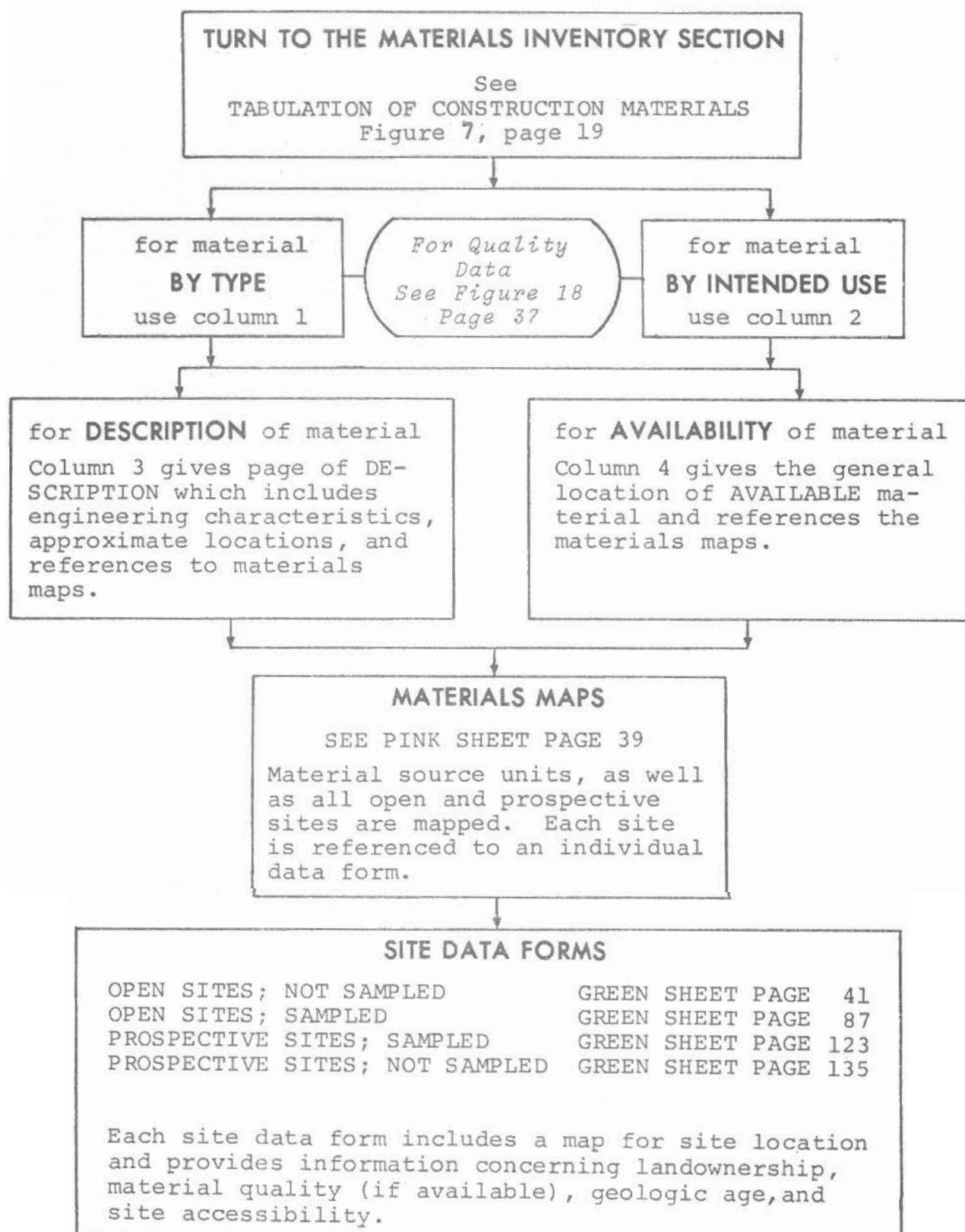
Prospective sites are areas where geologic conditions are best for finding construction material.

The diagram opposite shows how the MATERIALS INVENTORY SECTION may be used to evaluate and locate mapped sites.

The individually mapped sites certainly do not constitute the total construction material resources of the county. And, the data outlined in the diagram may be used for purposes other than the evaluation and location of these sites.

Beginning on page 5 is a section explaining the Geology of the county. This information, along with the maps, descriptions, and test data provides a means of evaluating and locating additional construction material sources in the geologic units throughout Nemaha County.

**TO LOCATE AND EVALUATE
A MAPPED SITE OF CONSTRUCTION MATERIAL IN NEMAHA COUNTY**



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PREFACE

This report is one of a series compiled for the Highway Planning and Research Program, "Materials Inventory by Photo Interpretation." The program is a cooperative effort of the Bureau of Public Roads and the State Highway Commission of Kansas, financed by highway planning and research funds. The objective of the project is to provide a statewide inventory of construction materials, on a county basis, to help meet the demands of present and future construction needs (figure 1).

Several previous surveys in Nemaha County provided basic geologic and materials data for this report. "Geology and Construction Material Resources of Nemaha County, Kansas" (1959) by Mudge and others, provided geologic information. Other reports and data issued by the State Geological Survey of Kansas and the Materials Department, State Highway Commission of Kansas provided quality test results and other general facts pertaining to construction material resources of the county. Detailed geologic and soil data were obtained from soil surveys and centerline geological profiles prepared for design of major highways in the county by the State Highway Commission.

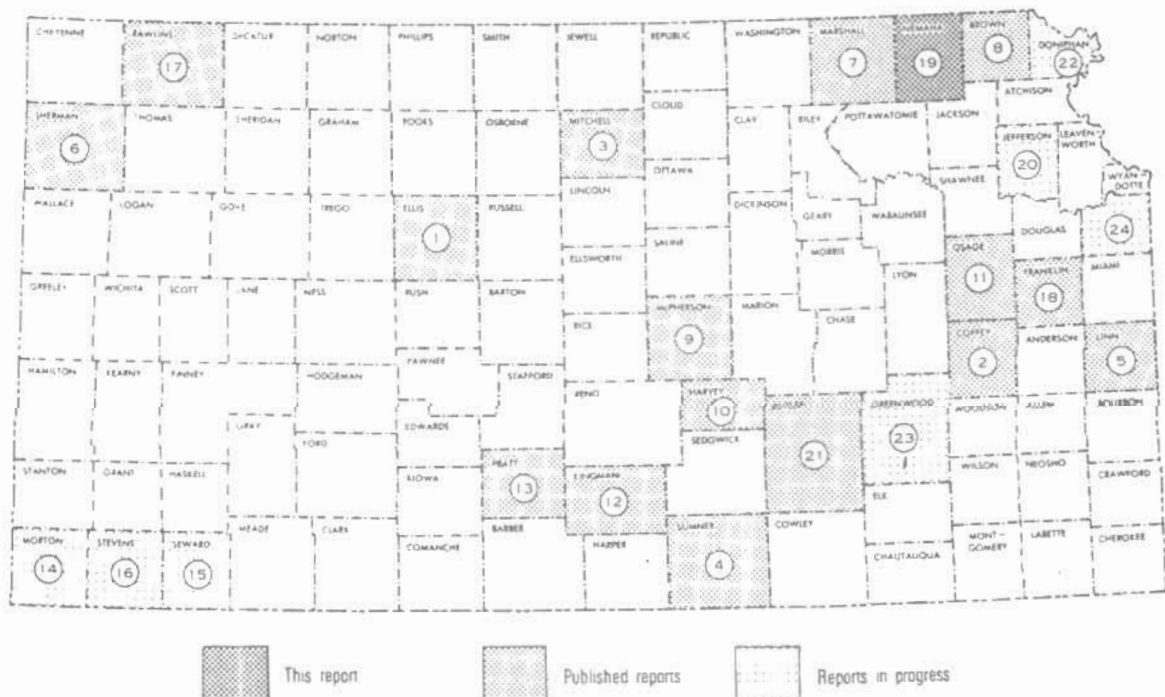


Figure 1. Index map of Kansas showing the location of Nemaha County along with the report number and location of other counties for which reports have been or are being completed.

Appreciation is extended to Mr. Lewis Shields, Nemaha County Engineer and Mr. J. M. Griffith, First Division Materials Engineer, for verbal information concerning construction materials in the area.

This report was prepared under the guidance of Mr. J. D. McNeal, State Highway Engineer, Mr. R. R. Biege, Jr., Engineer of Location and Design Concepts, Mr. G. M. Koontz and Mr. A. H. Stallard of the Location and Design Concepts Department.

ABSTRACT

Nemaha County lies in the Glaciated Region physiographic division of Kansas. The area is mantled by unconsolidated deposits of Pleistocene age with bedrock exposures along some stream valleys.

Unconsolidated deposits are mainly glacial till with lenses of outwash gravel. Glacial lacustrine deposits, composed mostly of silt, are found in the southern part of the county. Boulders composed mostly of quartzite are found scattered over the county. Thin Loess deposits cover the stream divide areas in the western one-half and an area in the northeast part. A limited amount of Alluvium and Terrace Deposits is found in the stream valleys.

Abundant sand and gravel is produced from Glacial Drift, mostly for light type surfacing purposes. A limited amount of silt is produced for mineral filler in southern Nemaha County and one boulder deposit is a source of crushed quartzite in the northern part.

Exposed bedrock units are Pennsylvanian and Permian Limestone, shale, sandstone, and coal. Because of upheaval associated with the Nemaha anticline, a thick section of bedrock is exposed in the county. The most important material producing beds are the Tarkio, Neva, and Cottonwood Limestones. Other units of minor significance include the Church, Emporia, and Wreford Limestones. All limestone sources are marginal in quality.

The most common geo-engineering problem encountered in Nemaha County is ground-water seepage from the top of impervious shales and from lenses of sand and gravel in glacial till. Generally all water is low in mineralization and will be acceptable for use in Portland Cement concrete.

GENERAL INFORMATION SECTION

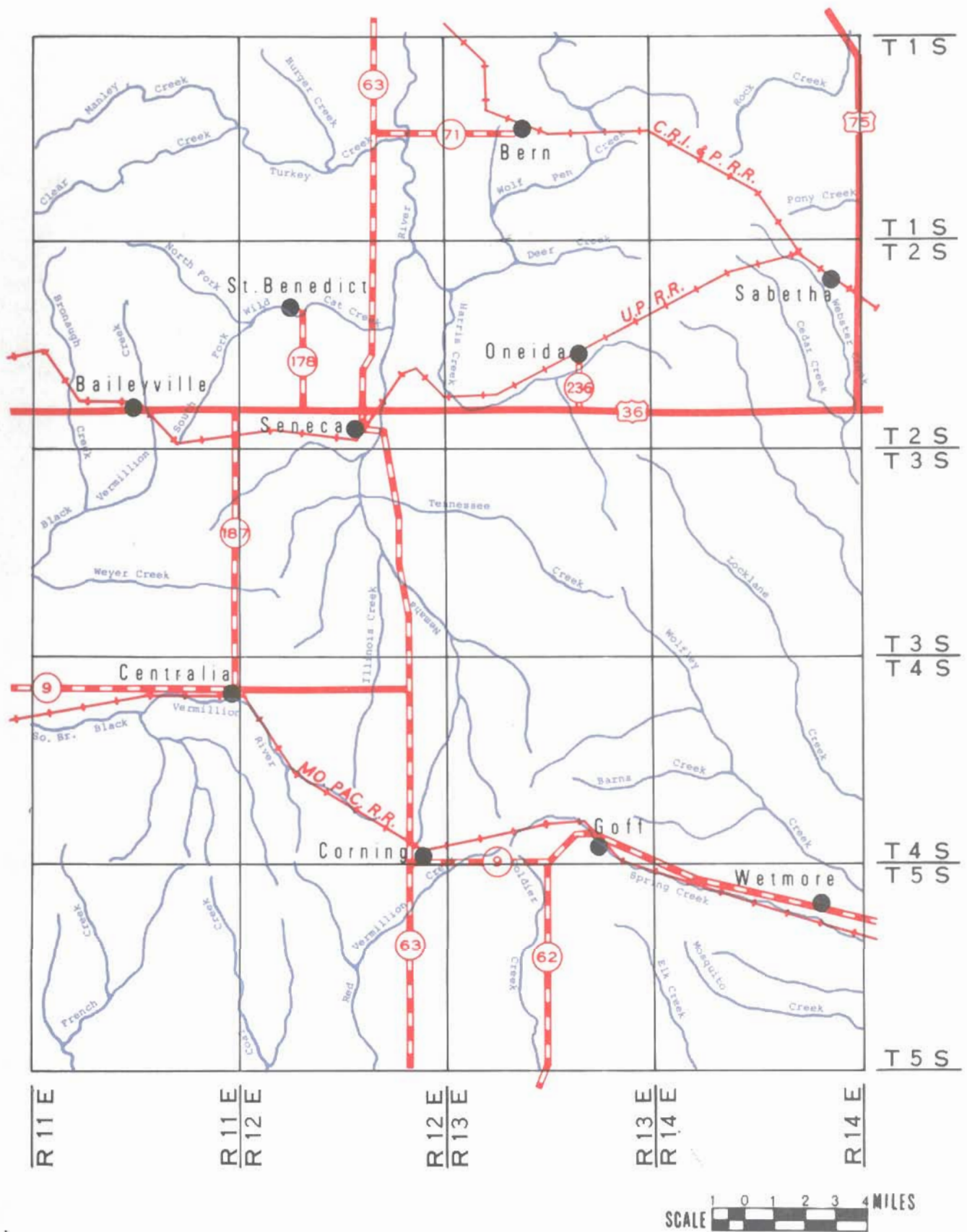


Figure 2. Drainage and major transportation facilities in Nemaha County.

FACTS ABOUT NEMAHA COUNTY

Drainage in Nemaha County is controlled by the Nemaha, Black Vermillion, and the Delaware Rivers and Soldier Creek. The county is served by US-36, US-75, K-9, K-62, K-63, and K-137 highways. The Missouri Pacific, Union Pacific, and Chicago Rock Island and Pacific Railroads serve the county. The transportation routes and drainage system are shown in figure 2.

METHODS OF INVESTIGATION

Investigation for this report consisted of three phases:

(1) research and review of available information, (2) photo interpretation, and (3) field reconnaissance.

During phase one, information pertaining to the geology, soils, and construction materials was reviewed. At this time the general geology of the county, relative to material sources, was determined. The results of quality tests on samples taken in Nemaha County were correlated with the various geologic units.

Phase two consisted of study and interpretation of aerial photographs taken by the State Highway Commission at a scale of one inch equals 2,000 feet. Figure 3 shows the photographic coverage of Nemaha County.

The geologic source beds were mapped and classified on photographs, as were all open material sites previously sampled and reported. All material sites were then correlated with the geology of the county.

Phase three, a field reconnaissance of the county, was conducted after initial study of the aerial photographs. This en-

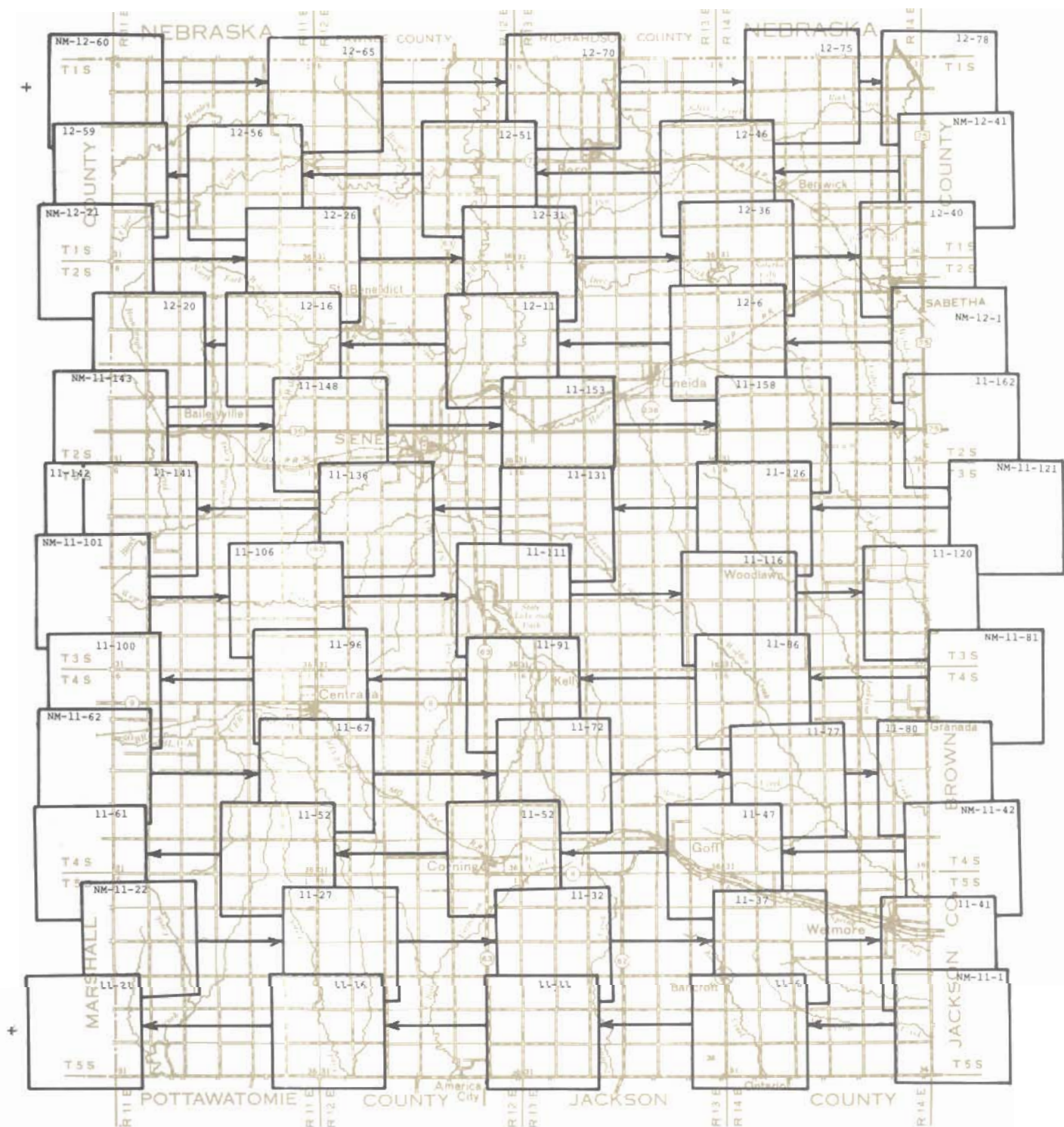
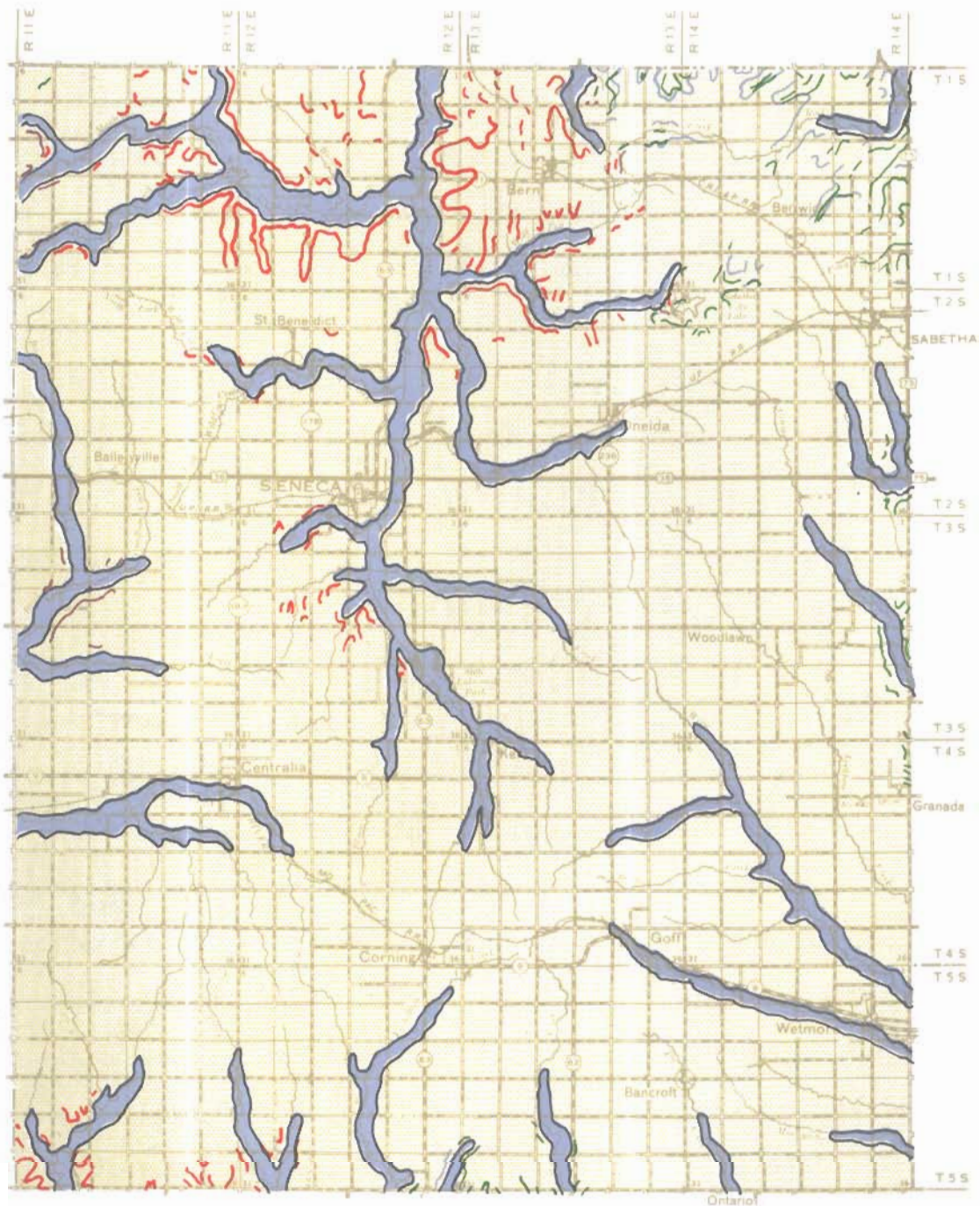


Figure 3. Aerial photographic coverage map for Nemaha County. The numbers indicate photograph numbers on flights taken by the Photogrammetry Section, State Highway Commission of Kansas, March 31 and June 9, 1964 at a scale of 1:24,000. Aerial photographs are on file in the Photogrammetry Laboratory, State Office Building, Topeka, Kansas.

abled the interpreter to inspect material sites, to verify doubtful mapping situations, and to better acquaint himself with the geology of the county.

GEOLOGY SECTION



General Geology of Nemaha County.

LEGEND

- Alluvium and Terrace Deposits
- Glacial Drift and (or) Loess
- Chase Group
- Council Grove Group
- Admire Group
- Wabaunsee Group

GENERAL GEOLOGY

GEOLOGY was used as the basis for conducting this materials inventory project because all material source units are the product of geologic agents. This makes it possible to ascertain the general properties of the material source, to identify and classify each according to current geologic nomenclature, and thereby, establish a uniform system of material source bed classification. *It is important to note that the quality of material from a given source may vary from one location to another, especially when one is dealing with unconsolidated deposits.*

Usually the geologic classification attached to unconsolidated deposits denote age rather than material type, therefore, two deposits laid down during the same time period in different parts of the state may have the same geologic name or classification, but may vary in composition because of the difference in parent material, mode of deposition, or carrying capacity of the depositing agent. By knowing the mode of deposition, type of material, geologic age, landform, and the results of quality tests, it is possible to derive general information on prospective areas. Sites selected for development can thus be evaluated by data obtained elsewhere from the same unit.

The geologic history of Nemaha County is presented to provide a general understanding of geologic events responsible for the deposition of construction material resources. Since construction material resources are either exposed or near the surface, emphasis is placed on the segment of geologic time during which the surface units were deposited.

Figure 4 is a table that illustrates era and period relationship of geologic time. Most geology in the county is represented in the Quaternary Period, the last million years on the timetable; however, some bedrock units of Pennsylvanian and Permian age are exposed. Figure 5, a geologic column illustrates the surface geology in Nemaha County and the stratigraphic position of each bed. Much of the geologic information used in this report was based on information presented by Mudge and others (1959) and Frye and Leonard (1952).

Nemaha County is underlain by igneous and metamorphic rock of Pre-Cambrian age. Because the county is traversed by the Nemaha Anticline, granite is found within a few hundred feet of the surface at some points.

Presumably, this area was inundated by a sea in early Paleozoic time and, except for relatively short spans of emergence, remained so until the end of the Mississippian Period. The end of Mississippian deposition was marked by the rise of the Nemaha Anticline. This uplift subjected rocks of Mississippian and older ages to varying degrees of erosion. By the beginning of the Pennsylvanian Period, the Nemaha Mountains were eroded to a peneplain and at this time subsidence started and the county soon sank below sea level. Limestone, shale, dolomite, sandstone, and coal were deposited over the roots of the ancient range. Even though marine deposition was the primary process during the late Paleozoic, some internal forces were still at work at this time and (or) later in geologic time beneath the old Nemaha Range. This is assumed because Pennsylvanian and Permian rocks have been

ERAS	PERIODS	ESTIMATED LENGTH IN YEARS	TYPE OF ROCK IN KANSAS	PRINCIPAL MINERAL RESOURCES
CENOZOIC	QUATERNARY (PLEISTOCENE)	1,000,000	Glacial drift; river silt, sand, and gravel; dune sand; wind-blown silt (loess); volcanic ash.	Sand and gravel; volcanic ash; agricultural soils; water.
	TERTIARY	59,000,000	Silt, sand, and gravel; fresh-water limestone; volcanic ash; bentonite; diatomaceous marl; opaline sandstone.	Sand and gravel; volcanic ash; diatomaceous marl; water.
MESOZOIC	CRETACEOUS	70,000,000	Chalky shale, dark shale, vari-colored clay, sandstone, conglomerate; outcropping igneous rock.	Concrete and bituminous aggregate, light type surfacing, shoulder and sub-grade material, riprap, and building stone; ceramic materials; water.
	JURASSIC	25,000,000	Sandstone and shale, chiefly subsurface.	
	TRIASSIC	30,000,000		
PALEOZOIC	PERMIAN	25,000,000	Limestone, shale, evaporites (salt, gypsum, anhydrite), red sandstone and siltstone, chert, and some dolomite.	Concrete and bituminous aggregate, light type surfacing, shoulder and sub-grade material, riprap, and building stone; natural gas, salt, gypsum, water.
	PENNSYLVANIAN	25,000,000	Alternating marine and non-marine shale; limestone, sandstone, coal, and chert.	Concrete and bituminous aggregate, light type surfacing, shoulder and sub-grade material, riprap, and limestone and shale for cement; ceramic materials; oil, coal, gas, and water.
	MISSISSIPPIAN	30,000,000	Mostly limestone, predominantly cherty.	Chat and other construction materials; oil, zinc, lead, and gas.
	DEVONIAN	55,000,000	Subsurface only. Limestone and black shale.	Oil.
	SILURIAN	40,000,000	Subsurface only. Limestone.	Oil.
	ORDOVICIAN	80,000,000	Subsurface only. Limestone, dolomite, sandstone, and shale.	Oil, gas, and water.
	CAMBRIAN	80,000,000	Subsurface only. Dolomite and sandstone.	Oil.
PRE-CAMBRIAN	(Including PROTEROZOIC and ARCHEOZOIC ERAS)	1,600,000,000 +	Subsurface only. Granite, other igneous rocks, and metamorphic rocks.	Oil and gas.

Figure 4. Geologic timetable.

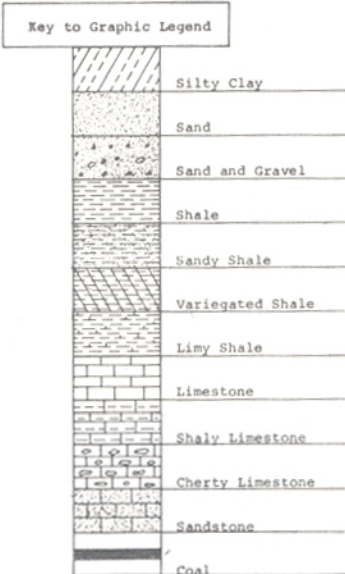


Figure 5. Generalized geologic column of the surface geology in Nemaha County.

tilted upward to varying degrees near the axis of the ridge.

Rocks of the Mesozoic Era are not found in Nemaha County. However, in Washington County 30 miles to the east, the Cretaceous Dakota Formation is exposed. Undoubtedly deposition occurred during the Mesozoic, however, subsequent erosion has removed all the sediments.

The topographic features found in Nemaha County today, were formed primarily during the Quaternary Period of the Cenozoic Era. Most unconsolidated deposits found in the county were laid down by glacial action that characterized this period. The Pleistocene Epoch of the Quaternary Period represents a time of repeated glacial and interglacial cycles. Figure 6 is a geologic timetable which shows the divisions of the Quaternary and the approximate length of each. The glacial ages (Nebraskan, Kansan, Illinoian, and Wisconsinan) represent times of glacial advancement, while the three interglacial ages (Aftonian, Yarmouthian, and Sangamonian) are periods of major glacial recession. Glacial activity in Kansas was restricted to the northeast portion of the state, including Nemaha County. Only the Kansan and Nebraskan Glaciers reached Kansas, but most glaciation in this county occurred during Kansan time.

The sequence of glaciation has played a controlling role in the development of Pleistocene nomenclature and classification of Pleistocene deposits throughout the state. The geologic history of the Pleistocene, as discussed here, is based chiefly on a report by Frye and Leonard (1952).

As the Nebraskan glacier started to accumulate, north-central Kansas was an area of moderate relief with many bedrock exposures. A major stream flowed east-southeast out of Marshall County in the vicinity of the Black Vermillion River and through southern Nemaha County. As the glacier increased in size, the streams in Kansas deepened their valleys. Later, as the ice retreated, the stream velocities decreased, and the streams aggraded their channels. Abundant outwash material probably covered a large part of the county at the close of the Nebraskan age.

Divisions of the Quaternary Period				
Period	Epoch	Age	Estimated length of age duration in years	Estimated time in years elapsed to present
Quaternary	Pleistocene	Recent		10,000
		Wisconsinan Glacial	45,000	55,000
		Sangamonian Interglacial	135,000	190,000
		Illinoian Glacial	100,000	290,000
		Yarmouthian Interglacial	310,000	600,000
		Kansan Glacial	100,000	700,000
		Aftonian Interglacial	200,000	900,000
		Nebraskan Glacial	100,000	1,000,000

Figure 6. Geologic timetable of the Quaternary Period.

The Kansan glacier entered the state from the northeast, overriding and carrying with it deposits of the prior glacial age. With the advance, streams generally deepened their channels. The prominent Nebraskan stream, flowing through southern Nemaha County was deepened; however, the channel was buried with sediment (Atchison Formation) as stream velocity decreased. As the glacier retreated, large quantities of meltwater flowed through the ancestral Black Vermillion River and Blue River channels to the newly established Kansas River drainage.

As a result of the Kansan glacier, Nemaha County was covered by till (direct glacial deposition), outwash (meltwater deposits), glaciolacustrine deposits (glacial lake deposits), and terrace deposits associated with meltwater flowing through the major drainage channels.

The stream pattern in Illinoisan time was controlled by a continuation of adjustments associated with Kansan glaciation. Downcutting occurred through older deposits in the major river valleys and the Loveland Loess was deposited on some stream divide areas.

The Wisconsin glacier, like the Illinoisan, stopped several hundred miles north of Kansas. It was during this period that wind-blown silt termed the Peoria Loess was deposited and low terraces developed along the major streams.

The Recent Age represents the time which has elapsed since the last retreat of the Wisconsin glacier. During this age, climatic conditions were probably similar to those which exist today. Throughout this time, the major streams developed their present

channels and reworked older Pleistocene Deposits. The reworked deposits are referred to as Alluvium.

GENERAL GEO-ENGINEERING CONDITIONS

Factors that govern geo-engineering problems in Nemaha County include: (1) the glacial drift and loess blanket over most of the county, (2) bedrock exposures along the major drainage, and (3) mineralization of water.

Loess and Glacial Drift will be encountered on most projects in Nemaha County. The Loess is primarily silt with a relatively consistent clay content, and would be classified as an A-4 or A-5 soil according to the A.A.S.H.O. soil classification. Glacial Drift has a highly variable composition ranging from clay to boulders. Pockets of sand and gravel, that may be saturated with water, are found randomly throughout the drift area and often cause hydrology problems in road construction. Boulders may be struck by piling resulting in a false bearing or damage to the pile.

Limestone, shale, and sandstone are exposed or near surface along major drainage channels. Some shale units found in Nemaha County display high shrinkage and swell characteristics. For example, problems of this nature have been encountered in the White Cloud, Cedar Vale, Friedrich, Plumb, and Havensville Shale Members. Piling for bridge footings may penetrate weathered shales in some areas. Shale, which is covered by mantle, may exhibit deep weathering characteristics due to the presence of water in the overlying material. Pile penetration will vary with depth of weathering and lithology of the unit.

In Nemaha County, ground-water problems are common when alternating layers of limestone, shale, and sandstone are encountered. Units that are known aquifers include the Reading, Tarkio, Pony Creek, Neva, Cottonwood, and Eiss Limestones and a sandstone bed in the lower part of the White Cloud Shale. The flow of water in these and other units may be intensified or diminished by structure caused by the Nemaha Anticline.

In Nemaha County, most water is produced from Glacial Drift. This unit and most bedrock sources provide water that normally is not highly mineralized and should be acceptable for use in Portland Cement concrete. However, water produced from dark-colored shale or from bedrock units at depths greater than 100 feet tends to have a relatively high sulfate ion content.

MATERIALS INVENTORY SECTION

GENERAL INFORMATION

A tabulation of quality test results is shown in figure 18 (page 37) for material taken from the Church, Wakarusa, Emporia, Tarkio, Neva, and Cottonwood Limestone units along with granular material of glacial origin. In general, the limestone units display similar engineering characteristics throughout the county; however, the Glacial Drift, which blankets a large amount of the county, is variable and may have a material range from clay to large diameter boulders. Most of the glacial material pits are found in meltwater outwash deposits.

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TYPE material and geologic source	USE	DESCRIPTION page	AVAILABILITY
<u>Limestone</u>			
Church Limestone Member	Concrete aggregate. Bituminous aggregate. Base course material. Shoulder material. Light type surfacing material. Riprap.	20	Small area in the north-central part of the county. Outcrop shown on plates I and II.
Emporia Limestone Formation (Reading and Elmont Limestone Members)	Base course material. Shoulder material. Light type surfacing material. Riprap (Reading only). Structural stone (Reading only).	22	Northwest portion of the county on the flanks of the major drainage. Outcrop shown on plates I, II, III and V.
Tarkio Limestone Member	Bituminous aggregate. Shoulder material. Base course material. Riprap.	24	Widely scattered areas in the eastern one-half of the county on the flanks of the major drainage. Outcrop shown on plates II, IV, and V.
Neva Limestone Member	Base course material. Shoulder material. Light type surfacing material.	26	Widely scattered areas in the eastern one-half of the county on the flanks of the major drainage. Outcrop shown on plates II, IV, and V.
Cottonwood Limestone Member	Base course material. Shoulder material. Light type surfacing material. Riprap. Structural stone.	28	Widely scattered areas in the eastern one-half of the county on the flanks of the major drainage. Outcrop shown on plates II, IV, V, and VI.
Wreford Limestone Formation (Threemile and Schroyer Limestone Members)	Light type surfacing material.	30	Northern portion of the northeast one-fourth of the county. Outcrop shown on plate II.
<u>Sand and Gravel</u>			
Glacial Drift	Bituminous aggregate. Base course material. Shoulder material. Light type surfacing material.	32	Blankets most of the county but is most prominent on stream divide areas. Glacial Drift is shown on plates I through VI.
Alluvium and Terrace Deposits	Possible concrete aggregate. Possible bituminous aggregate. Base course material. Shoulder material. Light type surfacing material.	32	Major stream valleys over the county. Alluvium and Terrace Deposits are shown on plates I through VI.
<u>Boulders</u>			
Glacial Drift	Possible concrete aggregate. Possible bituminous aggregate. Base course material. Shoulder material. Light type surfacing material. Building stone. Riprap.	33	Prominent on stream divide areas over much of the county. However, boulder accumulations are scattered deposits. Glacial Drift is shown on plates I through VI.
<u>Silt</u>			
Glacial Drift	Mineral Filler.	34	Prominent in a buried valley (Atchison Formation) found along the southern boundary of Nemaha County. Glacial Drift is shown on plates I through VI.
Loess	Not a source of aggregate or mineral filler. It is a source of subgrade, embankment, and slope material.	35	Most prominent in the western one-half and the northeast one-fourth of the county. Loess is shown on plates I through VI.

Figure 7. Tabulation of the construction material types and their availability in Nemaha County.

DESCRIPTION OF CONSTRUCTION MATERIALS

Limestone

Howard Limestone Formation, Church Limestone Member

The Howard Limestone Formation is divided into five members, which are, in ascending order: the Bachelor Creek Limestone, Aarde Shale, Church Limestone, Winzeler Shale, and Utopia Limestone. A facies change has occurred in the formation in Nemaha County and the normal sequence of members does not exist. Only the Church, Utopia, and Aarde Shale were identified and, in some places, the Utopia is absent. The Church is the limestone unit of major material significance.

The Church is a hard, dense, blue-gray, fossiliferous limestone exposed only along the Nemaha Anticline in extreme northern Nemaha County. In sections 1, 12, 24, and 25, T1S, R12E, the member is a massive limestone three to four feet thick that could be economically quarried. It is readily identified by the persistent *Nodaway Coal* zone, in the Aarde Shale, found one to two feet below the Church (figure 8). Exposures of the Church are shown on plates I and II.

Tests indicate that the Church Limestone Member is of good quality with the exception of marginal soundness. The crushed limestone may be suitable for concrete, bituminous, base course and shoulder aggregate, light type surfacing material, and rip-rap. Quality test results on samples of the Church show that the Los Angeles wear ranged from 23.7 to 35.3 percent, the soundness

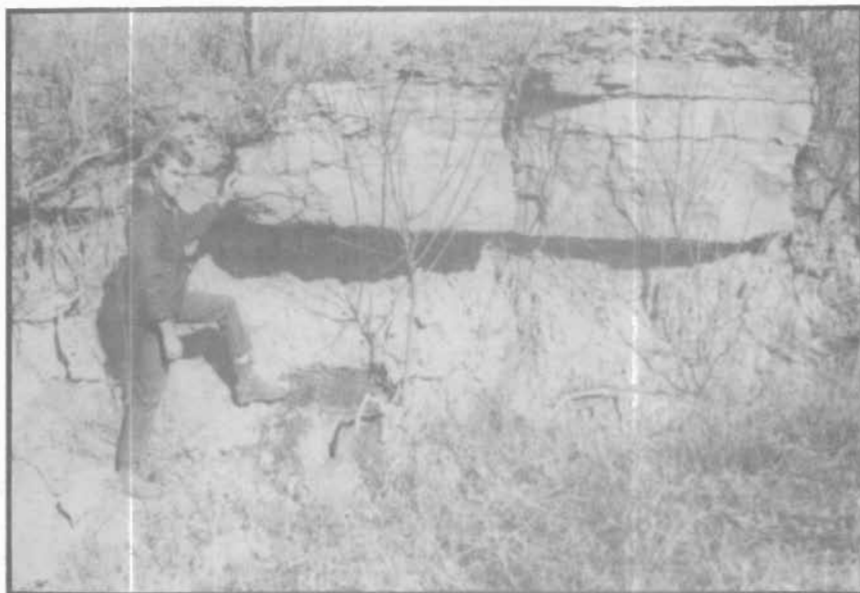


Figure 8. Church Limestone Member and underlying Aarde Shale with Nodaway Coal zone, SW $\frac{1}{4}$ sec. 1, T1S, R12E. Mans toe by Nodaway Coal.

loss ratio from 0.89 to 0.93, and the absorption ranged from 1.24 to 3.75 percent. Detailed test results are shown in figure 18, page 37.

Bern Limestone Formation, Wakarusa Limestone Member (not mapped)

The Bern Limestone Formation consists of three members: the Burlingame Limestone, Soldier Creek Shale, and Wakarusa Limestone Member. The Wakarusa, the upper member of the Bern, is the only unit of material significance.

The Wakarusa consists of one, two, and sometimes three beds of limestone separated by thin beds of shale. The limestone is soft to medium hard, and is generally about two and one-half feet thick. There are no known quarries in Nemaha County. Usually the Wakarusa is too deeply buried to be economically recovered. However, tests have been obtained on the bed in the SE $\frac{1}{4}$ sec. 7, T1S, R13E; therefore, it is briefly discussed but not mapped.

Emporia Limestone Formation, Reading & Elmont Limestone Members

The Emporia Limestone Formation is composed of three members: the Reading Limestone, Harveyville Shale, and Elmont Limestone. This formation is exposed in the north-central, central, and south-central parts of Nemaha County.

The Reading, the lower member, is a dense limestone which commonly weathers into three or four separate beds (figure 9). Large fossil crinoid columns are a distinguishing feature of the unit (figure 10).



Figure 9. Typical bedding of the Reading Limestone Member, SW $\frac{1}{4}$ sec.29, T1S, R12E.

The Harveyville Shale, which lies above the Reading, is a gray to gray-green calcareous shale. The thickness of the shale in the southern part of the exposure area averages about ten feet; however, toward the north, the shale grades into limestone and only about three feet of shale exists between the Elmont and Reading. In such areas, it is possible to quarry both limestone



Figure 10. Large crinoid columns typical of the Reading Limestone Member, SW $\frac{1}{4}$ sec.29, T1S, R12E.

beds in one operation (e.g. SW $\frac{1}{4}$ sec.29, T1S, R12E).

The Elmont Limestone may be one bed or several thin beds with thin shale partings. The upper-most portion is a tan-gray to blue-gray, dense, fossiliferous limestone with a rectangular joint pattern. The lower part is a brown to tan-gray, fossiliferous limestone with thin shale parting. The average thickness is about five feet (figure 11). The general exposure pattern of the Emporia Limestone Formation is shown on plates I, II, III, and V.

Material from the Reading and Elmont Limestones is marginal in quality. It is acceptable as base course, shoulder, and light type surfacing material. The Reading Member has been used for riprap and structural stone. Acquisition of material for crushed aggregate will probably be feasible only when the Harveyville



Figure 11. Quarry face showing Elmont Limestone Member with underlying Harveyville Shale, SW $\frac{1}{4}$ sec. 29, T1S, R12E.

Shale is thin and the Reading and Elmont Members can be quarried together. Test data on limestone from the Reading and Elmont show a Los Angeles wear range from 32.4 to 35.2 percent, soundness loss ratio from 0.80 to 0.87, and the absorption from 3.48 to 5.20 percent. More test data are shown in figure 18, page 37.

Zeandale Limestone Formation, Tarkio Limestone Member

The Zeandale Limestone Formation contains three members: the Tarkio Limestone, Wamego Shale, and the Maple Hill Limestone. The formation is exposed in the north-central and south-central portion of the county flanking both sides of the Nemaha Anticline. The thickness of the formation is about 24 feet.

The Tarkio Limestone, the lower member, is the only unit in this formation suitable for use as construction material. It is

easily identified by its brown color, massive character, and by the presence of wheat-like fossils called fusulinids (figure 12). It has a consistent thickness of about five feet. The exposure pattern of the Tarkio is shown on plates I, II, and V.



Figure 12. Exposure of the Tarkio Limestone Member showing prominent fusulinid fossils, NE $\frac{1}{4}$ sec. 18, T1S, R12E.

Although good quality rock has been produced from the Tarkio in counties to the south, only marginal material is produced from quarries in Nemaha County. Representative quality test data show the Los Angeles wear ranges from 31.5 to 35.8 percent, the soundness loss ratio from 0.84 to 0.89, and the absorption from 3.63 to 4.42 percent. Detailed quality information is presented in figure 18, page 37. It is assumed that the material could be used for bituminous aggregate, shoulder, subgrade, and light type surfacing material as well as riprap. Although tests show a marginal quality, the Tarkio is probably the best source of limestone available in the county.

The Wamego Shale and Maple Hill Limestone Members, which overlies the Tarkio, represent the upper part of the Zeandale Formation. These units often form the overburden which prevents feasible recovery of the Tarkio. The Wamego is a gray-brown, silty shale in the upper part, with some gray-green and maroon coloring and calcareous zones in the lower portion. According to Mudge and others (1959), the average thickness of the unit is 18 feet. The Maple Hill Limestone overlies the Wamego and has a thickness of about one foot. It is a tan-gray limestone that breaks off in small rectangular blocks.

Grenola Limestone Formation, Neva Limestone Member

The Grenola Limestone Formation consists of five members which are, in ascending order: the Sallyards Limestone, Legion Shale, Burr Limestone, Salem Point Shale, and Neva Limestone. This formation is exposed in the northeast and extreme south-central part of the county. It is about 28 feet thick.

The Sallyards is a tan-gray, massive limestone, one and one-half feet thick. The Legion Shale is a dark gray, calcareous shale about two feet thick. The Burr is two beds of light gray limestone separated by a thin, dark gray shale. It has been used as a source of material in some other Kansas counties but not in Nemaha County. The Salem Point, which is about four feet thick, overlies the Burr and is composed of tan-gray, silty, calcareous shale.

The Neva Limestone Member represents the upper unit of the Grenola and is the material producing bed (figure 13). It is



Figure 13. *Neva Limestone in a quarry face, SW $\frac{1}{4}$ sec. 36, T5S, R11E.*

composed of light tan-gray limestone and shaly limestone with thin shale partings. The total thickness of the unit is about 11 feet. The quality of rock is lowered by a massive porous zone, sometimes termed the *Honeycomb Zone*. The outcrop pattern of the Neva Limestone is shown on plates II, IV, and V.

The Neva Limestone is generally covered by heavy overburden as a result of the weather resistant Cottonwood Limestone forming the cap rock over much of the exposure area. It is not uncommon for the overburden thickness to vary from 0 to 40 feet in a short horizontal distance where the Eskridge Shale and Cottonwood Limestone overlie the Neva.

Material from this source is not high quality. Its use is restricted to base course, shoulder, and light type surfacing material. A quarry in Jackson County on the Nemaha County line

(N $\frac{1}{2}$ sec. 1, T6S, R12E) has produced abundant limestone from the Neva primarily for light type surfacing purposes. One test shows a Los Angeles wear value of 38.7 percent, a soundness loss ratio of 0.80 and an absorption of 4.19 percent.

Beattie Limestone Formation, Cottonwood Limestone Member

The Beattie Limestone Formation consists of three members: the Cottonwood Limestone, Florena Shale, and Morrill Limestone. The Cottonwood, the lower member, is a light gray, massive, soft, limestone which has many wheat-shaped fossils called fusulinids. Nodules of chert are found in the upper portion. The Cottonwood, which is about five feet thick, forms one of the most prominent outcrop patterns in the Permian System (figure 14).



Figure 14. Cottonwood Limestone in a quarry face, SW $\frac{1}{4}$ sec. 36, T5S, R12E.

The Florena Shale which overlies the Cottonwood is a silty, calcareous shale with abundant fossils, especially small brachipods termed *Chonetes*. The shale is tan-gray in color and variable in

thickness; however, it averages about five feet. In the NE $\frac{1}{4}$ sec.14, T1S, R14W, the shale thins to about one foot and the overlying Morrill Limestone and the underlying Cottonwood appear as one unit. The Morrill, the upper member of the Beattie, is about three feet thick and composed of tan-brown, porous limestone. Where the Florena Shale is thin the Cottonwood and Morrill Limestone may be utilized together in one quarrying operation. Because the primary source rock is the Cottonwood, the map unit is termed the Cottonwood.

Exposures of the Cottonwood are limited to the northeast and extreme south-central Nemaha County. Because the Neva and the Cottonwood are separated by only the Eskridge Shale, the two units are sometimes produced at the same locality. This is the case at a quarry on the Nemaha-Jackson County line (SW $\frac{1}{4}$ sec.36, T5S, R12E). Crushed rock from the Cottonwood is marginal to poor in quality and probably not acceptable for use as concrete or bituminous aggregate. However, the Cottonwood has been used for concrete aggregate in other Kansas counties. It is an important source of base course, shoulder, and light type surfacing material. This bed is also a source of riprap and structural stone. Representative quality information shows the Los Angeles wear ranges from 34.2 to 46.5 percent, the soundness loss ratio from 0.73 to 0.88, and the absorption from 3.58 to 7.13 percent. Detailed test results are shown in figure 18, page 37. The Cottonwood exposure pattern is shown on plates II, IV, V, and VI.

Wreford Limestone Formation, Threemile & Schroyer Limestone Members

The Wreford Limestone Formation is comprised of three members: the Threemile Limestone, Havensville Shale, and Schroyer Limestone. This formation is exposed in the northeast portion of the county near the state line. In Nemaha County, the Threemile, the lower limestone member, has a more extensive exposure pattern than either of the other members. The outcrop pattern of the Wreford is shown on plate II.

The Threemile is a tan-gray limestone with chert bands and nodules. It has a thickness of about eight feet. During weathering action, the calcium carbonate may be leached, leaving only chert rubble and red-brown sticky clay. Large chunks of chert, six to eight inches in diameter, are commonly found spalling off of outcrops. The chert has been used to a limited extent as light type surfacing material; however, it is difficult and costly to crush. Also, crushed chert has sharp edges which are detrimental to automobile tires. Because of the brittleness of the chert, aggregate produced from this unit would be undesirable for use in bituminous and concrete construction (figure 15).

The Havensville Shale lies above the Threemile but is not well-exposed in Nemaha County. It is about 17 feet thick and varies widely in composition; however, it is commonly a calcareous, tan-gray to olive colored shale. In some areas the shale grades into a limestone termed the *Havensville Reef*. The reef was not identified in any outcrop in Nemaha County, but may be present in some areas. Where found, the *Havensville Reef* is an important source of marginal quality rock.



Figure 15. Cherty Threemile Limestone Member, Wreford Limestone Formation, SE $\frac{1}{4}$ sec. 3, T1S, R13E.

The Schroyer Limestone, the youngest unit of the Wreford Formation, overlies the Havensville Shale. It is a massive, medium hard limestone that contains bands and nodules of chert. Like the Threemile, calcium carbonate has been leached out in many areas leaving chert rubble and red-brown clay. Exposures of the Schroyer are limited to sec. 5, 8, 15, and 17, T1S, R14E. If the total thickness of the unit exists in Nemaha County, it would probably be about ten feet. The type and quality of material produced from the Schroyer would be very similar to that derived from the Threemile. No test results are available on samples taken from the Wreford in Nemaha County. The use of the cherty limestone would probably be limited to light type surfacing material.

Sand and Gravel

Glacial Drift

A large portion of Nemaha County is covered by Glacial Drift which has a maximum thickness of about 300 feet. Granular material found in pits and exposures is composed of clay-bound silt, sand, gravel, and some boulders. The sand and gravel is used mostly as surfacing material on rural roads; however, some has been used in other phases of road construction. In several instances, aggregate from Glacial Drift deposits has been supplemented with crushed limestone aggregate and used in bituminous mixes. It may also be used in base course and as shoulder material. Quality test information on material of glacial origin shows a Los Angeles wear range of 23.5 to 37.6 percent, a soundness loss ratio from 0.90 to 0.97, and an absorption range from 0.5 to 2.77 percent. Because of the erratic composition of this source, test results should not be used as a representative for all material derived from this unit. Additional test information on gradation is shown in figure 18, page 37. Glacial Drift is shown on plates I through VI.

Alluvium and Terrace Deposits

The materials found in the Alluvium and in Terrace Deposits is similar; therefore, the two beds are included in the same map unit. In Nemaha County, the Alluvium is composed of fine-textured material consisting of tan-brown clay, silt, and fine sand. Its thickness probably does not exceed 25 feet. Terrace Deposits consist mostly of tan-colored clay, silt, and some fine sand; however, some gravel

is present along Silver Creek in the NE $\frac{1}{4}$ sec. 11, T1S, R13E. The maximum thickness of the Terrace Deposits does not exceed 40 feet. Alluvium and Terrace Deposits are shown on plates I through VI.

Very little material from the Alluvium and Terrace Deposits is suitable for construction purposes because of the overall fine, clayey nature. However, select locations will yield granular material that could be used in base course, shoulder, and as light type surfacing. Although quality tests are not available, it is possible that some material could be processed and used in concrete and for bituminous construction.

Boulders

Glacial Drift

Boulders are found scattered throughout the area covered by Glacial Drift. These erratics are composed mostly of quartzite but contain some granite and limestone. In local areas, they are concentrated to such a degree that it is feasible to start a quarry operation (figure 16). At one location in Nemaha County (NE $\frac{1}{4}$ sec. 27, T1S, R12E) quartzite boulders have been crushed, and used as a surfacing material on rural roads. It is probable that the aggregate would be acceptable for use in concrete and bituminous construction if processed; however, no quality tests have been conducted. Due to the red color, the aggregate is desired for use as a driveway surfacing material and ornamental purposes. Boulders have also been used for building purposes in the construction of stone walls, fireplaces, and for other decorative purposes. They may also be used for riprap.



Figure 16. Boulder pit in Glacial Drift, NE $\frac{1}{4}$ Sec. 27, T1S, R12E.

Because of their extreme hardness glacial boulders are difficult to crush and the process causes extensive wear on equipment. Also, the crushed product may have sharp edges and when used for light type surfacing, may cut automobile tires severely.

Boulder fields are a direct deposit of glaciation which occur as small moraines or as buried valley fills. Deposits of this type, large enough for feasible recovery, are difficult to locate. Abundant boulders on the ground surface or a weather resistant ridge that does not fit the surrounding terrain are major clues to finding accumulations. Boulder deposits are included in the Glacial Drift map unit which is shown on plates I through VI.

Silt

Glacial Drift

Abundant silt deposits of glacial origin occur in an ancient

buried valley in southern Nemaha County. This material belongs to the Atchison Formation and is thought to be a glacial lacustrine deposit. A unique characteristic of the material is its low plastic index which may make it acceptable for mineral filler (figure 17).



Figure 17. Silt deposit in Glacial Drift (Atchison Formation), SW¼ sec.34, T5S, R12E.

The Atchison Formation could not be differentiated from other glacial material, thus, it is included in the Glacial Drift map unit. Drift is shown on plates I through VI.

Loess

Loess is an eolian deposit composed of tan-brown colored clay bound silt with some caliche nodules. The unit ordinarily does not exceed ten feet in thickness. The material mantles stream divide areas mostly in the western one-half and the northeast one-fourth of the county.

Loess is not suitable for aggregate or mineral filler and is included in this inventory only because of the large area which it blankets. Although it may have undesirable plastic properties, it is utilized in the subgrade, embankment, and is desirable as slope material where the development of a turf is desired. Loess deposits are shown on plates I through VI.

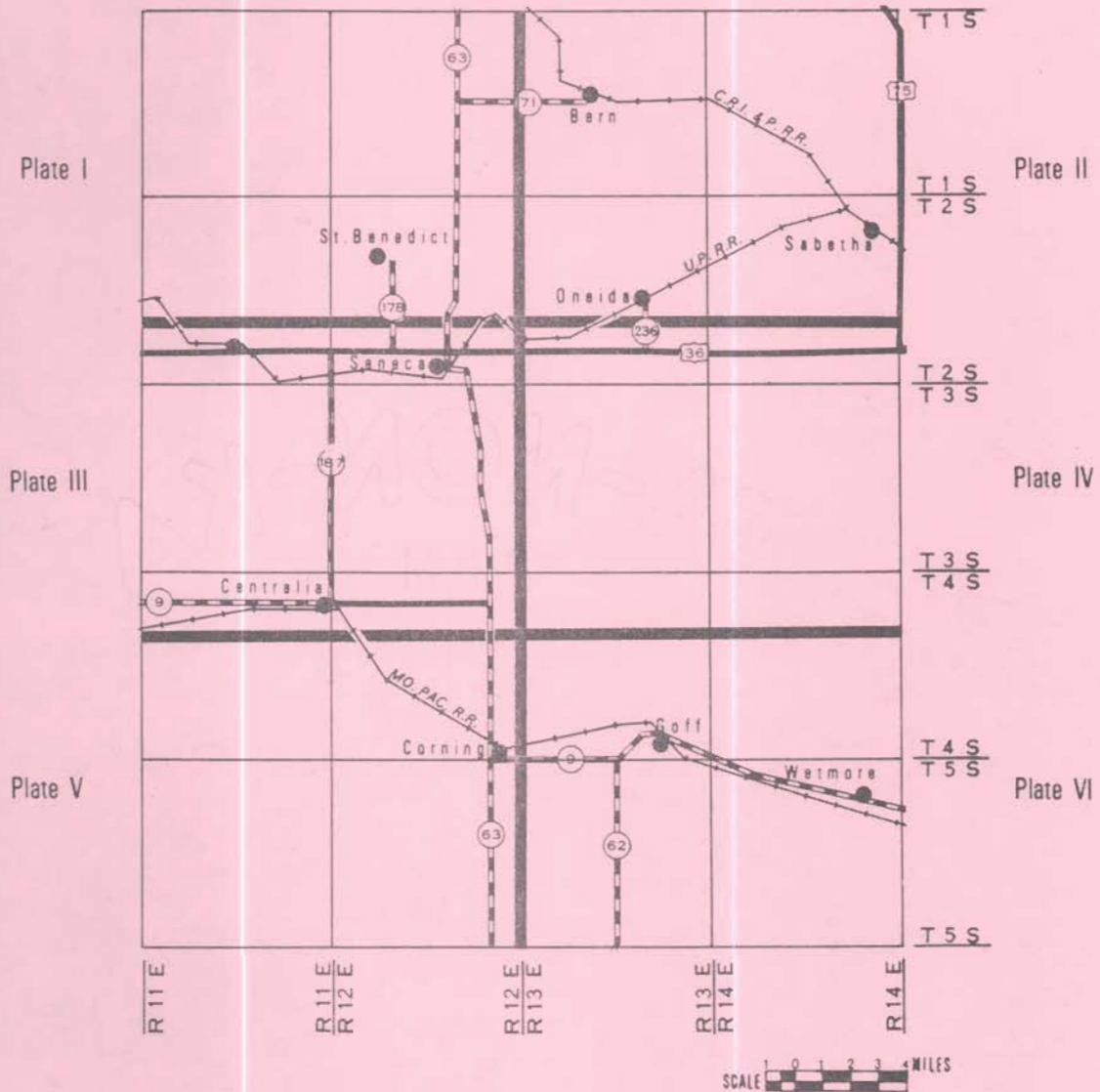
Percent Retained											Wash	G.F.	L.L.	P.I.	Sp.Gr. Wet	Sp.Gr. Dry	Wt./Cu.Ft.	% L.A. Wear	Soundness	% Absorption	Source of Data	
Site No.	Material Type	1/2	3/4	3/8	4	8	16	30	50	100												
Source of Material: Church Limestone Member - Pc																						
LS-54	Limestone													2.76	2.72		23.7(A)	0.93	1.24	SHC form 645, Lab. No. 49191		
LS-55	Limestone													2.72	2.67		35.3(A)	0.89	1.76	SHC form 645, Lab. No. 49190		
LS-56	Limestone													2.71	2.65		25.6(A)	0.90	3.75	SHC form 645, Lab. No. 62161		
Source of Material: Wakarusa Limestone Member - Fw																						
LS-79	Limestone													2.64	2.60		23.4(A)	0.93	1.65	SHC form 645, Lab. No. 66442		
Source of Material: Emporia Limestone Formation - Fe																						
LS-47	Limestone													2.54	2.45		35.2(B)	0.80	3.48	SHC form 645, Lab. No. 1015		
LS-51	Limestone													2.43	2.32		35.0(A)	0.85	4.85	SHC form 645, Lab. No. 65429		
LS-52	Limestone													2.45	2.33		32.4(A)	0.87	5.20	SHC form 645, Lab. No. 65430		
Source of Material: Tarkio Limestone Member - Ft																						
LS+50	Limestone													2.53	2.42		35.7(B)	0.89	4.42	SHC form 619 No. 66-21		
LS-49	Limestone													2.56	2.46		35.8(B)	0.84	3.95	SHC form 633, Lab. No. 67-1529		
LS+48	Limestone													2.52	----		31.5(B)	0.85	3.63	SHC form 619 No. 66-22		
Source of Material: Neva Limestone Member - Pn																						
LS-75	Limestone													2.48	2.38		38.7(B)	0.80	4.19	SHC form 645, Lab. No. 68422		
Source of Material: Cottonwood Limestone Member - Pc																						
LS+80	Limestone													2.51	2.43		34.2(A)	0.84	3.58	SHC form 645, Lab. No. 64452		
LS-72	Limestone													2.47	2.36		46.5(A)	0.78	4.64	SHC form 645, Lab. No. 63652		
LS+67	Limestone													2.43	2.32		39.7(B)	0.88	4.81	SHC form 645, Lab. No. 96177		
LS-57	Limestone													2.40	2.24		45.4(B)	0.73	7.13	SHC form 619 No. 66-32		
LS-58	Limestone													2.42	2.29		40.7(B)	0.77	5.92	SHC form 619 No. 66-25		
Source of Material: Glacial Drift - Qgd																						
SG+45	Sand & Gravel	-	-	1	3	5	8	25	54	85	10.0	1.94		2.61	----	118.8	25.3(C)	0.94	----	Av. SHC form 619 No. 66-12		
SG-46	Sand & Gravel	2	5	11	19	32	51	75	90	94	5.7	3.78		2.60	----	101.0	28.4(C)	0.90	----	SHC form 619 No. 66-24		
SG+53	Sand & Gravel	-	-	-	-	-	-	-	-	-	----	----		2.62	----	110.14	29.8(D)	0.95	1.86	SHC form 619 No. 66-30		
SG-59	Sand & Gravel	-	7	18	27	40	51	70	82	90	8.0	3.85		2.62	----	122.7	23.8(C)	0.96	0.5	SHC form 619 No. 66-20		
SG+60	Sand & Gravel	4	10	13	18	27	40	56	78	85	14.0	3.30		2.53	----	91.2	29.0(D)	0.96	----	SHC form 619 No. 66-23		
SG+61	Sand & Gravel	-	3	12	23	35	50	70	85	90	8.5	3.68		2.59	----	108.5	25.3(D)	0.94	1.5	SHC form 633, Lab. No. 99194		
SG-62	Sand & Gravel	1	6	13	23	30	43	61	82	92	2.8	3.51		2.60	2.58	113.41	29.7(C)	0.95	0.91	SHC form 633, Lab. No. 65-2031		
SG+63	Sand & Gravel	-	9	26	39	52	64	73	84	89	9.0	4.36		2.62	----	124.8	37.6(B)	0.92	----	SHC form 633, Lab. No. 63991		
SG+64	Sand & Gravel	-	-	-	5	-	15	-	-	85	13.0	----		----	----	----	----	----	----	No. Mal in Geo. Survey Bull. 1060D		
SG+65	Sand & Gravel	-	3	10	24	-	63	-	-	95	5.0	3.01		----	2.56	93.0	----	----	----	No. Ca3 in Geo. Survey Bull. 1060D		
SG+66	Sand & Gravel	2	4	6	10	16	26	56	77	92	6.0	2.88		----	----	----	----	----	----	Av. SHC form 619 No. 66-19		
SG+68	Sand & Gravel	-	-	-	1	2	5	26	65	91	5.0	1.90		----	----	----	----	----	----	SHC form 619 No. 66-26		
SG-69	Sand & Gravel	-	-	-	1	3	12	43	79	89	9.0	2.40		----	----	----	----	----	----	Av. SHC form 619 No. 66-15		
SG-70	Sand & Gravel	-	-	2	4	9	19	44	72	85	13.0	2.35		----	----	----	----	----	----	Av. SHC form 619 No. 66-16		
SG-71	Sand & Gravel	-	-	1	3	6	12	31	76	91	5.6	2.20		2.58	----	90.7	----	----	----	SHC form 633 Lab. No. 66437		
SI+73	Silt	-	-	-	-	-	-	-	-	1	49.0	----	22	1	----	----	----	----	----	SHC form 619 No. 66-28		
SG+74	Sand & Gravel	-	-	-	-	-	-	-	-	-	----	----		2.56	----	110.19	24.4(D)	0.94	2.77	SHC form 619 No. 66-33		
SG+76	Sand & Gravel	-	-	3	13	32	60	86	92	93	6.2	3.79		2.60	----	99.34	29.4(C)	0.91	2.0	SHC form 619 No. 66-29		
SG+77	Sand & Gravel	-	-	1	3	9	19	43	67	87	10.0	2.30		2.61	----	108.3	23.5(C)	0.97	----	Av. SHC form 619 No. 66-13		
SG-81	Sand & Gravel	-	1	9	16	24	34	52	72	89	7.0	3.02		2.56	----	93.0	27.0(A)	0.90	----	SHC form 633, Lab. No. 66439		
SG-82	Sand & Gravel	-	-	-	1	3	5	34	63	90	8.0	2.05		----	----	----	----	----	----	Av. SHC form 619 No. 66-18		
SG+83	Sand & Gravel	-	-	5	8	13	20	45	61	84	13.0	2.35		----	----	----	----	----	----	Av. SHC form 619 No. 66-14		
SI-84	Silt	-	-	-	-	-	-	-	-	-	----	----	33	11	----	83.0	----	----	----	SHC form 623 Lab. No. AA6086		
SI+85	Silt	-	-	-	-	-	-	-	-	1	6	66.0	----	----	2.63	87.9	----	----	----	SHC form 623 Lab. No. 66440		
SG+86	Sand & Gravel	-	-	1	2	5	21	23	37	66	25.0	----	----	----	----	----	----	----	----	SHC form 619 No. 66-27		
Source of Material: Alluvium and Terrace Deposits - Qalt																						
CG-78	Chert Gravel	-	39	52	60	----	74	----	----	93	6.3	5.67	----	----	----	----	36.0	0.89	----	No. Cgl in Geo. Survey Bull. 1060D		

Figure 18. Results of tests completed on samples of material from the various geologic source beds in Nemaha County.

NEMAHA COUNTY MATERIALS MAPS

On the following pages are six materials maps covering Nemaha County as shown below.

index map

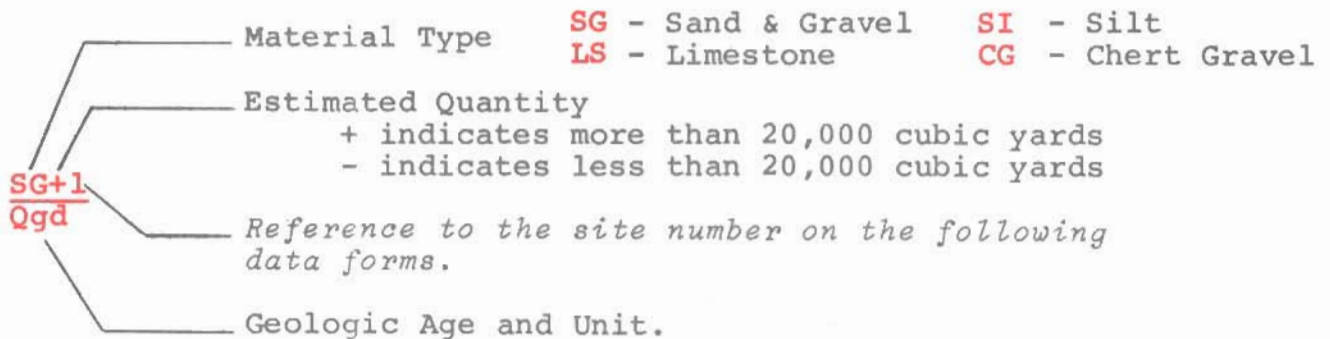


Note: The individual site data forms follow Plate VI.

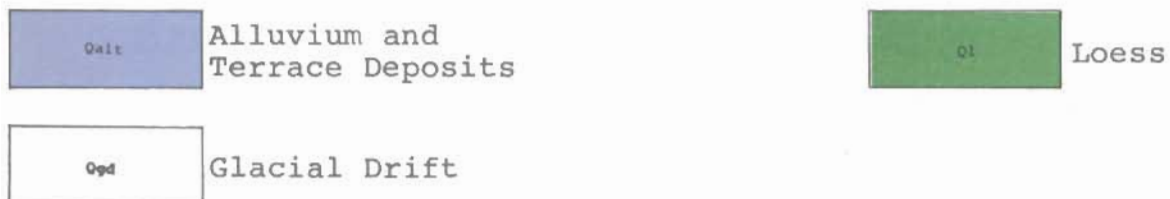
NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

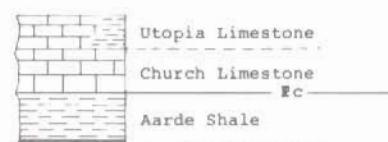
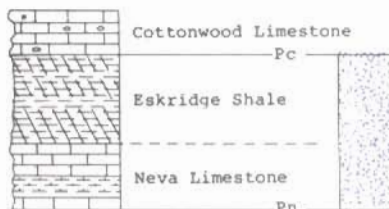
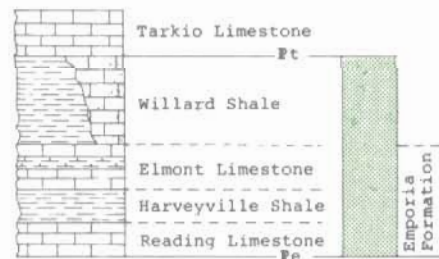
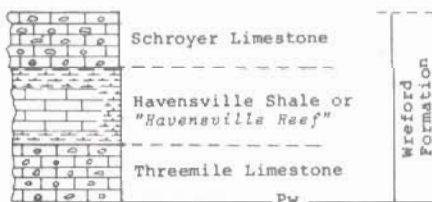
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- ▼ Prospective site; sampled
- ◆ Prospective site; not sampled



EXPLANATION OF MAP SYMBOLS



Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.



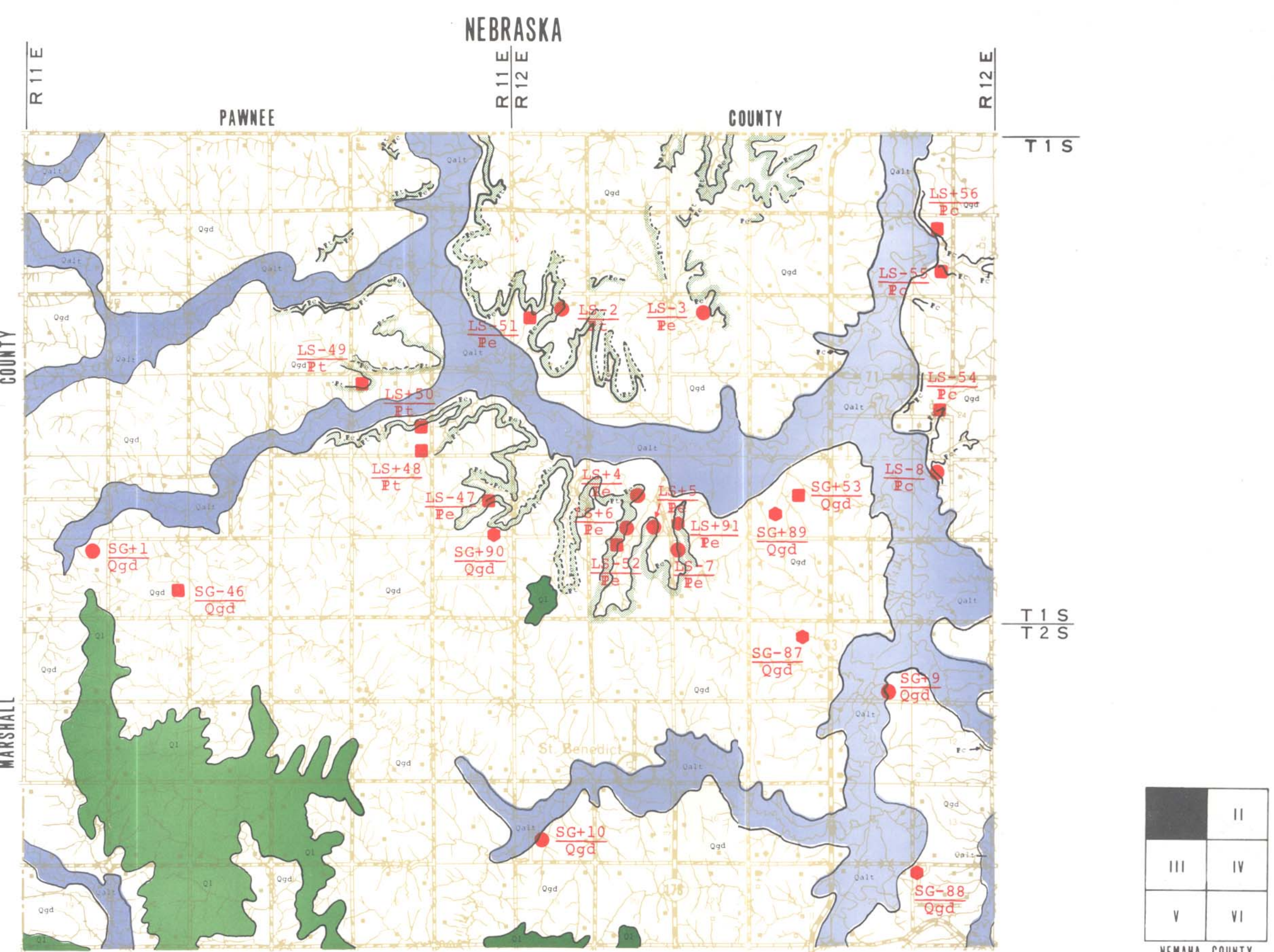
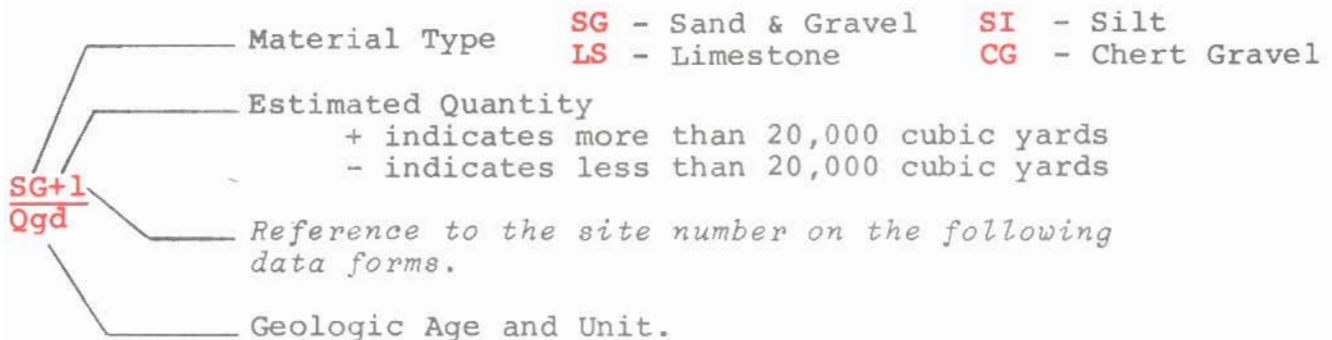


PLATE I

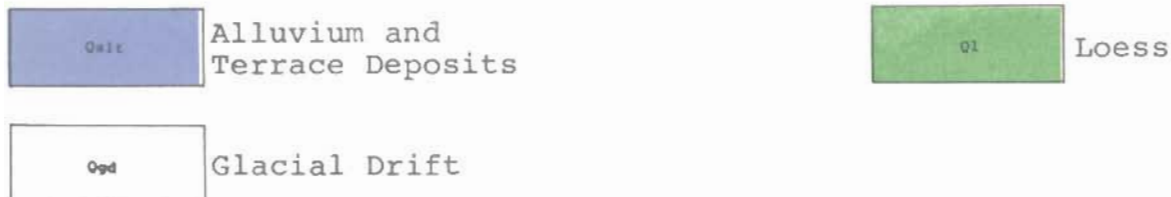
NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

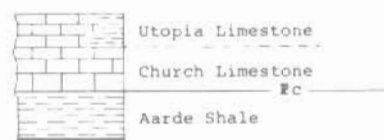
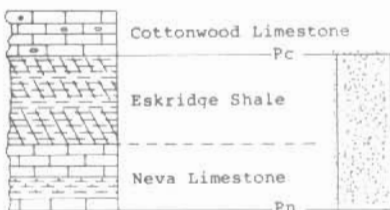
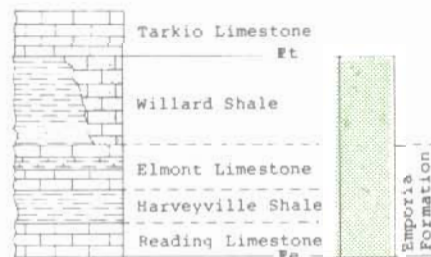
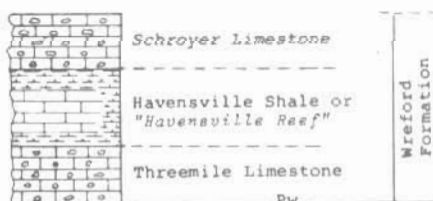
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EXPLANATION OF MAP SYMBOLS



Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.

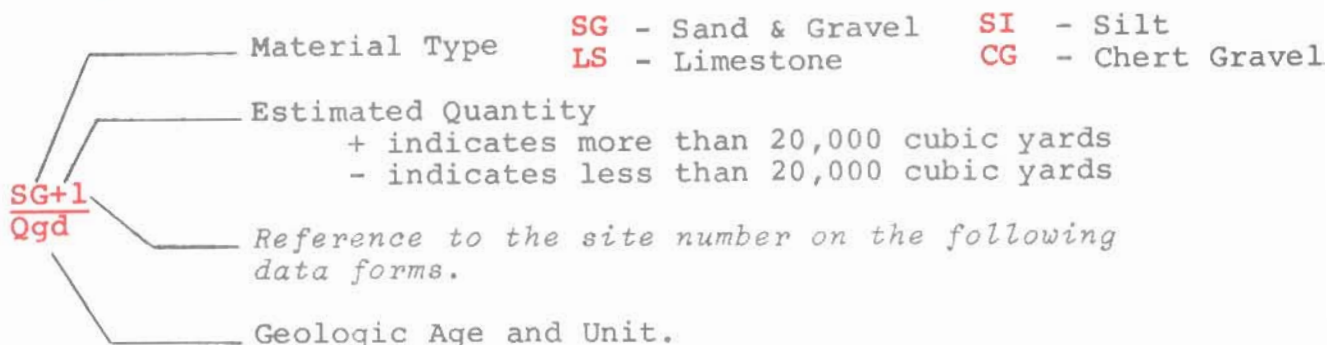




NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

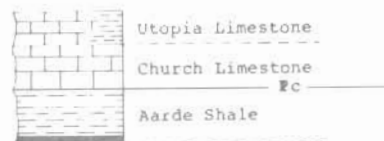
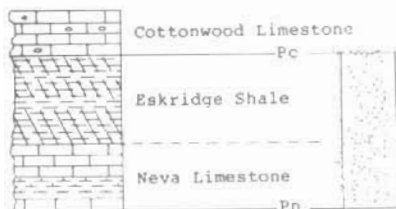
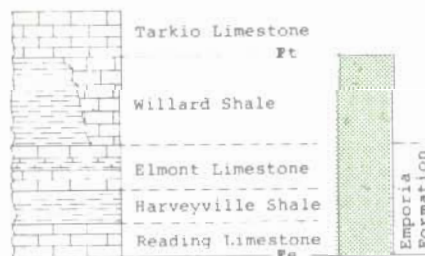
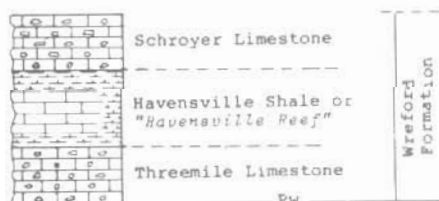
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- ▼ Prospective site; sampled
- Prospective site; not sampled



EXPLANATION OF MAP SYMBOLS



Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.



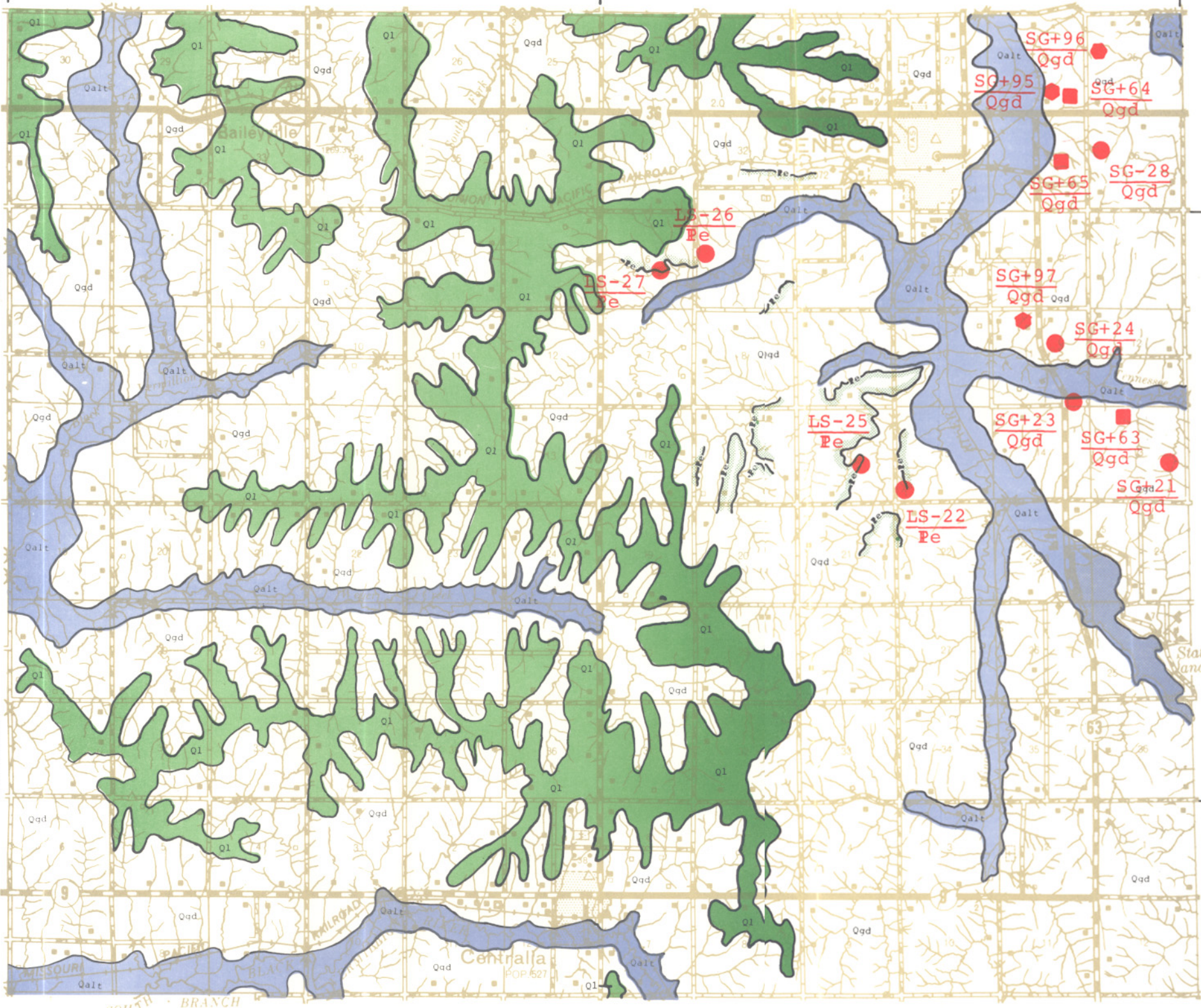
R 11 E

R 11 E
R 12 E

R 12 E

COUNTY

MARSHALL



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T 3 S

T 3 S
T 4 S

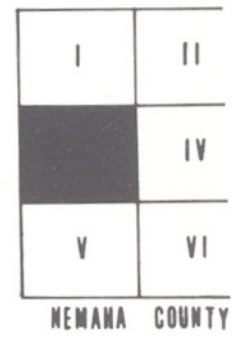
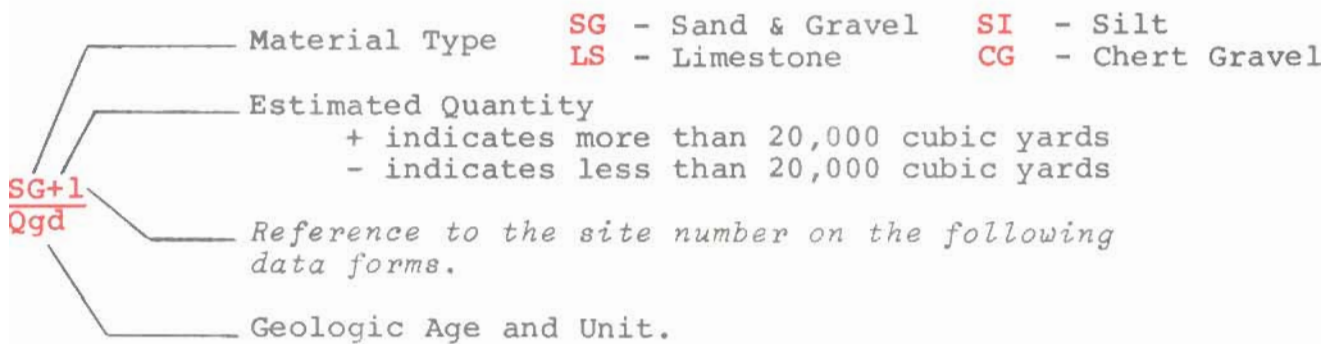


PLATE III

NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

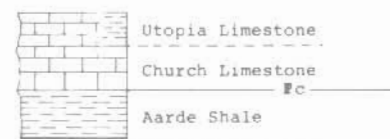
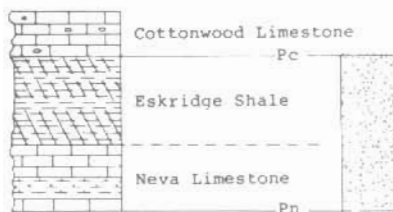
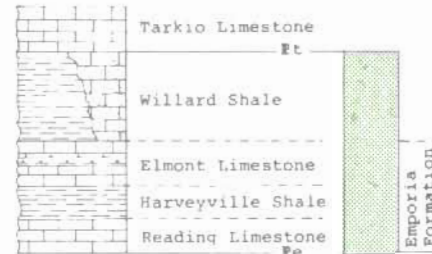
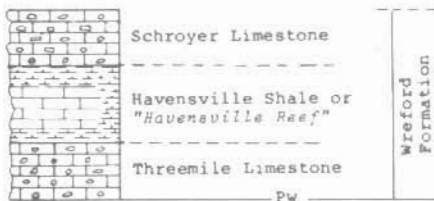
- Open site; not sampled
- Open site; sampled
- ▼ Prospective site; sampled
- ◆ Prospective site; not sampled



EXPLANATION OF MAP SYMBOLS



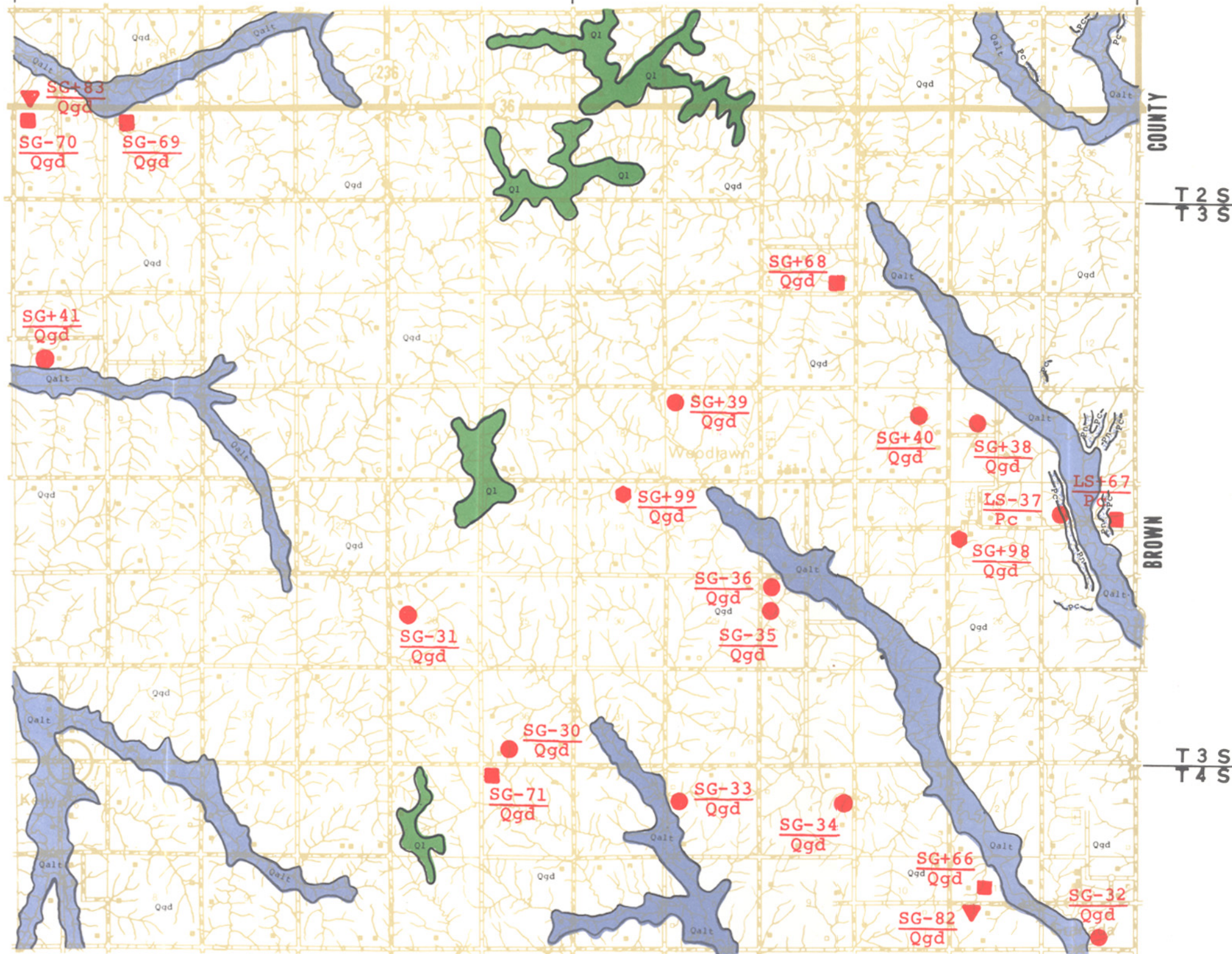
Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.



R 13 E

R 13 E
R 14 E

R 14 E



I	II
III	IV
V	VI

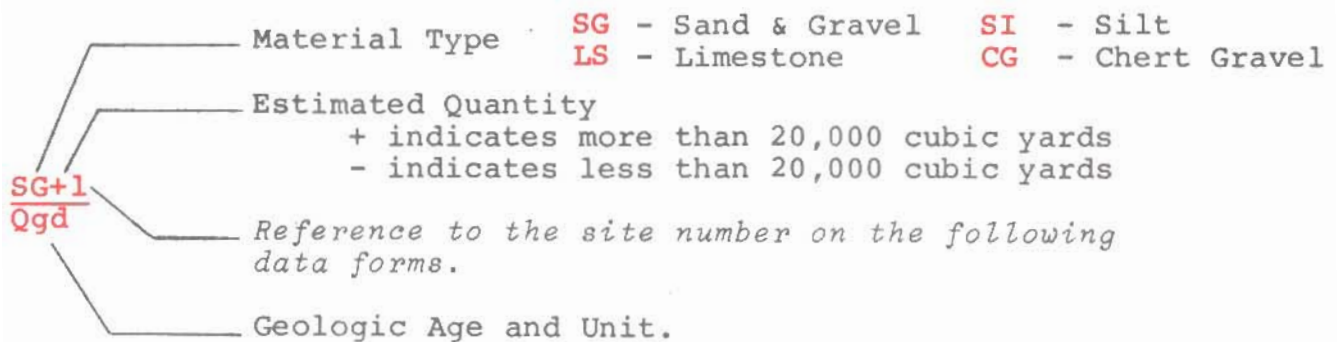
NEMANA COUNTY

PLATE IV

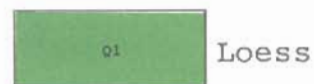
NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

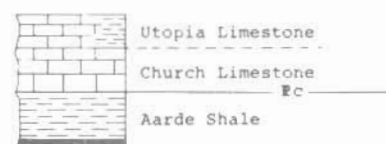
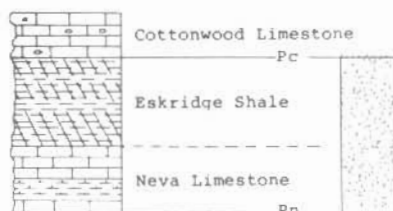
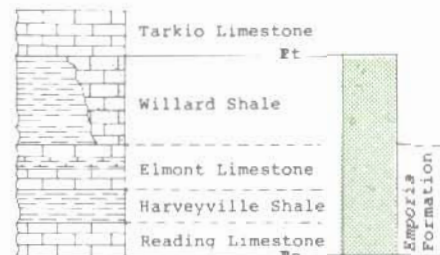
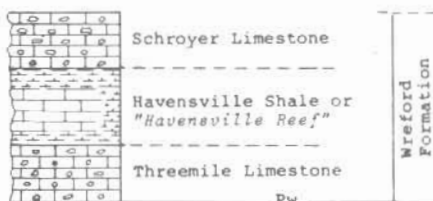
- Open site; not sampled
- Open site; sampled
- ▼ Prospective site; sampled
- Prospective site; not sampled

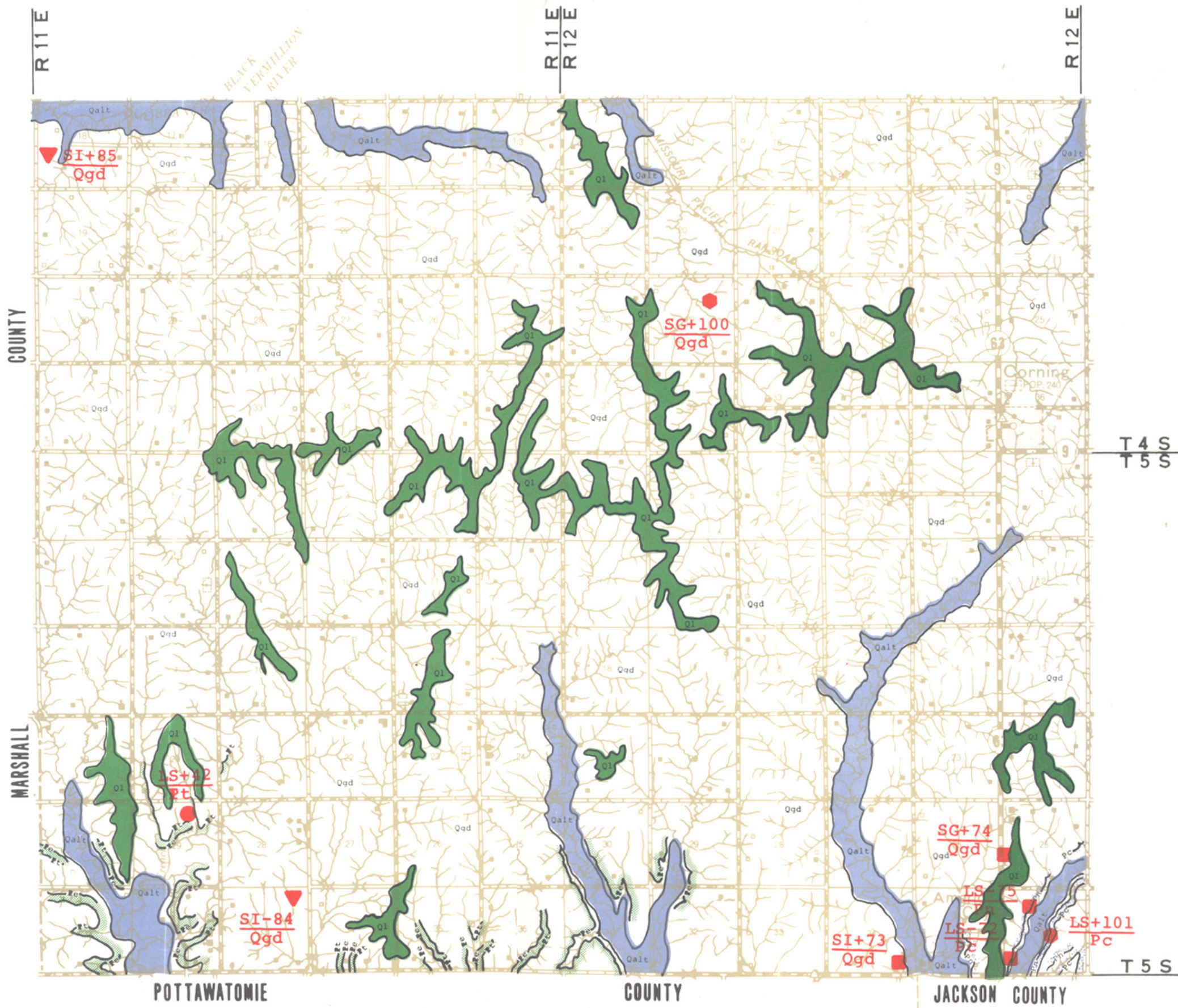


EXPLANATION OF MAP SYMBOLS



Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.





I	II
III	IV
	VI

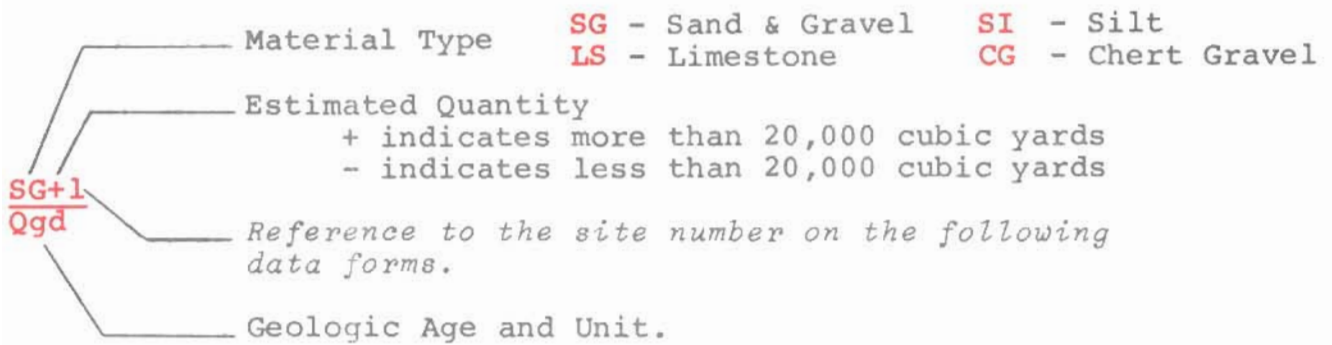
NEMANA COUNTY

PLATE V

NEMAHA COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

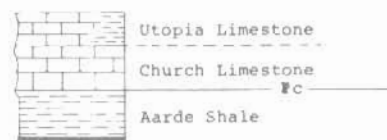
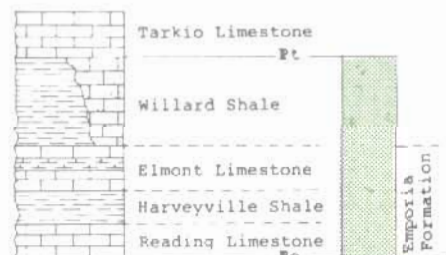
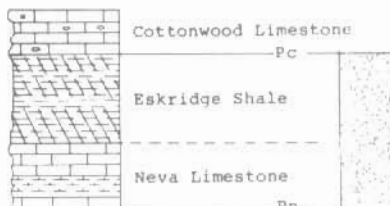
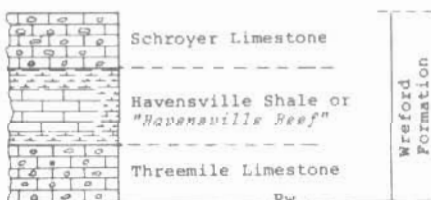
- Open site; not sampled
- Open site; sampled
- ▼ Prospective site; sampled
- ◆ Prospective site; not sampled



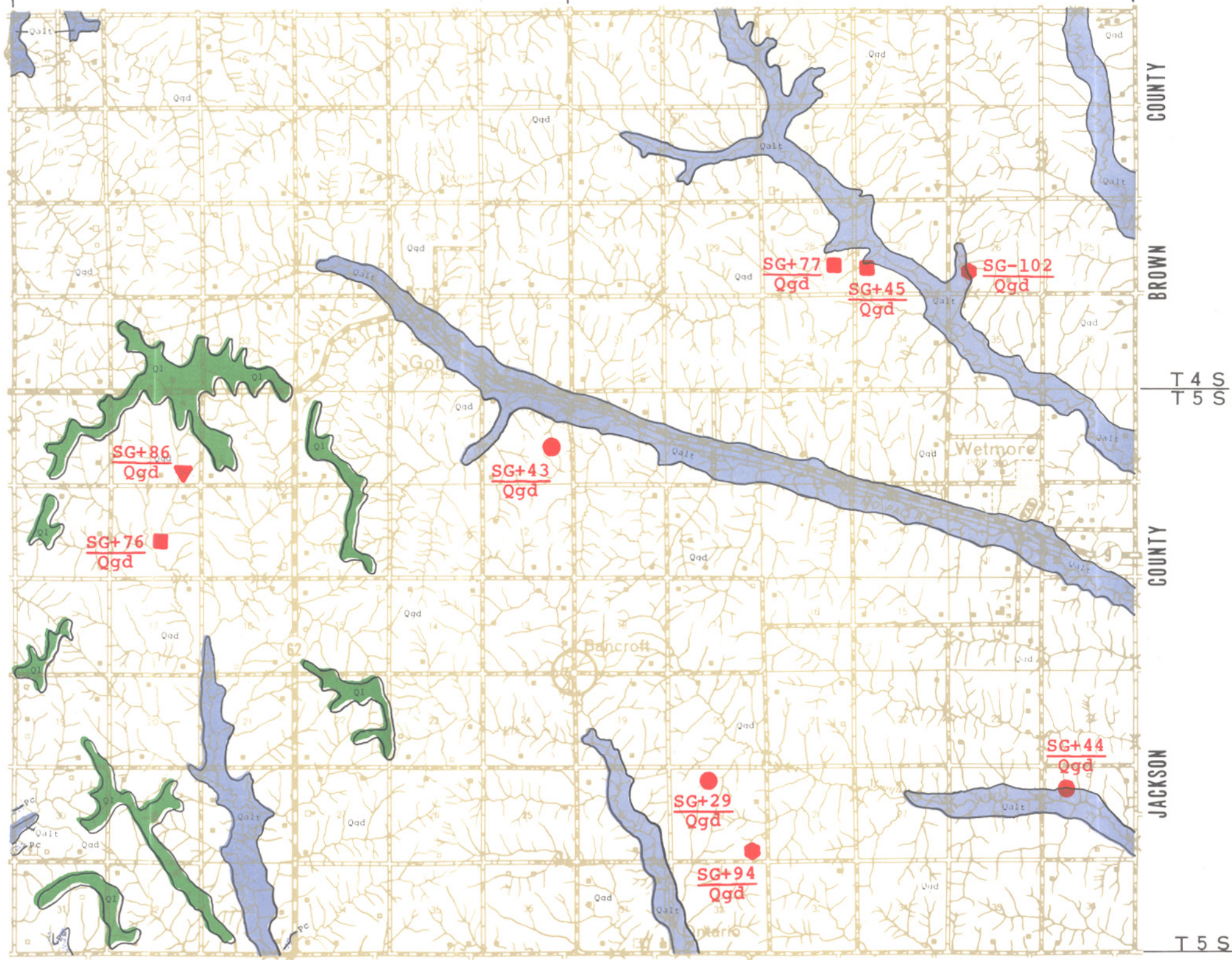
EXPLANATION OF MAP SYMBOLS



Note: Included in this map unit are Permian and Pennsylvanian bedrock units, which are not considered to have material value. This bedrock may be exposed on the flanks of the major drainage, especially in the northern one-third of the county.



R14 E



JACKSON

COUNTY

PLATE VI

I	II
III	IV
V	

NEMANA COUNTY

OPEN MATERIALS SITES; NOT SAMPLED

LEGEND

===== Trail or lane

———— Road

+ + + + + Railroad

~~~~~ Hedge or trees

- x - x - Fence

———— Major stream

~~~~~ Intermittent streams

—●— Pond or lake

● Open materials site;
not sampled

○ Center of section

□ Dwelling

⊕ Cemetery

▣ School

⊕ Church

▣ Town or city

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+1
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ Sec. 31 Twp. 1S Range 11E
 Owner Clarence W. & Willis E. Ford Axtell, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

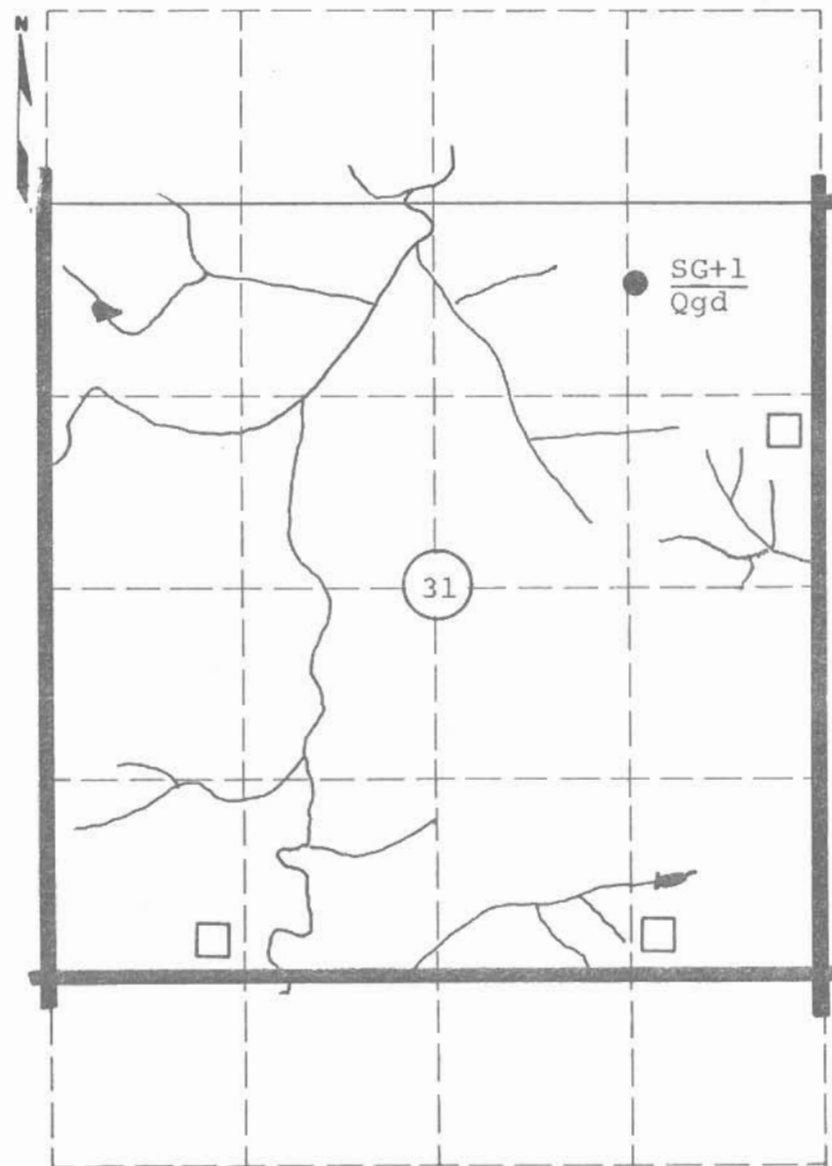
EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 60 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

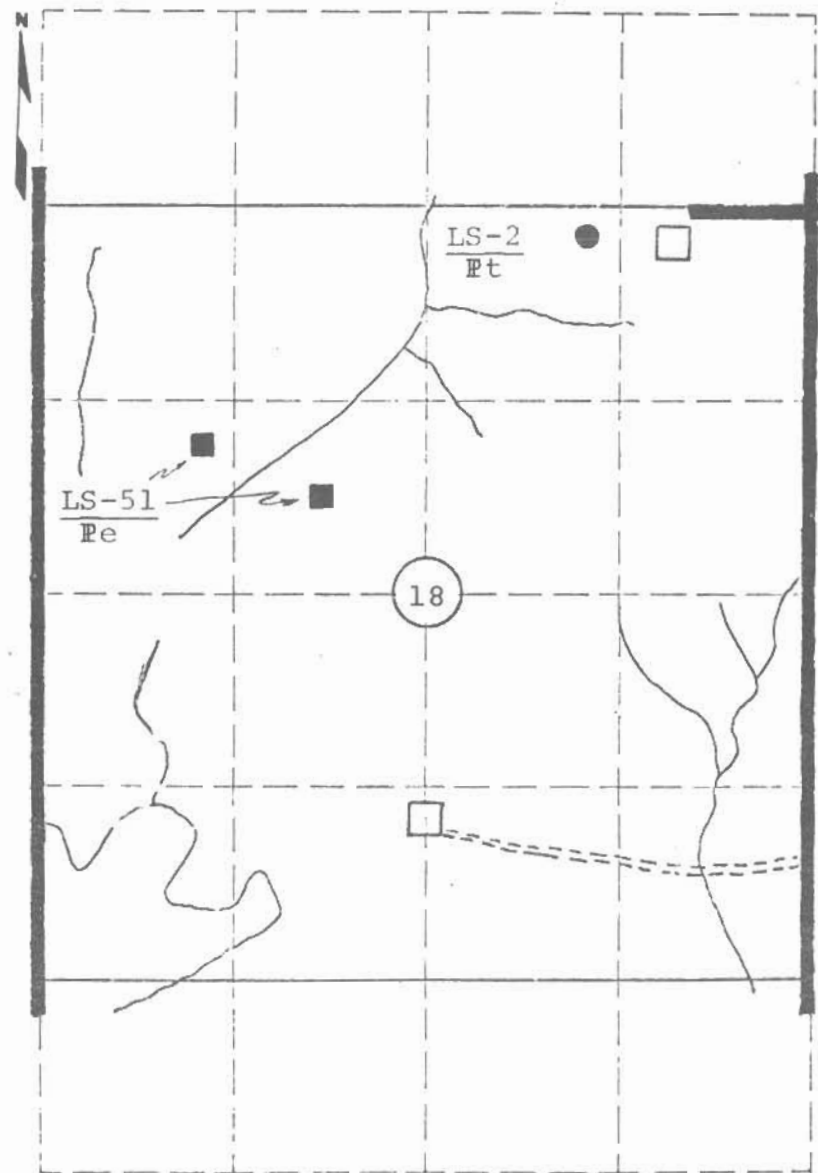
Site No. LS-2
Pt Date April, 1968
 Material Limestone County Nemaha
 Location NE 1/4 Sec. 18 Twp. 1S Range 12E
 Owner John A. Wissler Seneca, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test
hole | Material
at
bottom
of hole | Depth
of
over-
burden | Depth
of
Material | Percent Retained | | | | | | | | Wash
200 | G.F. | L.L. | P.L. |
|--------------|-------------------------------------|--------------------------------|-------------------------|------------------|-----|-----|---|---|----|----|----|-------------|------|------|------|
| | | | | 1/2 | 3/4 | 7/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Tarkio Limestone Member
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Bear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

Site No. LS-3
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 16 Twp. 1S Range 12E
 Owner Bernice Bredemeier Seneca, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

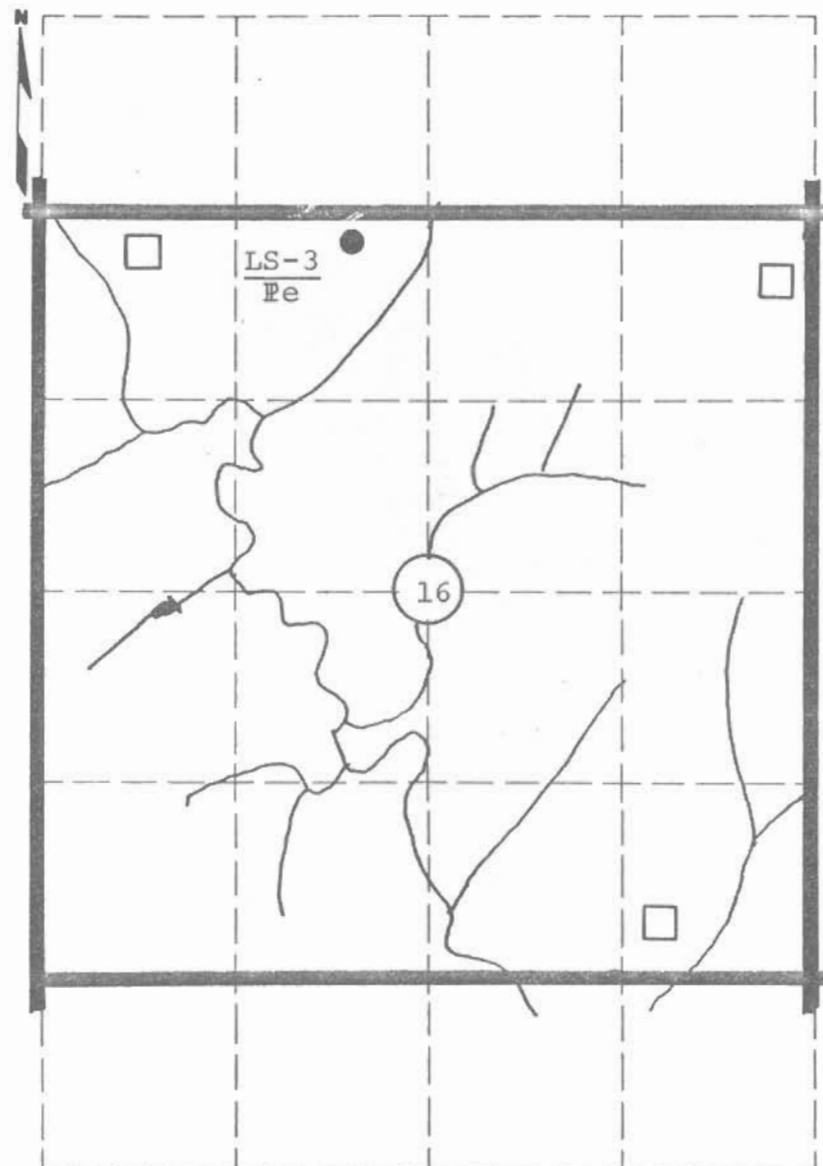
EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

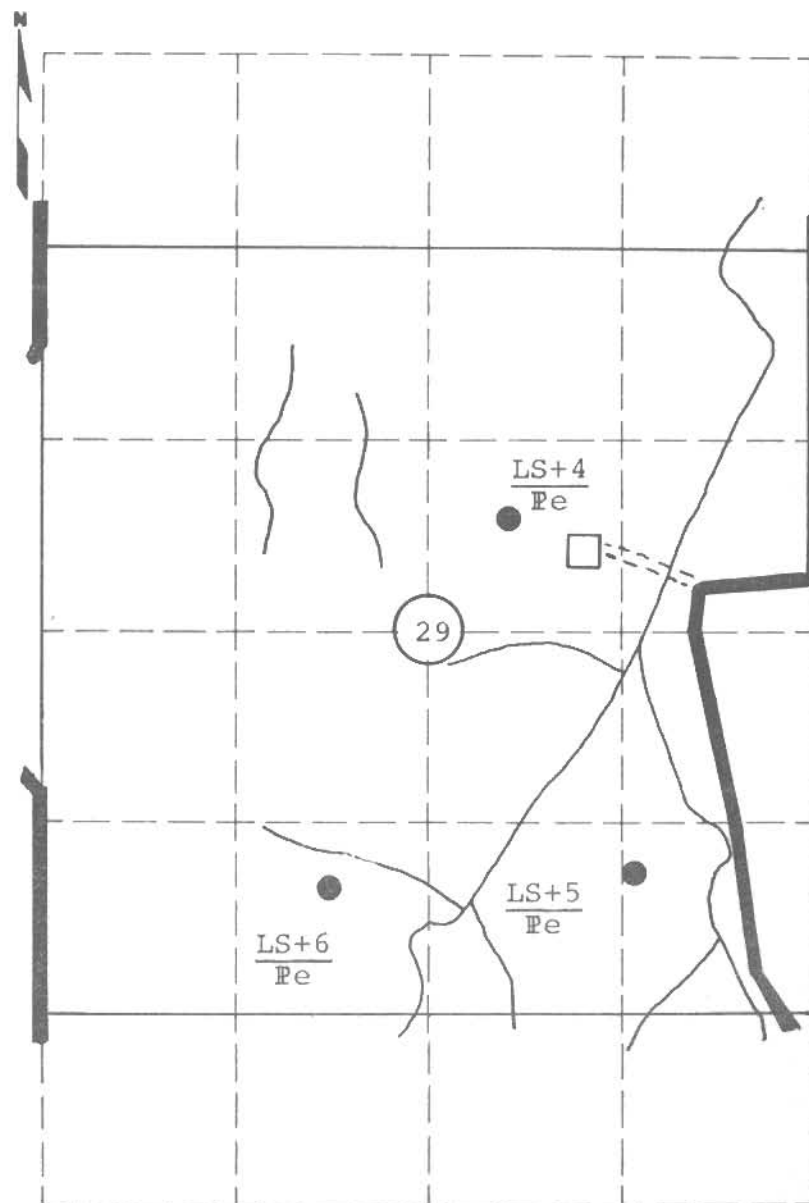
Site No. LS+4
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 29 Twp. 1S Range 12E
 Owner Clarence R. Haug Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

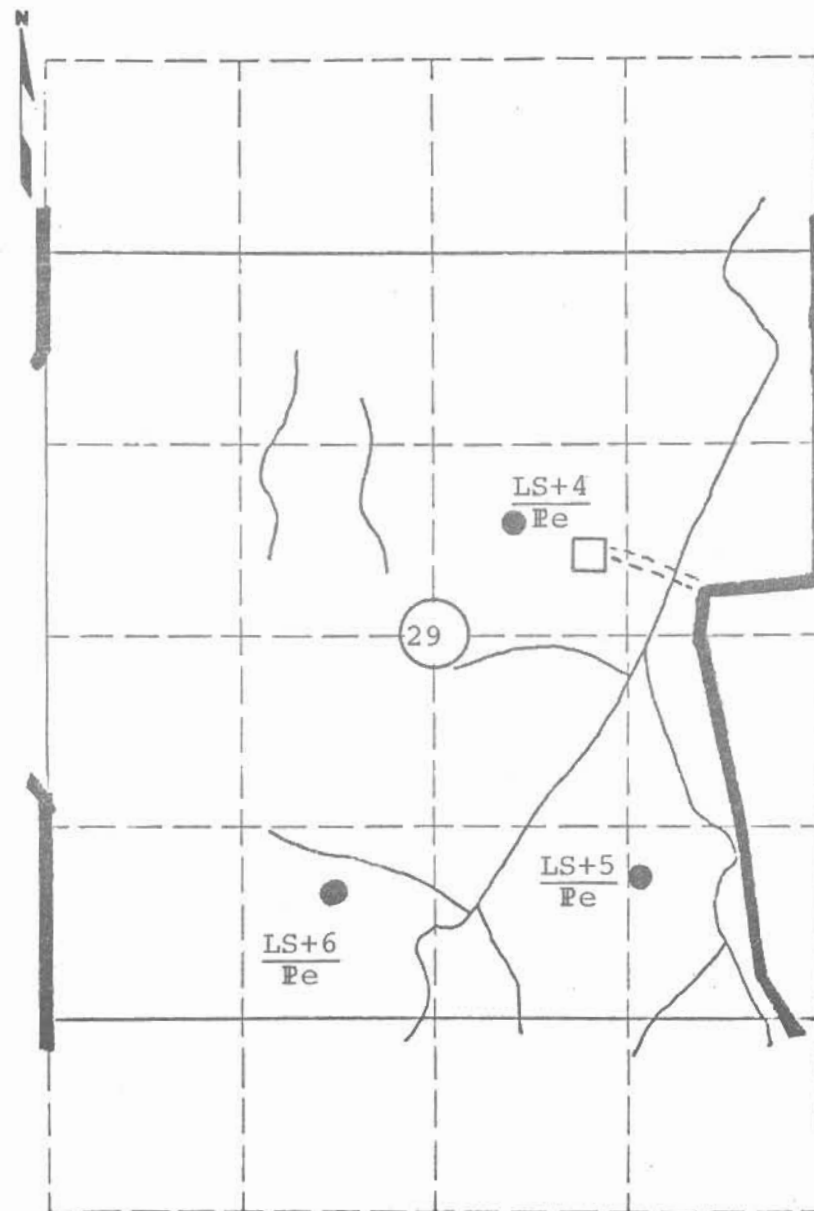
Site No. LS+5
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SE 1/4 Sec. 29 Twp. 1S Range 12E
 Owner Clarence & Louis Haug Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. | |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|-----|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

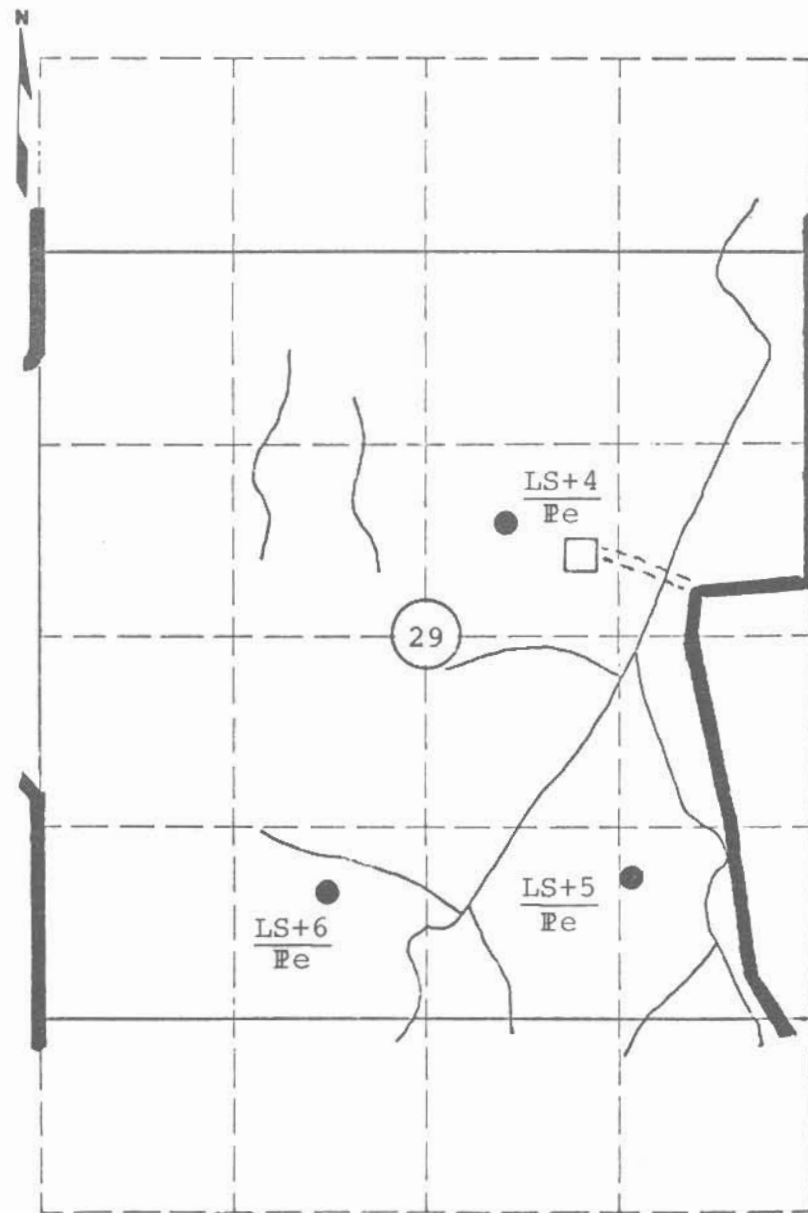
Site No. LS+6
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 29 Twp. 1S Range 12E
 Owner Clarence Haug Seneca, Kansas
 Nature of Deposit Dry Accessibility Poor Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

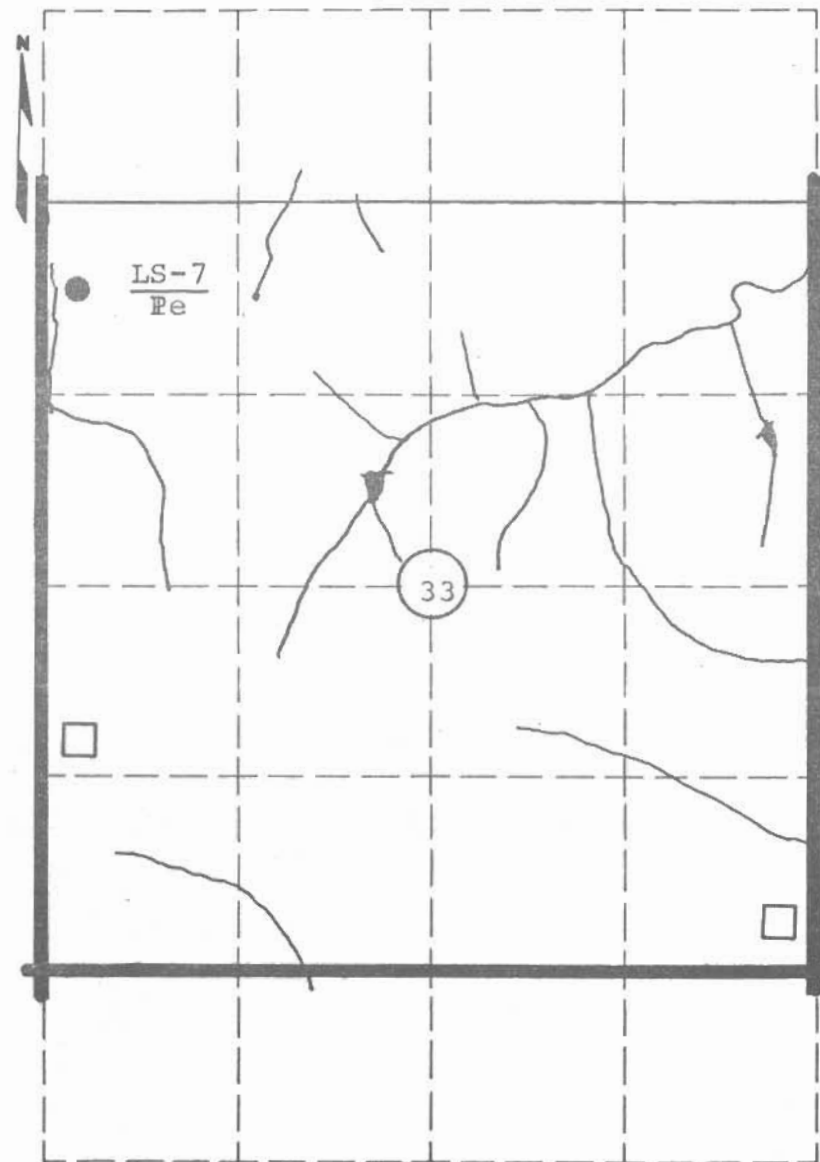
Site No. LS-7
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 33 Twp. 1S Range 12E
 Owner Frank Tangeman etux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

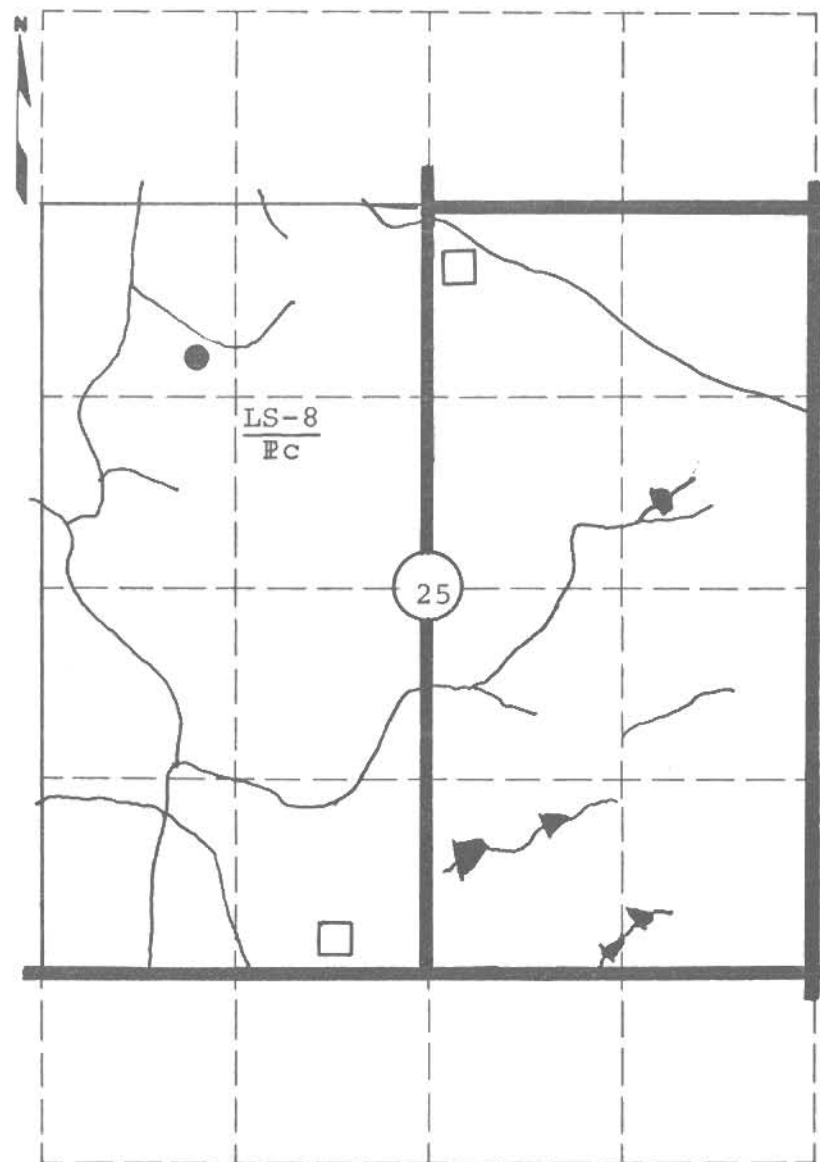
Site No. LS-8
Pc Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 25 Twp. 1S Range 12E
 Owner See Remarks
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Church Limestone Member
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks Alice Hunzeker & Ben W. Grimm
% Raymond Rilinger, Seneca, Kansas

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

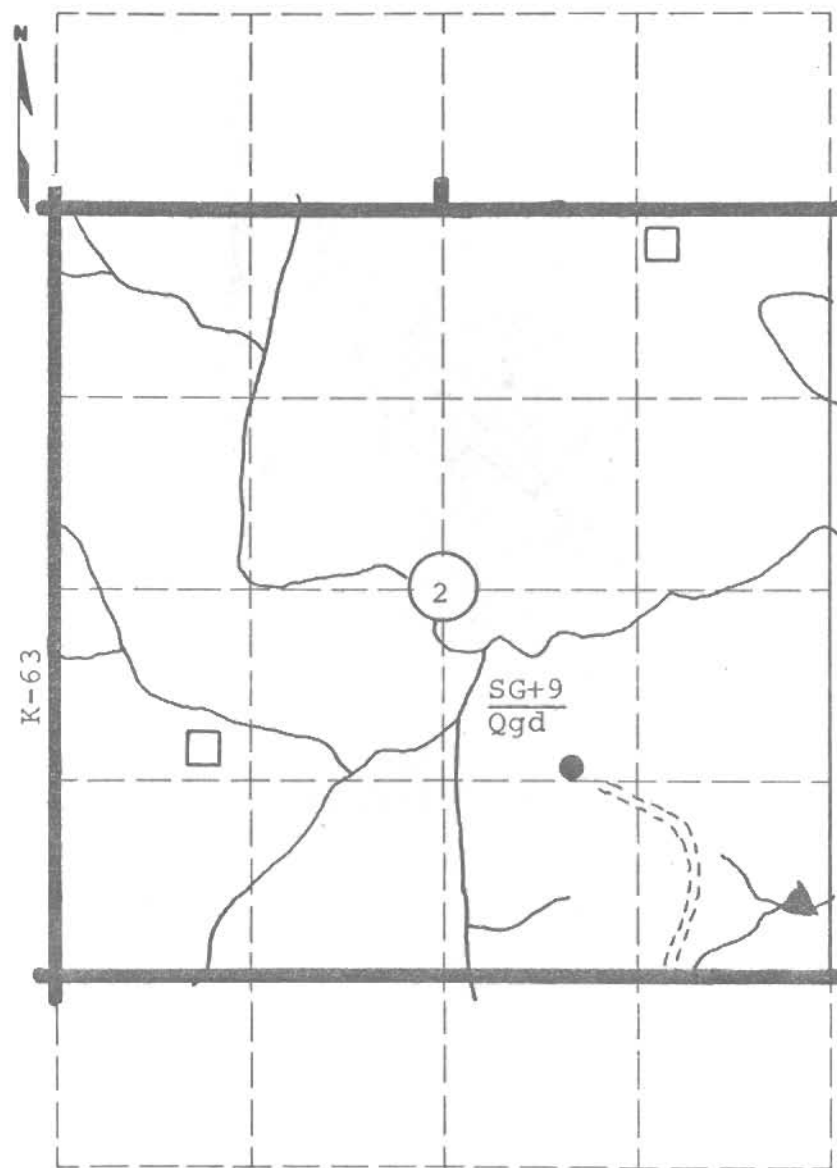
Site No. SG+9
Ogd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 2 Twp. 2S Range 12E
 Owner Conrad F. Siess Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks May be expansion possibilities to the east of the present site.

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

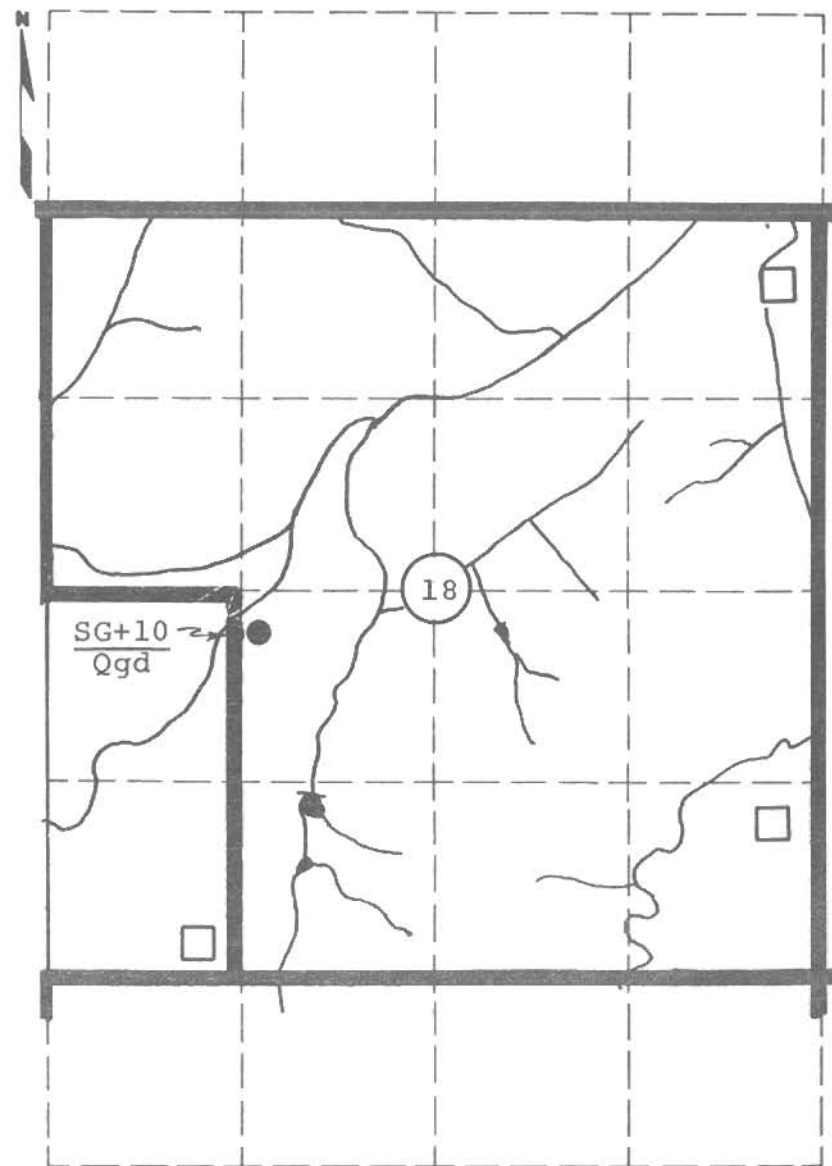
Site No. SG+10
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 18 Twp. 2S Range 12E
 Owner Clarence R. Engelken et ux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

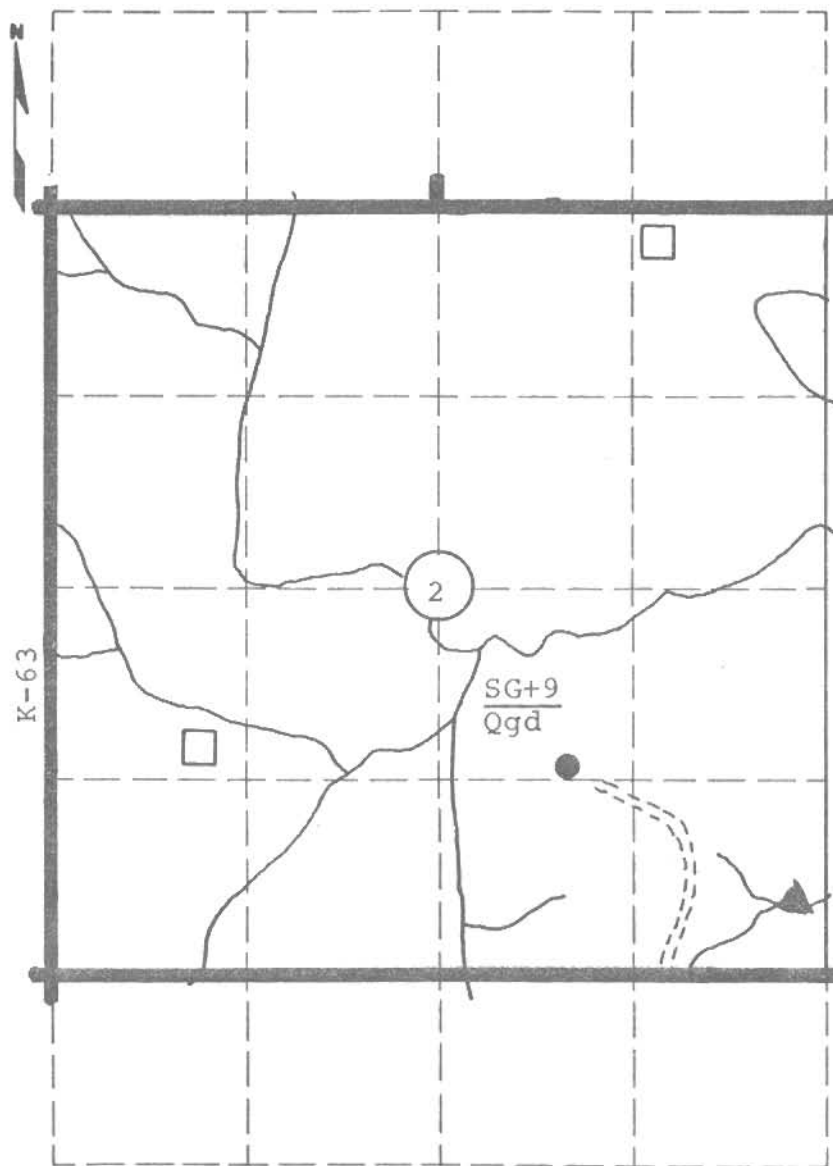
Site No. SG+9
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 2 Twp. 2S Range 12E
 Owner Conrad F. Siess Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks May be expansion possibilities to the east of
the present site.

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+10
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 18 Twp. 2S Range 12E
 Owner Clarence R. Engelken et ux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; not sampled

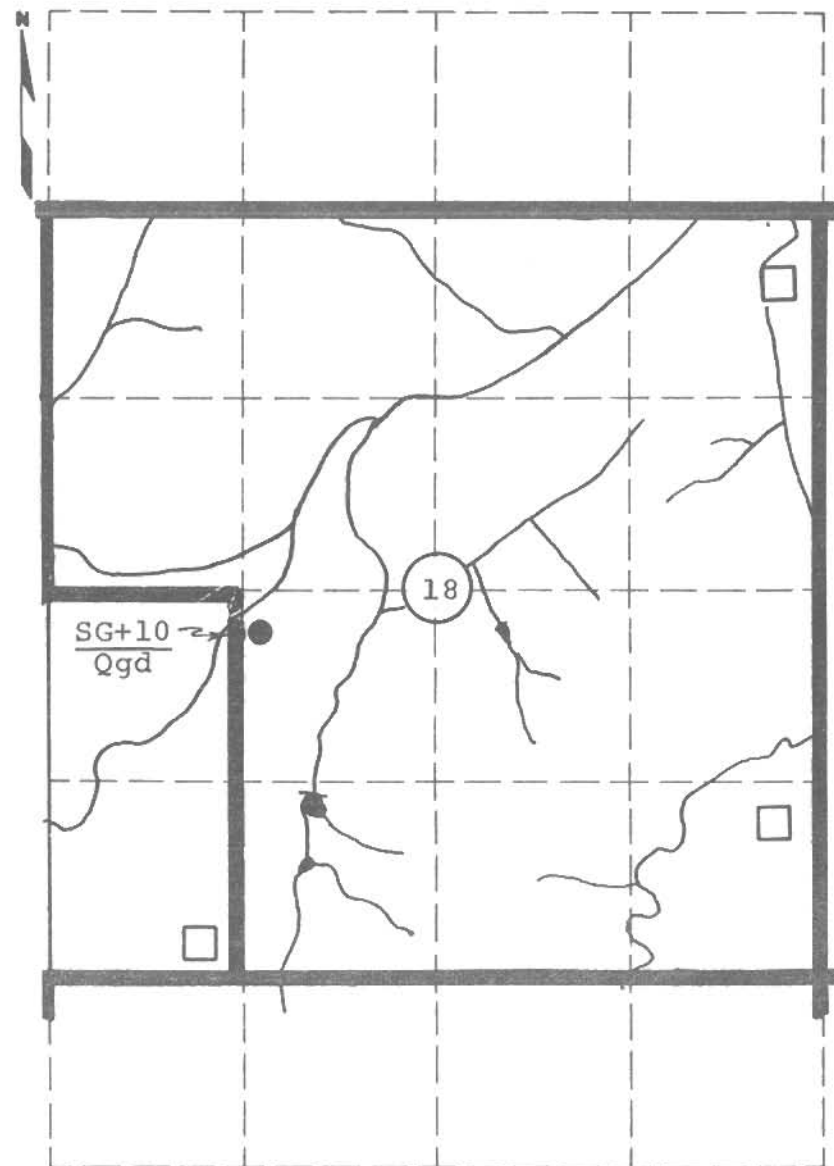
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

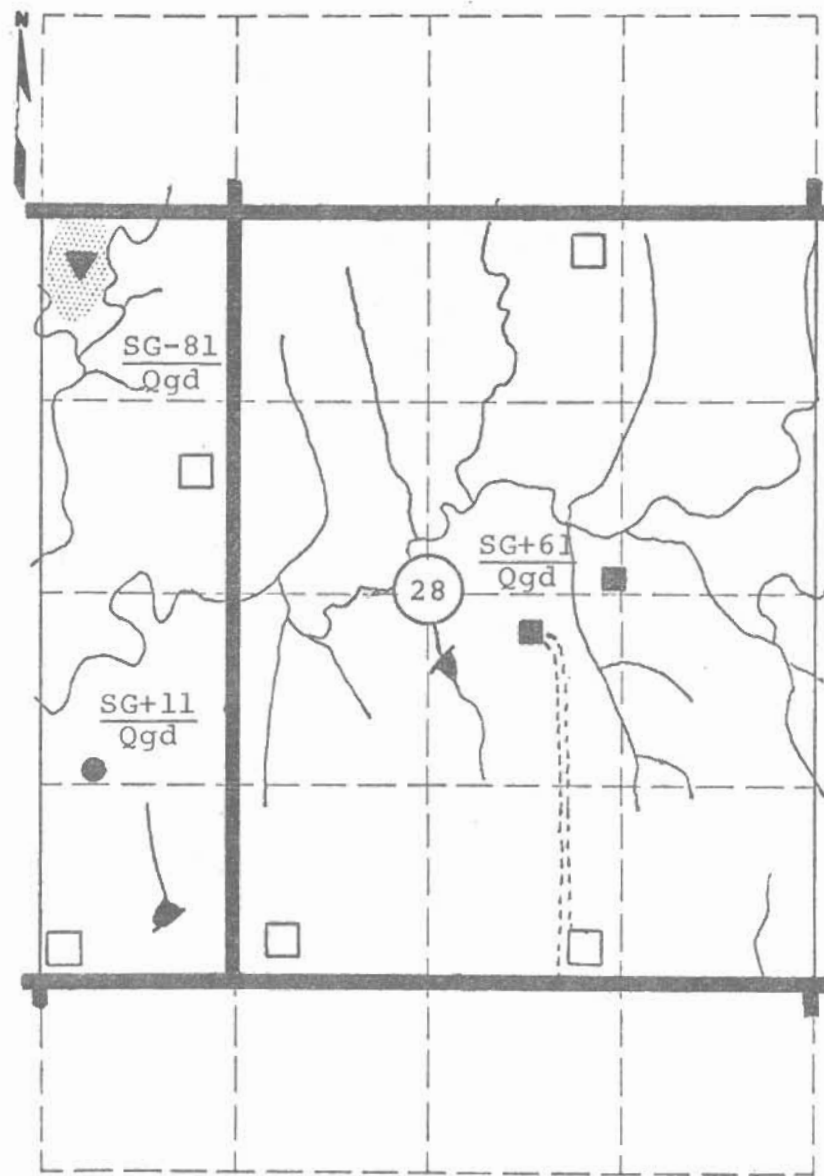
Site No. SG+11
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location W $\frac{1}{2}$ SW $\frac{1}{4}$ Sec. 28 Twp. 1S Range 13E
 Owner Eli Meyer et ux, & Robert Meyer Bern, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of overburden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|---------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Co. Fl. _____ Str. Ratio _____
 Remarks _____

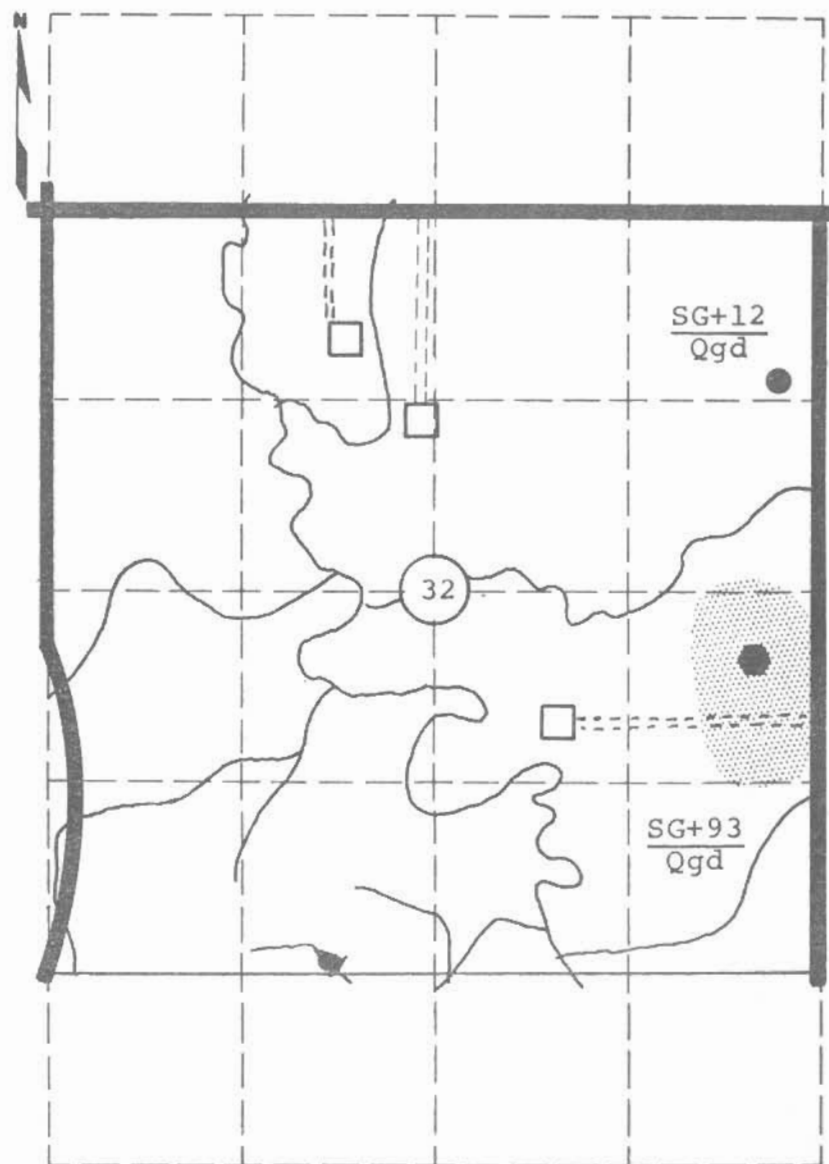
Scale: 1" = $\frac{1}{4}$ Mile

EXPLORATION DATA

[illegible]

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To _____

Specific Gravity (Sat.) _____ (Dry) _____
Los Angeles Wear _____
Absorption _____ Soundness _____
Wt. Cu.Ft. _____ Str. Ratio _____
Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

EXPLORATION DATA

[illegible]

CORRELATION DATA

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

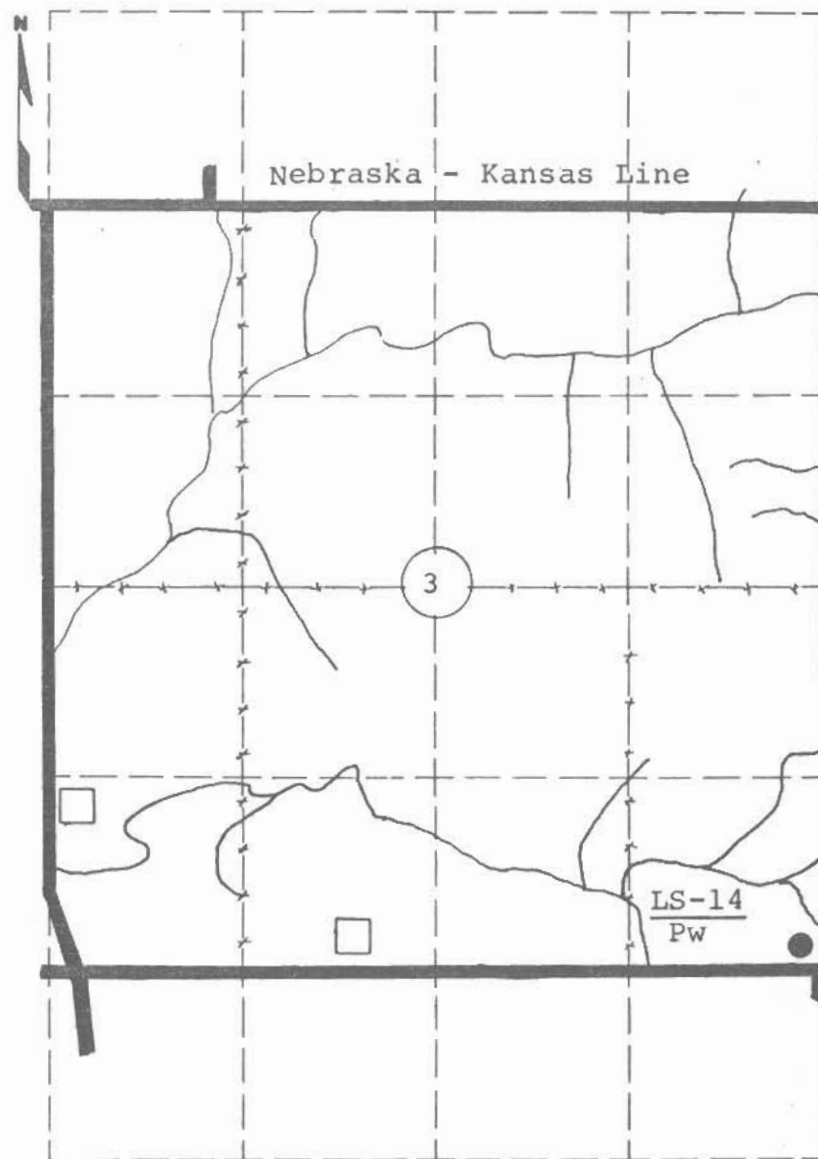
Site No. LS-14
Pw Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 3 Twp. 1S Range 13E
 Owner Donald Lee Ehrsam Bern, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Wreford Limestone Formation
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks The material being removed from this site is a weathered cherty limestone.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

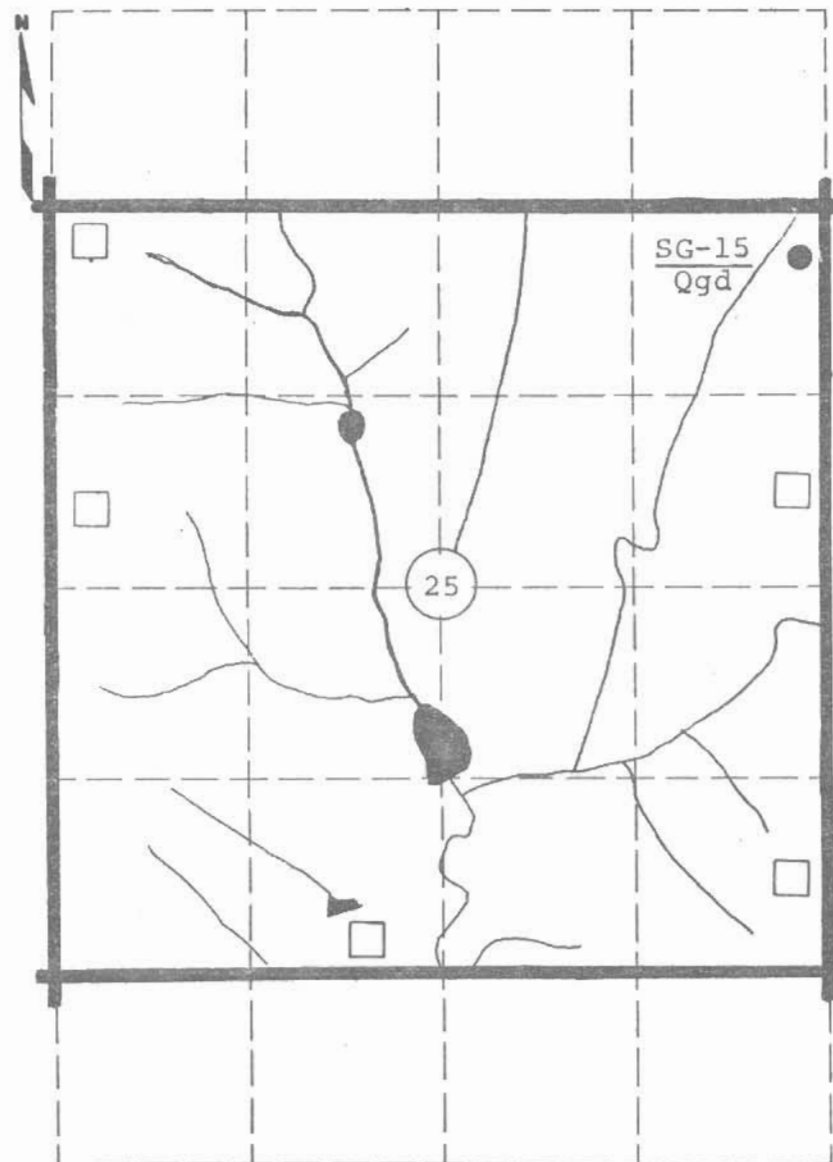
Site No. SG-15
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 25 Twp. 1S Range 13E
 Owner Clayton J. Strahm et ux Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

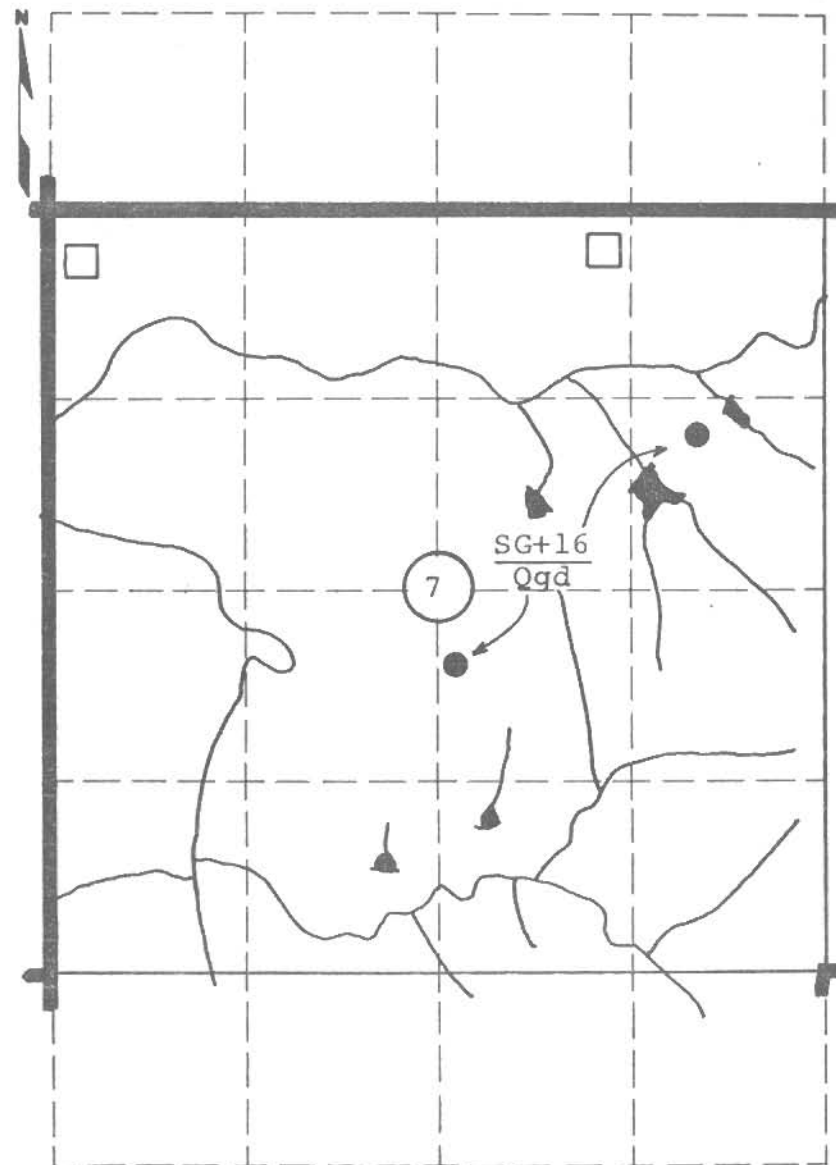
Site No. SG+16
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location E½ Sec. 7 Twp. 2S Range 13E
 Owner See Remarks
 Name _____ address _____
 Nature of Deposit Dry Accessibility Fair Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks NE¼ Gordon Mosteller, Bern, Kansas
SE¼ Jesse A. Hunzeker, Bern, Kansas



Scale: 1" = ¼ Mile

MATERIAL SURVEY REPORT

Site No. LS-17
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SE 1/4 Sec. 1 Twp. 2S Range 13E
 Owner John W. Plattner et ux Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate II
 Status of Site Open site; not sampled

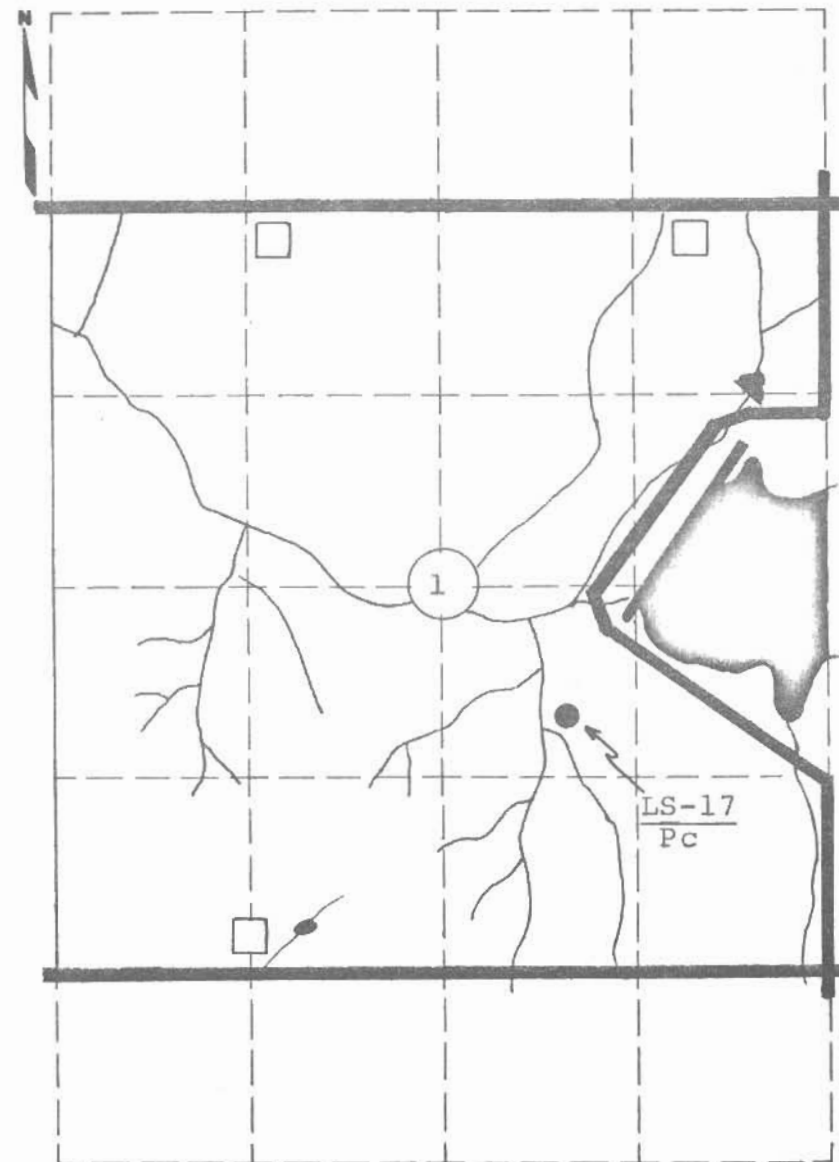
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. | |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|-----|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu-Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

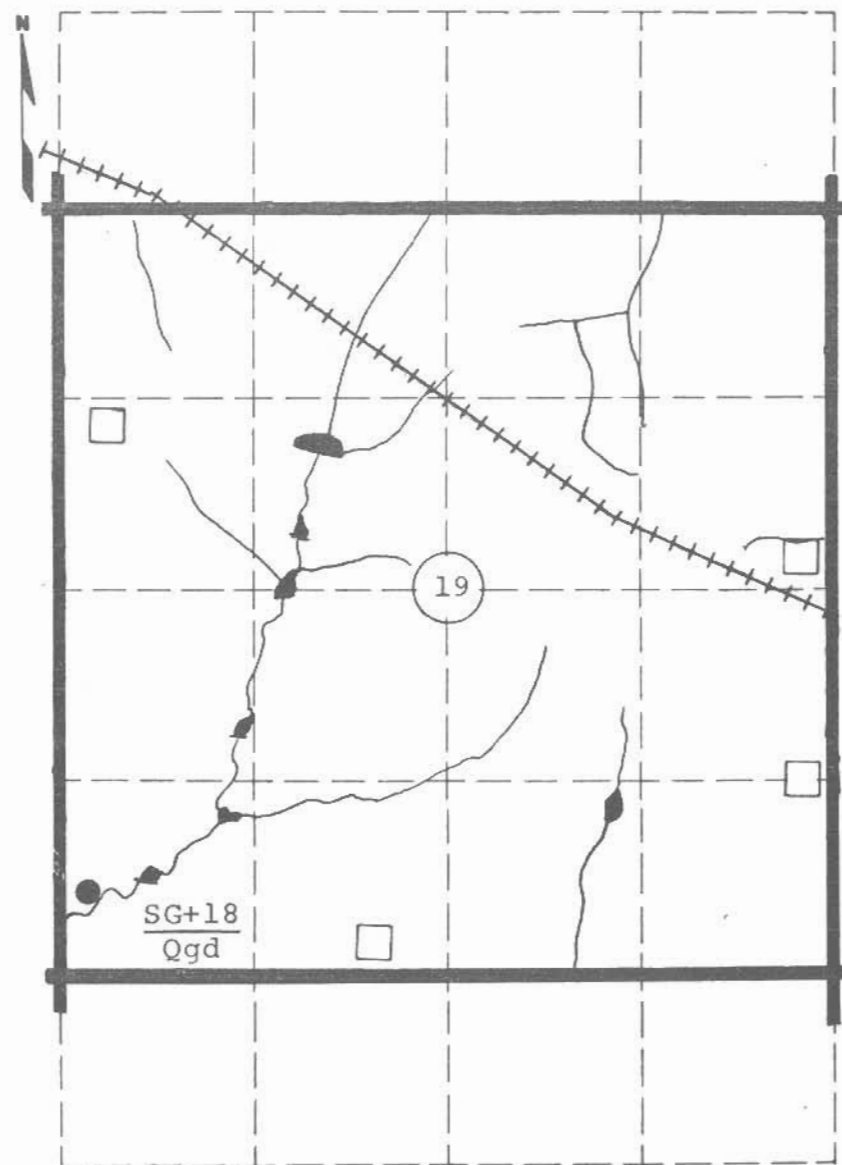
Site No. SG+18
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 19 Twp. 1S Range 14E
 Owner Willis J. Gerber Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG-19
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 6 Twp. 2S Range 14E
 Owner Harry W. Edelman Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate II
 Status of Site Open site; not sampled

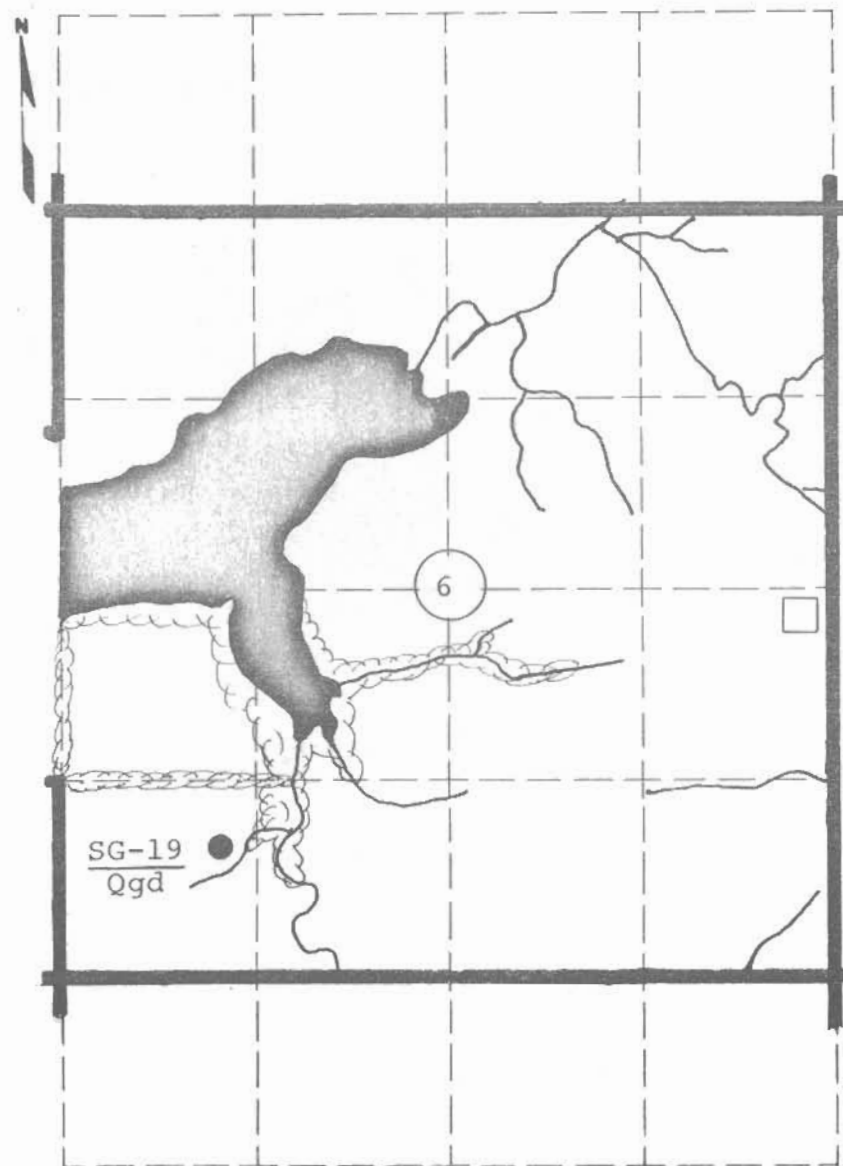
EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.L. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks Pit very small; not much potential.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

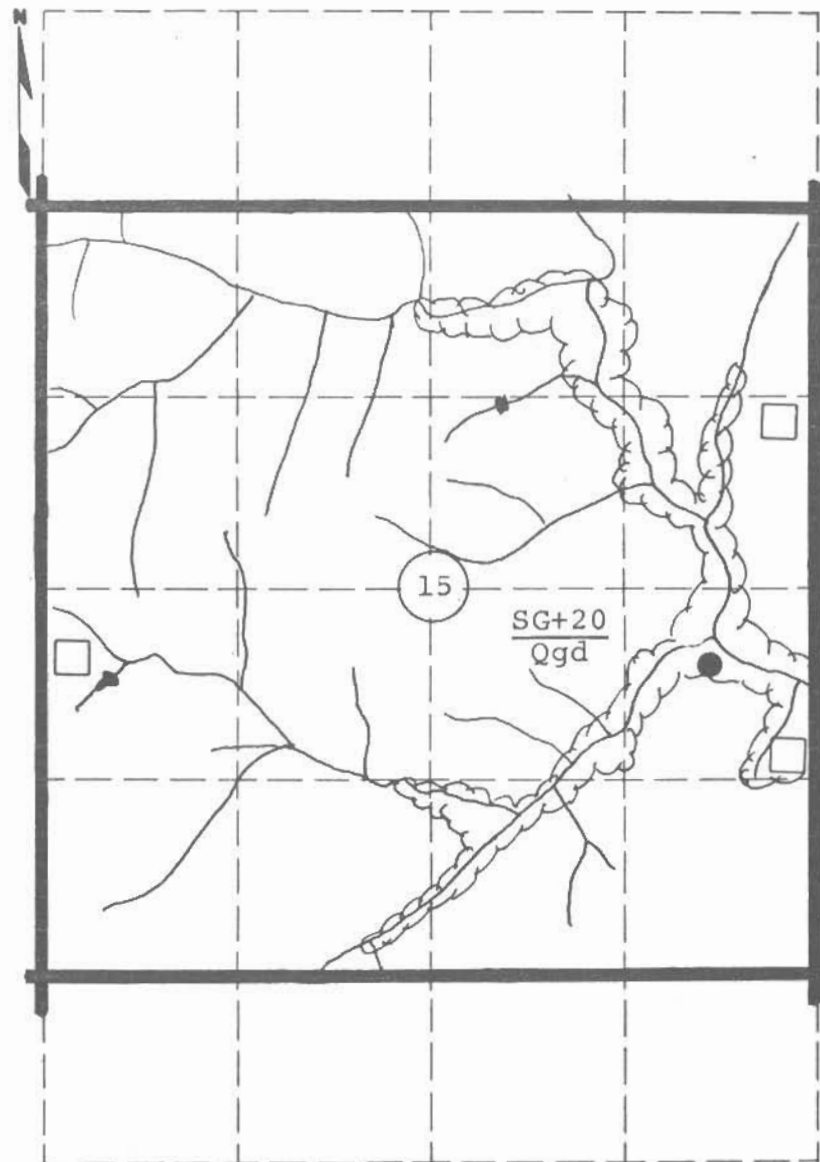
Site No. SG+20
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 15 Twp. 2S Range 14E
 Owner Marvin L. Scoby Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate II
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

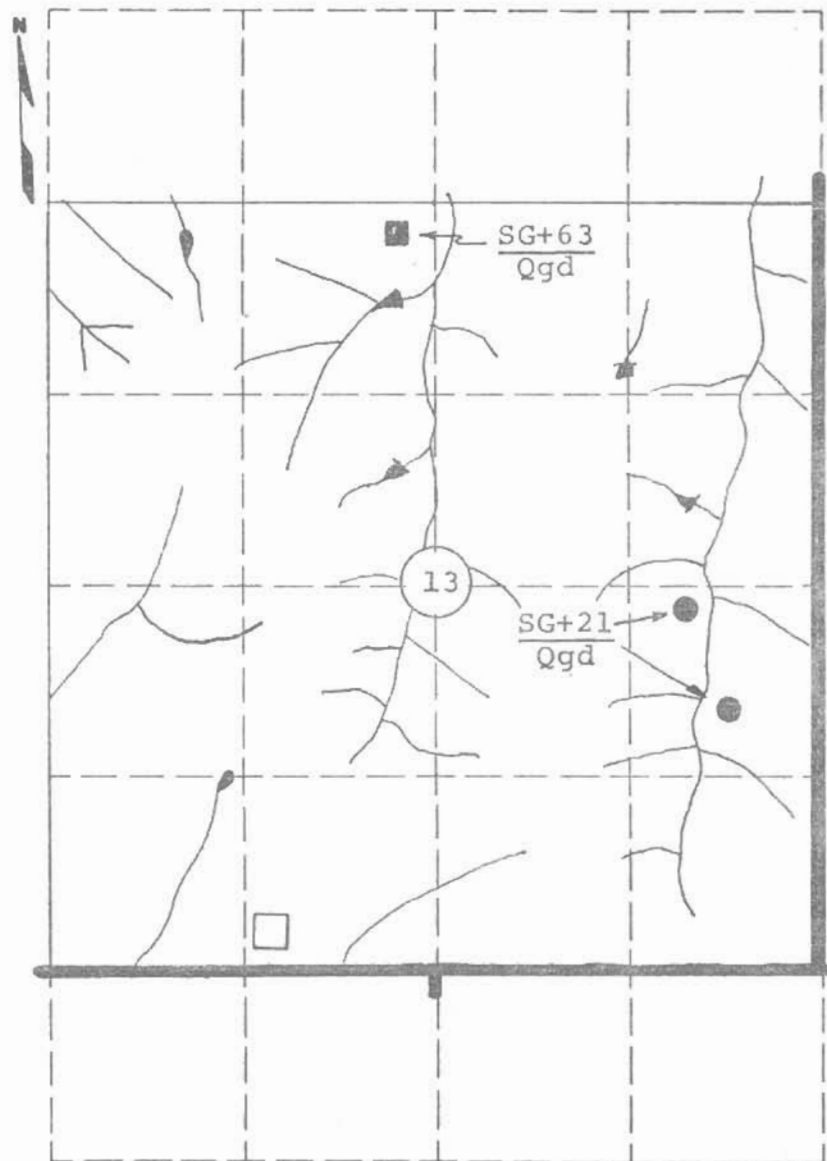
Site No. SG+21
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 13 Twp. 3S Range 12E
 Owner Elizabeth Rethman, & Mrs. B. Rethman, Seneca, Kans.
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Set.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Cu.ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

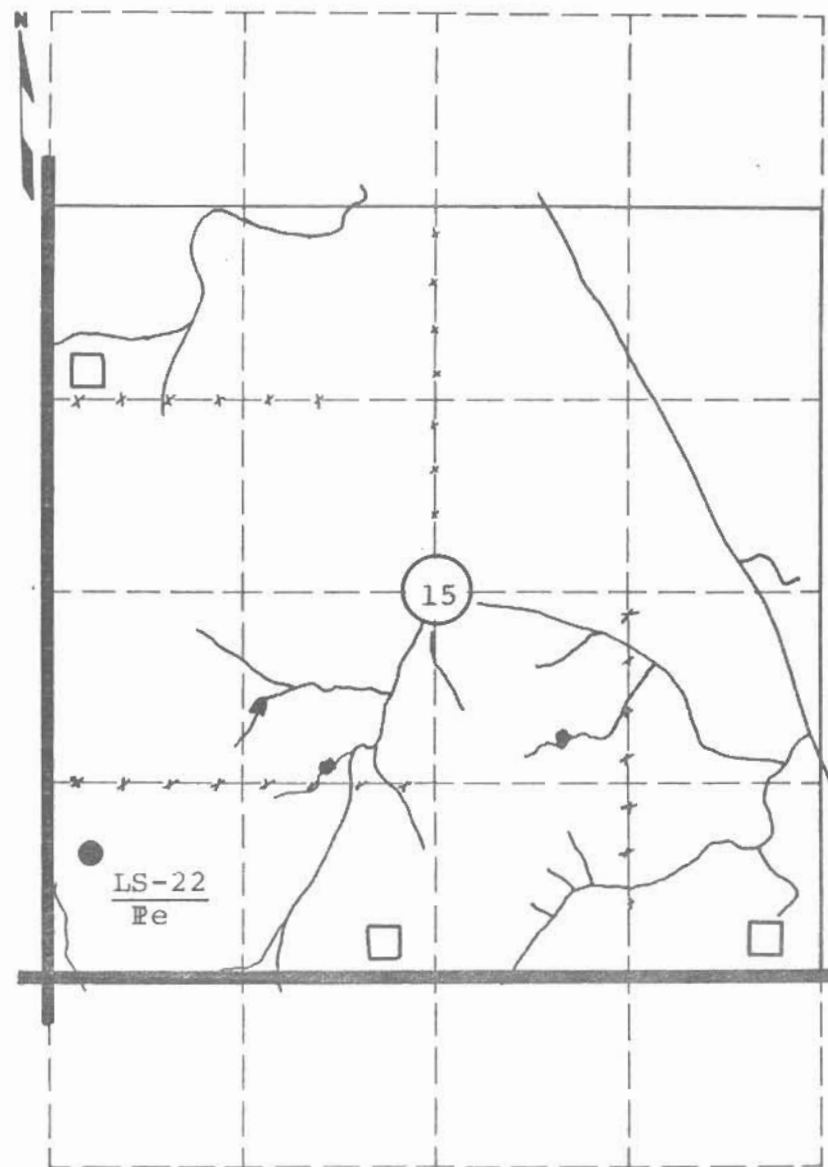
Site No. LS-22
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SW $\frac{1}{4}$ Sec. 15 Twp. 3S Range 12E
 Owner Daniel J. Henry et ux Seneca, Kansas
 Nature of Deposit Dry Accessibility Fair Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

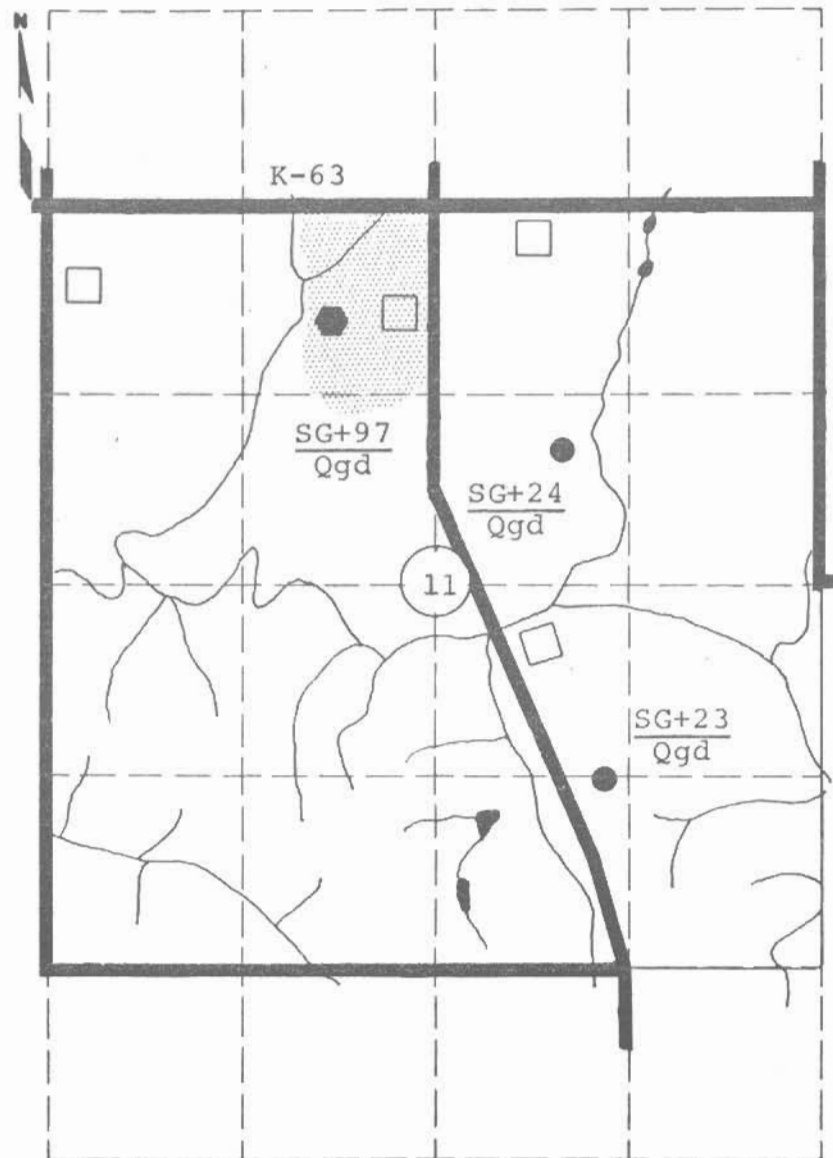
Site No. SG+23
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ Sec. 11 Twp. 3S Range 12E
 Owner Mathias C. Rochel et ux Seneca, Kansas
 Name Address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

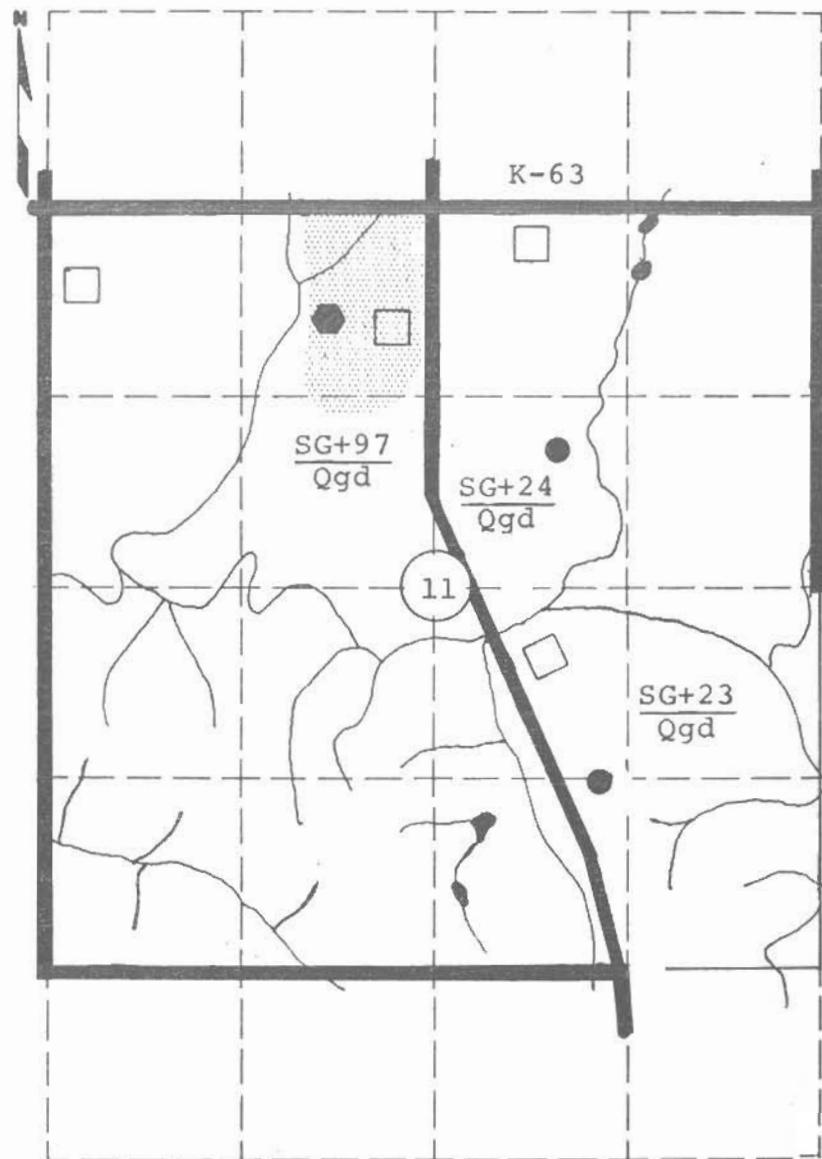
Site No. SG+24
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 11 Twp. 3S Range 12E
 Owner Frank Kuckelman etux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry)
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

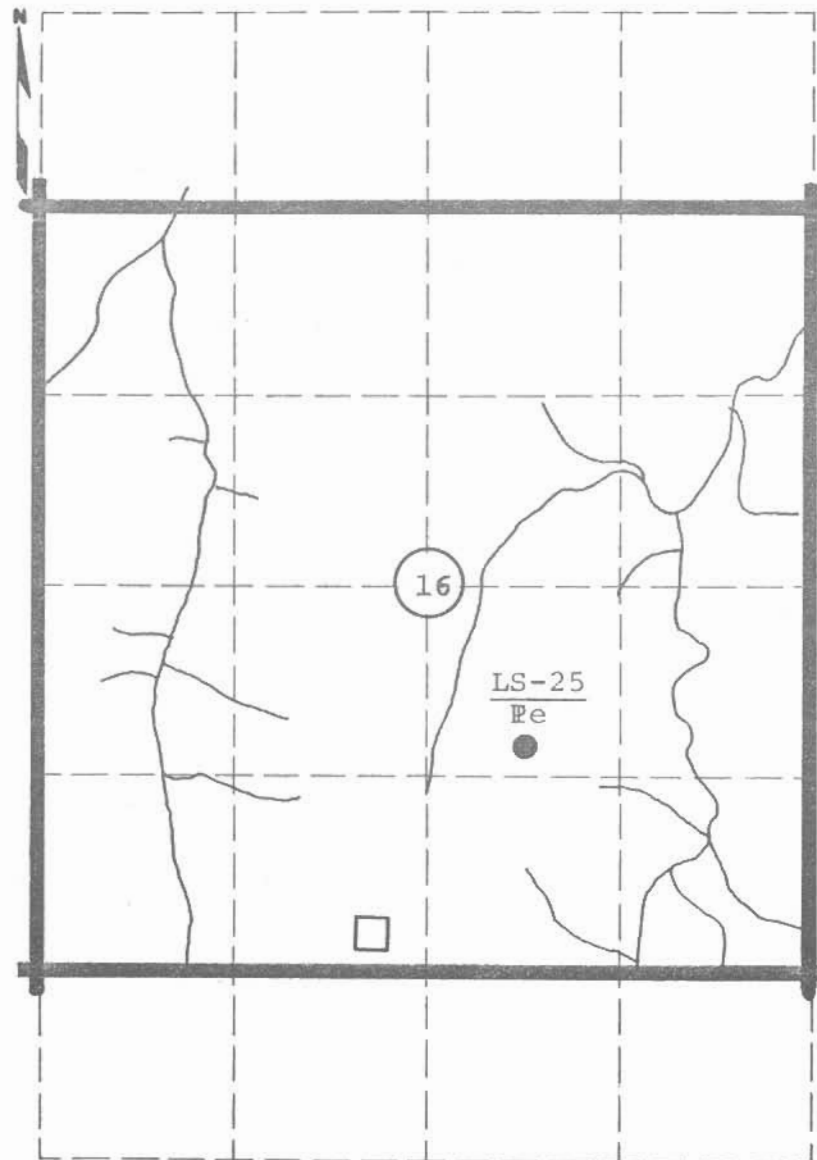
Site No. LS-25
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 16 Twp. 3S Range 12E
 Owner Bernard W. Kampert et ux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu. Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

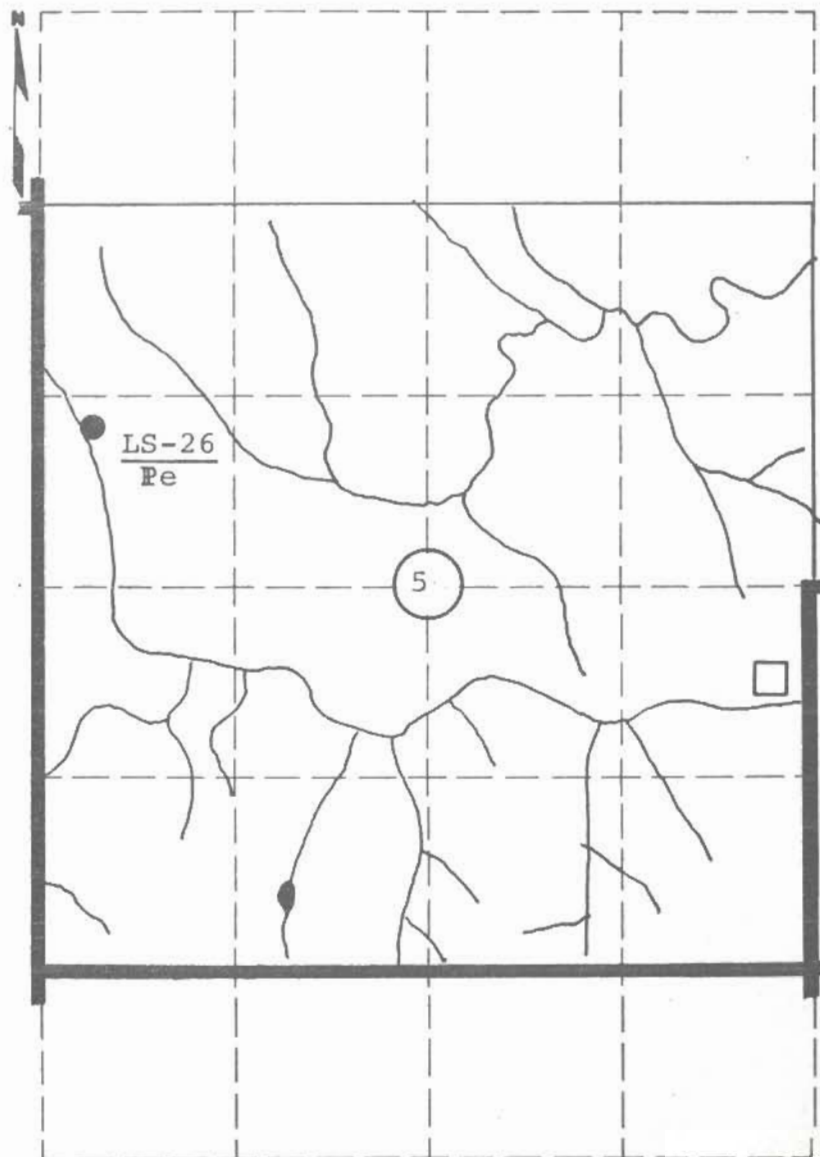
Site No. LS-26
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 5 Twp. 3S Range 12E
 Owner Donald J. Uphaus et ux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G. F. | L. L. | P. I. | |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|-------|-------|-------|-----|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

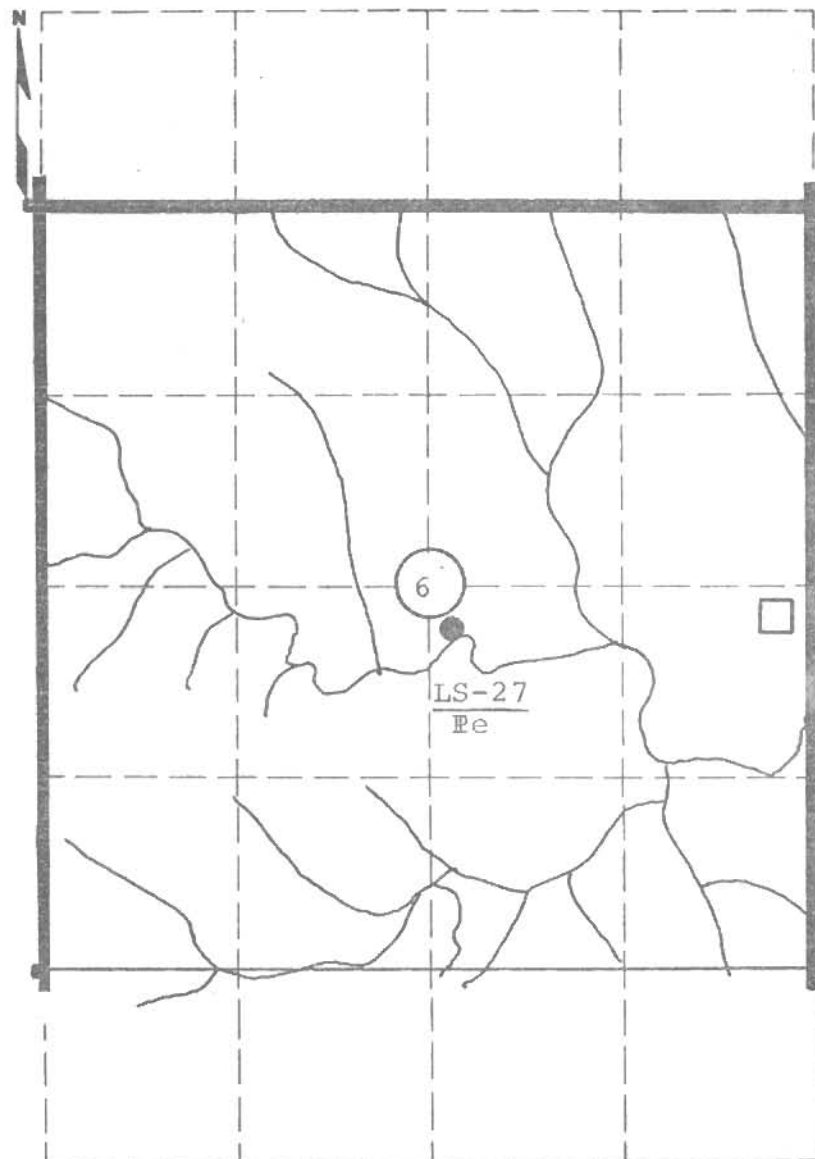
Site No. LS-27
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 6 Twp. 3S Range 12E
 Owner Norbert A. Stallbaumer etux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate III
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

Site No. SG-28
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 36 Twp. 2S Range 12E
 Owner Mary Sudbeck Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Open site; not sampled

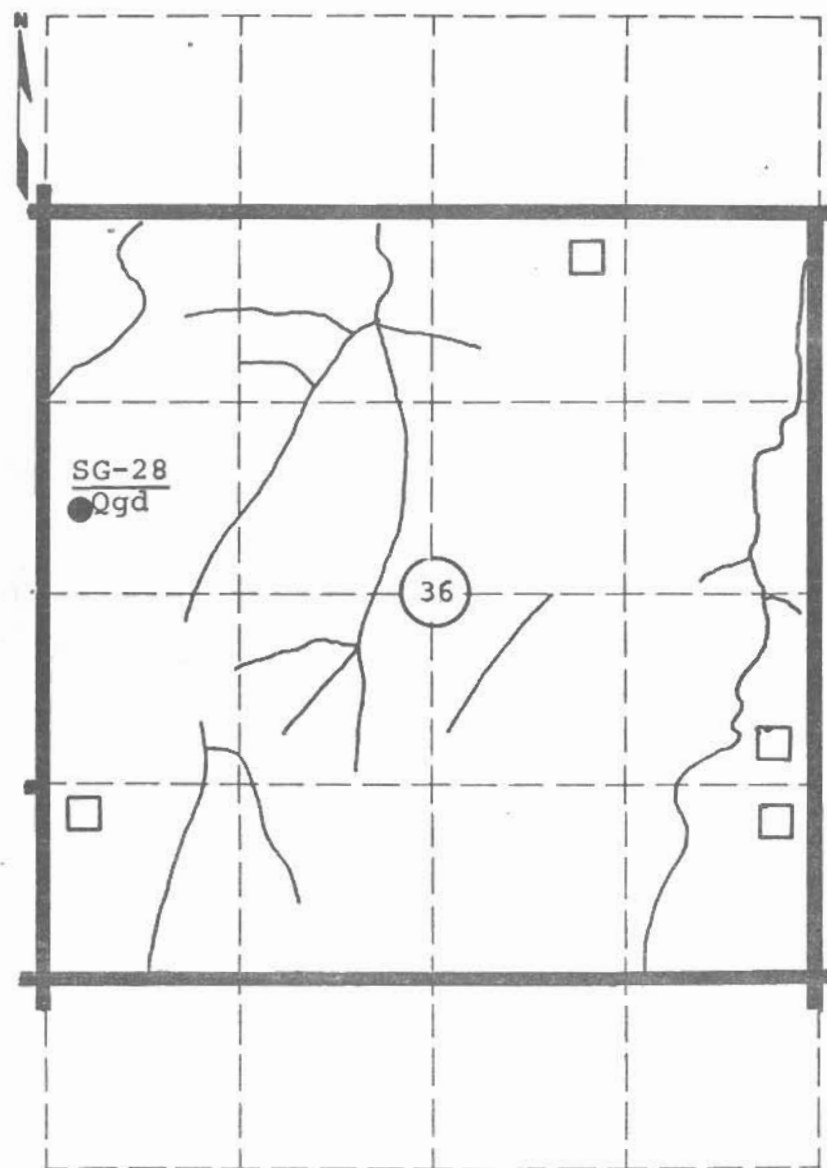
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

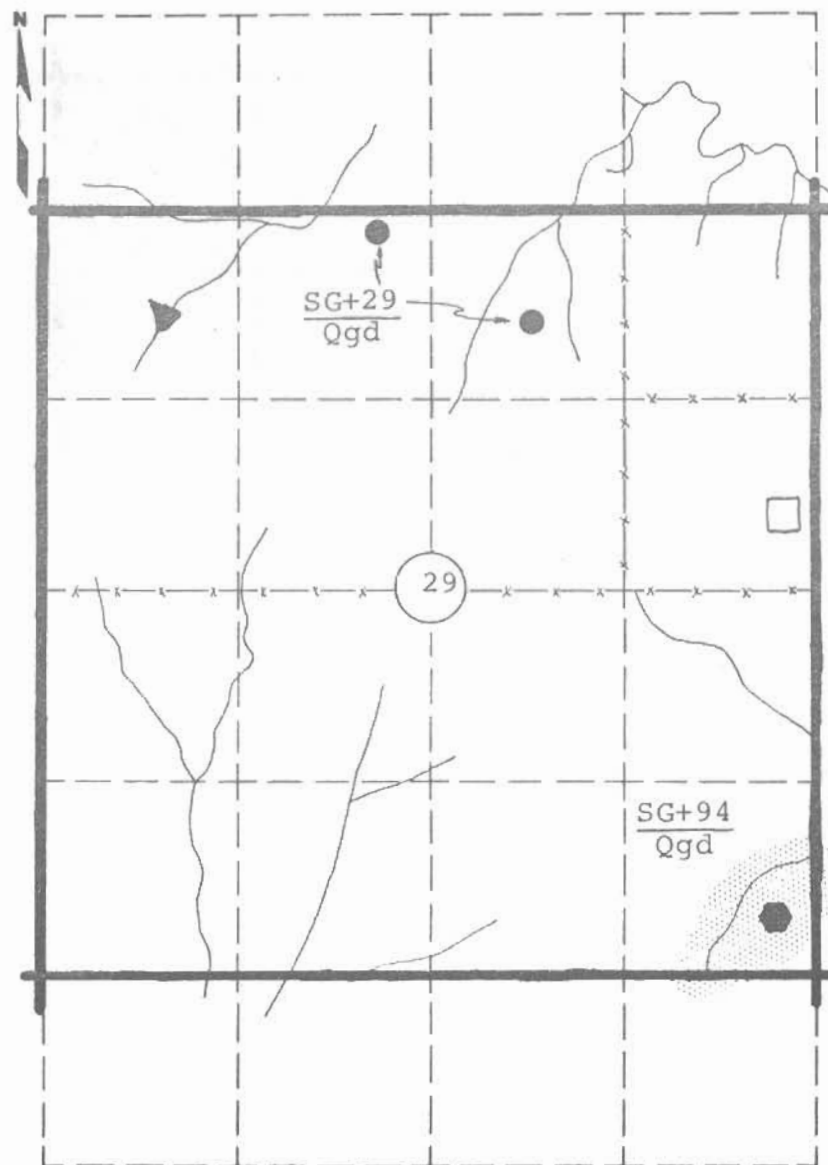
Site No. SG+29
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location N $\frac{1}{2}$ N $\frac{1}{2}$ Sec. 29 Twp. 5S Range 14E
 Owner Lloyd Pfrang Goff, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate VI
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Det.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

Site No. SG-30
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 36 Twp. 3S Range 13E
 Owner Francis J. Levret Goff, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

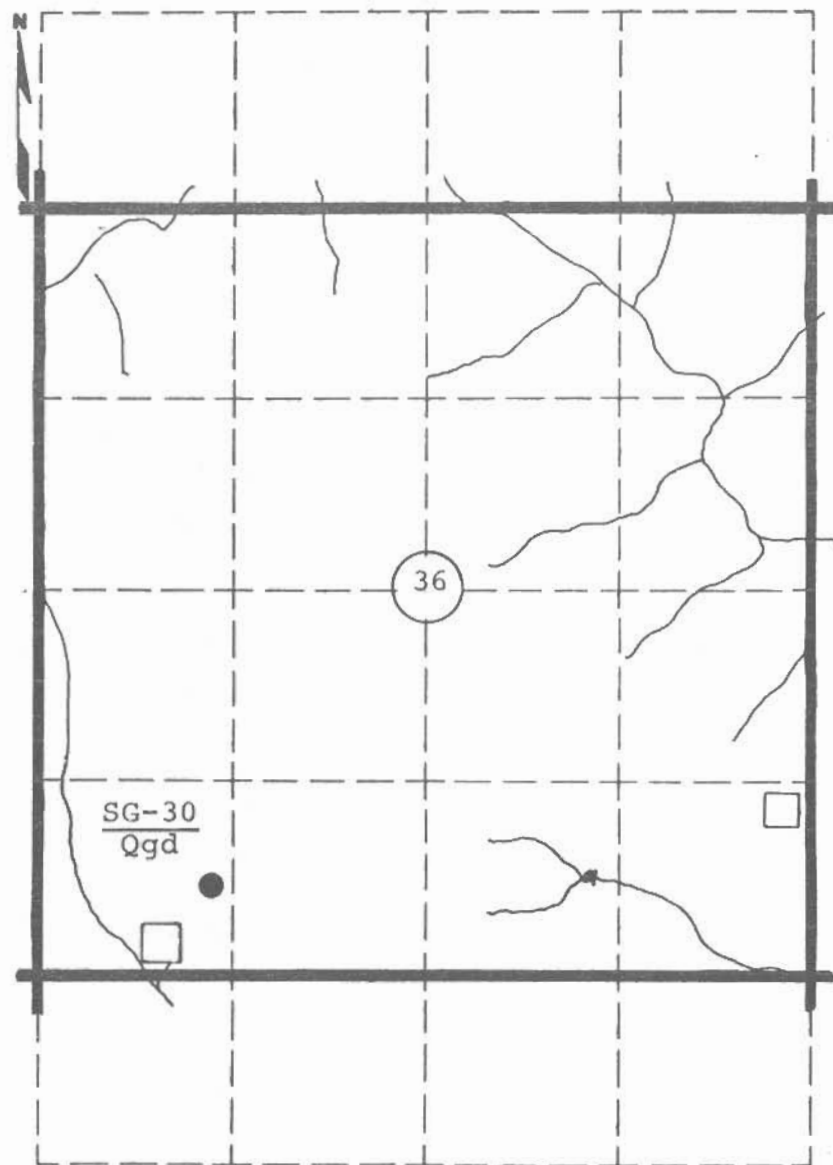
| Test Hole | Material at bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Ret.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____

Remarks This site is reported in the Geological Survey
Bull. No. 1060D.



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

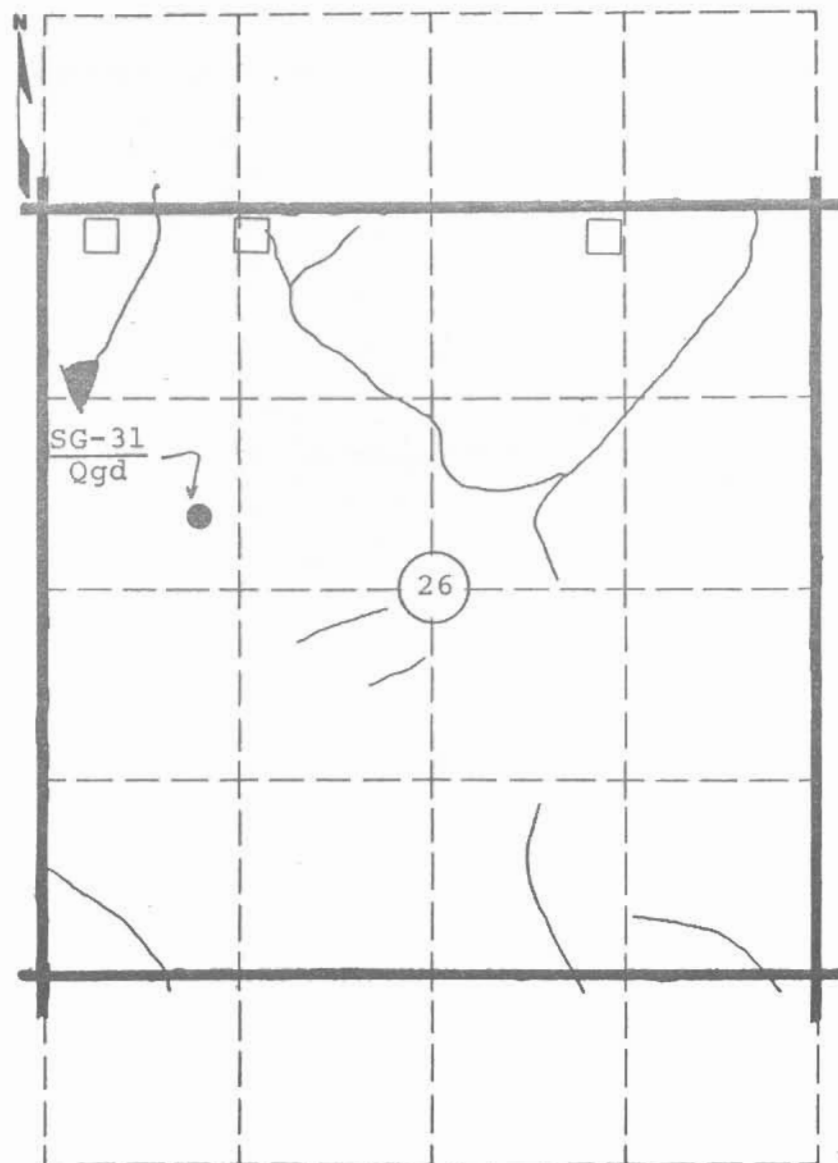
Site No. SG-31
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 26 Twp. 3S Range 13E
 Owner John E. Swart, & Carl D. Swart, Seneca, Kansas
 Nature of Deposit Dry Accessibility Fair Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

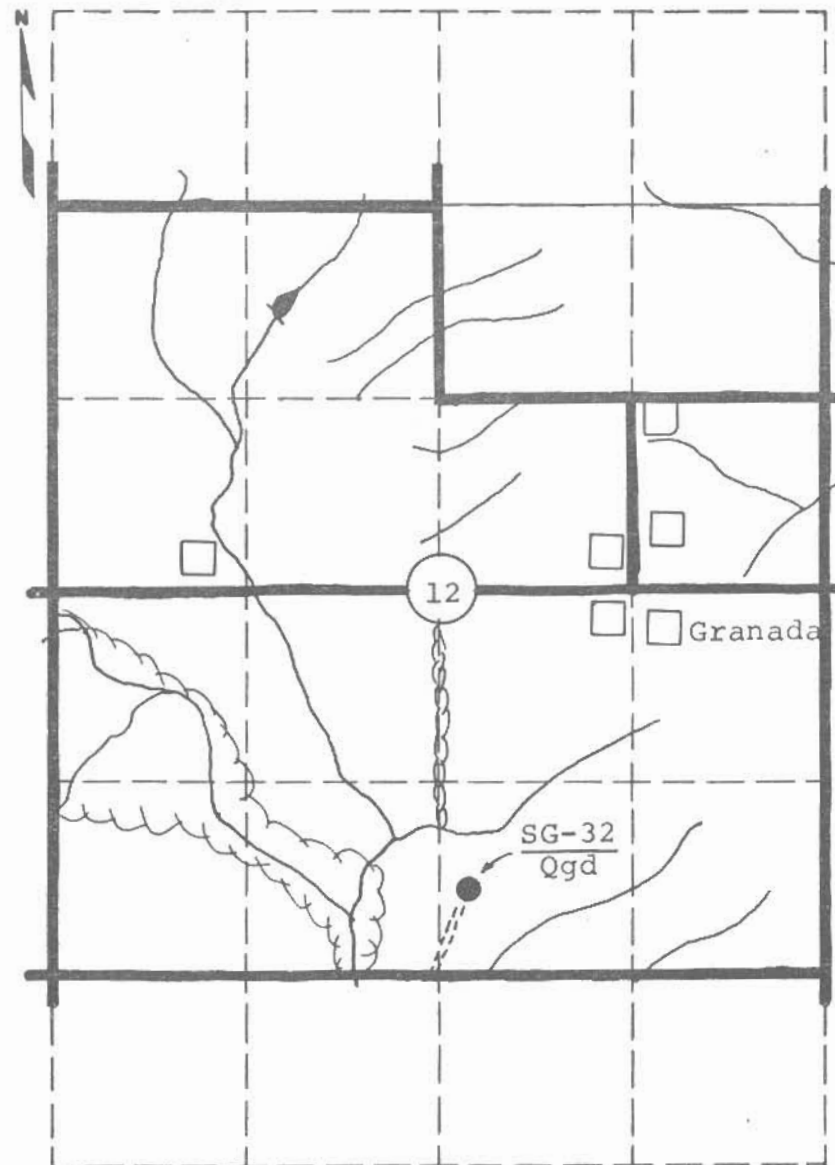
Site No. SG-32
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 12 Twp. 4S Range 14E
 Owner Robert F. Achten Wetmore, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plat IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of overburden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|---------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

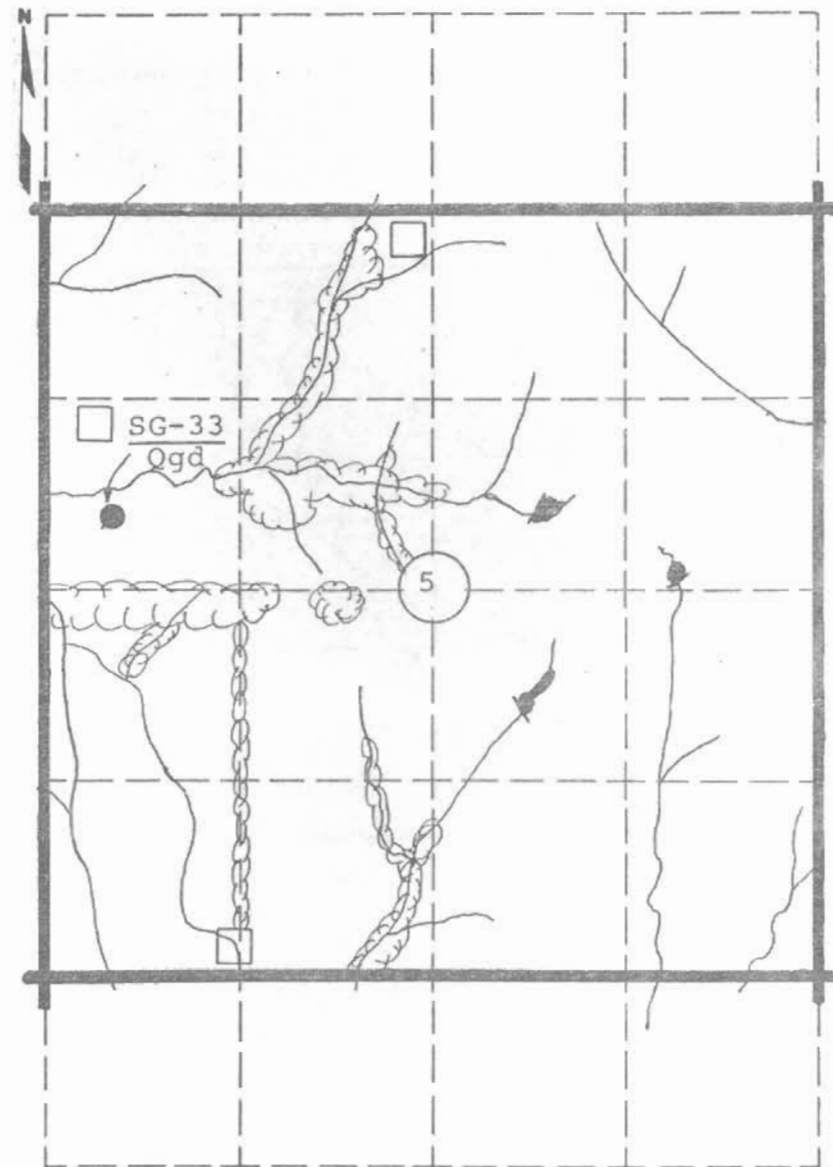
Site No. SG-33
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 5 Twp. 4S Range 14E
 Owner Jimmie McDaniel Goff, Kansas
name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of hole | Depth of overburden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|---------------------|-------------------|------------------|-----|-----|-----|------|-----|------|------|------|------|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/2 | 3/16 | 1/8 | 1/16 | 3/32 | 1/32 | 1/64 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu. Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

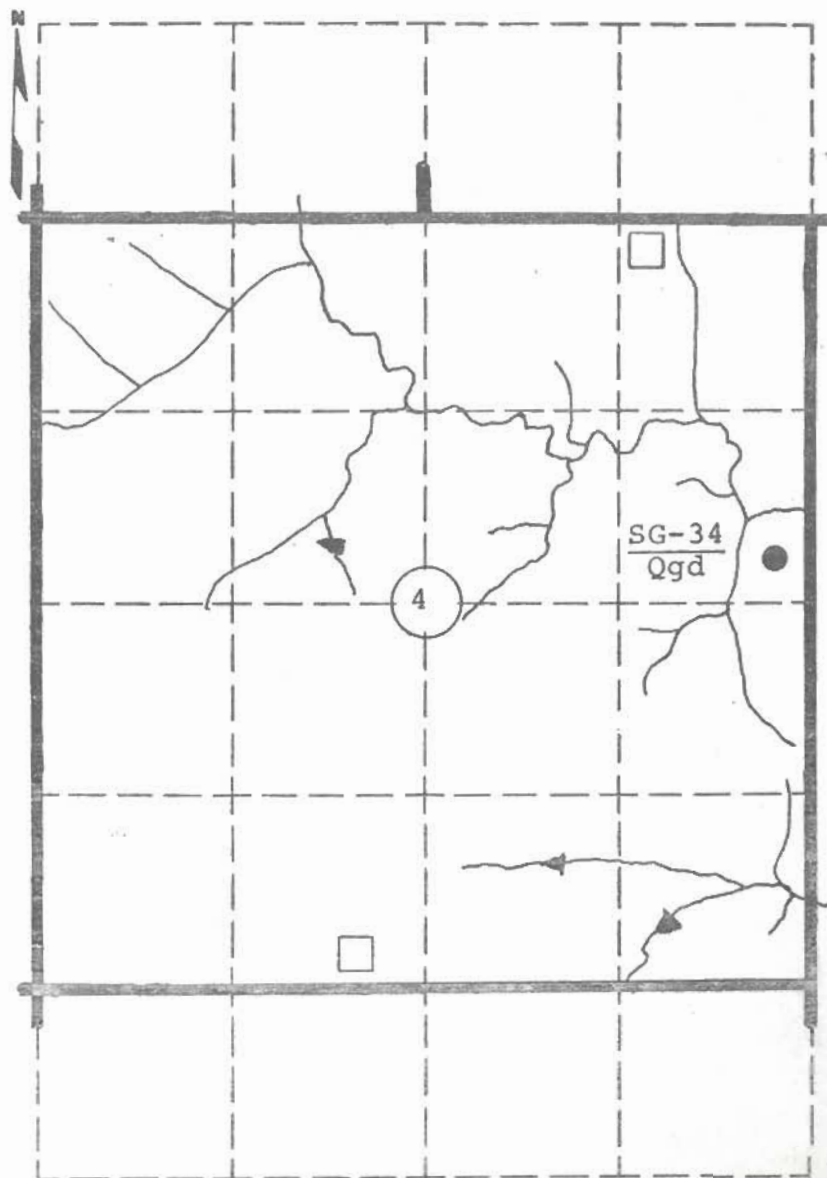
MATERIAL SURVEY REPORT

EXPLORATION DATA

[illegible]

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To _____

Specific Gravity (Sat.) _____ (Dry) _____
Los Angeles Wear _____
Absorption _____ Soundness _____
Wt. Cu.Ft. _____ Str. Ratio _____
Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

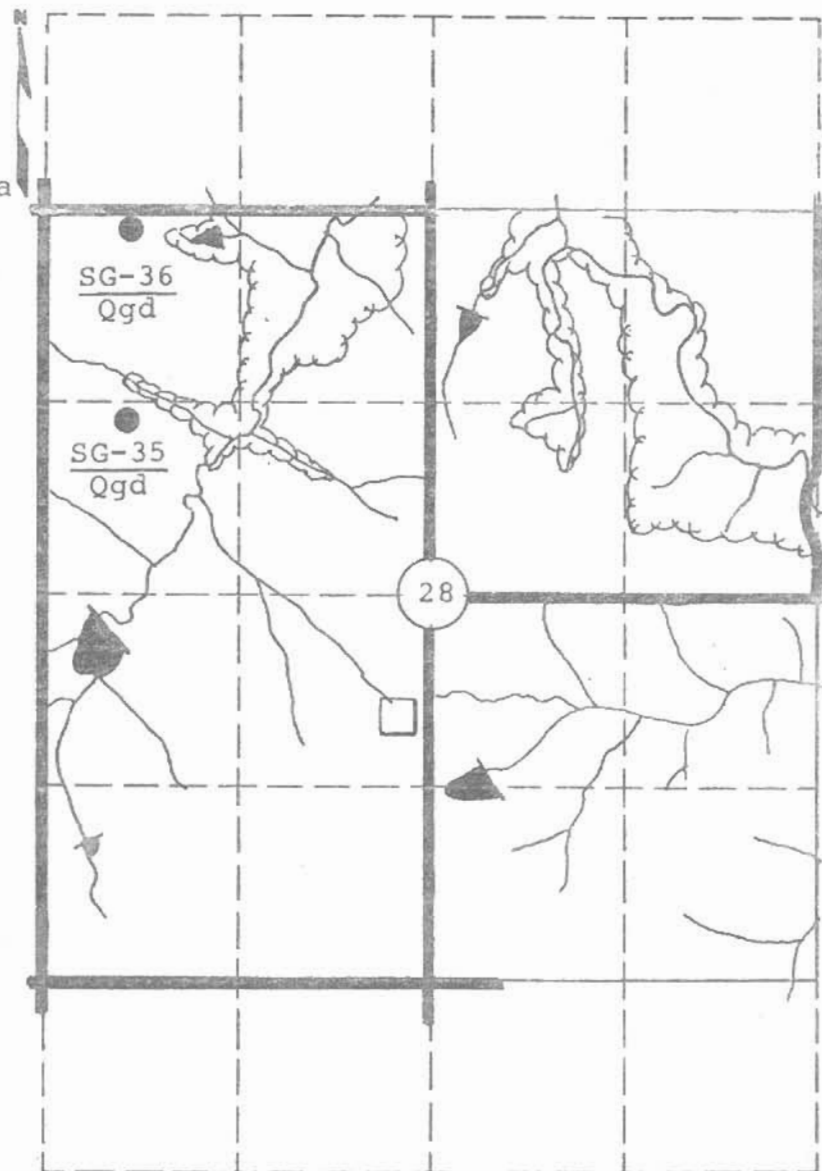
Site No. SG-35
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 28 Twp. 3S Range 14E
 Owner Eugene & Violet Kistner, 1013 5th Ave., Sheldon, Iowa
 Name Address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|-----|------|------|------|------|-------|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 1/8 | 1/16 | 3/32 | 1/32 | 1/64 | 1/128 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Ut. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

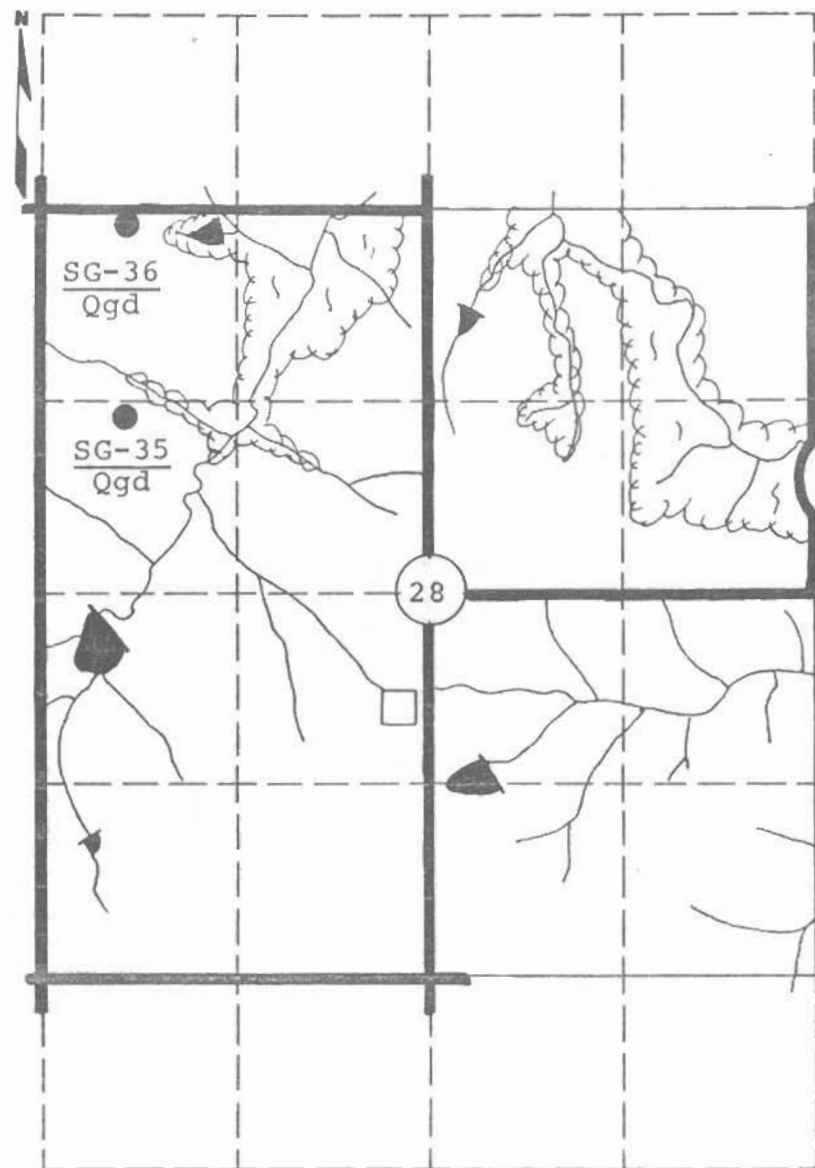
Site No. SG-36
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 28 Twp. 3S Range 14E
 Owner Eugene & Violet Kistner, 1015 5th Ave., Sheldon, Iowa
 name address
 Nature of Deposit Wet Accessibility Good Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 60 | 100 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This pit is abandoned and is currently being
used as a pond.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

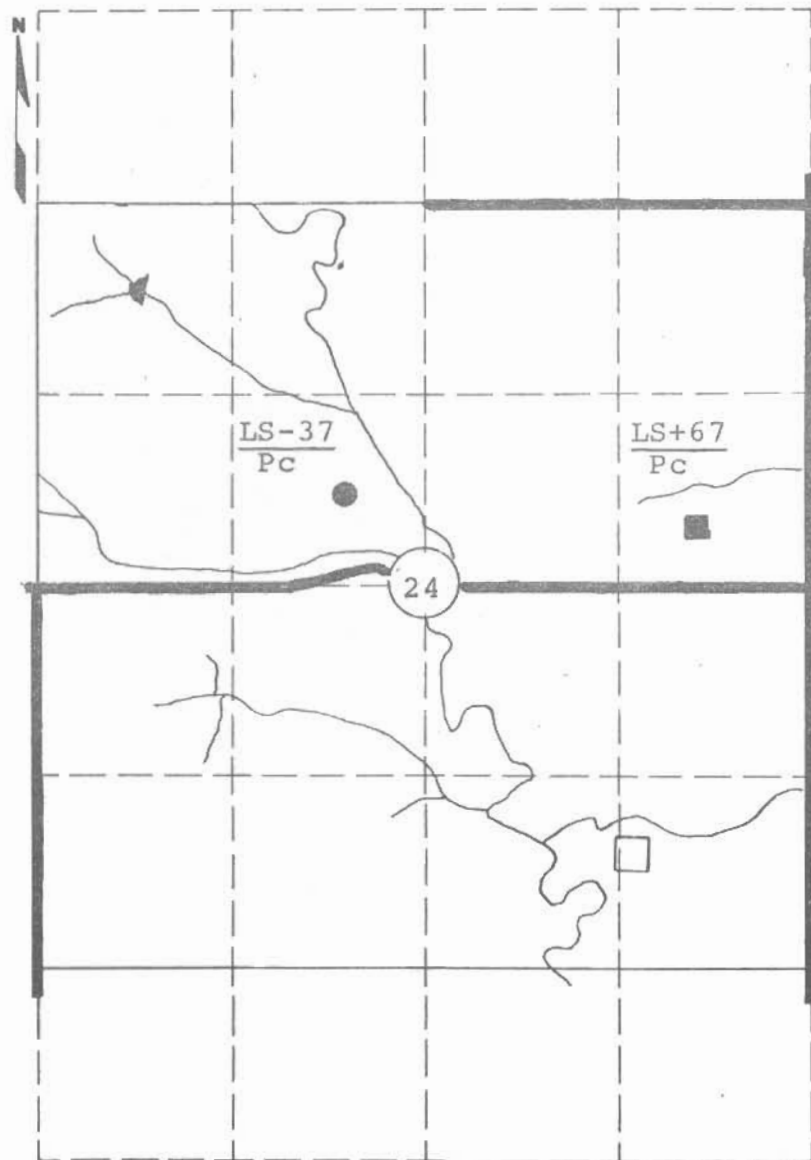
Site No. LS-37
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SE 1/4 NW 1/4 Sec. 24 Twp. 3S Range 14E
 Owner Edward A. Barben Fairview, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+38
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 14 Twp. 3S Range 14E
 Owner Carl W. Evans et ux Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; not sampled

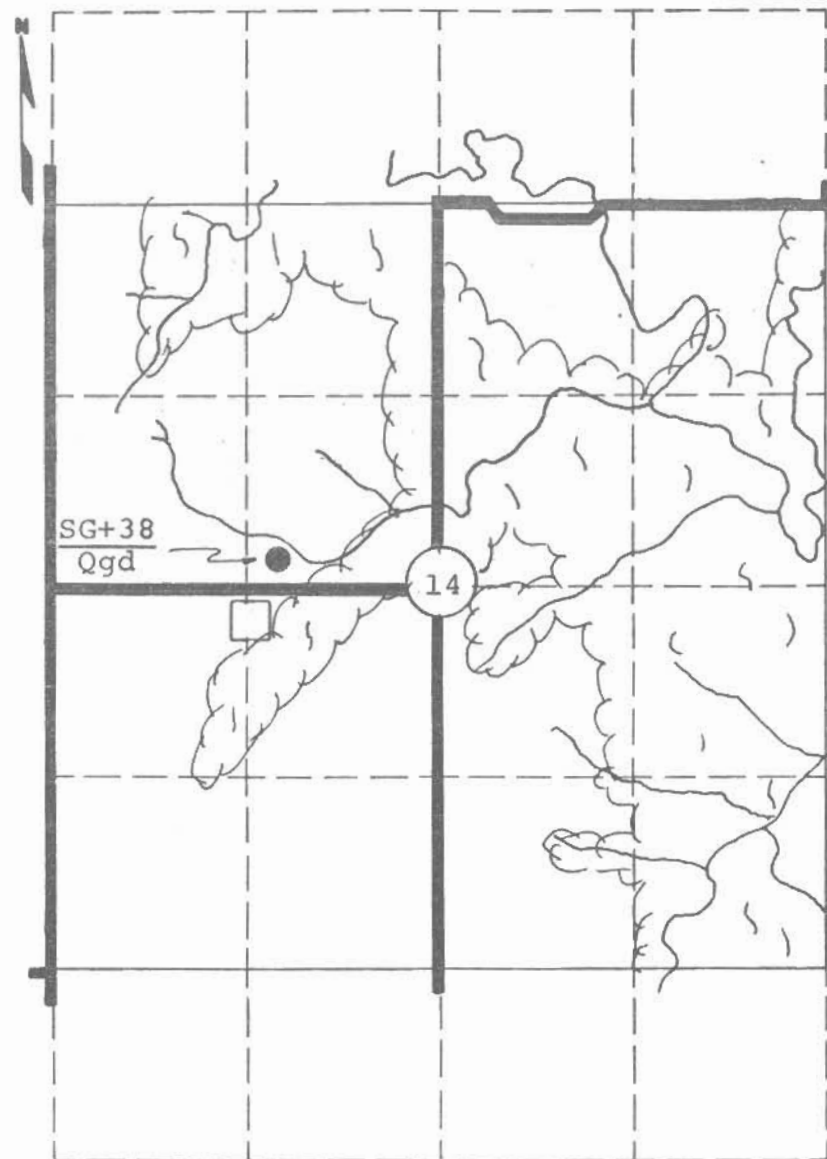
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. | |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|-----|
| | | | | 1/2 | 3/4 | 3/8 | 5 | 8 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

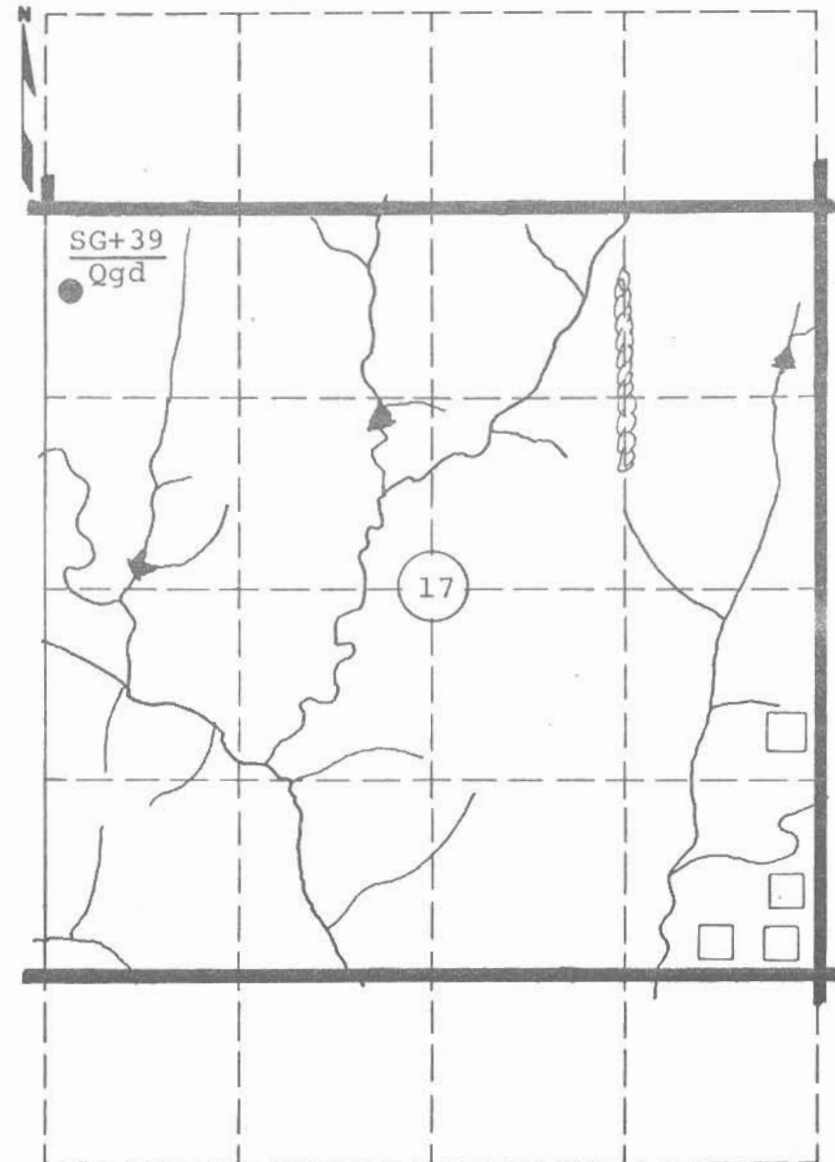
Site No. SG+39
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 17 Twp. 3S Range 14E
 Owner Ralph E. Bartley et ux 209 W. 115th, Kansas City, Mo.
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | S.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

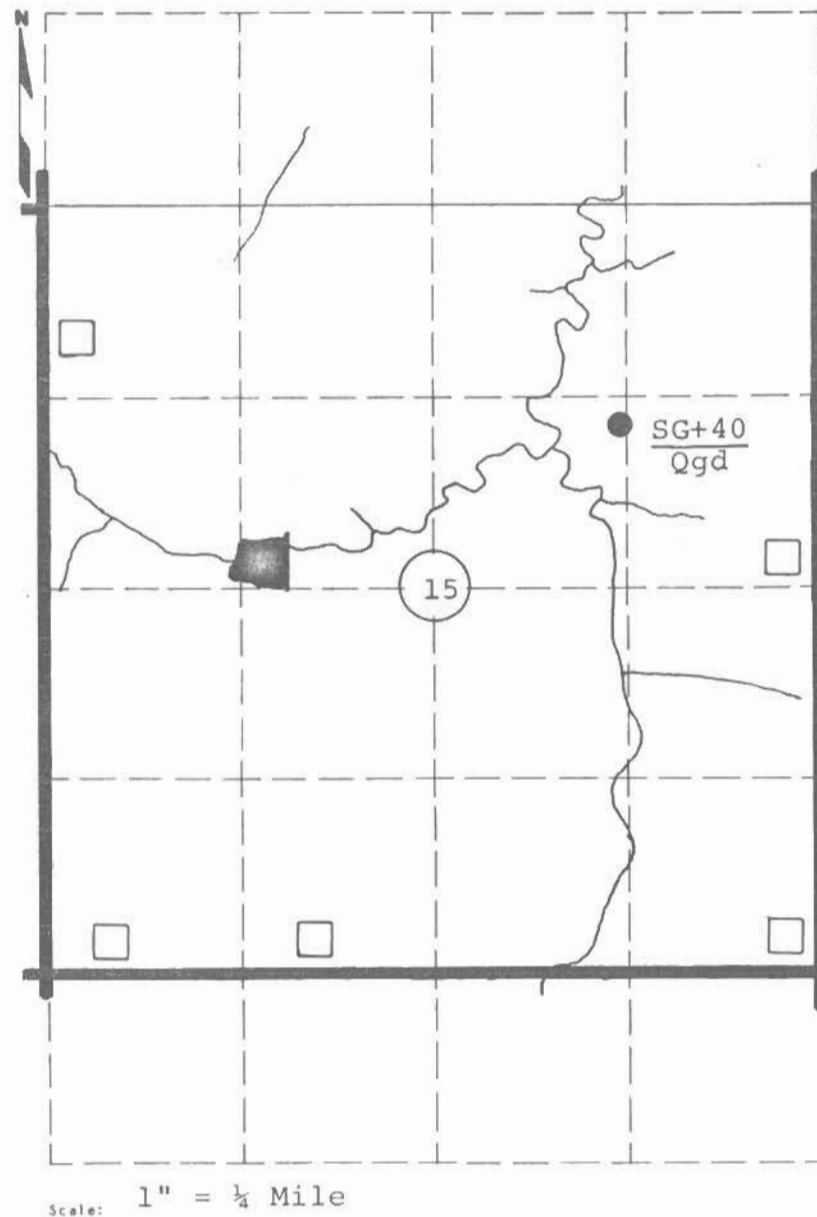
Site No. SG+40
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ Sec. 15 Twp. 3S Range 14E
 Owner Jim D. Brownlee etux Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate IV
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



MATERIAL SURVEY REPORT

Site No. SG+41
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 7 Twp. 3S Range 13E
 Owner See Remarks
 Name _____ address _____
 Nature of Deposit Dry Accessibility Poor Site Located on Plate IV
 Status of Site Open site; not sampled

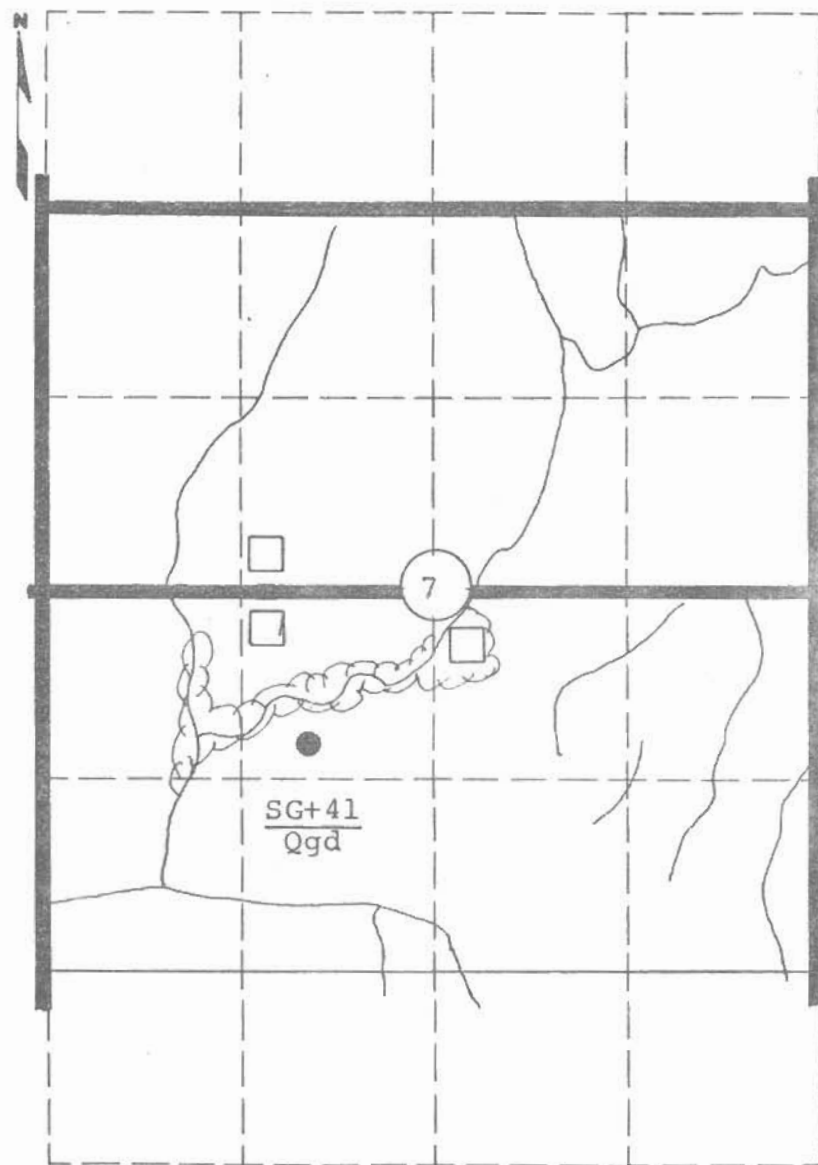
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Fl. _____ Str. Ratio _____
 Remarks This site is reported in the Geological Survey
Bull. No. 1060D

Aesa H. Ford & Gladys Lepper, & Albert J. Schmelzle, Seneca, Kansas



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

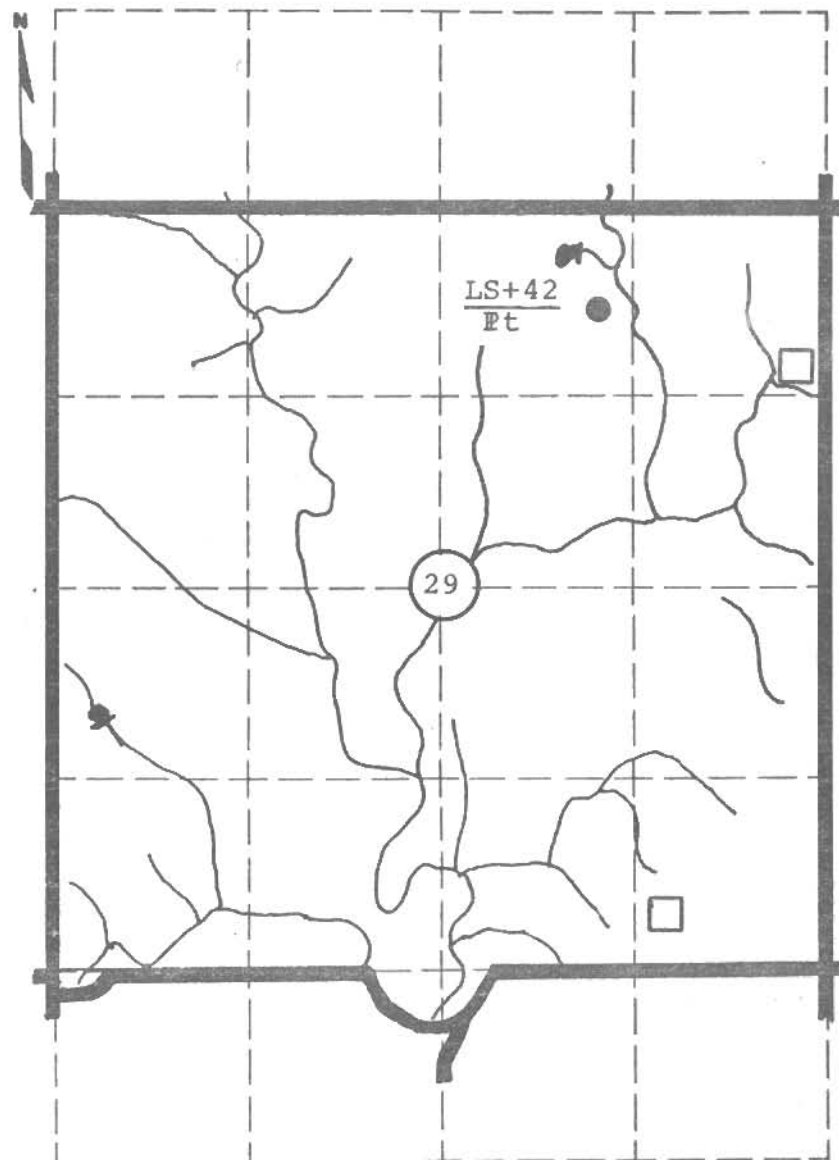
Site No. LS+42
Pt Date April, 1968
 Material Limestone County Nemaha
 Location NE $\frac{1}{4}$ Sec. 29 Twp. 5S Range 11E
 Owner Walter Bonjour Onaga, Kansas
name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate V
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Tarkio Limestone Formation
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

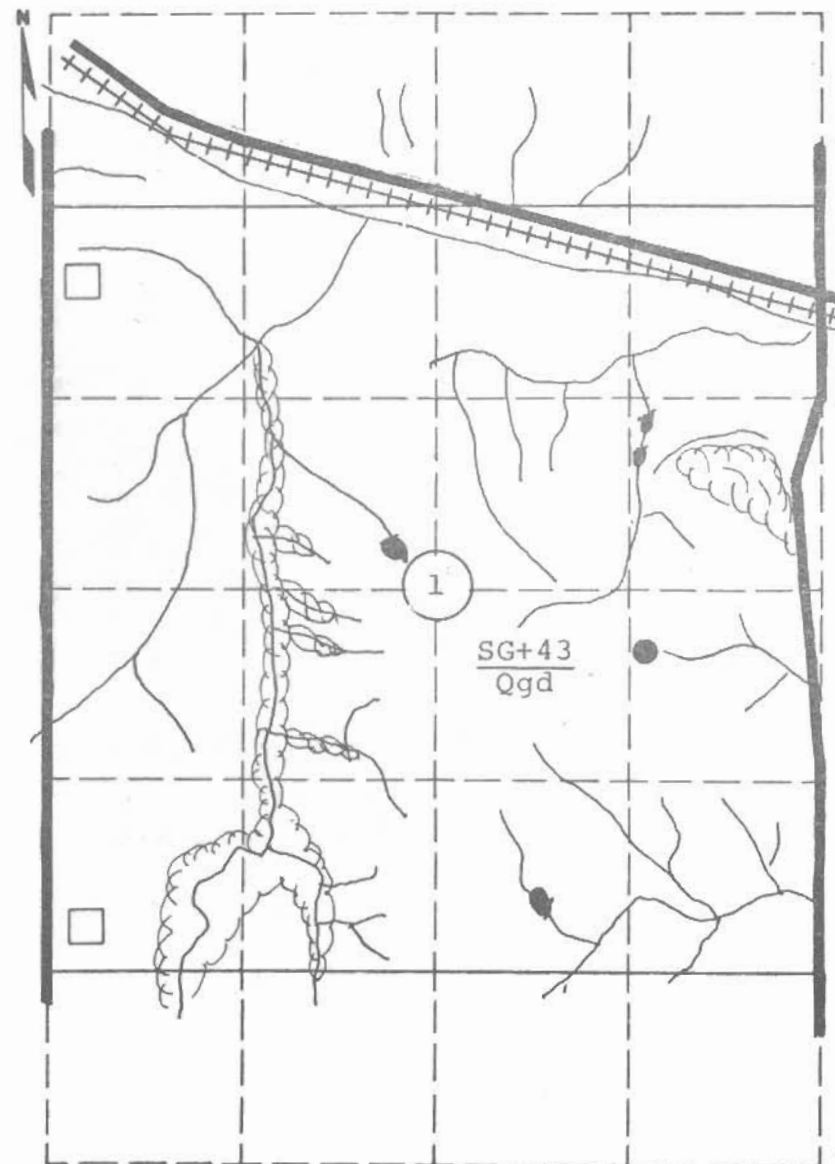
Site No. SG+43
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 1 Twp. 5S Range 13E
 Owner W. E. Henry 3670 N. Park Ave., Tucson, Arizona
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate VI
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

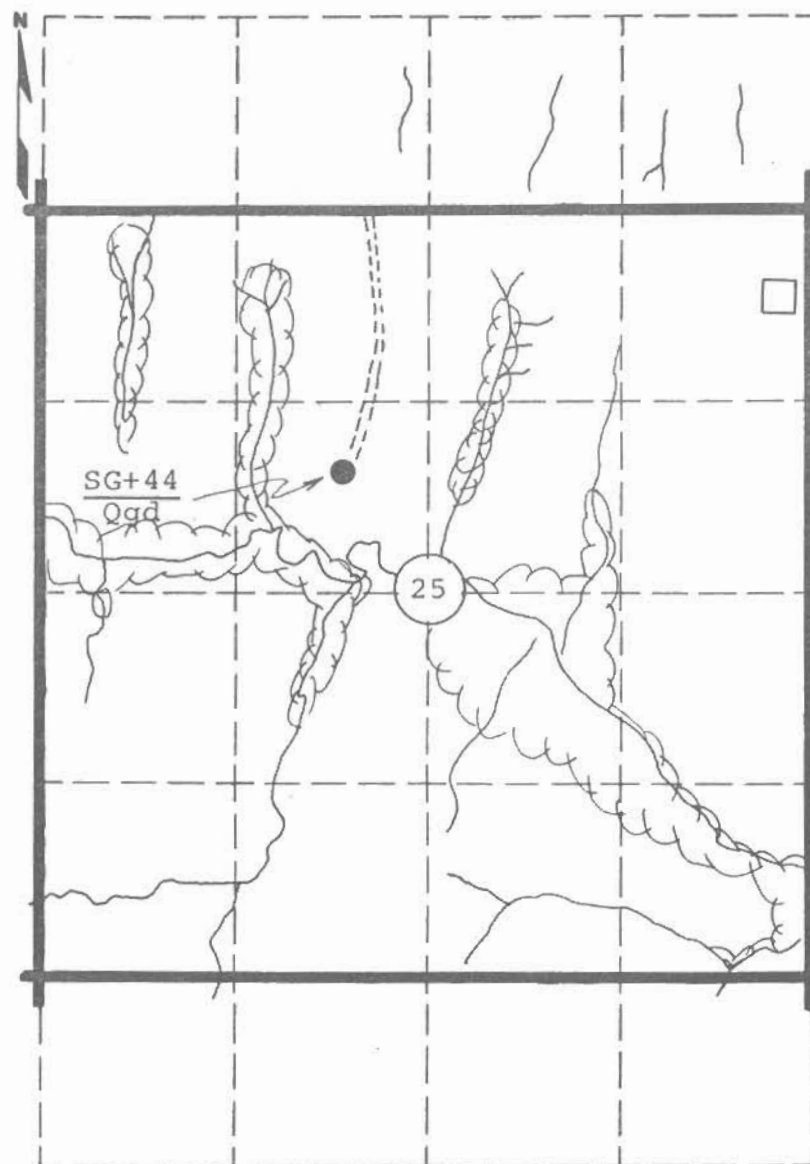
Site No. SG+44
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 25 Twp. 5S Range 14E
 Owner Donald H. Pagel et ux Netawaka, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate VI
 Status of Site Open site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____




Scale: 1" = $\frac{1}{4}$ Mile

OPEN MATERIALS SITES; SAMPLED

LEGEND

 Trail or lane


 Road

 Railroad


 Hedge or trees


 Fence

 Major stream

 Intermittent streams


 Pond or lake


 Open materials sites; sampled


 Center of section

 Dwelling

 Cemetery

 School

 Church

 Town or city

MATERIAL SURVEY REPORT

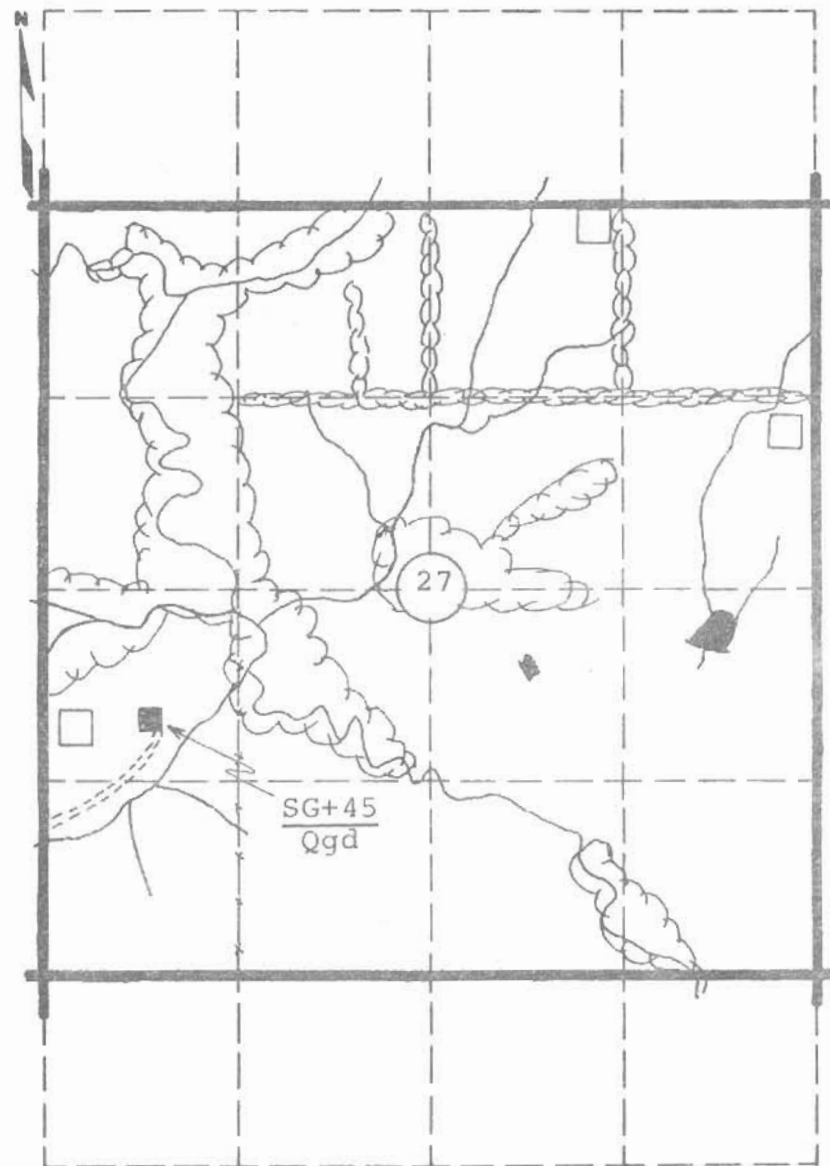
Site No. SG+45
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 27 Twp. 4S Range 14E
 Owner Harry A. Scott et ux Wetmore, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate VI
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
| av | | 4 | 9 | | | 1 | 3 | 5 | 8 | 25 | 54 | 85 | 10 | 1.94 | | | |
| 2 | | 6 | 6 | | | 3 | 4 | 7 | 14 | 48 | 73 | 91 | 7 | 2.40 | | | |
| 3 | | 4 | 4 | | | | | 2 | 8 | 26 | 45 | 67 | 28 | 1.48 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-12 Lab. No. 10440
 Specific Gravity (Sat.) 3.83 (Dry) _____
 Los Angeles Wear 25.3(C)
 Absorption _____ Soundness 0.94
 Mt. Co. Ft. 118.8 Str. Ratio 1-day 1.23, 3-day 1.28
 Remarks Gradation data for holes 2 and 3 represent
the finest and coarsest material that has been
tested at this site.



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

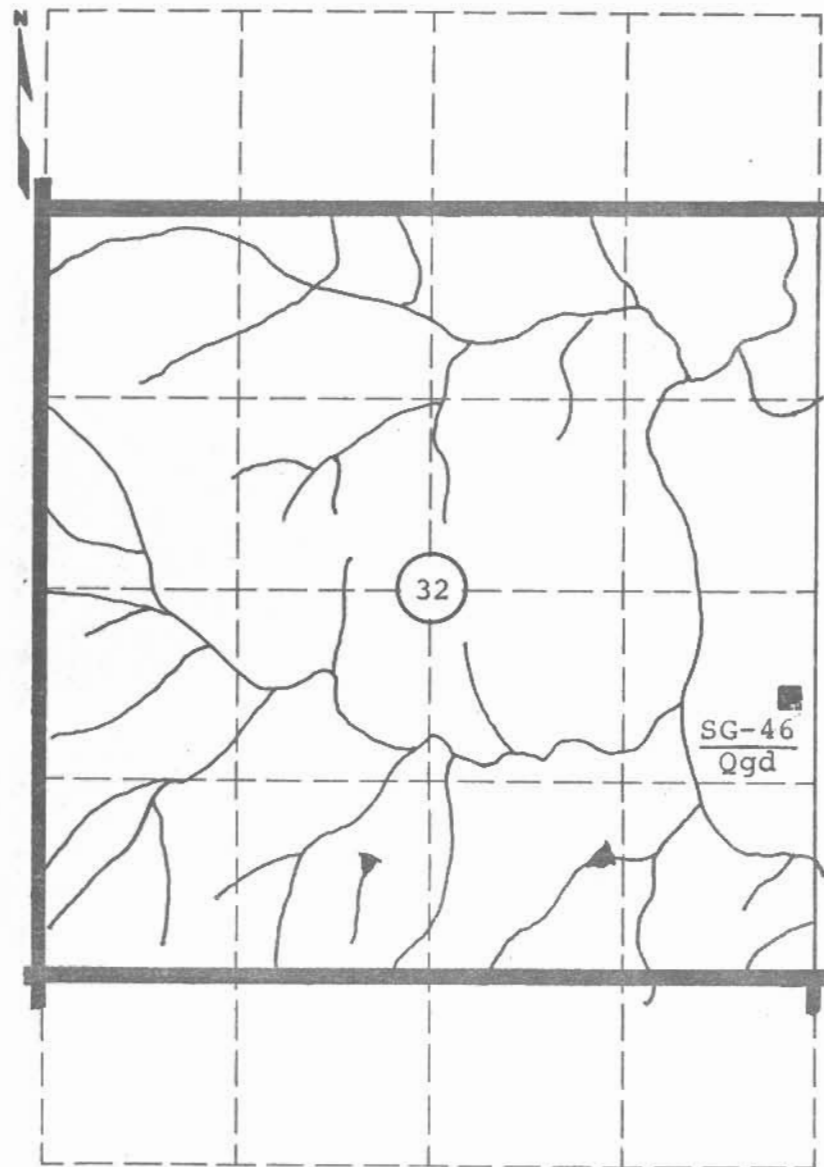
Site No. SG-46
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 32 Twp. 1S Range 11E
 Owner Wilbert A. Wassenberb Baileyville, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | 2 | 5 | 11 | 19 | 32 | 51 | 75 | 90 | 94 | 5.7 | 3.78 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619 No.
66-24 Lab. No. 89223
 Specific Gravity (Sat.) 2.60 (Dry) _____
 Los Angeles Wear 28.4(C)
 Absorption _____ Soundness 0.90
 Wt. Cu.Ft. 101.0 Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

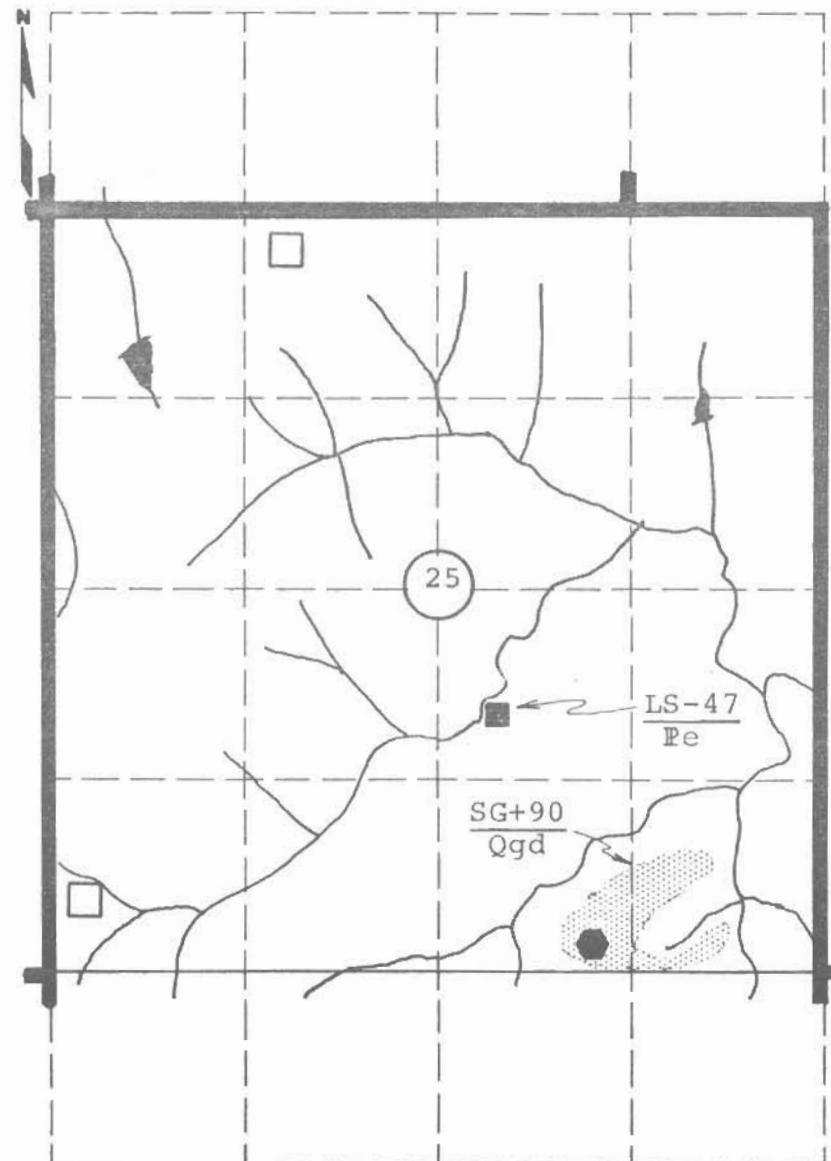
Site No. LS-47
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NW 1/4 SE 1/4 Sec. 25 Twp. 1S Range 11E
 Owner Clarence Schmitz Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Reading Member)
 Material Similar To Material reported on SHC Form 645
Lab. No. 1015
 Specific Gravity (Sat.) 2.54 (Dry) 2.45
 Los Angeles Wear 35.2 (B)
 Absorption 3.48 Soundness 0.80
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

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MATERIAL SURVEY REPORT

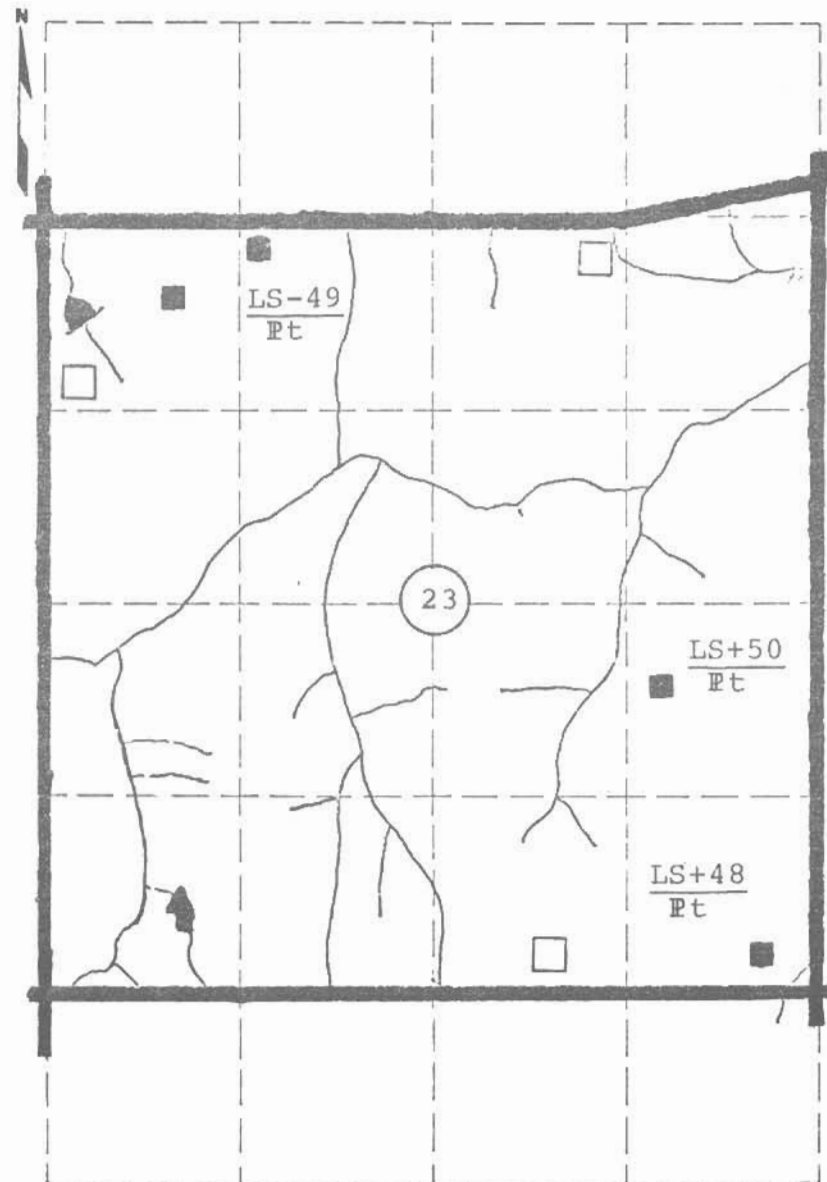
Site No. LS-49
Pt Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ Sec. 23 Twp. 1S Range 11E
 Owner Virgil J. Schmitz Baileyville, Kansas
 Name Address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at bottom of hole | Depth of Layer - Dardon | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|-------------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Tarkio Limestone Member
 Material Similar To Material reported on SHC Form 633
 Lab. No. 67-1529
 Specific Gravity (Sat.) 2.56 (Dry) 2.46
 Los Angeles Near 35.8(B)
 Absorption 3.95 Soundness 0.84
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

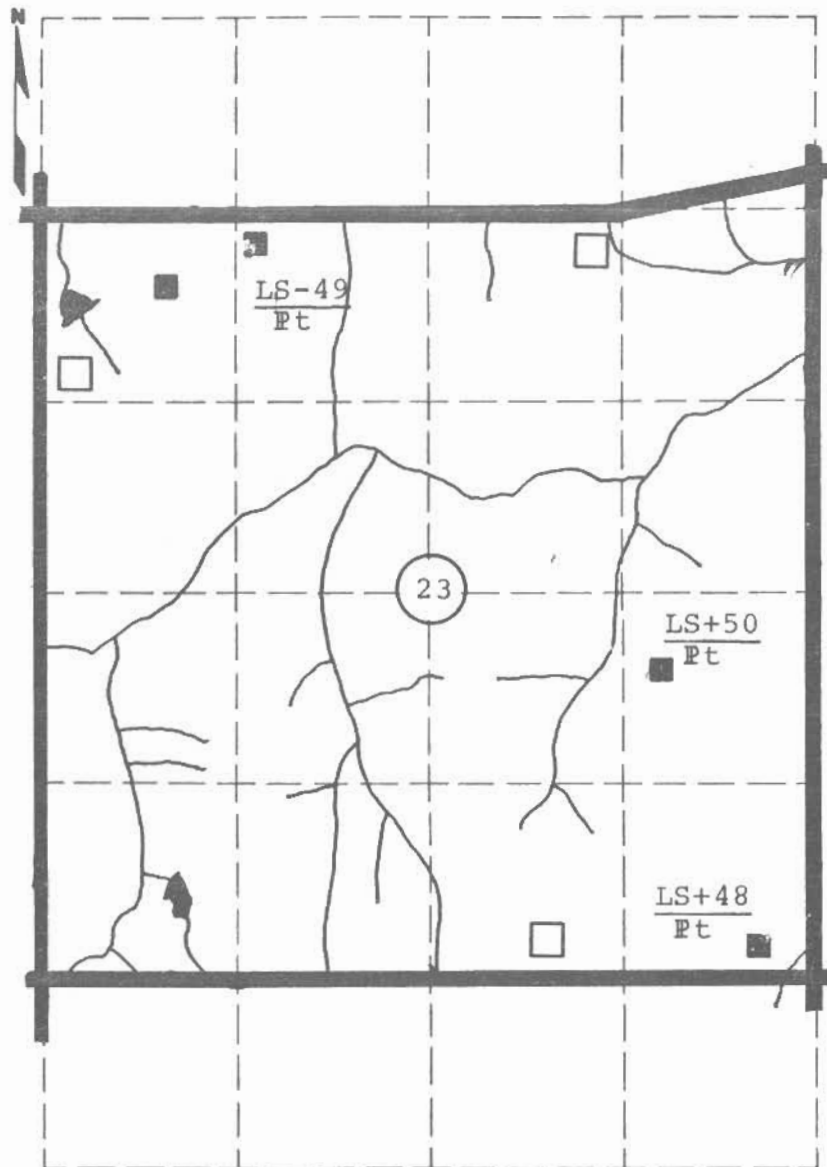
LS+50
Pt
 Site No. _____ Date April, 1968
 Material Limestone County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 23 Twp. 1S Range 11E
 Owner Edwin J. Schmitz Baileyville, Kansas
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 15 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Tarkio Limestone Member
 Material Similar To Material reported on SHC Form 619
No. 66-21
 Specific Gravity (Sat.) 2.53 (Dry) 2.42
 Los Angeles Wear 35.7(B)
 Absorption 4.42 Soundness 0.89
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

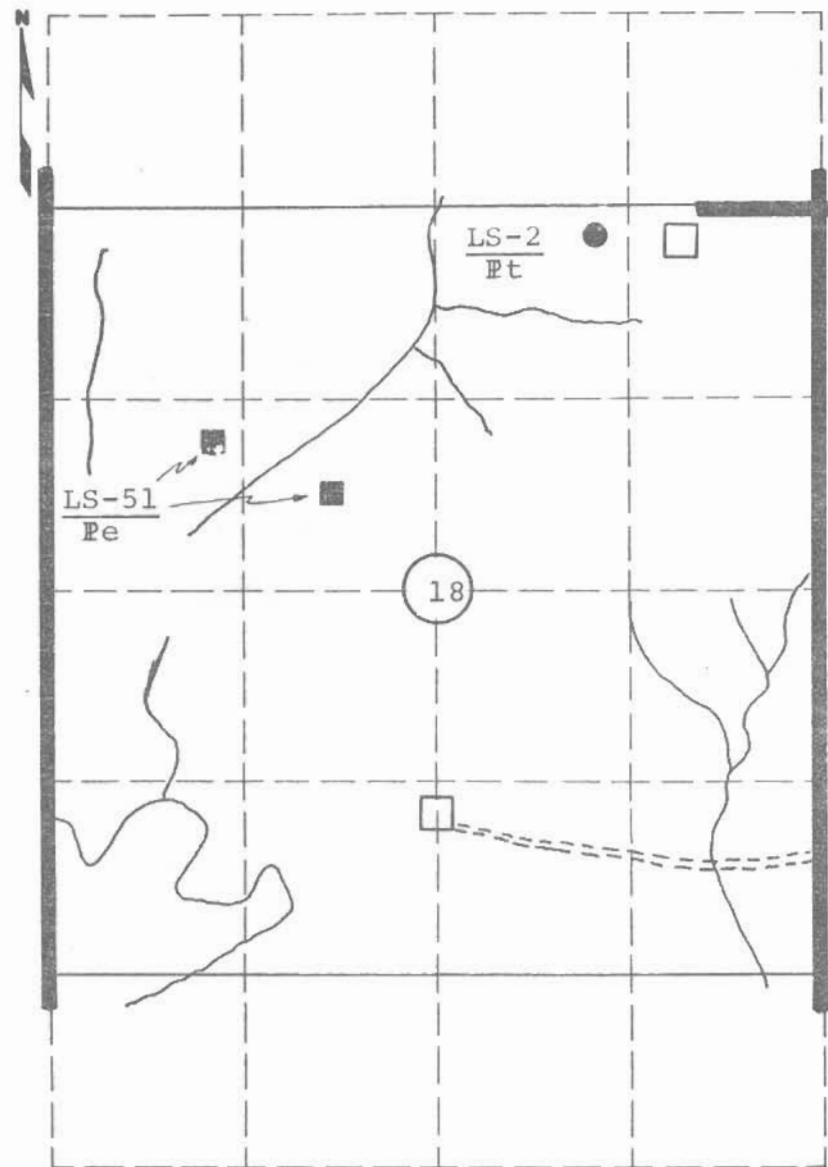
Site No. LS-51
Pe Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ Sec. 18 Twp. 1S Range 12E
 Owner Emmett & Cyril Fangman Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To Material reported on SHC Form No. 645
Lab. No. 65429
 Specific Gravity (Sat.) 2.43 (Dry) 2.32
 Los Angeles Wear 35.0 (A)
 Absorption 4.85 Soundness 0.85
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks Quarry follows edge of bluff



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

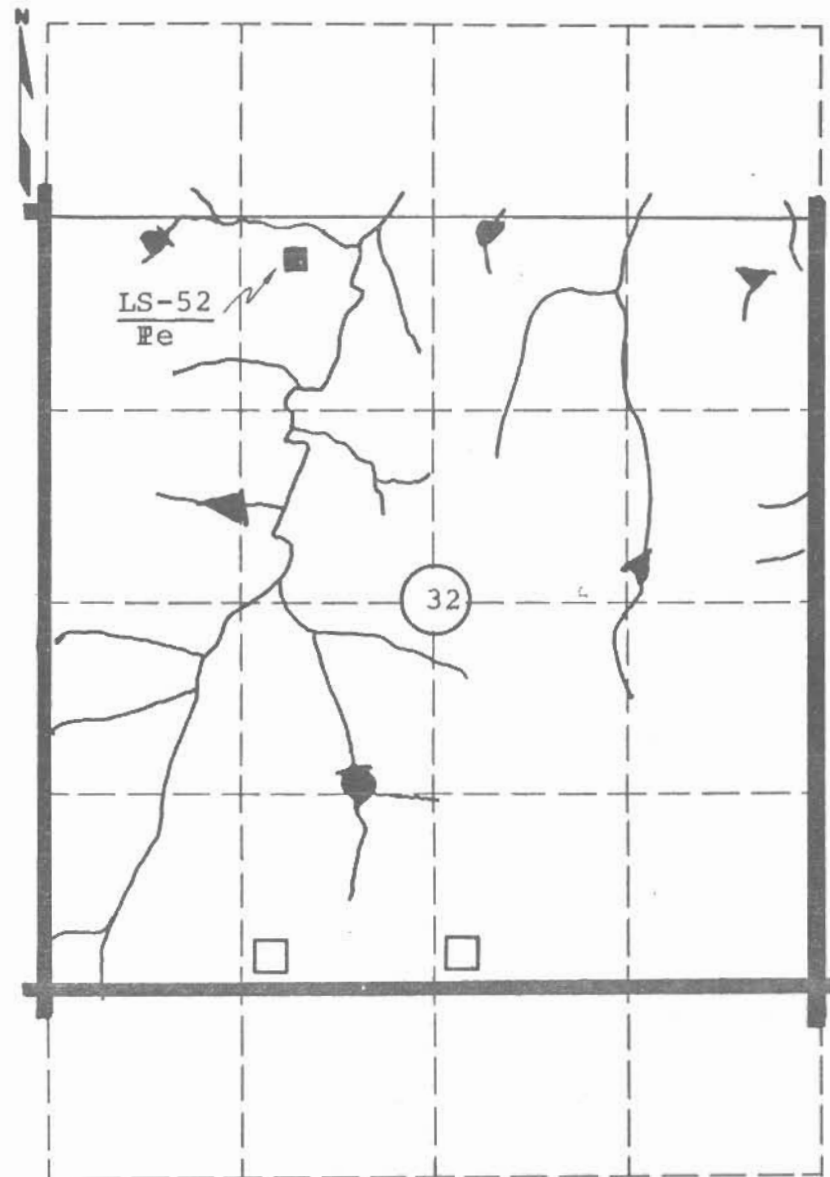
Site No. LS-52
Fe Date April, 1968
 Material Limestone County Nemaha
 Location NE 1/4 NW 1/4 Sec. 32 Twp. 1S Range 12E
 Owner Frances Heiman Baileyville, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To Material reported on SHC Form No. 645
 Lab. No. 65430
 Specific Gravity (Sat.) 2.45 (Dry) 2.33
 Los Angeles Wear 32.4 (A)
 Absorption 5.20 Soundness 0.87
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

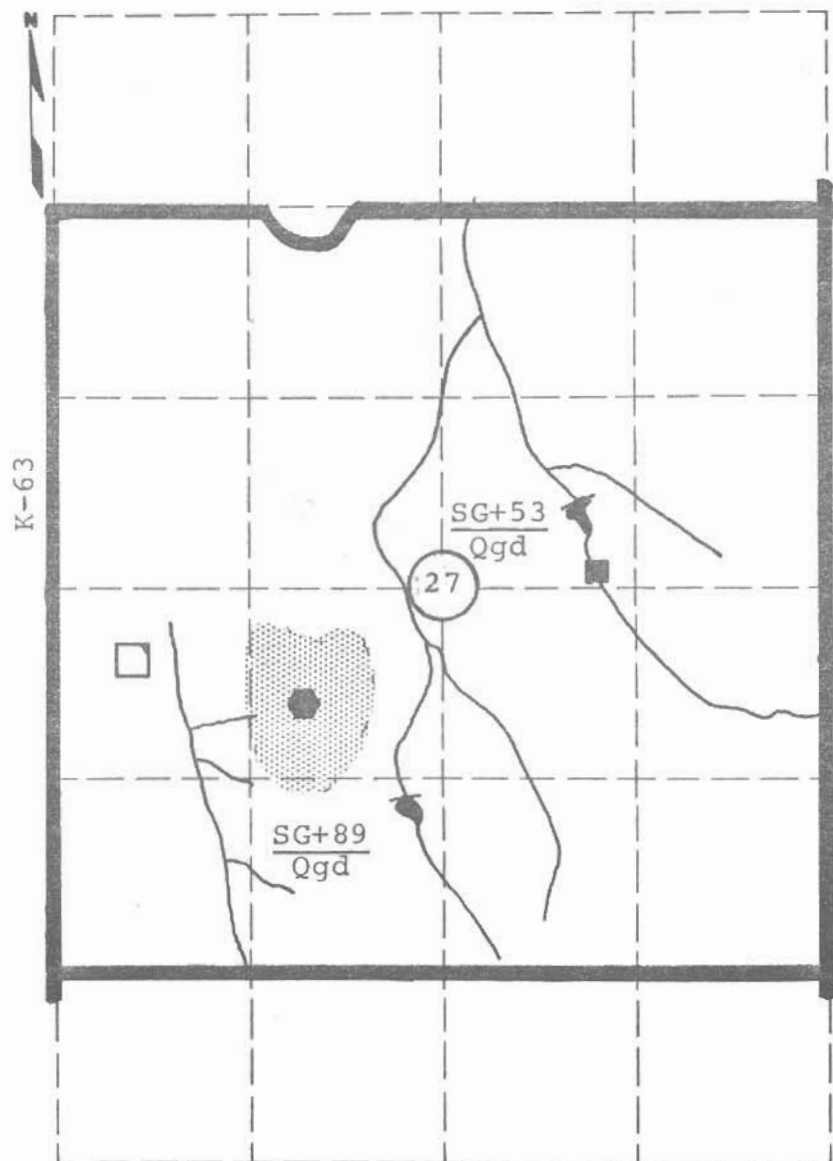
Site No. SG+53
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 27 Twp. 1S Range 12E
 Owner Albert A. Rottinghaus Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-30 Lab. No. 22679
 Specific Gravity (Sat.) 2.62 (Dry)
 Los Angeles Wear 29.8(D)
 Absorption 1.86 Soundness 0.95
 Wt. Cu.Ft. 110.14 Str. Ratio
 Remarks The material from this site is obtained by the
crushing of glacial boulders.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

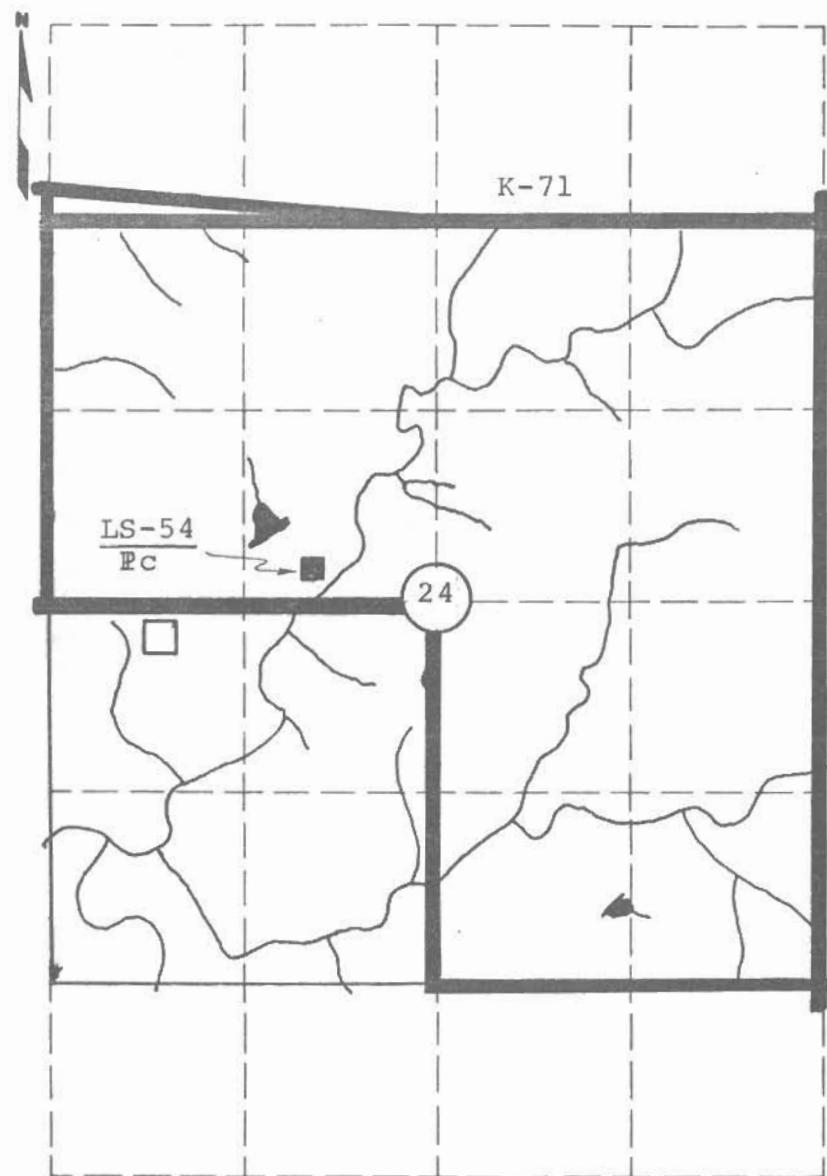
Site No. LS-54
PC Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 24 Twp. 1S Range 12E
 Owner Herman Lange Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Church Limestone Member
 Material Similar To Material reported on SHC Form 645
Lab. No. 49191
 Specific Gravity (Sat.) 2.76 (Dry) 2.72
 Los Angeles Wear 23.7(A)
 Absorption 1.24 Soundness 0.93
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks Some Nodaway Coal is exposed in this quarry.

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

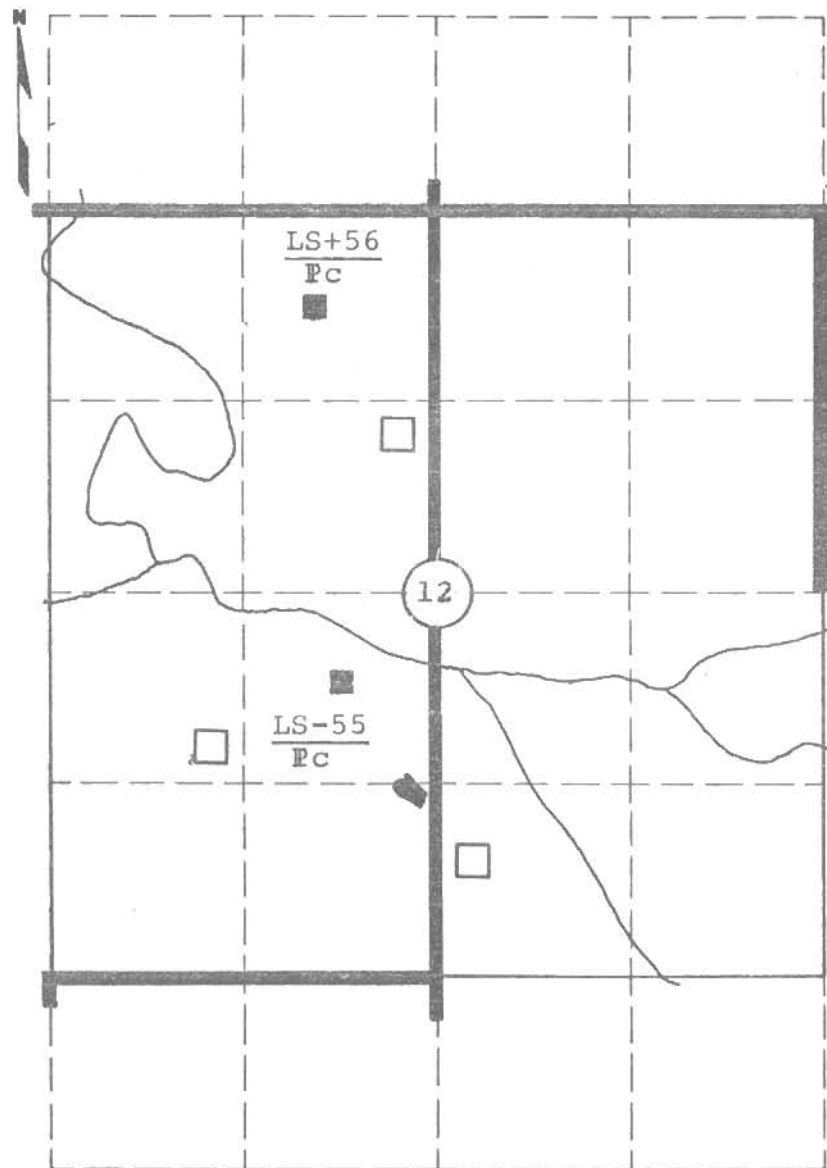
Site No. LS-55
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SW $\frac{1}{4}$ Sec. 12 Twp. 1S Range 12E
 Owner Paul Korber Bern, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of overburden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.L. |
|-----------|----------------------------|---------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Church Limestone Member
 Material Similar To Material reported on SHC Form 645
Lab. No. 49190
 Specific Gravity (Sat.) 2.72 (Dry) 2.67
 Los Angeles Wear 35.3(A)
 Absorption 1.76 Soundness 0.89
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks The Nodaway Coal has been mined at this site.

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

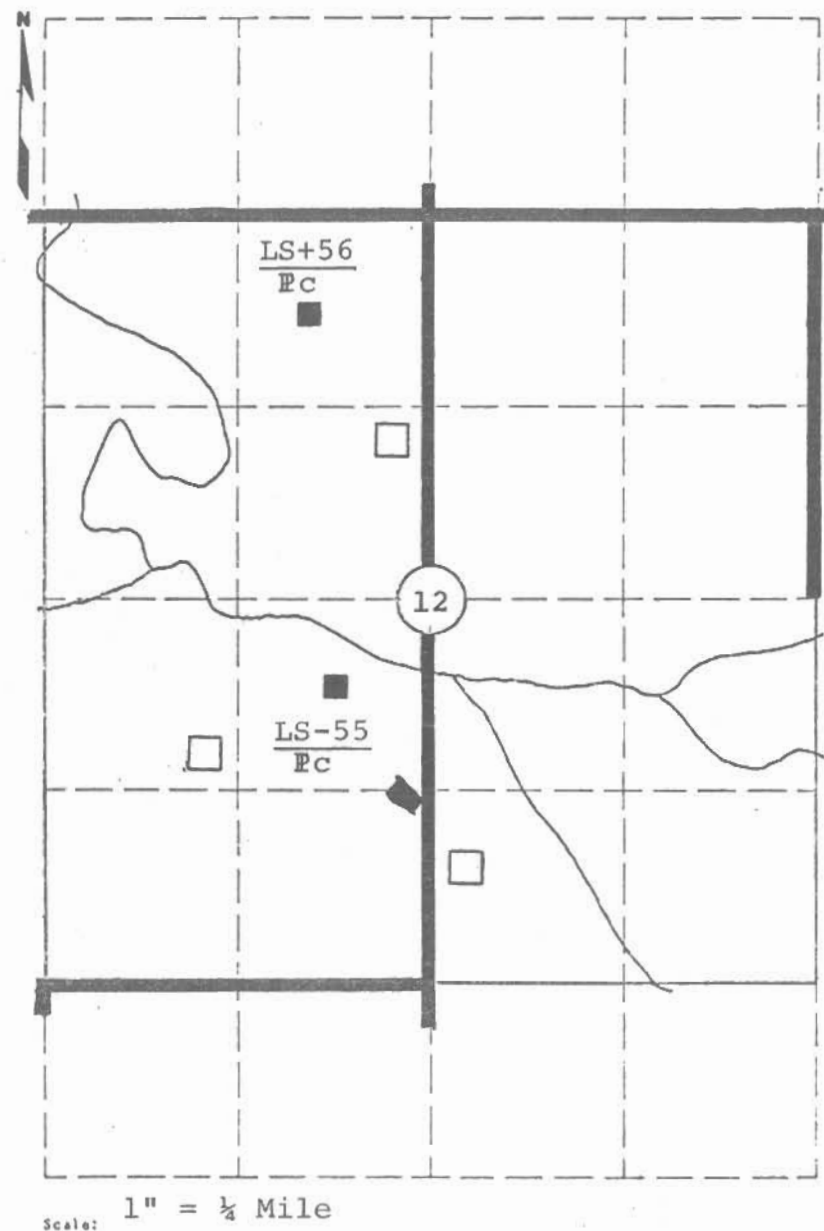
Site No. LS+56
Pc Date April, 1968
 Material Limestone County Nemaha
 Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 12 Twp. 1S Range 12E
 Owner Alvina Korber Bern, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of Over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Church Limestone Member
 Material Similar To Material reported on SHC Form 645
 Lab. No. 62161
 Specific Gravity (Sat.) 2.71 (Dry) 2.65
 Los Angeles Wear 25.6 (A)
 Absorption 3.75 Soundness 0.90
 Mt. Cu. Ft. _____ Str. Ratio _____
 Remarks The Nodaway Coal has been mined at this site.



STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

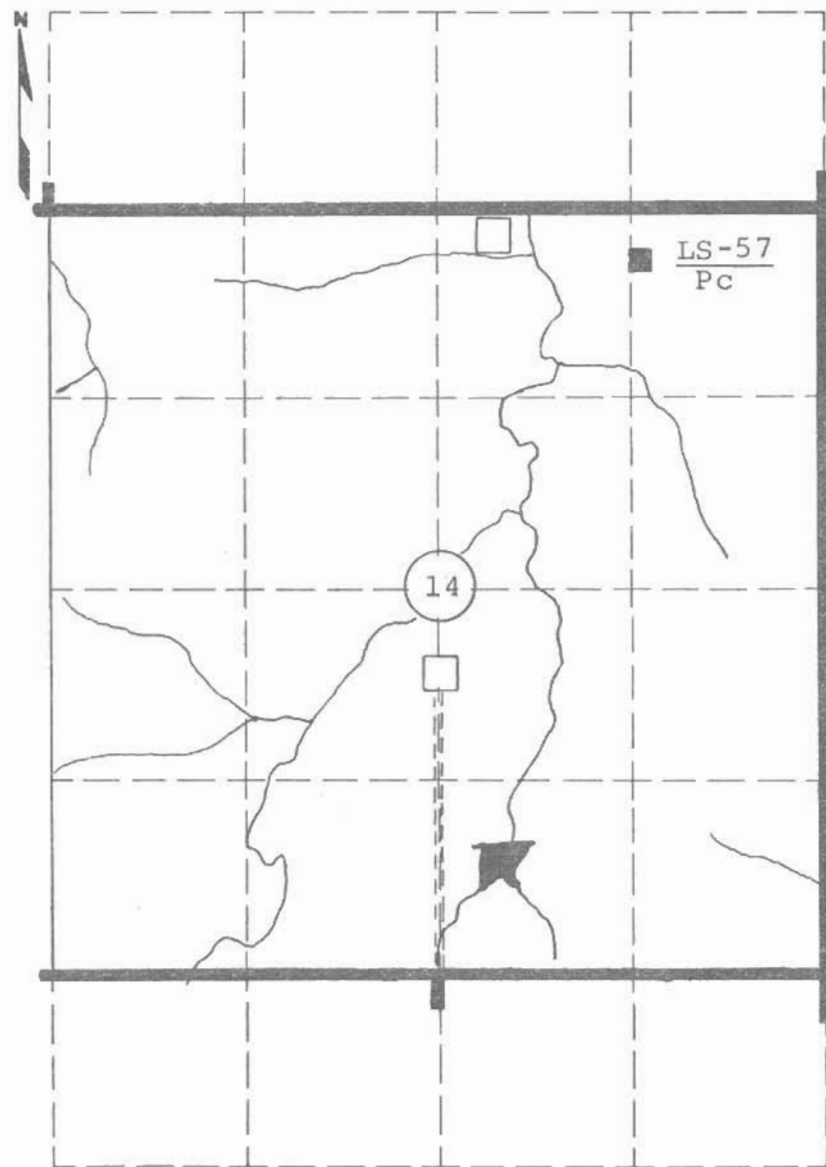
Site No. LS-57
Pc Date April, 1968
 Material Limestone County Nemaha
 Location NE $\frac{1}{4}$ Sec. 14 Twp. 1S Range 14E
 Owner Kate Ott Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To Material reported on SHC Form 619
No. 66-32
 Specific Gravity (Sat.) 2.40 (Dry) 2.24
 Los Angeles Wear 45.4 (B)
 Absorption 7.13 Soundness 0.73
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

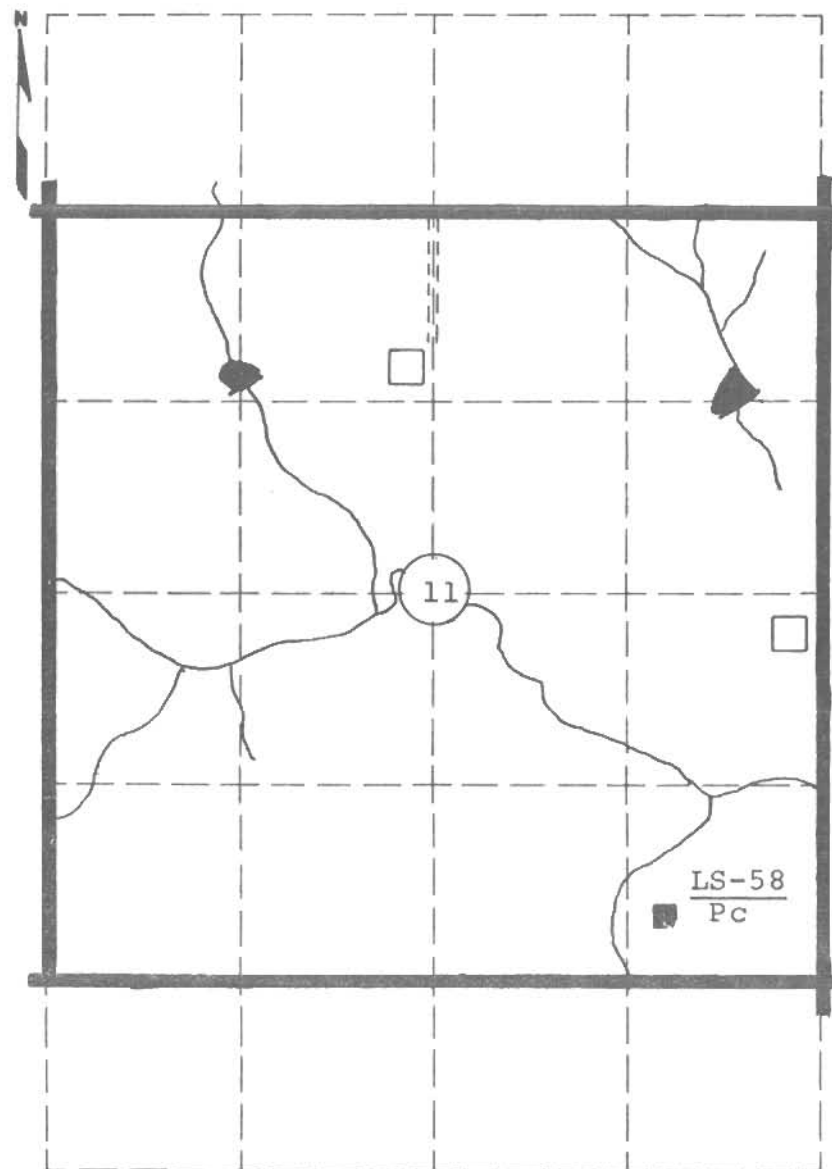
Site No. LS-58
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ Sec. 11 Twp. 1S Range 14E
 Owner Harvey F. Bechtelheimer Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To Material reported on SHC Form 619
No. 66-25 Lab. No. 14658
 Specific Gravity (Sat.) 2.42 (Dry) 2.29
 Los Angeles Wear 40.7(B)
 Absorption 5.92 Soundness 0.77
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

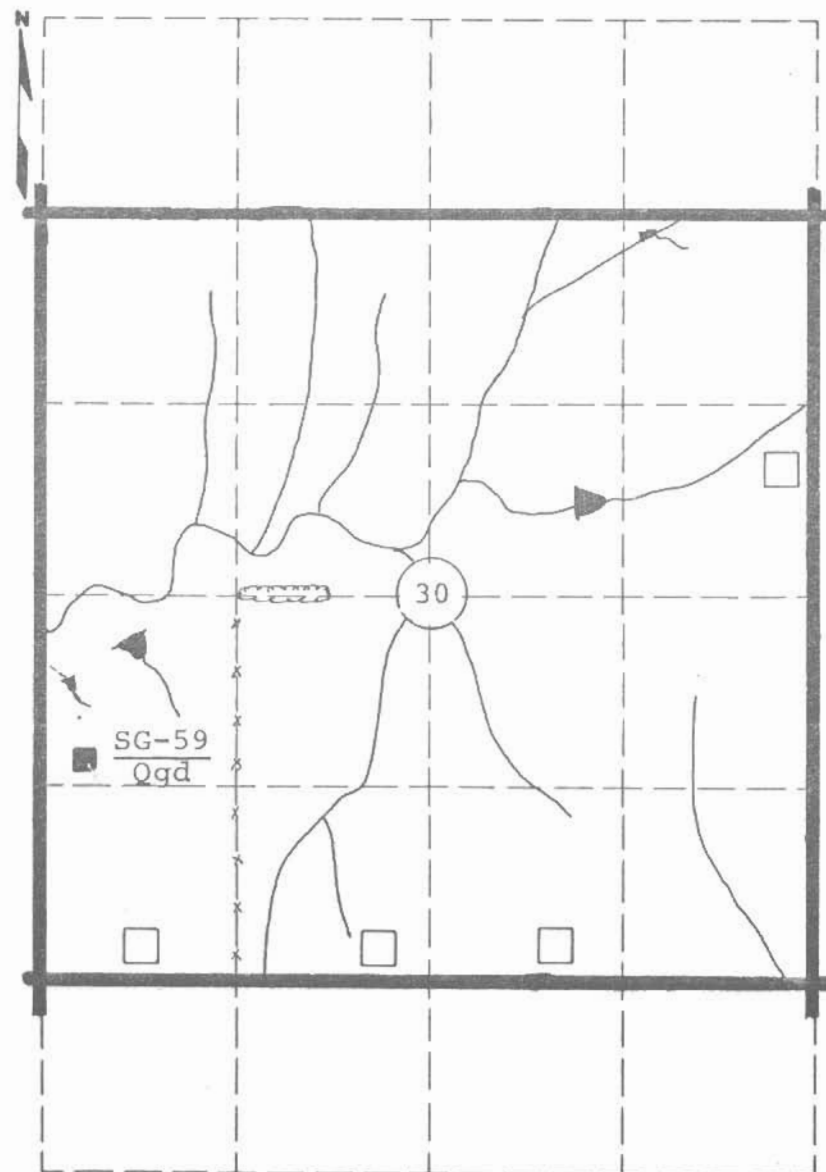
Site No. SG-59
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ Sec. 30 Twp. 1S Range 14E
 Owner R. B. Rokey Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| 8 | | | | | 7 | 18 | 27 | 40 | 51 | 70 | 82 | 90 | 8 | 3.85 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-20
 Specific Gravity (Sat.) 2.62 (Dry)
 Los Angeles Wear 23.8(C)
 Absorption 0.5 Soundness 0.96
 Wt. Cu.Ft. 122.7 Str. Ratio 1-day 1.22, 3-day 1.23
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

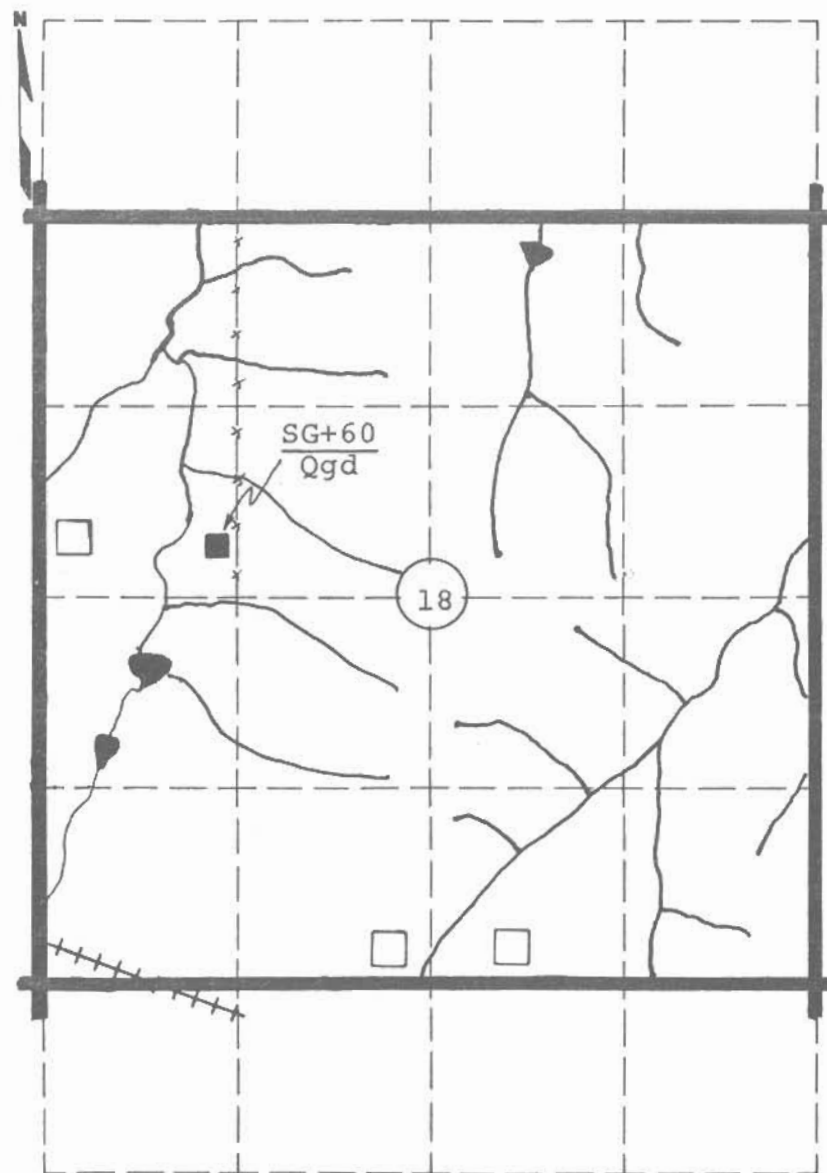
Site No. SG+60
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 18 Twp. 1S Range 14E
 Owner Clayton J. Strahm et ux Bern, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | 4 | 10 | 13 | 18 | 27 | 40 | 56 | 78 | 85 | 14 | 3.30 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-23 Lab. No.
 Specific Gravity (Sat.) 2.53 (Dry)
 Los Angeles Wear 29.0 (D)
 Absorption _____ Soundness 0.96
 Wt. Cu.Ft. 91.2 Str. Ratio _____
 Remarks _____

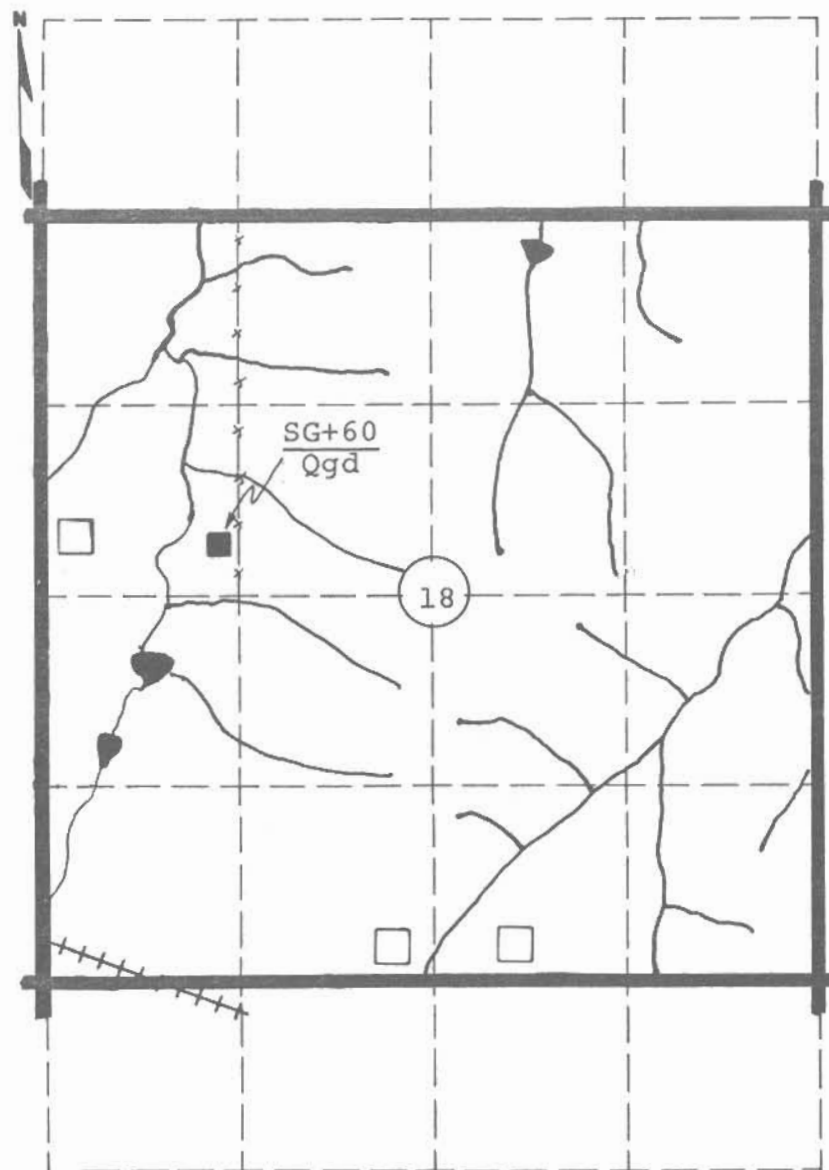


Scale: 1" = 1/4 Mile

EXPLORATION DATA

[illegible]

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To Material reported on SHC Form 619
No. 66-23 Lab. No.
Specific Gravity (Sat.) 2.53 (Dry) _____
Los Angeles Wear 29.0 (D)
Absorption _____ Soundness 0.96
Wt. Cu.Ft. 91.2 Str. Ratio _____
Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

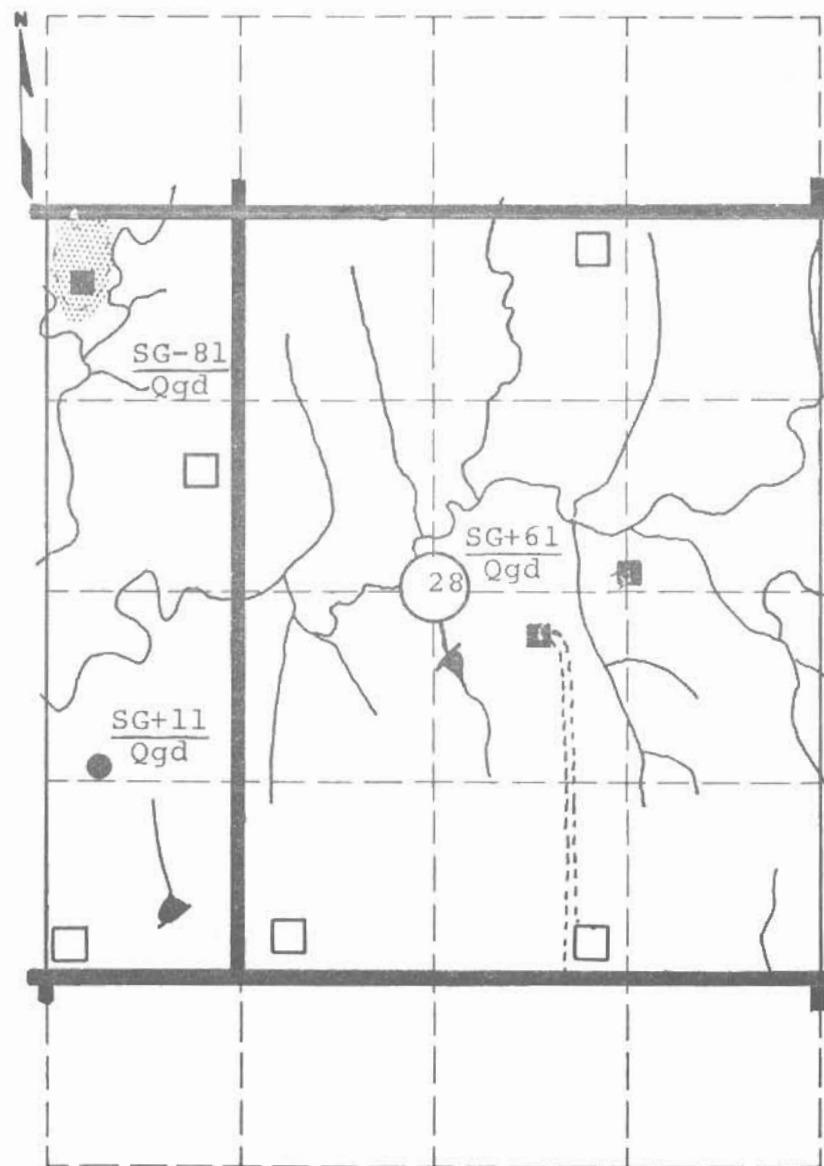
Site No. SG+61
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location E½ Sec. 28 Twp. 1S Range 13E
 Owner See Remarks name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.L. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|-------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | 3 | 12 | 23 | 35 | 50 | 70 | 85 | 90 | | 8.5 | 53.68 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 633
Lab. No. 99194. Tested 9-6-67
 Specific Gravity (Sat.) 2.59 (Dry)
 Los Angeles Wear 25.3(D)
 Absorption 1.5 Soundness 0.94
 Wt. Cu.Ft. 108.5 Str. Ratio
 Remarks NE¼ Roy Ehrsam, Bern, Kansas
W½ SE¼ Waymer G. Esslinger, Bern, Kansas



Scale: 1" = ¼ Mile

MATERIAL SURVEY REPORT

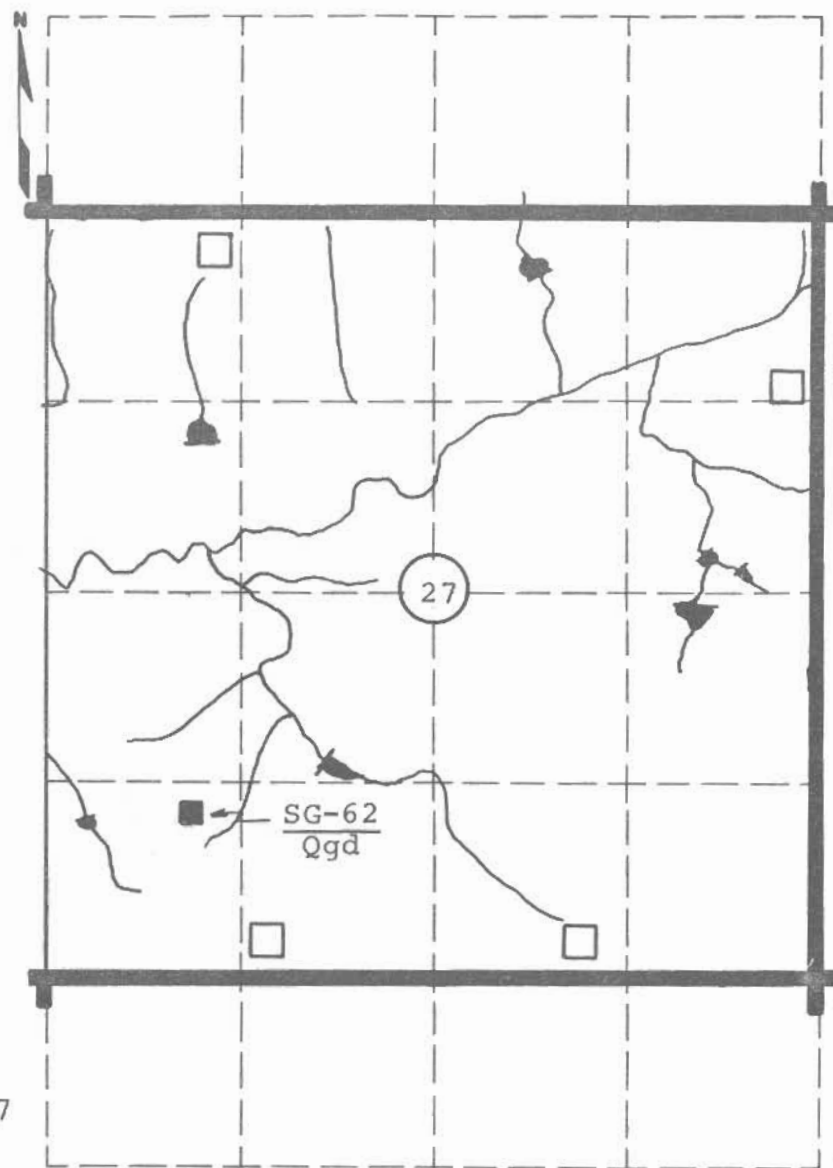
Site No. SG-62
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 27 Twp. 1S Range 13E
 Owner Pearl L. Meyer Bern, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate II
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
| | | | | 1 | 6 | 13 | 23 | 30 | 43 | 61 | 82 | 92 | 2.8 | 3.51 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 633
Lab. No. 65-2031
 Specific Gravity (Sat.) 2.60 (Dry) 2.58
 Los Angeles Wear 29.7(C)
 Absorption 0.91 Soundness 0.95
 Wt. Cu.Ft. 113.41 Str. Ratio 1-day 0.68, 3-day 0.87
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

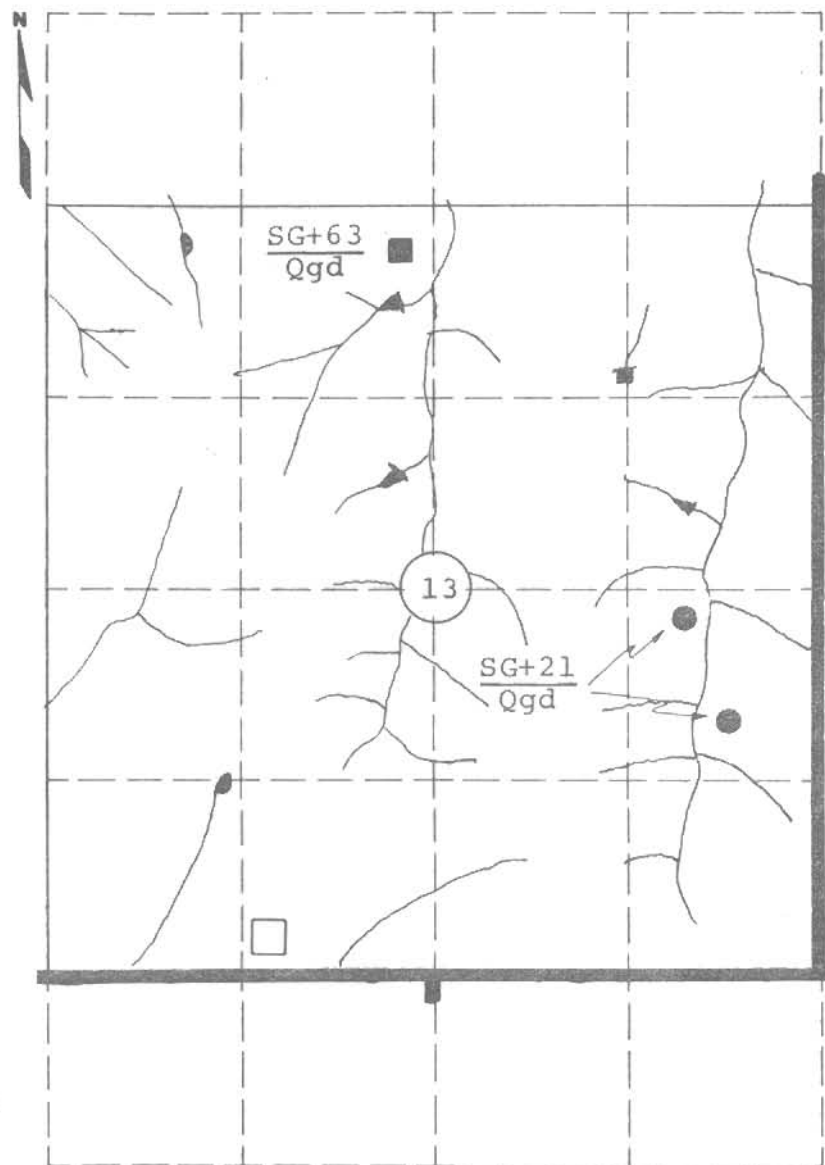
Site No. SG+63
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 13 Twp. 3S Range 12E
 Owner Albert B. Hermes et ux Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate III
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | | 9 | 26 | 39 | 52 | 64 | 73 | 84 | 89 | 9 | 4.36 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form No. 633
Lab. No. 63991
 Specific Gravity (Sat.) 2.62 (Dry)
 Los Angeles Wear 37.6 (B)
 Absorption _____ Soundness 0.92
 Mt. Cu.Ft. 124.8 Str. Ratio 1-day 1.39, 3-day 1.60
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

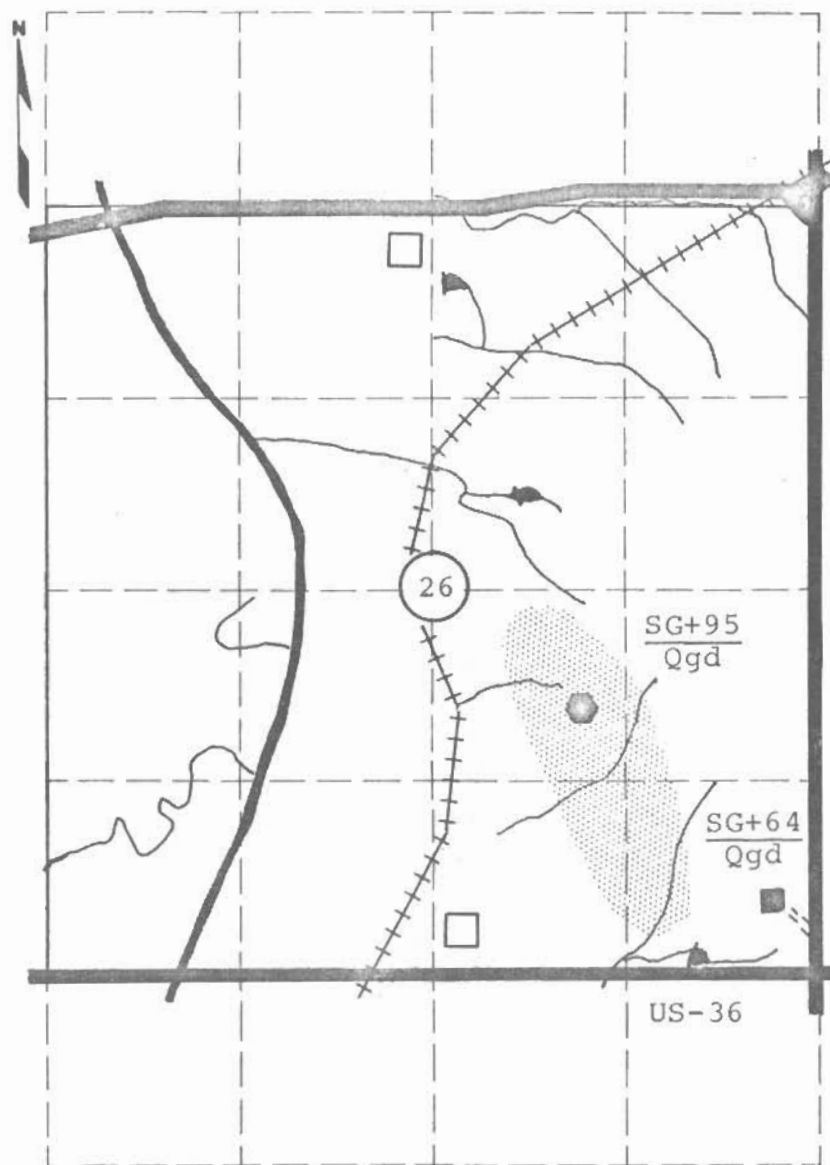
Site No. SG+64
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 26 Twp. 2S Range 12E
 Owner A. E. Vitt Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| Mal | | | | | | | 5 | | 15 | | | 85 | 13 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported in Geological Survey
Bull. No. 1060D
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.ft. _____ Str. Ratio _____
 Remarks This site was tested for the Geological Survey
by the State Highway Commission of Kansas.



Scale: 1" = 1/4 Mile

SG+65

Qqđ

April, 1968

Site No. Q9d Date April, 1968

Material Sand and Gravel County Nemaha

Location E $\frac{1}{2}$ Sec. 35 Twp. 2S Range 12E

Owner See Remarks
name address

Nature of Deposit Dry Accessibility Fair Site Located on Plate III

Status of Site Open site; sampled

[illegible]

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To Material reported in Geological Survey
Bull. No. 1060D. Lab. No. 21951

Specific Gravity (Sat.) _____ (Dry) 2.56

Los Angeles Wear _____

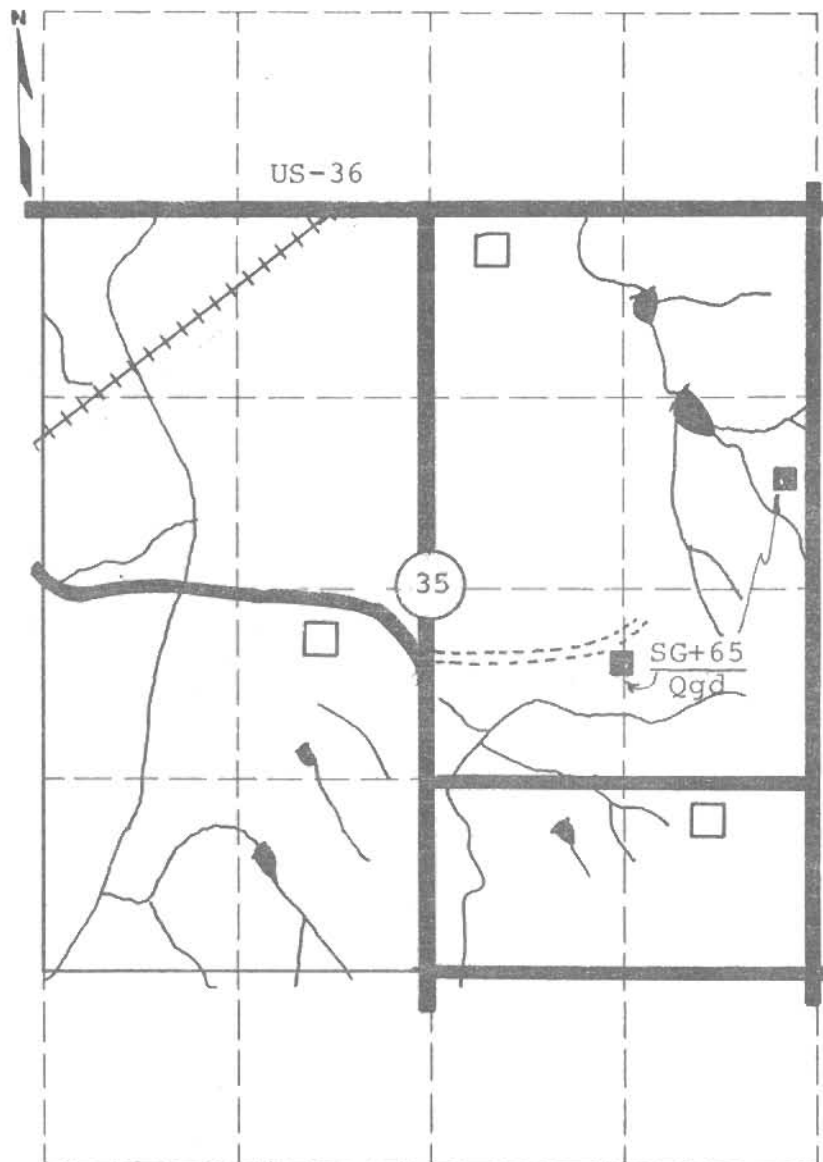
Absorption _____ Soundness _____

Wt. Cu.Ft. 93.0 Str. Ratio 1-day .80, 3-day .84

Remarks Tested for the Geological Survey by the State

Highway Commission in October, 1933

Bertha M. Kiene, % E. A. Kiene, 3707 West 29th St. Terr.
Topeka, Kansas



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

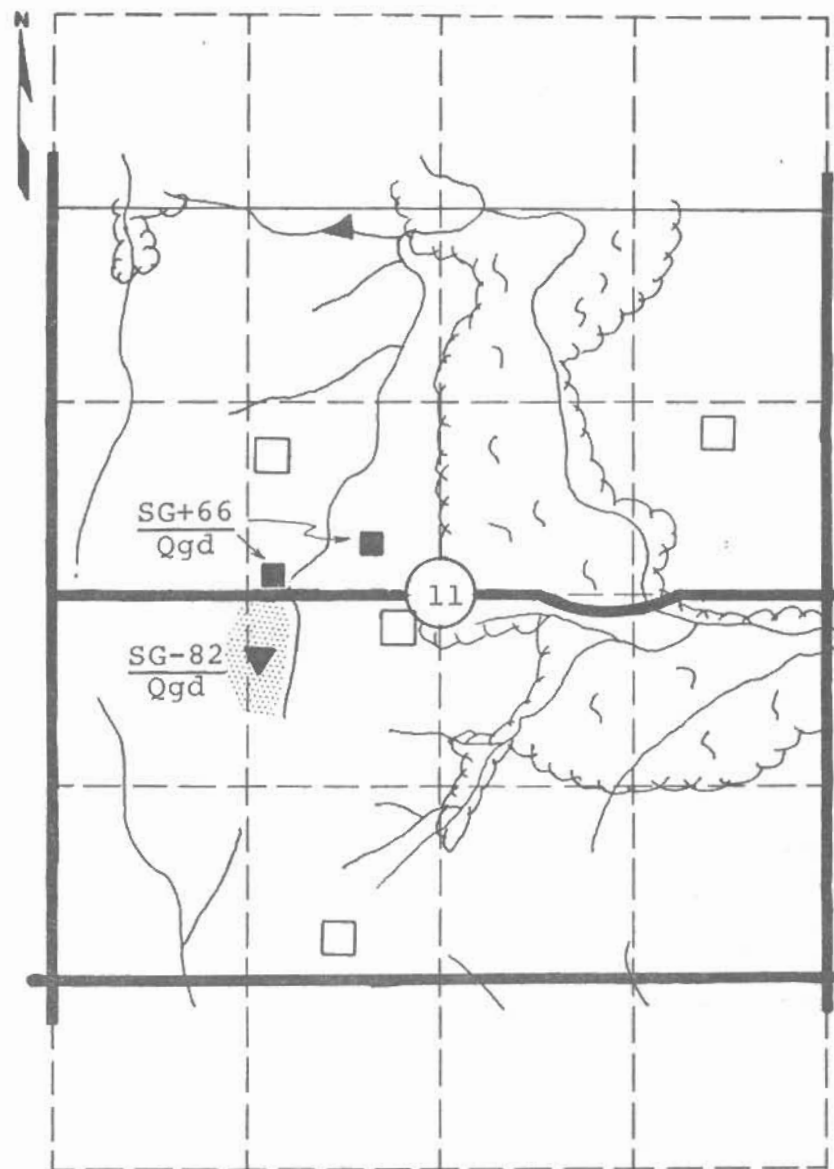
Site No. SG+66
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 11 Twp. 4S Range 14E
 Owner George W. McDaniel et ux Wetmore, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
| av | | 8 | 8 | 2 | 4 | 6 | 10 | 16 | 26 | 56 | 77 | 92 | 6 | 2.88 | | | |
| 1 | | 7 | 9 | 6 | 9 | 11 | 20 | 27 | 37 | 60 | 78 | 87 | 10 | 3.35 | | | |
| 3 | | 8 | 9 | | | | 1 | 4 | 12 | 44 | 77 | 95 | 3 | 2.33 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. Ms 66-19
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks Test data for test holes 1 and 3 represents the
finest and coarsest material tested at this site.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

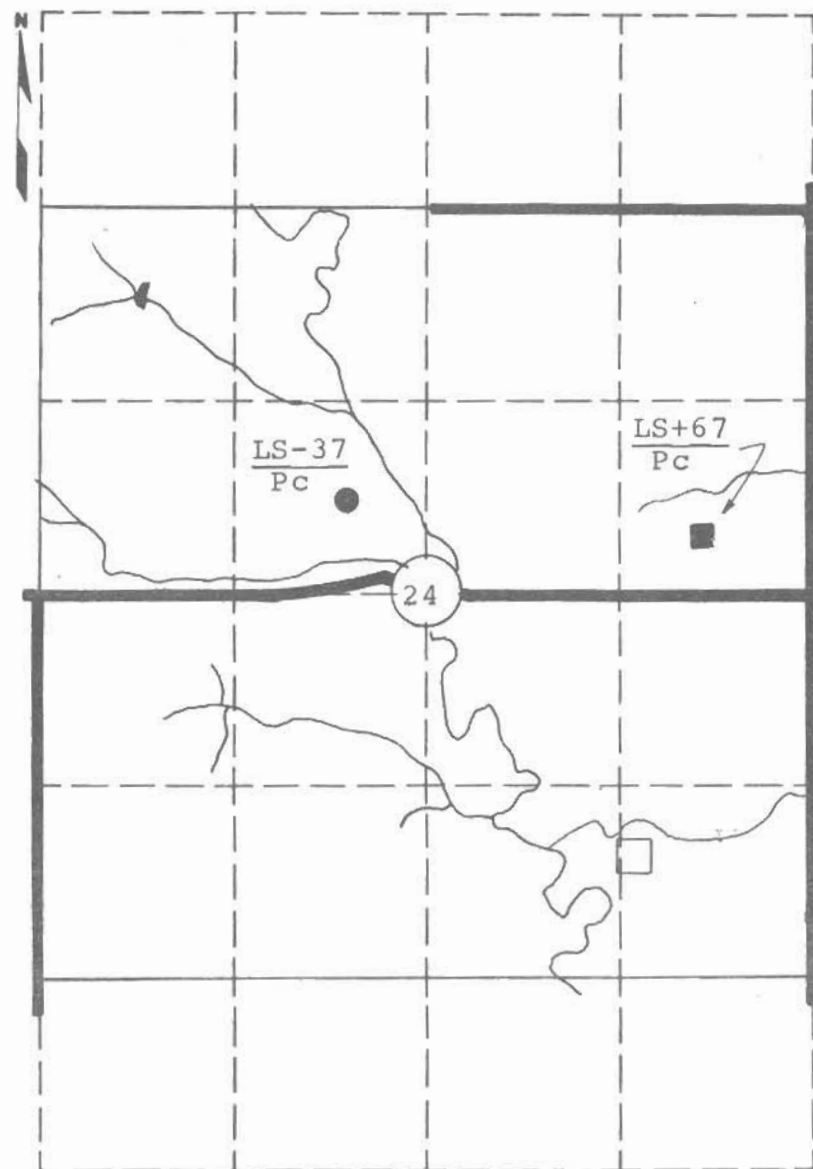
Site No. LS+67
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 24 Twp. 3S Range 14E
 Owner Edward A. Barben Fairview, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To Material reported on SHC Form 645
 Lab. No. 96177
 Specific Gravity (Sat.) 2.43 (Dry) 2.32
 Los Angeles Wear 39.7(B)
 Absorption 4.81 Soundness 0.88
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

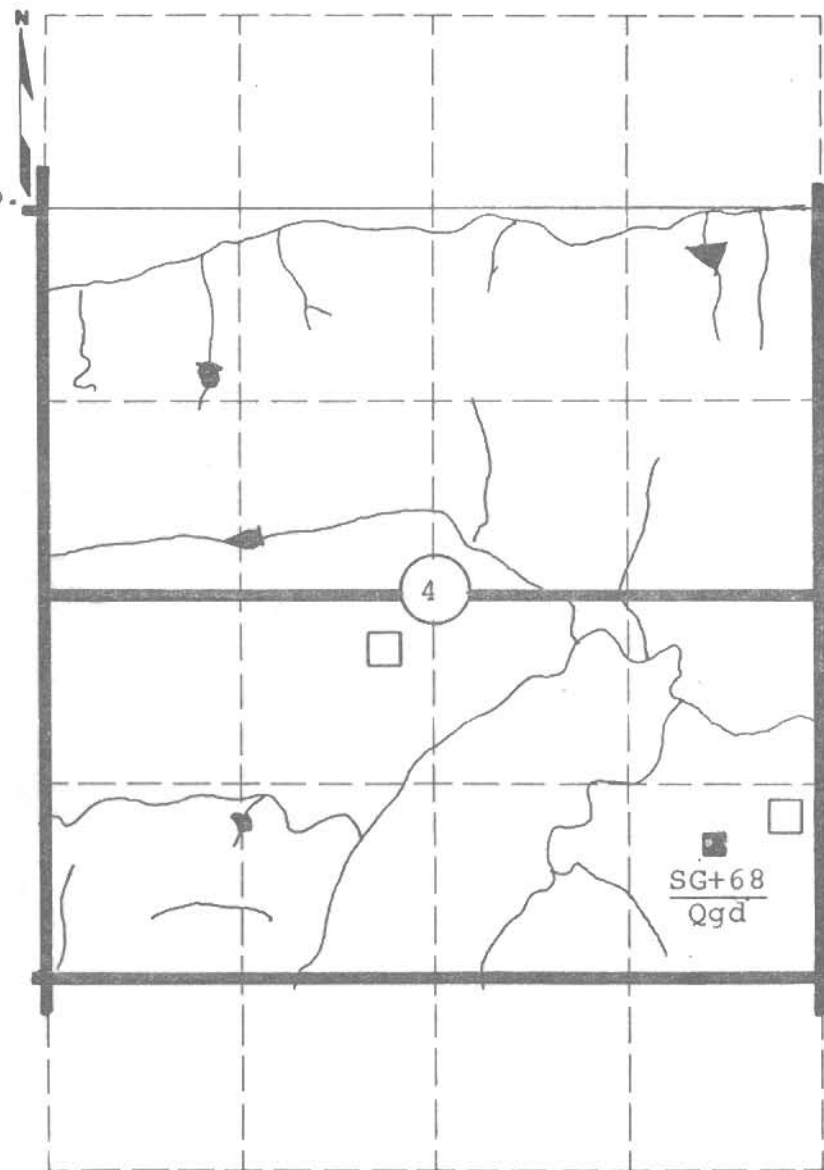
Site No. SG+68
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 4 Twp. 3S Range 14E
 Owner Ralph E. Bartley et ux, 209 W. 115th, Kansas City, Mo.
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|---|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
| 6 | | 9 | 3 | | | 0 | 1 | 2 | 5 | 26 | 65 | 91 | 5 | 1.90 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-26
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This pit has been virtually worked out.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

Site No. SG-69
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 32 Twp. 2S Range 13E
 Owner Ambrose & Rose A. Koelzer Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

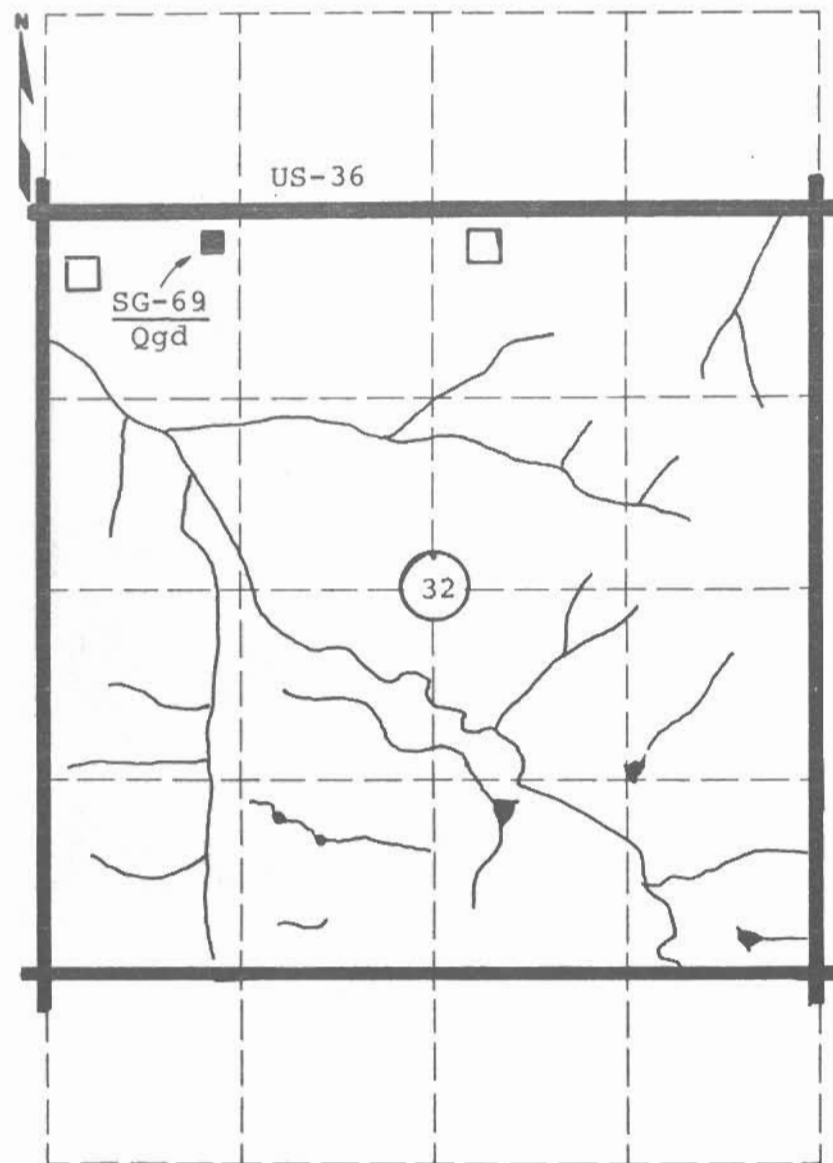
EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|----|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| av | | | | | | | 1 | 3 | 12 | 43 | 79 | 89 | 9 | 2.40 | | |
| 2 | | | | | | | 6 | 13 | 28 | 59 | 89 | 94 | 5 | 2.89 | | |
| 10 | | | | | | | | | 1 | 2 | 58 | 86 | 11 | 2.36 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-15
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____

Remarks Gradation data for test holes 2 and 10 represents the coarsest and finest material tested at this site.



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

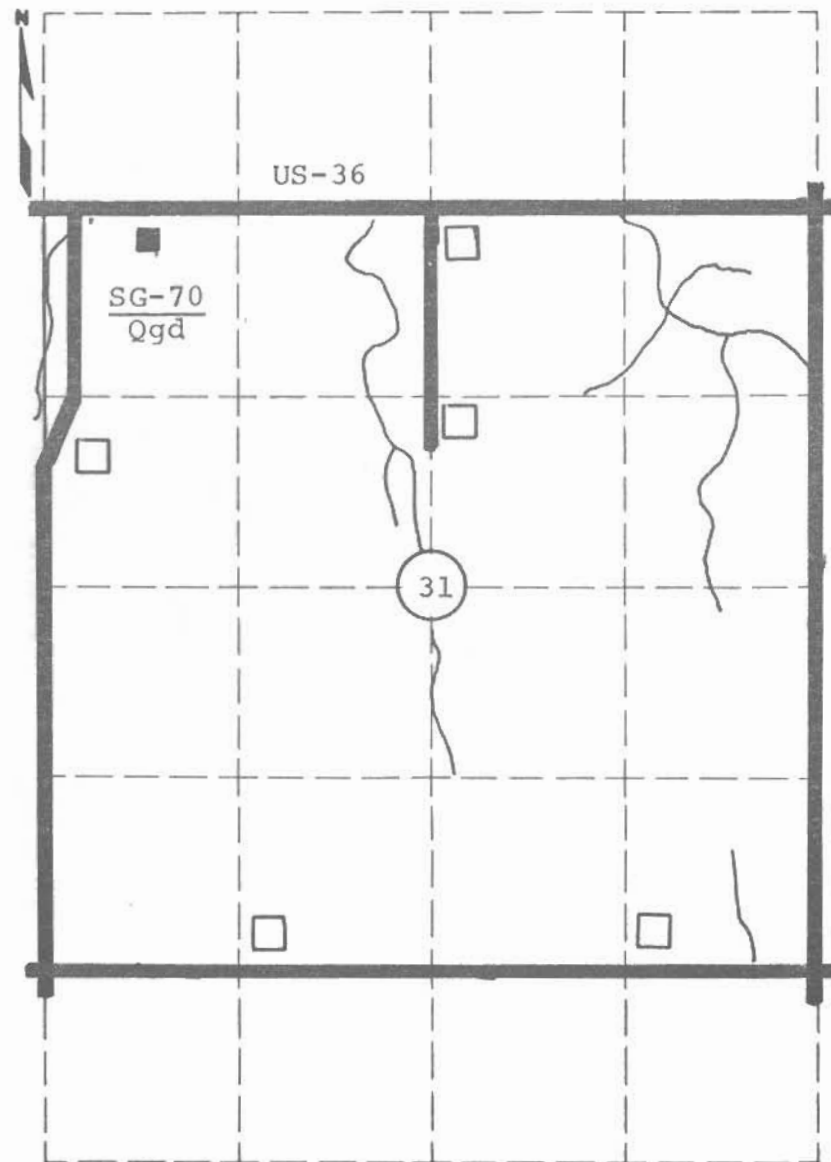
Site No. SG-70
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 31 Twp. 2S Range 13E
 Owner Mathias J. Lierz Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| av | | 10 | 6 | | | 2 | 4 | 9 | 19 | 44 | 72 | 85 | 13 | 2.35 | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-16
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

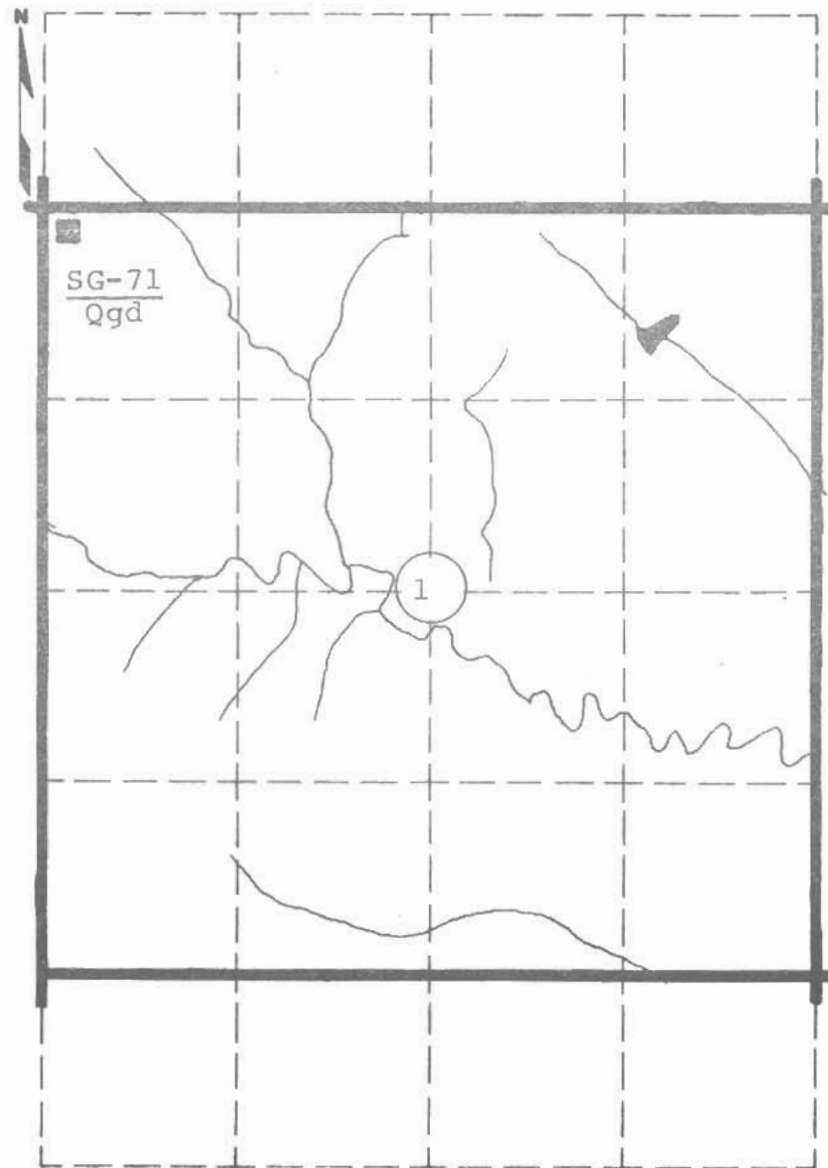
Site No. SG-71
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 1 Twp. 4S Range 13E
 Owner Albert & John Niehues Goff, Kansas
 name address
 Nature of Deposit Dry accessibility Good Site Located on Plate IV
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of overburden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|---------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
| | | | | | | 1 | 3 | 6 | 12 | 31 | 76 | 91 | 5.6 | 2.20 | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 633
Lab. No. 66437
 Specific Gravity (Set.) 2.58 (Dry)
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 wt. Cu.Ft. 90.7 Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

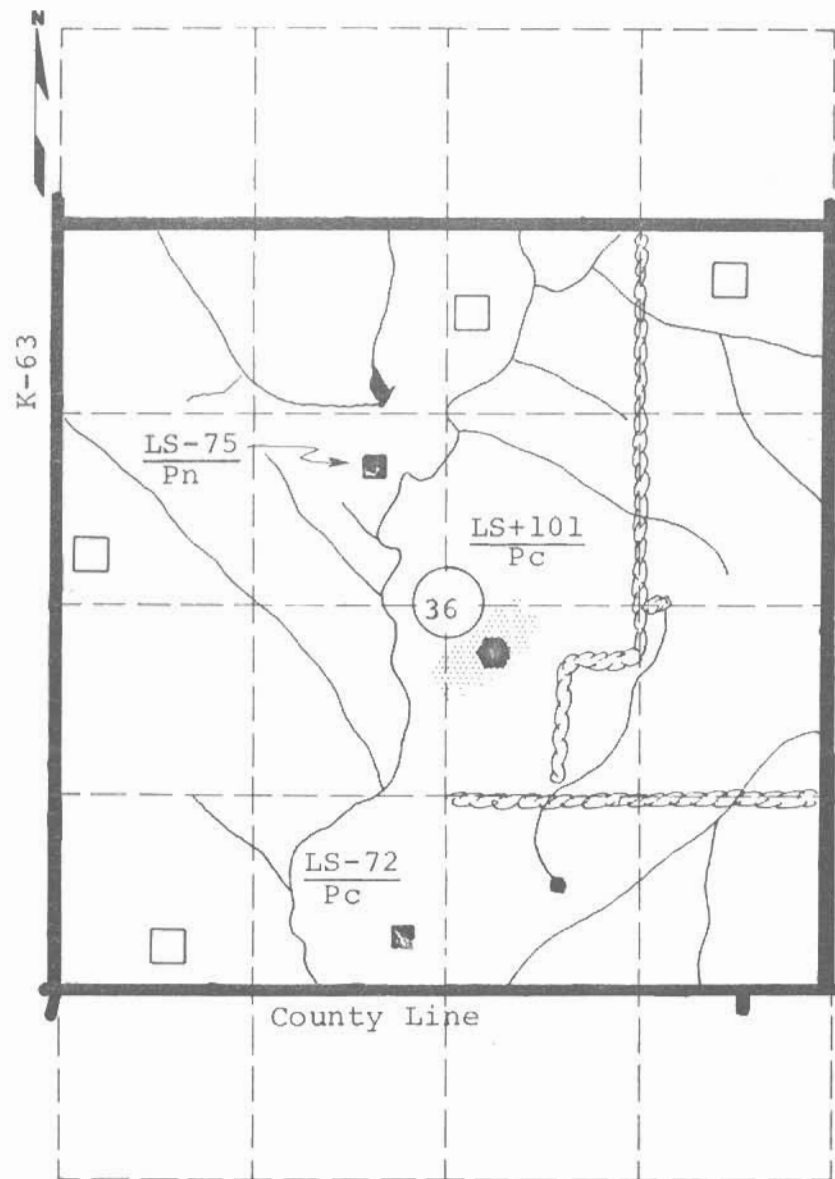
Site No. LS-72
Pc Date April, 1968
 Material Limestone County Nemaha
 Location SE 1/4 SW 1/4 Sec. 36 Twp. 5S Range 12E
 Owner Hiram W. Channel Soldier, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate V
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of Over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood & Neva Limestone Members
 Material Similar To Material reported on SHC Form 645
Lab. No. 63652
 Specific Gravity (Sat.) 2.47 (Dry) 2.36
 Los Angeles Wear 46.5 (A)
 Absorption 4.64 Soundness 0.78
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks Overburden has become very heavy. Site appears to be worked out.



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

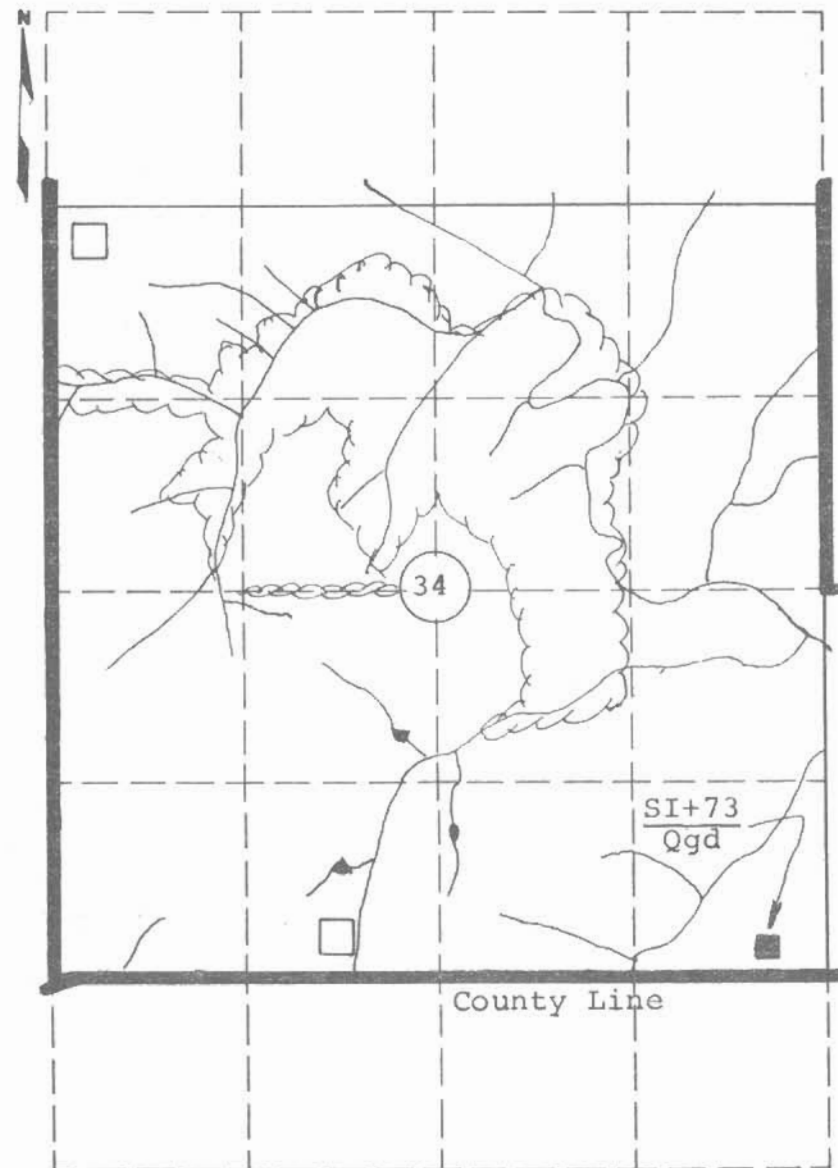
Site No. SI+73
Qgd Date April, 1968
 Material Silt County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 34 Twp. 5S Range 12E
 Owner Herbert Post etux Havensville, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate V
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | | | | | | | | 0 | 1 | 49 | | 22 | 1 |
| | | | | | | | | | | | | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift (Atchison Formation)
 Material Similar To Material reported on SHC Form 619
No. 66-28 Lab. No. 1-62-1000
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

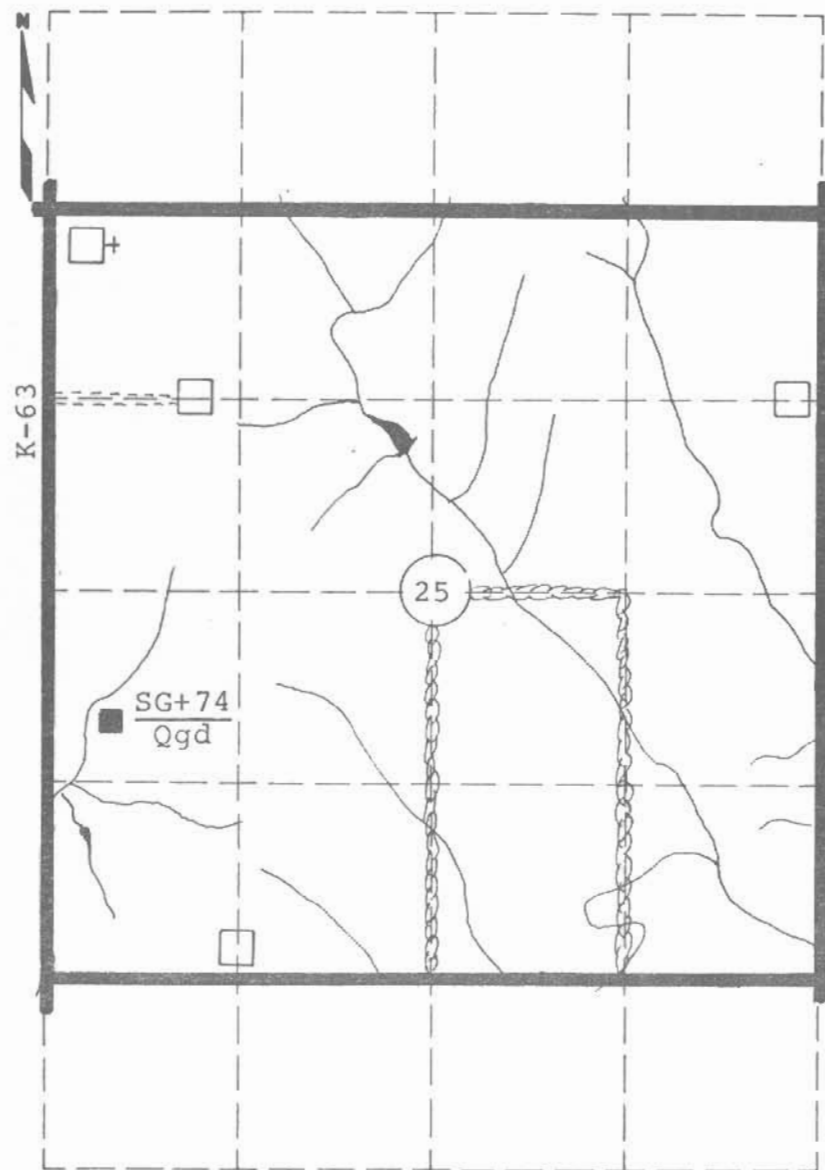
Site No. SG+74
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ Sec. 25 Twp. 5S Range 12E
 Owner Evelyn C. Haug Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate V
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-33 Lab. No. 38055
 Specific Gravity (Sat.) 2.56 (Dry) _____
 Los Angeles Wear 24.4 (D)
 Absorption 2.77 Soundness 0.94
 Wt. Cu.Ft. 110.19 Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

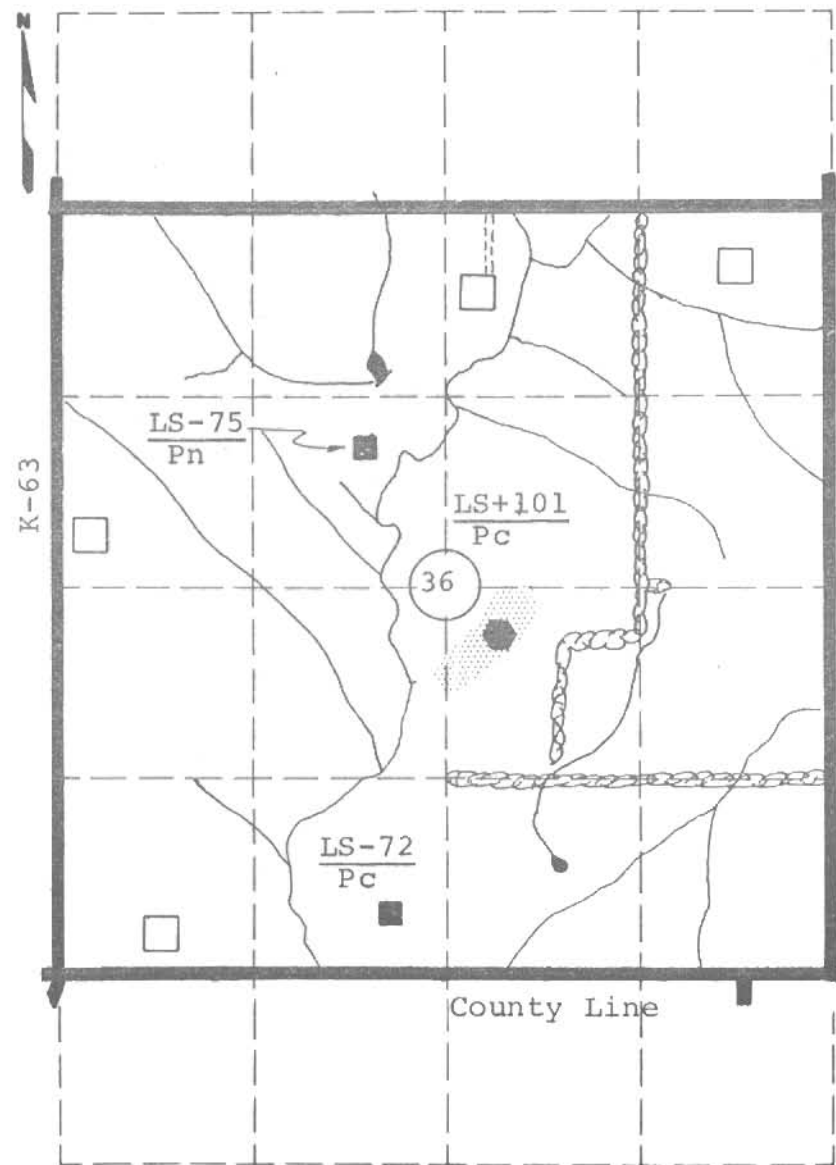
LS-75
Pn
 Site No. _____ Date April, 1968
 Material Limestone County Nemaha
 Location SE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 36 Twp. 5S Range 12E
 Owner Morris Molineux Soldier, Kansas
 Nature of Deposit Dry Accessibility Poor Site Located on Plate V
 Status of Site Open site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Neva Limestone Member
 Material Similar To Material reported on SHC Form No. 645
Lab. No. 68422
 Specific Gravity (Sat.) 2.48 (Dry) 2.38
 Los Angeles Wear 38.7(A)
 Absorption 4.19 Soundness 0.80
 Wt. Cu.ft. _____ Str. Ratio _____
 Remarks This quarry has been abandoned for several years.



Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

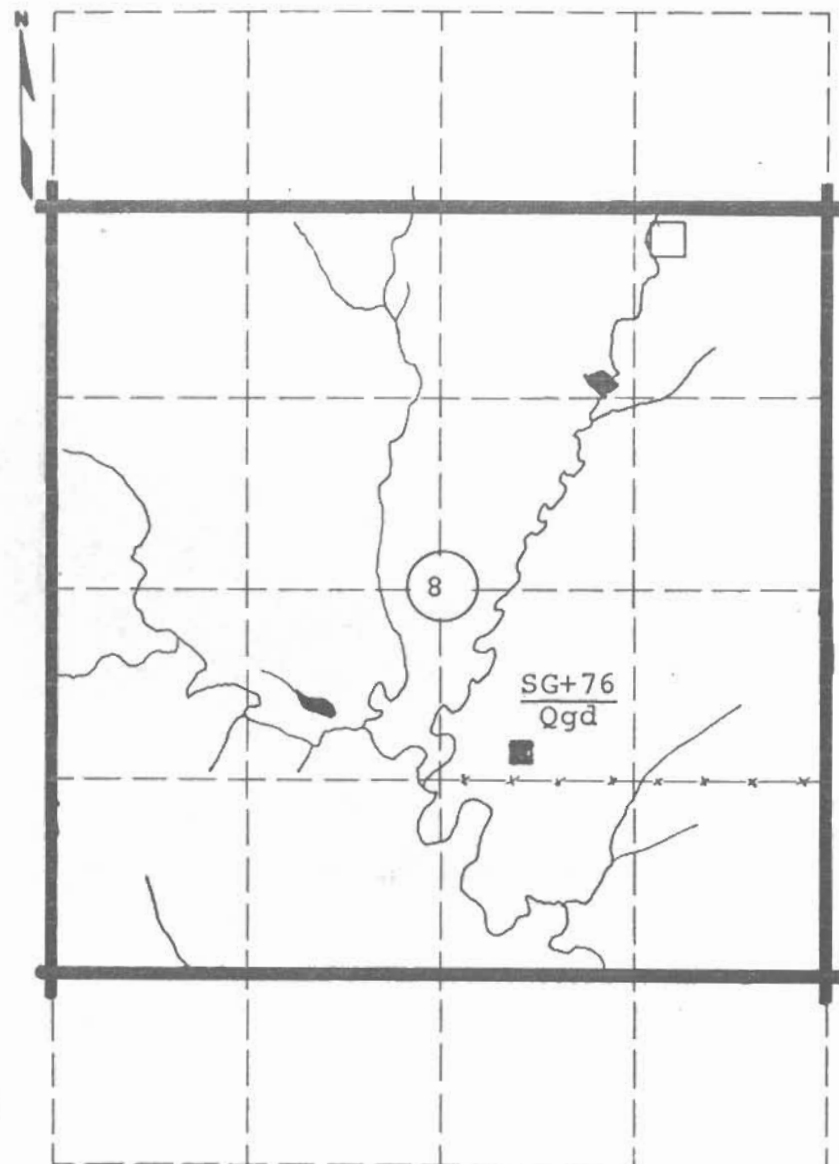
Site No. SG+76
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 8 Twp. 5S Range 13E
 Owner Lester V. Deters etux Goff, Kansas
 name address
 Nature of Deposit Wet Accessibility Fair Site Located on Plate VI
 Status of Site Open site, sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
| | | | | | | 3 | 13 | 32 | 60 | 86 | 92 | 93 | 6.2 | 3.79 | | |
| | | | | | | | | | | | | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619
No. 66-29
 Specific Gravity (Sat.) 2.60 (Dry)
 Los Angeles Wear 29.4(C)
 Absorption 2.0 Soundness 0.91
 Wt. Cu.Ft. 99.34 Str. Ratio 1-day 0.84, 3-day 0.96
 Remarks

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

Site No. SG+77
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location E $\frac{1}{2}$ SE $\frac{1}{4}$ Sec. 28 Twp. 4S Range 14E
 Owner Fannie Vernon Goff, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate VI
 Status of Site Open site; sampled

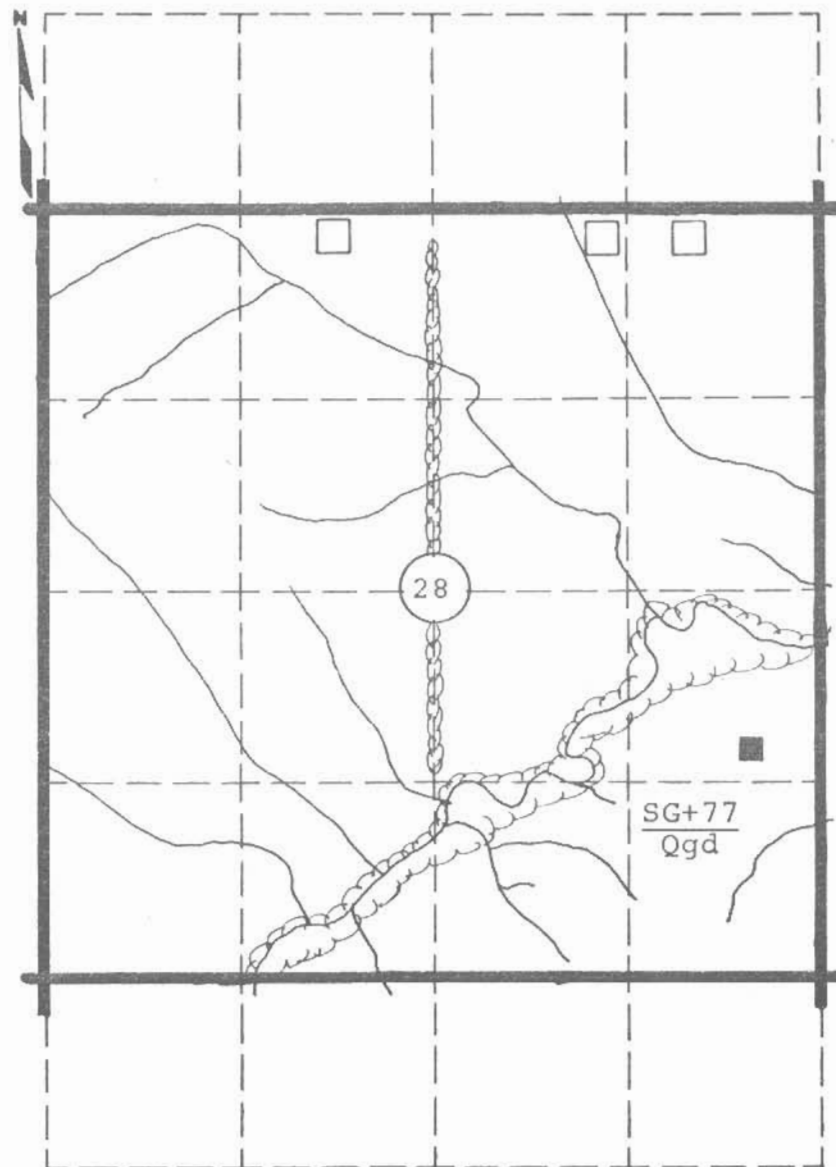
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | S.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|------|-----|------|------|------|------|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/2 | 3/16 | 1/8 | 1/16 | 3/32 | 1/32 | 1/64 | | | | |
| av. | | | | | | 1 | 3 | 9 | 19 | 43 | 67 | 87 | 10 | 2.30 | | | |
| 10 | | 7 | 16 | | | 1 | 6 | 11 | 24 | 58 | 81 | 92 | 7 | 2.73 | | | |
| 16 | | 8 | 12 | | | | | | | 2 | 52 | 95 | 3 | 1.49 | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To Material reported on SHC Form 619 No. 66-13 Lab. No. 10441
 Specific Gravity (Sat.) 2.61 (Dry) _____
 Los Angeles Wear 23.5(C)
 Absorption _____ Soundness 0.97
 Wt. Cu.Ft. 108.3 Sir. Ratio 1-day 0.83, 3-day 0.80

Remarks Test data for holes 10 and 16 represents the finest and coarsest material that has been tested at this site.



Scale: 1" = $\frac{1}{4}$ Mile

PROSPECTIVE MATERIALS SITES; SAMPLED

LEGEND

===== Trail or lane

———— Road

+ + + + + Railroad


~~~~~ Hedge or trees


- x - x - Fence

———— Major stream

~~~~~ Intermittent  
streams

~~~~~ Pond or lake

 Prospective materials sites;  
sampled

 Center of section

 Dwelling

 Cemetery

 School

 Church

 Town or city

CG-78  
Qalt

Site No. \_\_\_\_\_ Date April, 1968

Material Chert Gravel County Nemaha

Location NW $\frac{1}{4}$  NW $\frac{1}{4}$  Sec. 14 Twp. 1S Range 13E

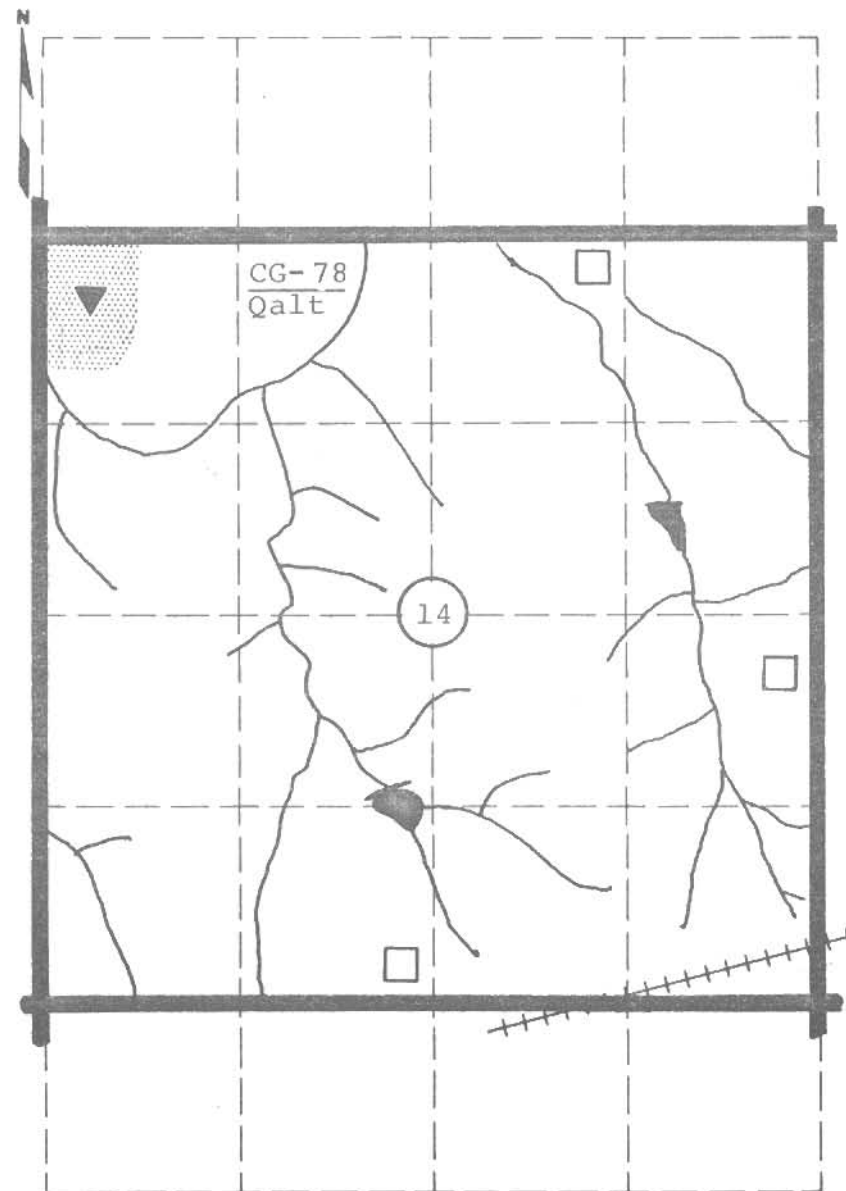
Owner David Lortscher Bern, Kansas  
name address

Nature of Deposit Dry Accessibility Good Site Located on Plate II

Status of Site Prospective site; sampled

[illegible]

Geological Age Quaternary  
Geological Source Terrace Deposit (Illinoisian?)  
Material Similar To Material reported in Geological Survey  
Bull. No. 1060D.  
Specific Gravity (Sat.) \_\_\_\_\_ (Dry) 5.67  
Los Angeles Wear 36.0  
Absorption \_\_\_\_\_ Soundness .89  
Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_  
Remarks \_\_\_\_\_



Scale: 1" =  $\frac{1}{4}$  Mile

## STATE HIGHWAY COMMISSION OF KANSAS

## MATERIAL SURVEY REPORT

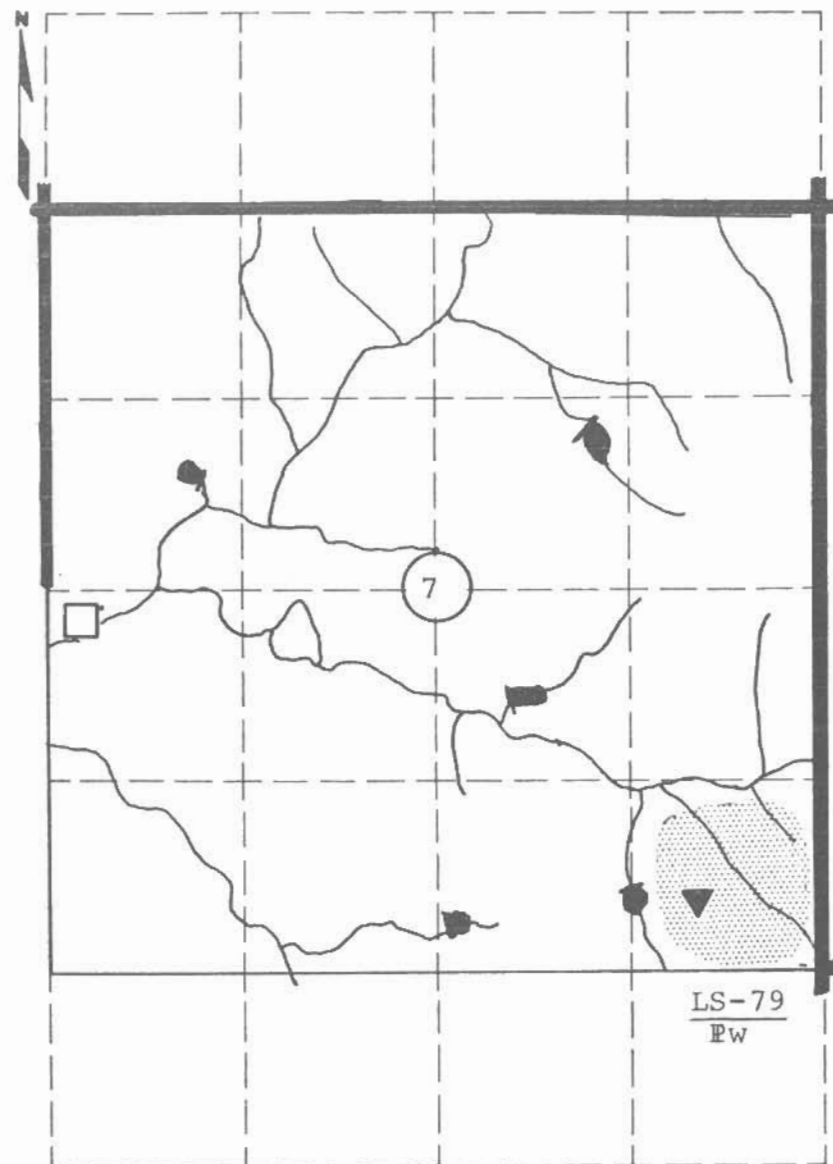
Site No. LS-79  
PW Date April, 1968  
 Material Limestone County Nemaha  
 Location SE $\frac{1}{4}$  SE $\frac{1}{4}$  Sec. 7 Twp. 1S Range 13E  
 Owner Jesse A. Hunzeker Bern, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate II  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
|           |                            |                      |                   | 1 1/2            | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |

## CORRELATION DATA

Geological Age Pennsylvanian  
 Geological Source Wakarusa Limestone Member  
 Material Similar To Material reported on SHC Form 645  
Lab. No. 66442  
 Specific Gravity (Sat.) 2.64 (Dry) 2.60  
 Los Angeles Wear 23.4 (A)  
 Absorption 1.65 Soundness 0.93  
 Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_  
 Remarks \_\_\_\_\_



Scale: 1" =  $\frac{1}{4}$  Mile



## MATERIAL SURVEY REPORT

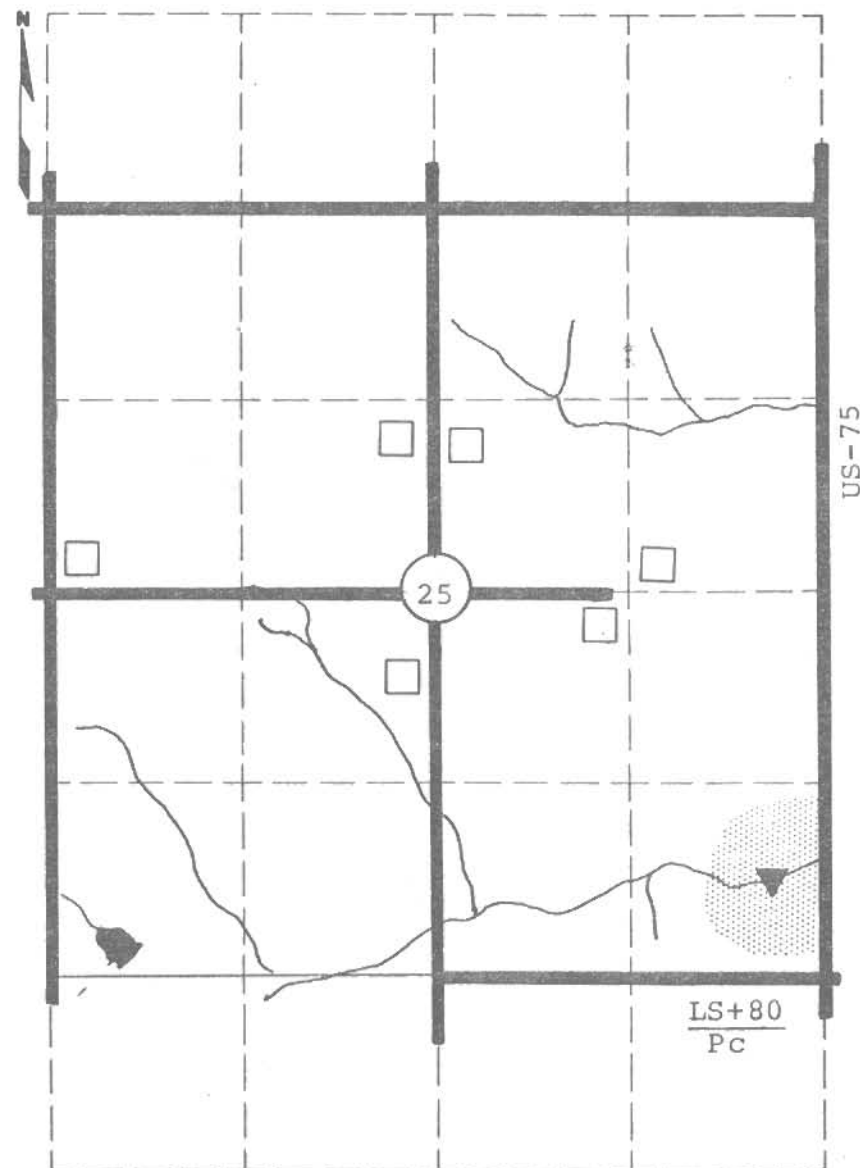
Site No. LS+80  
Pc Date April, 1968  
 Material Limestone County Nemaha  
 Location SE $\frac{1}{4}$  Sec. 25 Twp. 1S Range 14E  
 Owner Lee A. & Esther White Sabetha, Kansas  
 Name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate II  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
|           |                            |                      |                   | 1/2              | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |

## CORRELATION DATA

Geological Age Permian  
 Geological Source Cottonwood Limestone Member  
 Material Similar To Material reported on SHC Form 645  
Lab. No. 64452  
 Specific Gravity (Sat.) 2.51 (Dry) 2.43  
 Los Angeles Wear 34.2 (A)  
 Absorption 3.58 Soundness 0.84  
 Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_  
 Remarks The ledge is exposed in the backslope of  
U.S. 75 highway.

Scale: 1" =  $\frac{1}{4}$  Mile

## STATE HIGHWAY COMMISSION OF KANSAS

## MATERIAL SURVEY REPORT

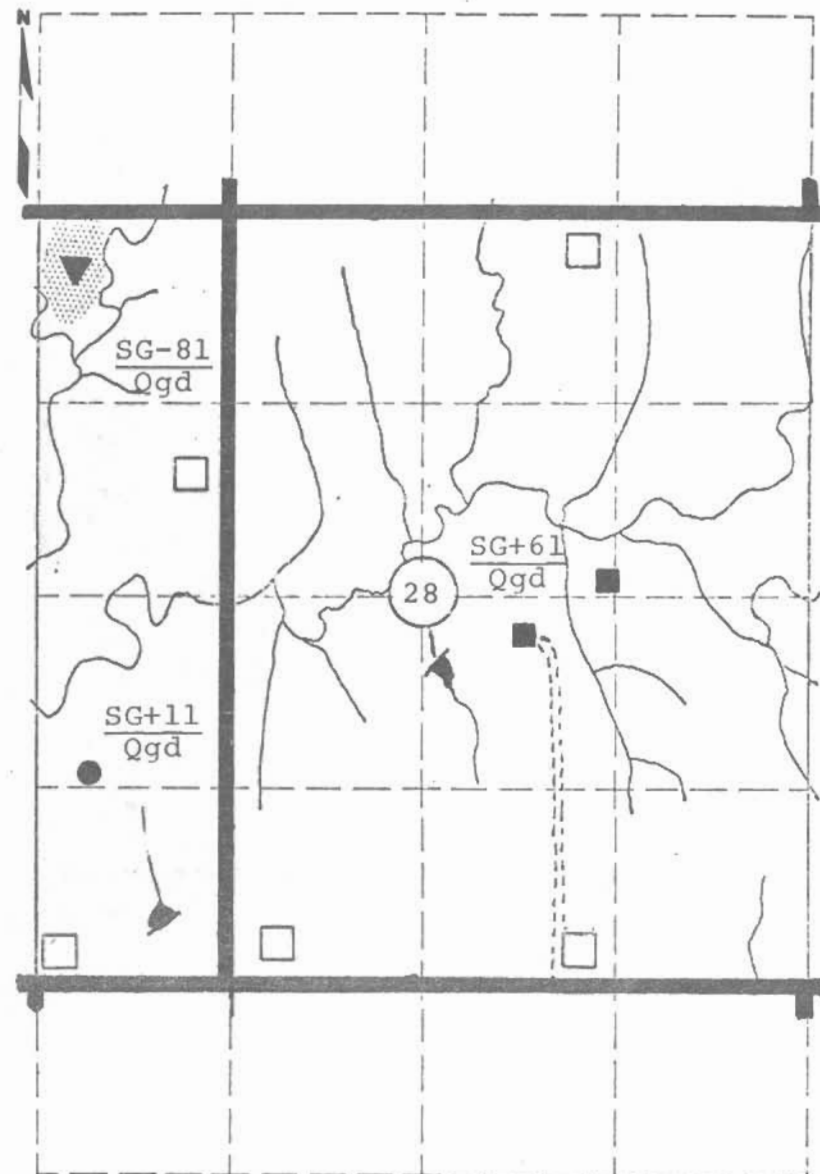
Site No. SG-81  
Ogd Date April, 1968  
 Material Sand and Gravel County Nemaha  
 Location NW $\frac{1}{4}$  NW $\frac{1}{4}$  Sec. 28 Twp. 1S Range 13E  
 Owner Leonard L. Grose Bern, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate II  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test<br>Data | Material<br>at<br>Bottom<br>of Hole | Depth<br>of<br>over-<br>burden | Depth<br>of<br>Material | Percent Retained |     |     |    |    |    |    |    |     | Wash<br>200 | G.F. | L.L. | P.L. |
|--------------|-------------------------------------|--------------------------------|-------------------------|------------------|-----|-----|----|----|----|----|----|-----|-------------|------|------|------|
|              |                                     |                                |                         | 1/2              | 3/4 | 3/8 | 4  | 8  | 16 | 30 | 50 | 100 |             |      |      |      |
|              |                                     |                                |                         |                  | 1   | 9   | 16 | 24 | 34 | 52 | 72 | 89  | 7           | 3.02 |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |
|              |                                     |                                |                         |                  |     |     |    |    |    |    |    |     |             |      |      |      |

## CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar to Material reported on SHC Form  
No. 633 Lab. No. 66439  
 Specific Gravity (Sat.) 2.56 (Dry)  
 Los Angeles Wear 27.0 (A)  
 Absorption \_\_\_\_\_ Soundness 0.90  
 Mt. Cu.Ft. 93.0 Str. Ratio 1-day 0.55, 3-day 0.65  
 Remarks \_\_\_\_\_

Scale: 1" =  $\frac{1}{4}$  Mile

## MATERIAL SURVEY REPORT

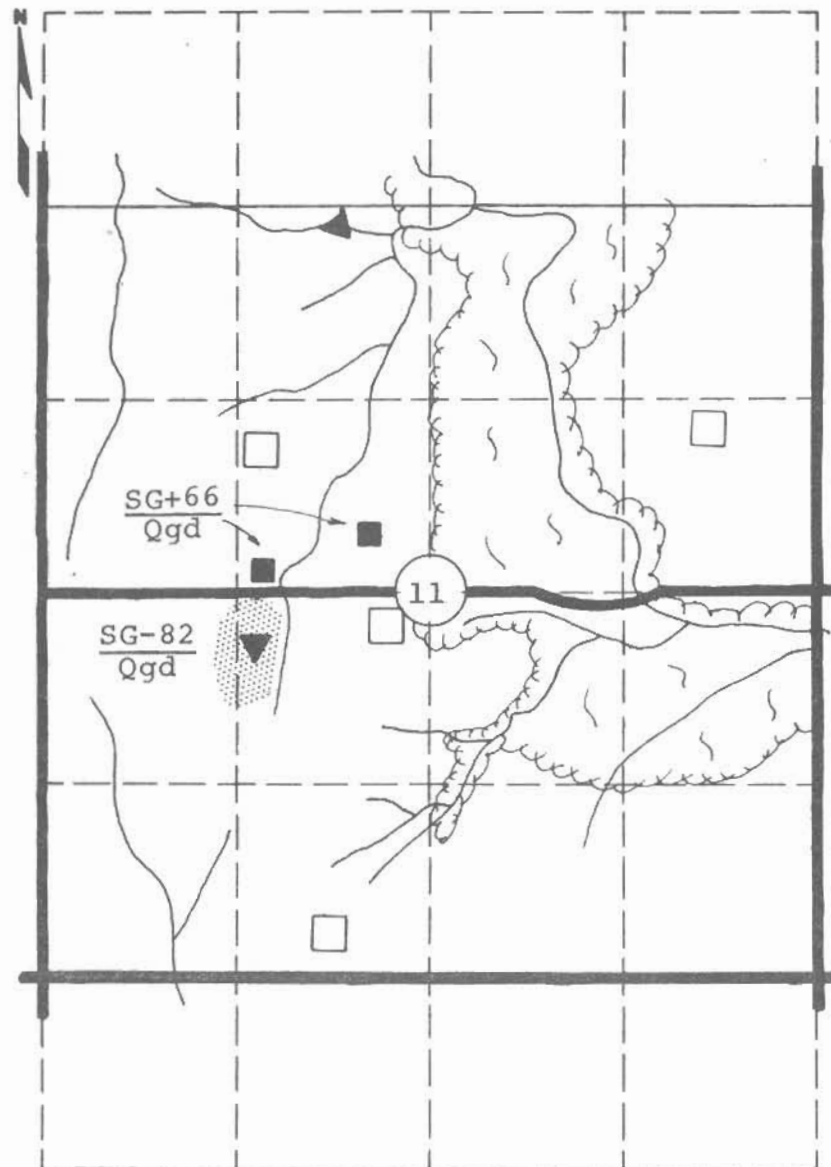
Site No. SG-82  
Qgd Date April, 1968  
 Material Sand and Gravel County Nemaha  
 Location NE  $\frac{1}{4}$  SW  $\frac{1}{4}$  Sec. 11 Twp. 4S Range 14E  
 Owner George W. McDaniel Wetmore, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     |    | Wash 200 | G.F. | L.L. | P.L. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----|----------|------|------|------|
|           |                            |                      |                   | 1 1/2            | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |    |          |      |      |      |
| av.       |                            | 7                    | 4                 |                  |     |     | 1 | 3 | 5  | 34 | 63 | 90  | 8  | 2.05     |      |      |      |
| 6         |                            | 13                   | 0                 |                  |     |     |   |   |    | 12 | 36 | 87  | 9  | 1.36     |      |      |      |
| 4         |                            | 3                    | 4                 |                  |     |     | 1 | 7 | 12 | 56 | 69 | 86  | 13 | 2.54     |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |    |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |    |          |      |      |      |

## CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar To Material reported on SHC Form 619  
No. MS 66-18  
 Specific Gravity (Sat.) \_\_\_\_\_ (Dry) \_\_\_\_\_  
 Los Angeles Wear \_\_\_\_\_  
 Absorption \_\_\_\_\_ Soundness \_\_\_\_\_  
 Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_  
 Remarks Test data for test holes 6 and 4 represent  
the finest and coarsest material tested at this site.



Scale: 1" =  $\frac{1}{4}$  Mile

## STATE HIGHWAY COMMISSION OF KANSAS

## MATERIAL SURVEY REPORT

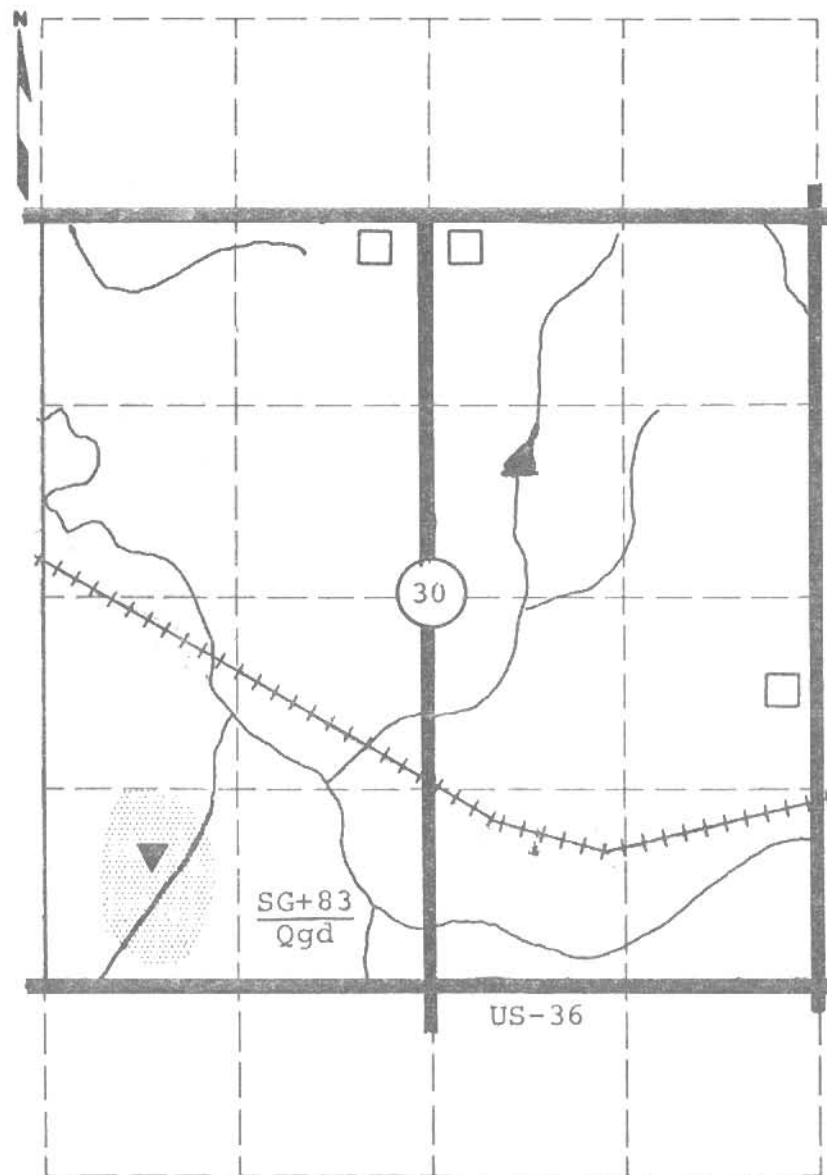
Site No. SG+83  
Ogd Date April, 1968  
 Material Sand and Gravel County Nemaha  
 Location SW $\frac{1}{4}$  SW $\frac{1}{4}$  Sec. 30 Twp. 2S Range 13E  
 Owner Mabel Ehrsam Bern, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |    |    |    |    |    |     | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|----|----|----|----|----|-----|----------|------|------|------|
|           |                            |                      |                   | 1/2              | 3/4 | 3/8 | 4  | 8  | 16 | 30 | 50 | 100 |          |      |      |      |
| av        |                            |                      |                   |                  |     | 5   | 8  | 13 | 20 | 45 | 61 | 84  | 13       | 2.35 |      |      |
| 1         |                            |                      |                   |                  |     |     |    | 1  | 3  | 65 | 87 | 93  | 6        | 2.49 | 26   | 8    |
| 13        |                            |                      |                   |                  |     |     | 20 | 32 | 47 | 67 | 82 | 90  |          | 3.53 | 23   | 8    |
|           |                            |                      |                   |                  |     |     |    |    |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |    |    |    |    |    |     |          |      |      |      |

## CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar To Material reported on SHC Form 619  
No. 66-14  
 Specific Gravity (Sat.) \_\_\_\_\_ (Dry) \_\_\_\_\_  
 Los Angeles Wear \_\_\_\_\_  
 Absorption \_\_\_\_\_ Soundness \_\_\_\_\_  
 Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_  
 Remarks Gradation data for test holes 1 and 13 re-  
presents the finest and coarsest material tested at  
this site



Scale: 1" = 1/4 Mile



MATERIAL SURVEY REPORT

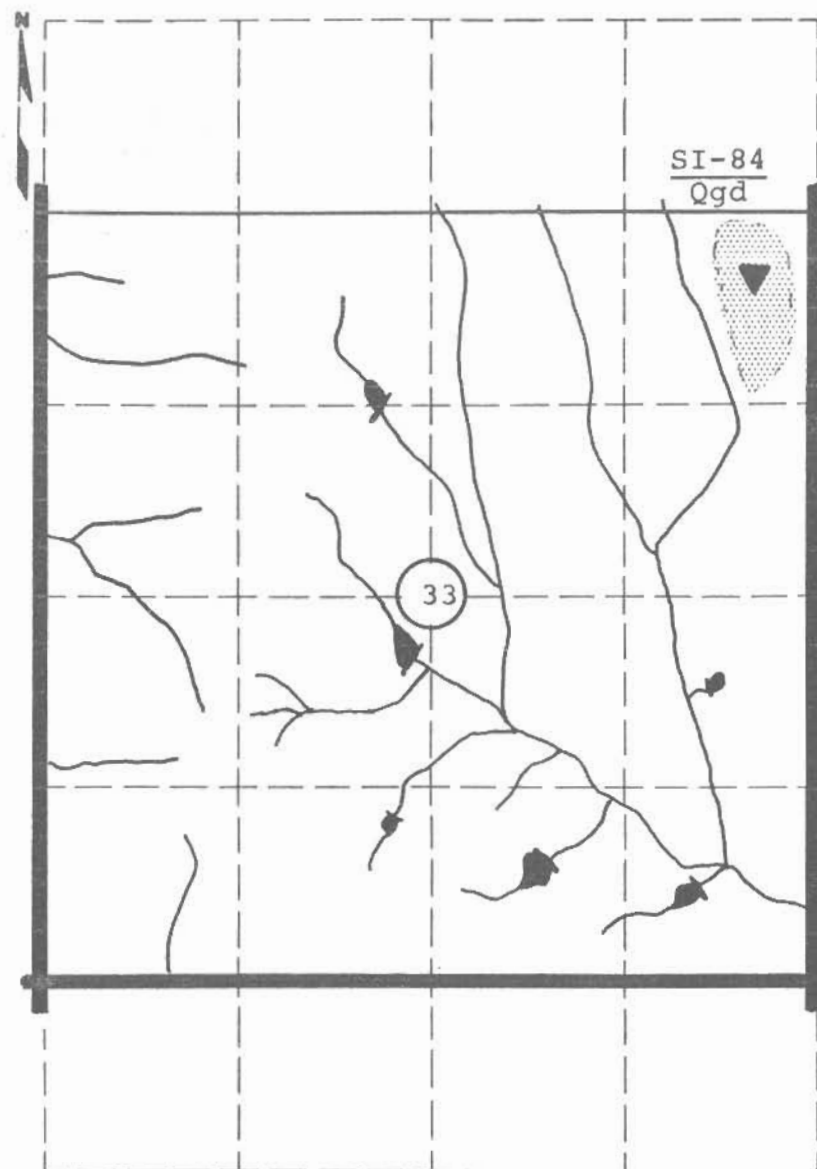
Site No. SI-84  
Qgd Date April, 1968  
 Material Silt County Nemaha  
 Location NE $\frac{1}{4}$  NE $\frac{1}{4}$  Sec. 33 Twp. 5S Range 11E  
 Owner Flossie May Peterson Onaga, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Fair Site Located on Plate V  
 Status of Site Prospective site; sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     |   | 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|---|-----|------|------|------|
|           |                            |                      |                   | 1 1/2            | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |   |     |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    | 0   | 2 |     |      | 33   | 11   |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |   |     |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |   |     |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |   |     |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |   |     |      |      |      |

CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar To Material reported on SHC Form 623  
Lab. No. AA6086  
 Specific Gravity (Sat.) \_\_\_\_\_ (Dry) \_\_\_\_\_  
 Los Angeles Wear \_\_\_\_\_  
 Absorption \_\_\_\_\_ Soundness \_\_\_\_\_  
 Wt. Cu.Ft. 83.0 Str. Ratio \_\_\_\_\_  
 Remarks This material was tested for use as mineral filler



Scale: 1" =  $\frac{1}{4}$  Mile

## STATE HIGHWAY COMMISSION OF KANSAS

## MATERIAL SURVEY REPORT

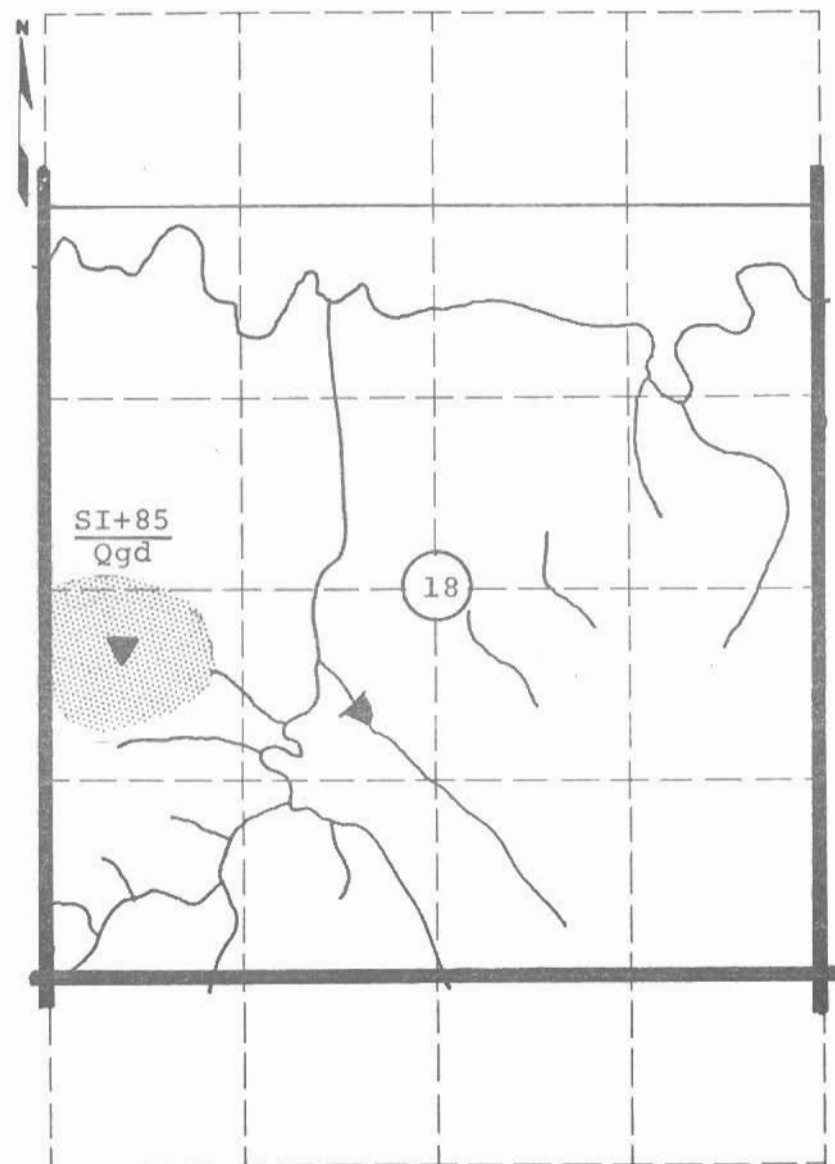
Site No. SI+85  
Qgd Date April, 1968  
 Material Silt County Nemaha  
 Location NW $\frac{1}{4}$  SW $\frac{1}{4}$  Sec. 18 Twp. 4S Range 11E  
 Owner Lucy Gray Vermillion, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate V  
 Status of Site Prospective site; sampled

## EXPLORATION DATA

| Test Hole | Material at bottom of hole | Depth of over-burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
|           |                            |                      |                   | 1 1/2            | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   | 0  | 0  | 1  | 6   | 66       |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |          |      |      |      |

## CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar To Material reported on SHC Form No. 623  
Lab. No. 66440  
 Specific Gravity (Sat.) 2.63 (Dry)  
 Los Angeles Wear \_\_\_\_\_  
 Absorption \_\_\_\_\_ Soundness \_\_\_\_\_  
 Wt. Cu.Ft. 87.9 Str. Ratio \_\_\_\_\_  
 Remarks This material was tested for use as mineral filler.

Scale: 1" =  $\frac{1}{4}$  Mile

MATERIAL SURVEY REPORT

Site No. SG+86  
Qgd Date April, 1968  
 Material Sand and Gravel County Nemaha  
 Location SE $\frac{1}{4}$  SE $\frac{1}{4}$  Sec. 5 Twp. 5S Range 13E  
 Owner Eugene S. Visser et ux Goff, Kansas  
 name address  
 Nature of Deposit Dry Accessibility Good Site Located on Plate VI  
 Status of Site Prospective site; sampled

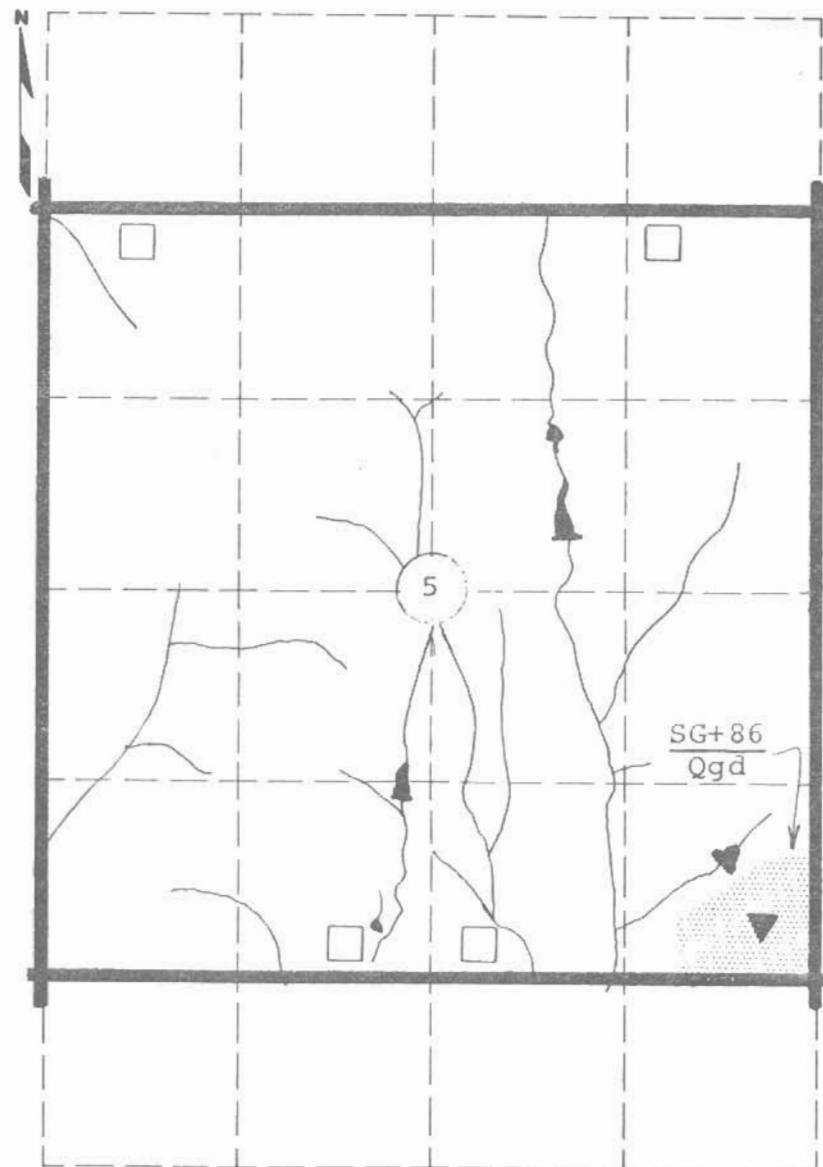
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained |     |     |   |   |    |    |    |     |    | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----|----------|-------|-------|-------|
|           |                            |                      |                   | 1/2              | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 |    |          |       |       |       |
| av        |                            | 4                    | 11                |                  |     | 1   | 2 | 5 | 21 | 23 | 37 | 66  | 25 |          |       | 3     |       |
| 1         |                            |                      |                   |                  |     | 1   | 5 | 9 | 22 | 44 | 69 | 90  | 8  |          |       | 0     |       |
| 5         |                            |                      |                   |                  |     |     | 1 | 1 | 3  | 6  | 9  | 36  | 47 |          |       | 4     |       |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |    |          |       |       |       |
|           |                            |                      |                   |                  |     |     |   |   |    |    |    |     |    |          |       |       |       |

CORRELATION DATA

Geological Age Quaternary  
 Geological Source Glacial Drift  
 Material Similar To Material reported on SHC Form 619  
No. 66-27  
 Specific Gravity (Sat.) \_\_\_\_\_ (Dry) \_\_\_\_\_  
 Los Angeles Wear \_\_\_\_\_  
 Absorption \_\_\_\_\_ Soundness \_\_\_\_\_  
 Wt. Cu.Ft. \_\_\_\_\_ Str. Ratio \_\_\_\_\_

Remarks Gradation data for test holes 1 and 5 represent the finest and coarsest material tested at this site.



Scale: 1" = 1/4 Mile

# PROSPECTIVE MATERIALS SITES; NOT SAMPLED

## LEGEND

===== Trail or lane

———— Road

+ + + + + Railroad

~~~~ Hedge or trees

-x-x- Fence

———— Major stream

~ Intermittent streams

~ Pond or lake

● Prospective materials site; not sampled

○ Center of section

□ Dwelling

⊕ Cemetery

□ School

⊕ Church

■ Town or city

MATERIAL SURVEY REPORT

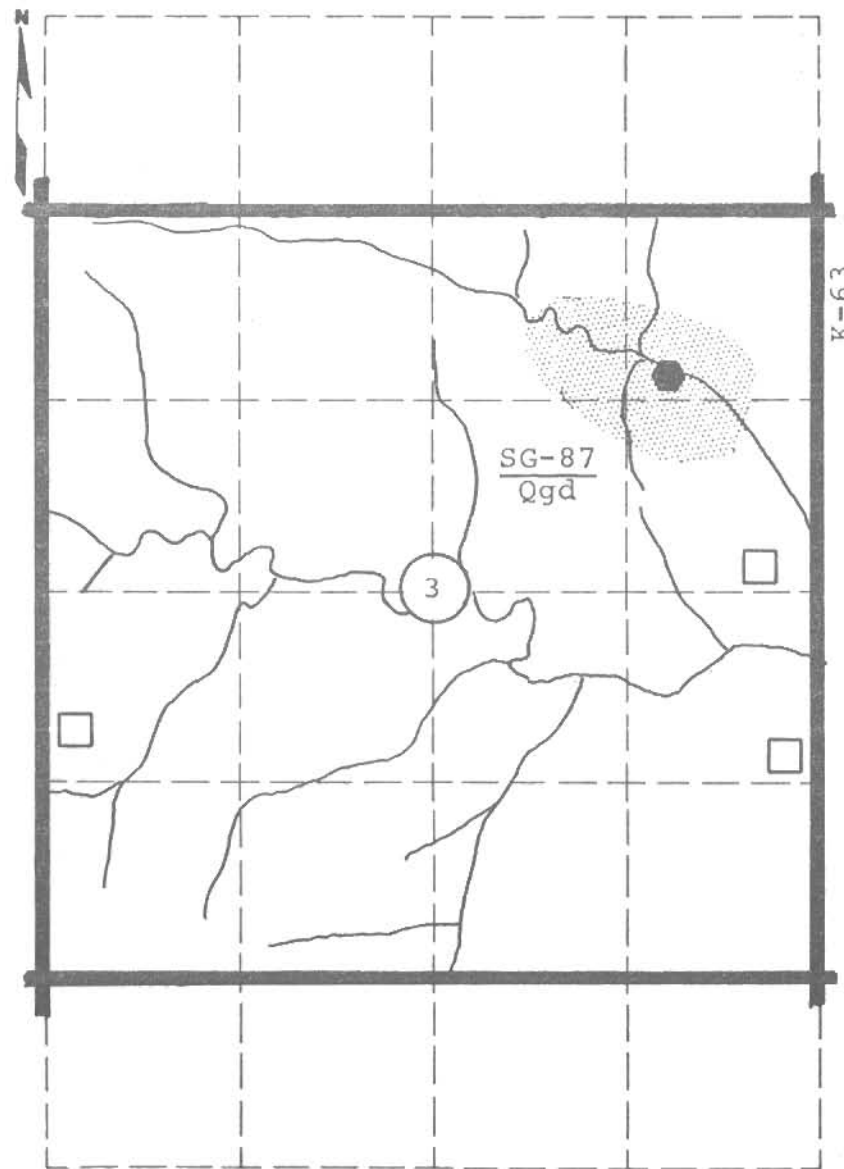
Site No. SG-87
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ Sec. 3 Twp. 2S Range 12E
 Owner Mary Tangeman Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

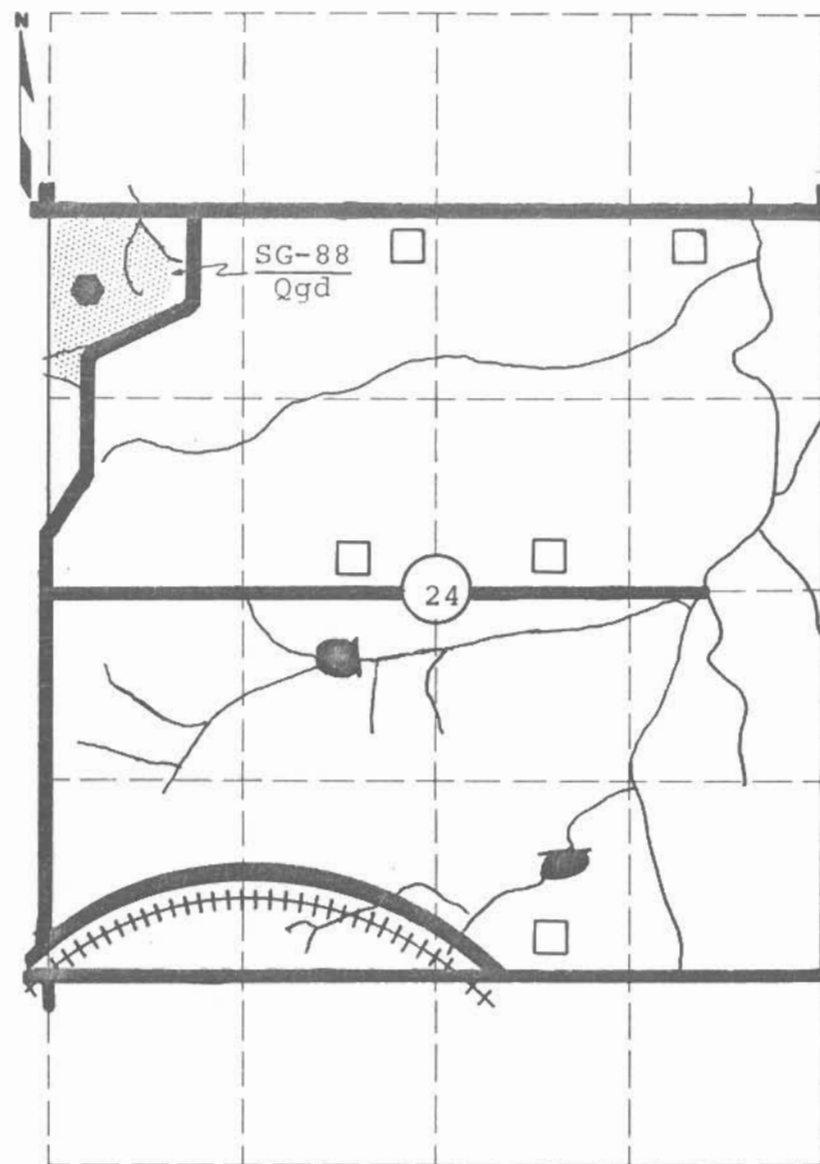
Site No. SG-88
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 24 Twp. 2S Range 12E
 Owner John A. Dalsing Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

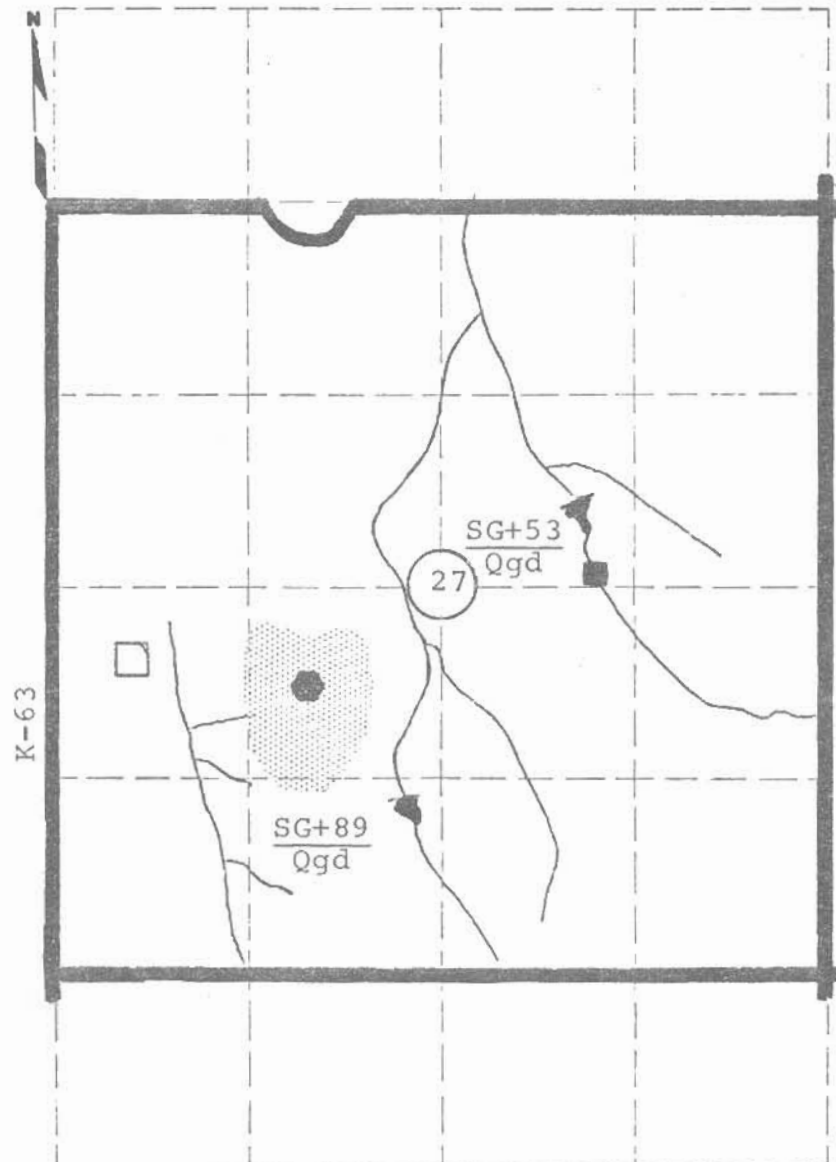
Site No. SG+89
Qgd Date April, 1968
 Material Sand and Gravel Nemaha
 Location SW $\frac{1}{4}$ Sec. 27 Twp. 1S Range 12E
 Owner Melvin Bredemeier et ux Seneca, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate I
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test
Hole | Material
at
Bottom
of Hole | Depth
of
over-
burden | Depth
of
Material | Percent Retained | | | | | | | | Wash
200 | G.F. | L.L. | P.I. | |
|--------------|-------------------------------------|--------------------------------|-------------------------|------------------|-----|-----|---|----|----|----|----|-------------|------|------|------|-----|
| | | | | 1/2 | 3/4 | 3/8 | 5 | 10 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Sh. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

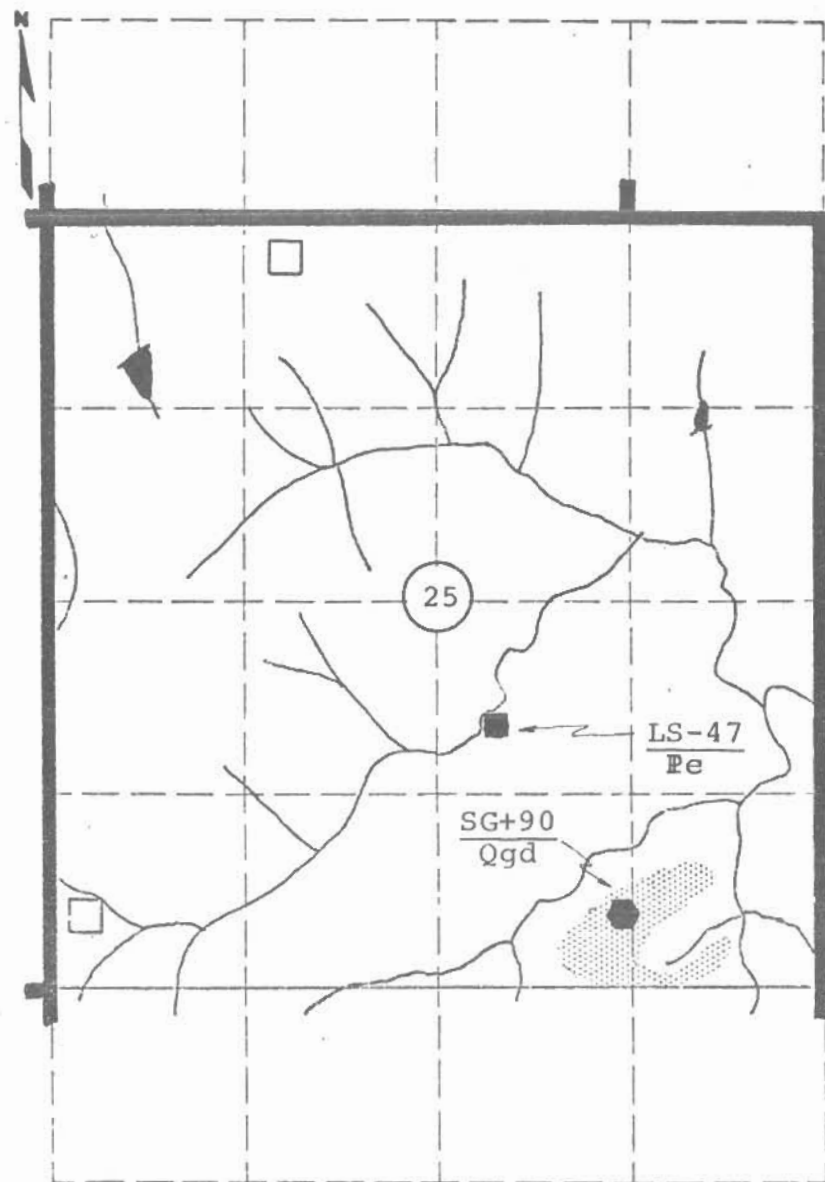
Site No. SG+90
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 25 Twp. 1S Range 11E
 Owner Clarence Schmitz Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair S. Located on Plate I
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

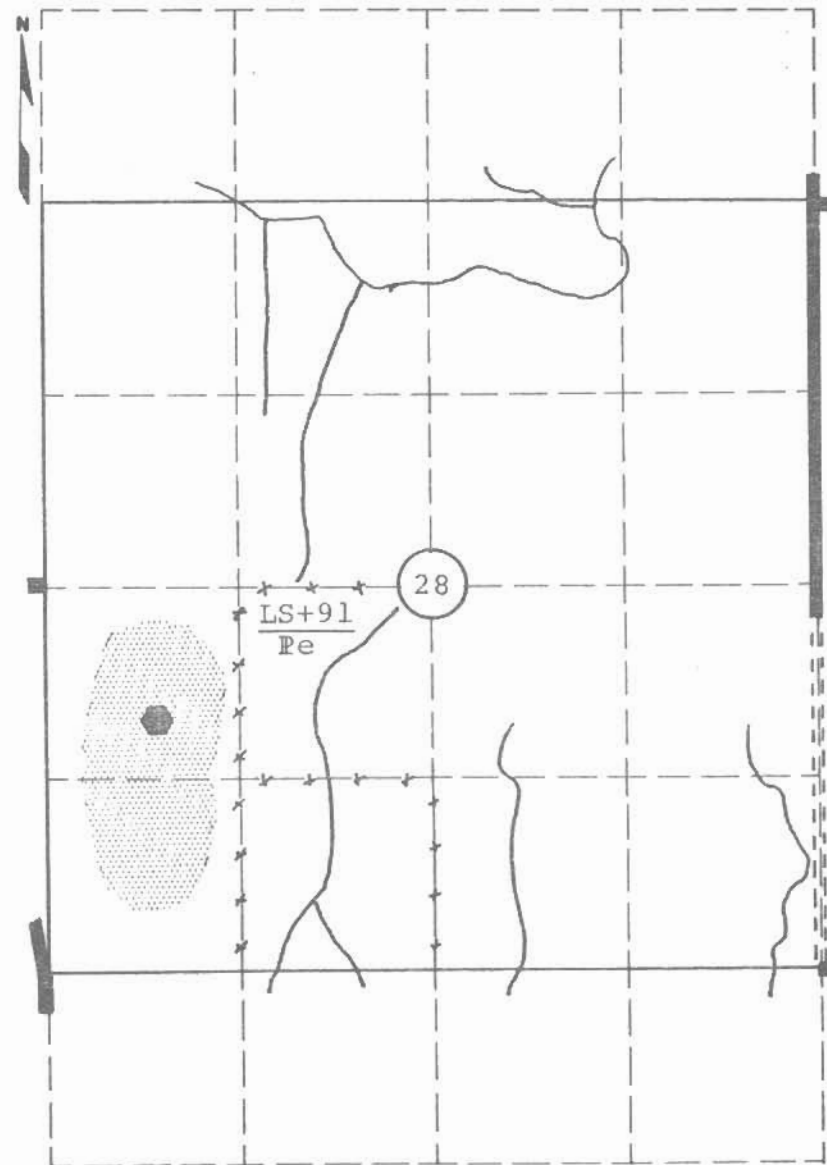
Site No. LS+91
Pe Date April, 1968
 Material Limestone County Nemaha
 Location SW 1/4 Sec. 28 Twp. 1S Range 12E
 Owner Frank Tangeman Seneca, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate I
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Pennsylvanian
 Geological Source Emporia Ls. Form. (Elmont & Reading Members)
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

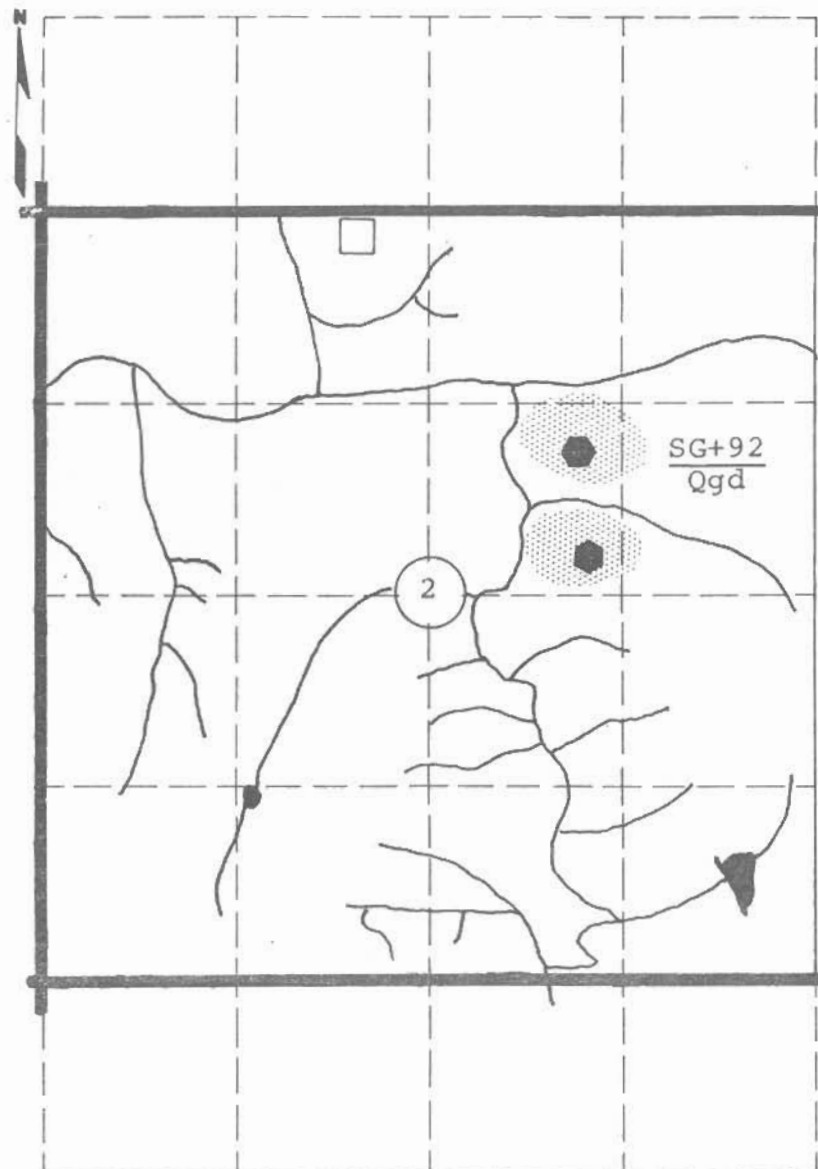
Site No. SG+92
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ Sec. 2 Twp. 2S Range 13E
 Owner Clifford Edelman Sabetha, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate II
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in USGS Bull. No. 1060D

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

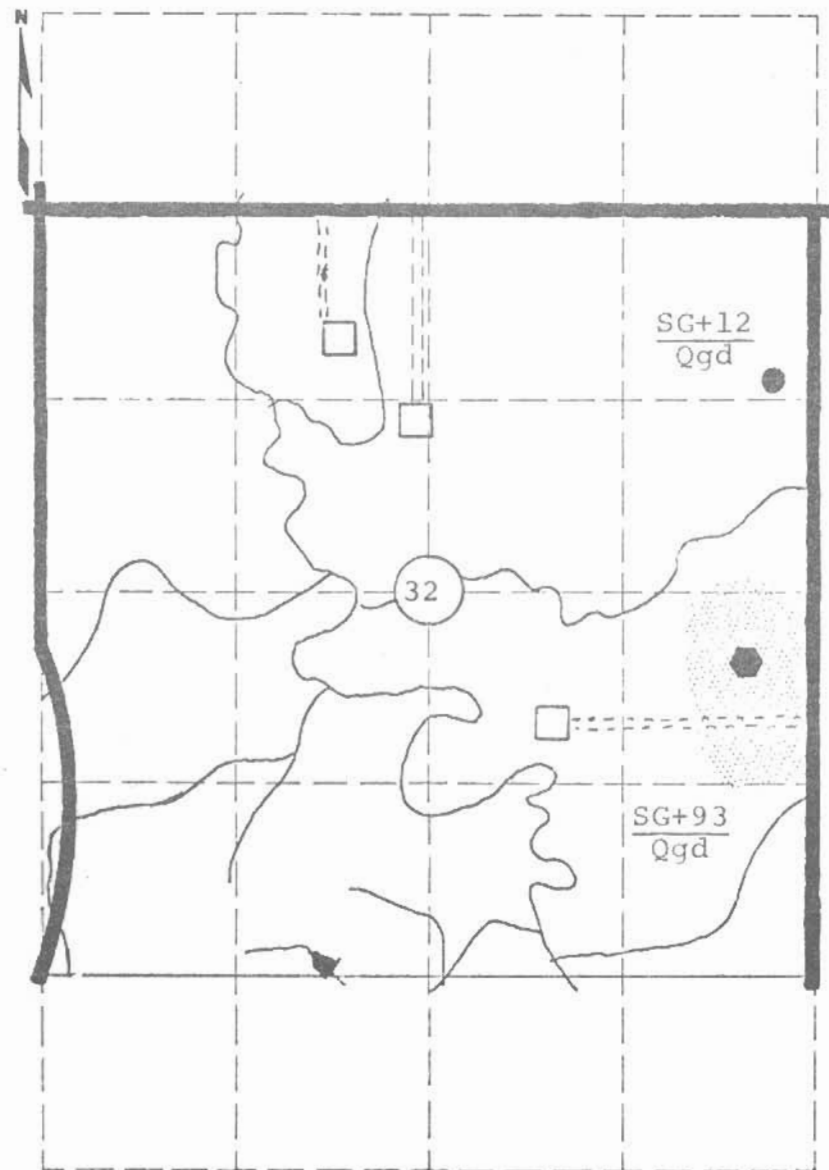
Site No. SG+93
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 32 Twp. 1S Range 13E
 Owner Ramond E. Miller Bern, Kansas
 Nature of Deposit Dry Accessibility Good Site Located on Plate II
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of hole | Depth of Over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

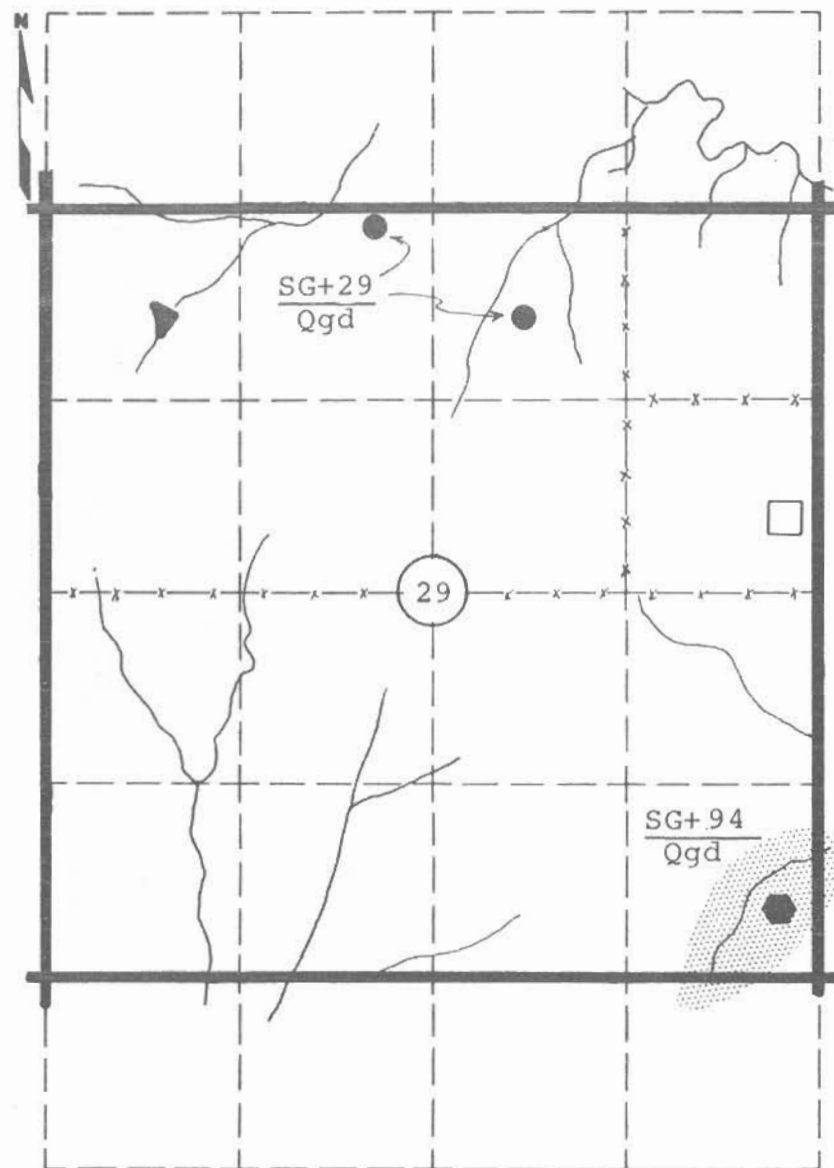
Site No. SG+94
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 29 Twp. 5S Range 14E
 Owner Lloyd Pfrang Goff, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate VI
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|-----|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 1/4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

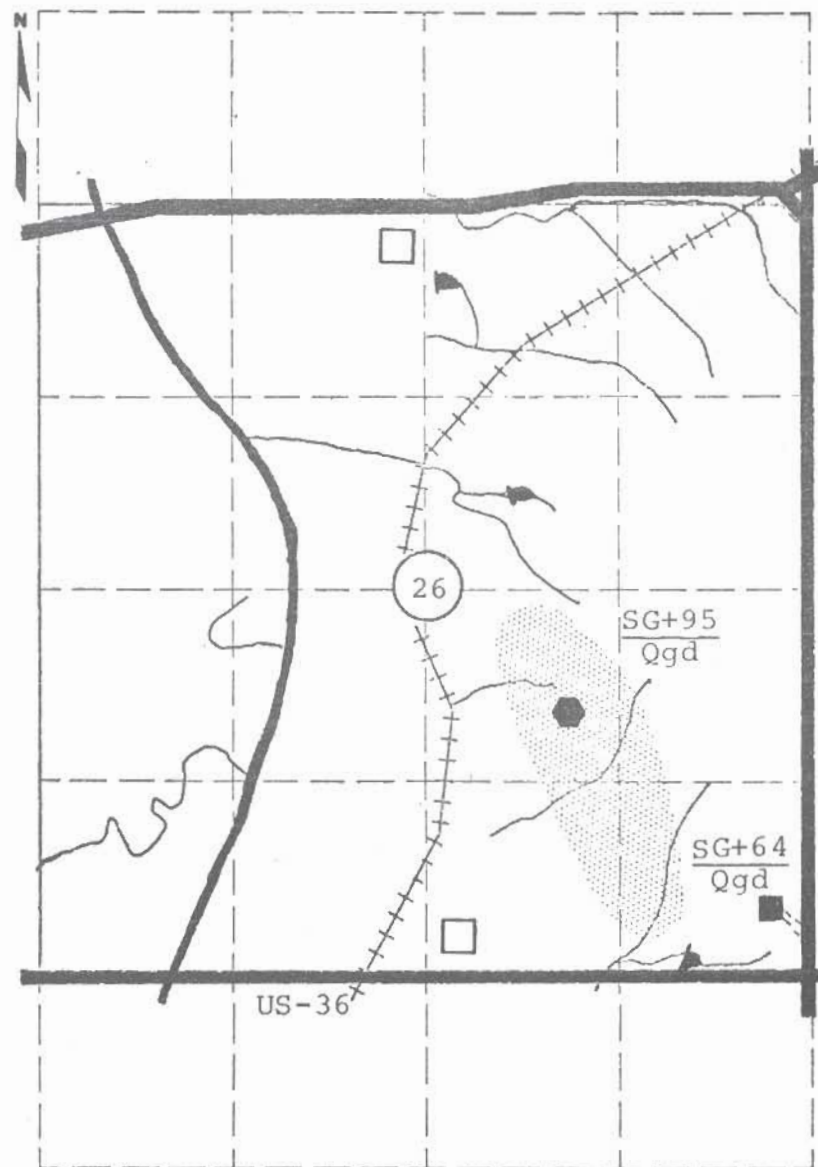
SG+95

EXPLORATION DATA

[illegible]

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To _____

Specific Gravity (Sat.) _____ (Dry) _____
Los Angeles Wear _____
Absorption _____ Soundness _____
Wt. Cu.Ft. _____ Str. Ratio _____
Remarks _____



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+96
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ Sec. 25 Twp. 2S Range 12E
 Owner Clarence Ronnebaum Seneca, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Prospective site; not sampled

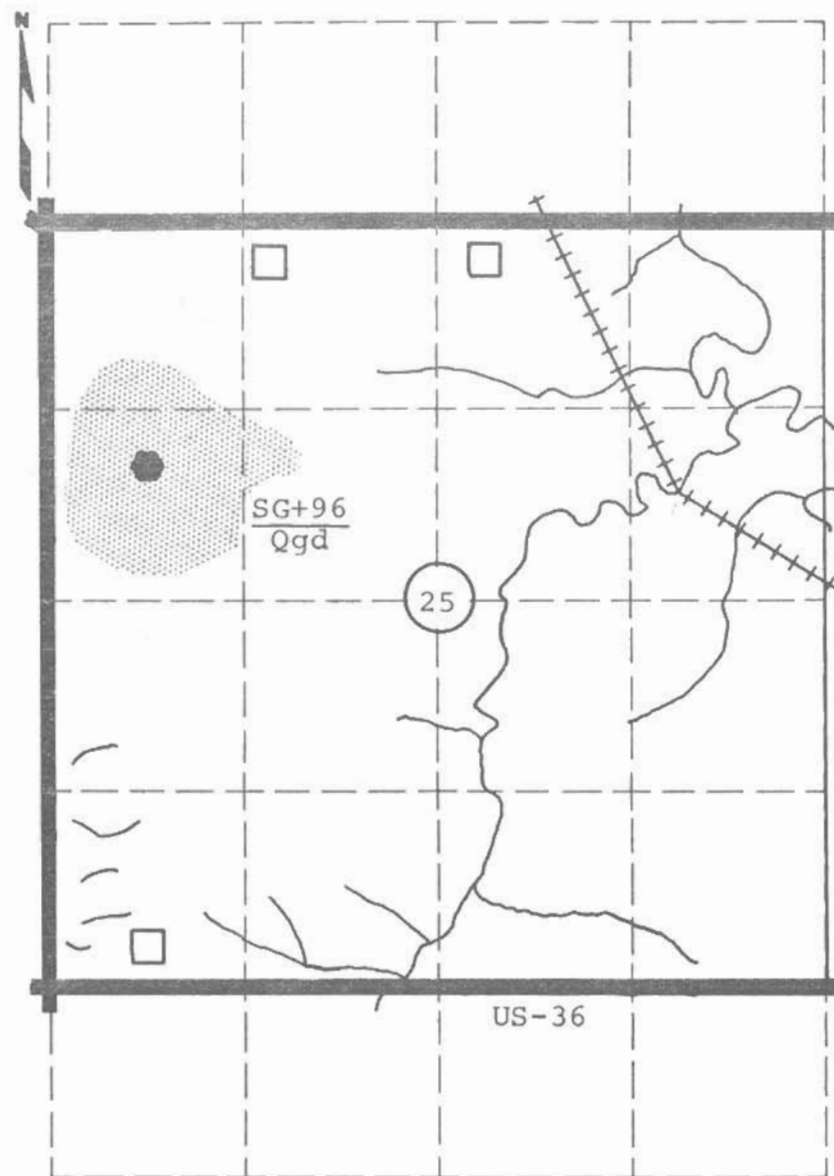
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

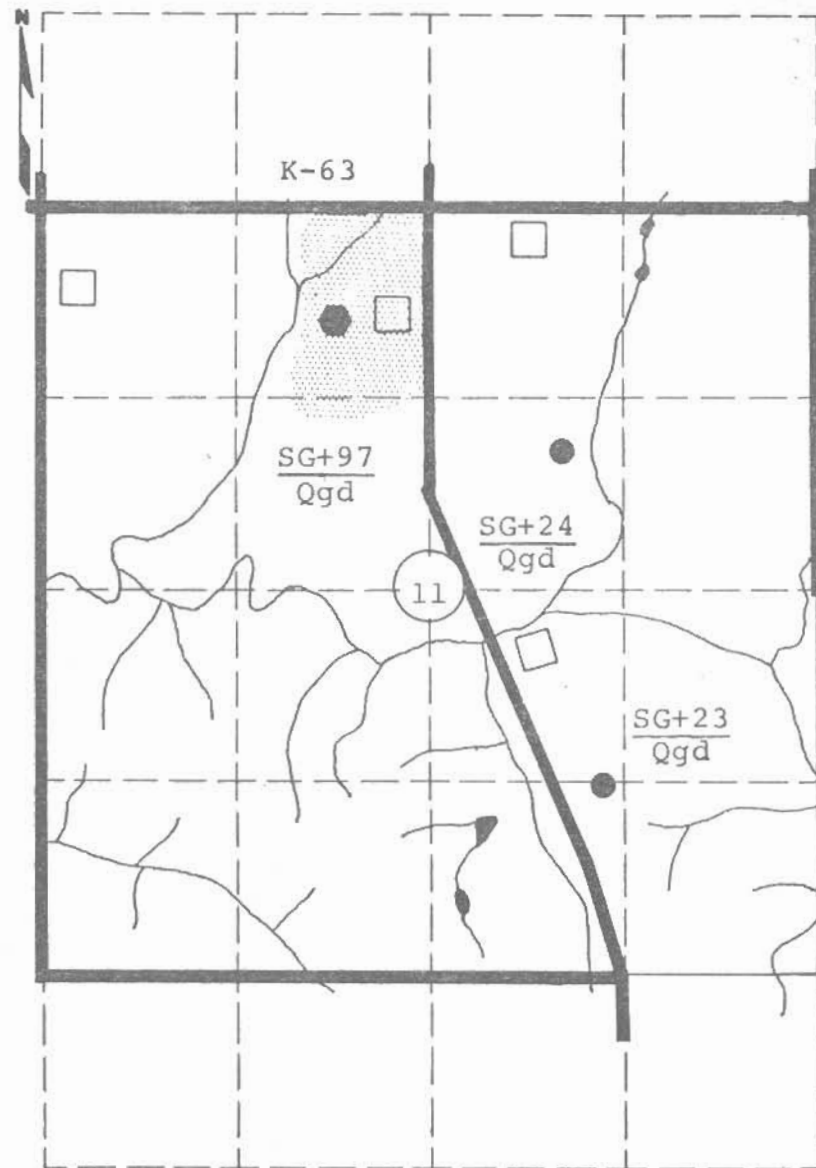
Site No. SG+97
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 11 Twp. 3S Range 12E
 Owner Louis B. Ronnebaum Seneca, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate III
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

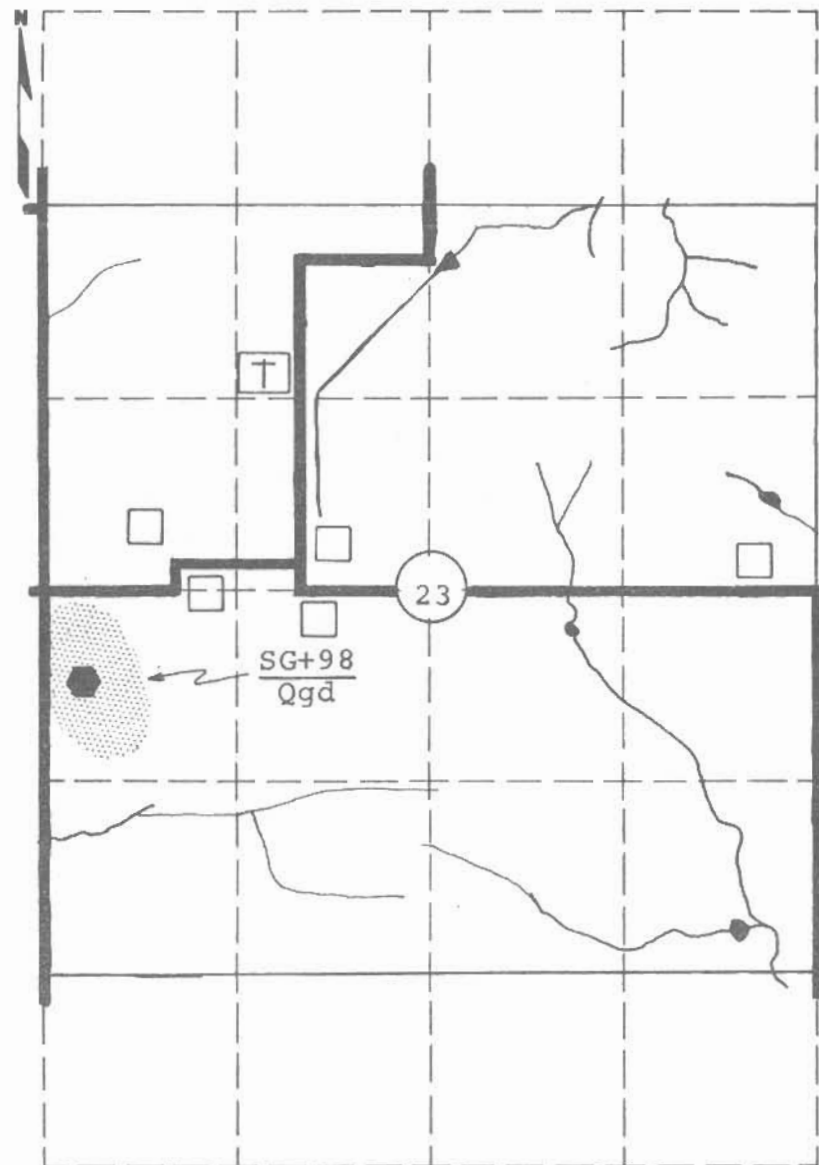
Site No. SG+98
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 23 Twp. 3S Range 14E
 Owner J. A. Bockenstette Sabetha, Kansas
name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey Bull. No. 1060D.

Scale: 1" = $\frac{1}{4}$ Mile

MATERIAL SURVEY REPORT

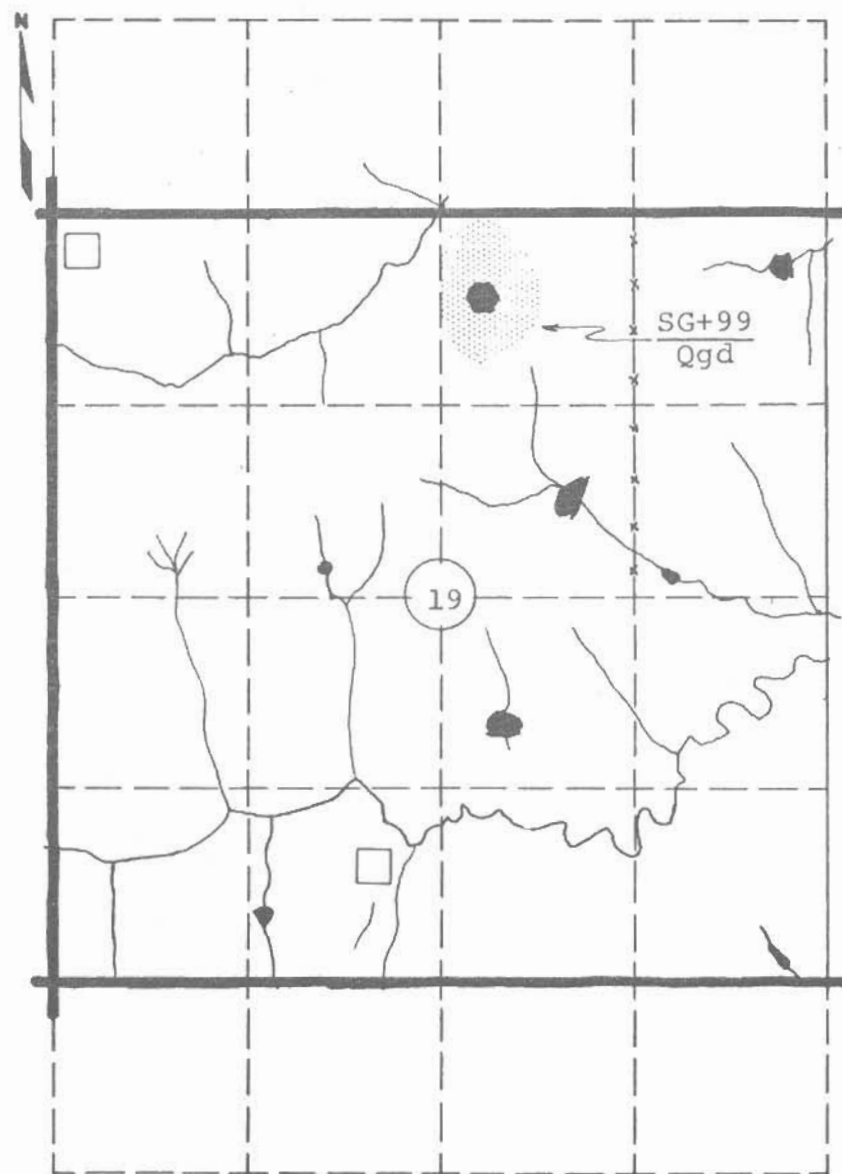
Site No. SG+99
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NW $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 19 Twp. 3S Range 14E
 Owner Carl E. Baumgartner & Keith Hailey, Goff, Kansas
 name address
 Nature of Deposit Dry Accessibility Good Site Located on Plate IV
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site reported in the Geological Survey
Bull. No. 1060D.



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+100
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location NE $\frac{1}{4}$ Sec. 29 Twp. 4S Range 12E
 Owner Alva M. Mead Centralia, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate V
 Status of Site Prospective site; not sampled

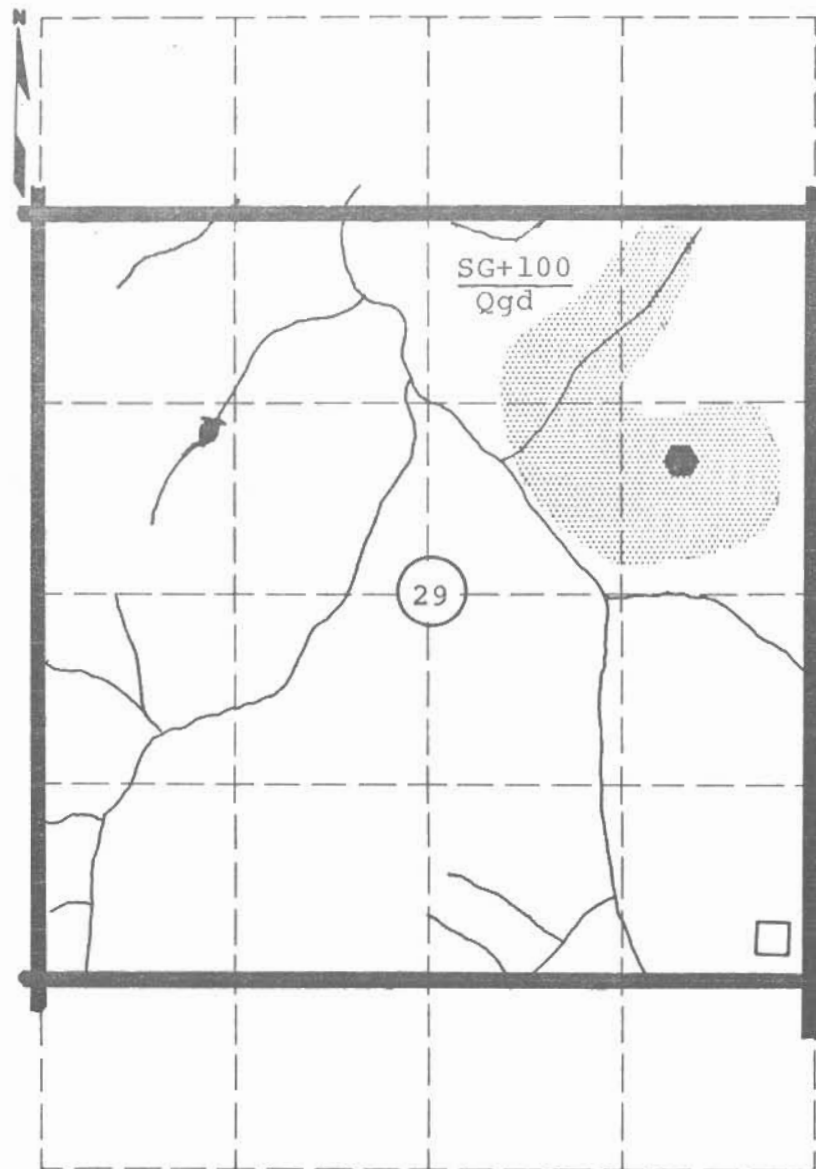
EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | | Wash 200 | G.F. | L.L. | P.I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|--|----------|------|------|------|
| | | | | 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | | |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____

 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks _____



Scale: 1" = 1/4 Mile

MATERIAL SURVEY REPORT

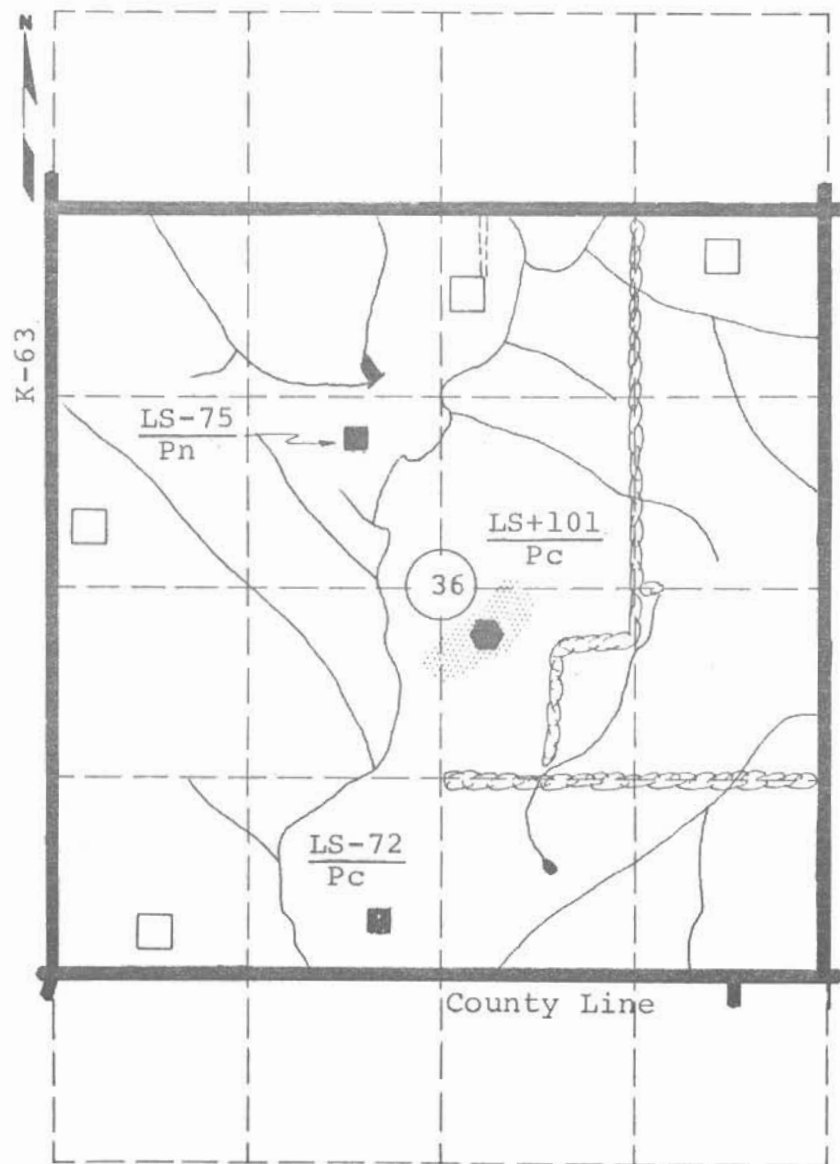
Site No. LS+101
Pc Date April, 1968
 Material Limestone County Nemaha
 Location NW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 36 Twp. 5S Range 12E
 Owner Thelma Eisenbarth Soldier, Kansas
name address
 Nature of Deposit Dry Accessibility Poor Site Located on Plate V
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | | Wash 200 | G. F. | L. L. | P. I. |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|-----|----------|-------|-------|-------|
| | | | | 1 1/2 | 3/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | 100 | | | | |
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CORRELATION DATA

Geological Age Permian
 Geological Source Cottonwood Limestone Member
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Mt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site was reported in Geological Survey
Bull. No. 1060D.



Scale: 1" = $\frac{1}{4}$ Mile

STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

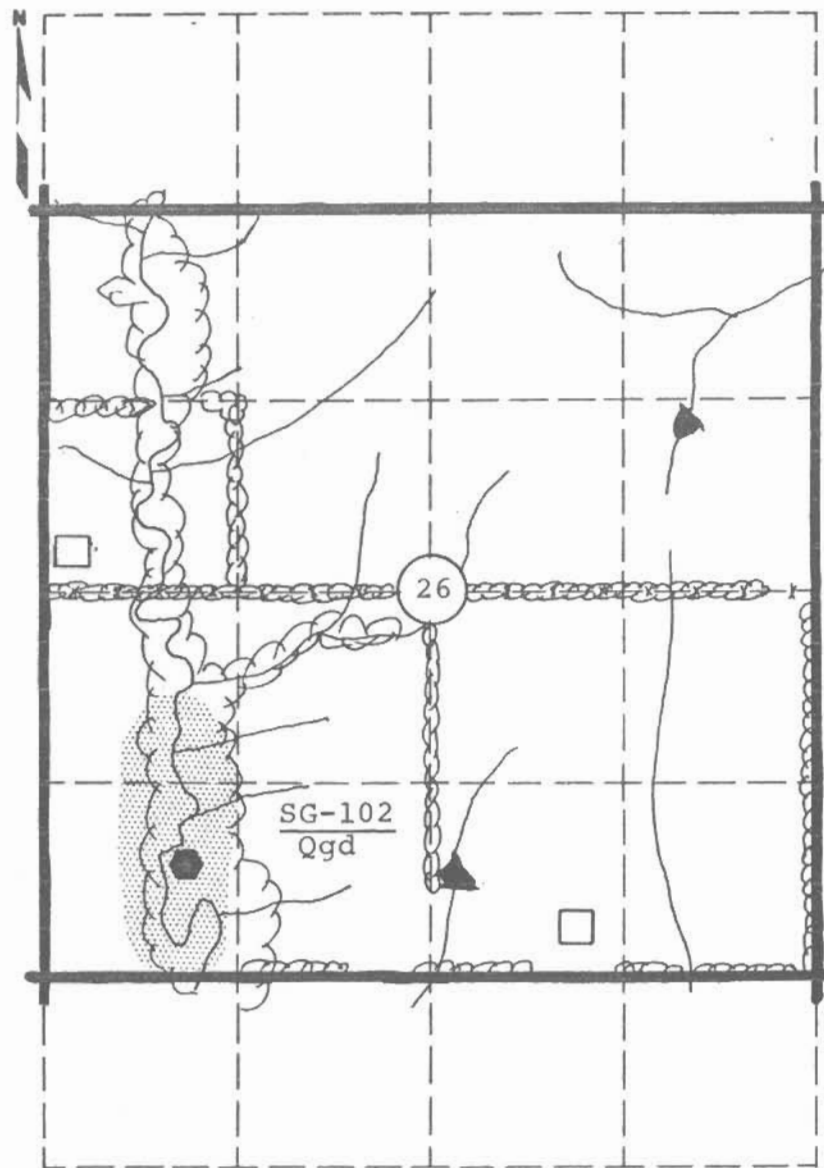
Site No. SG-102
Qgd Date April, 1968
 Material Sand and Gravel County Nemaha
 Location SW $\frac{1}{4}$ Sec. 26 Twp. 4S Range 14E
 Owner Freddie J. Shumaker Wetmore, Kansas
 name address
 Nature of Deposit Dry Accessibility Fair Site Located on Plate VI
 Status of Site Prospective site; not sampled

EXPLORATION DATA

| Test Hole | Material at Bottom of Hole | Depth of over-Burden | Depth of Material | Percent Retained | | | | | | | | Wash 200 | G. F. | L. L. | P. I. | |
|-----------|----------------------------|----------------------|-------------------|------------------|-----|-----|---|---|----|----|----|----------|-------|-------|-------|-----|
| | | | | 1 1/2 | 2/4 | 3/8 | 4 | 8 | 16 | 30 | 50 | | | | | 100 |
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CORRELATION DATA

Geological Age Quaternary
 Geological Source Glacial Drift
 Material Similar To _____
 Specific Gravity (Sat.) _____ (Dry) _____
 Los Angeles Wear _____
 Absorption _____ Soundness _____
 Wt. Cu.Ft. _____ Str. Ratio _____
 Remarks This site is reported in the Geological
Survey Bull. No. 1060D.



Scale: 1" = 1/4 Mile

GLOSSARY OF SIGNIFICANT TERMS

- A.A.S.H.O.: American Association of State Highway Officials.
- Absorption: Determined by tests performed in accordance with A.A.S.H.O. designation T 85.
- Aggrade: To raise the grade or level of a river valley or stream bed by depositing particles of clay, silt, sand, and gravel.
- Alluvium: A deposit of clay, silt, sand, or gravel laid down by flowing water.
- Anticline: A fold that is convexed upward.
- Arkosic gravel: Gravel composed of mineral fragments derived from weathered granite.
- Caliche: Term used in this report for secondary accumulations of calcium carbonate in unconsolidated deposits.
- Chert: A dull, flint-like, siliceous rock.
- Chonetes*: Small fossil brachipods with shallow concave-convex shell and short pointed spines.
- Consolidated deposit: Deposit of limestone, shale, or sandstone. In Kansas, this term generally applies to rock older than Pliocene age.
- Crinoid columns: An ancient group of sea-lily type animals belonging to phylum Echinodermata.
- Drift: A general term for all rock debris which has been transported by glaciers and is deposited either directly by the ice or from the accompanying meltwater.
- Degrade: To lower the level of a stream valley by washing away particles of material.
- Formation: A layer of persistent strata of one general kind of rock.
- Fusulinid: A small marine fossil, about the shape and size of a grain of wheat, belonging to the foraminifera.
- Geologic period: A unit of geologic time, smaller than an era and larger than an epoch.
- Geologic unit: This term is used in this report to denote: 1. a geologic formation, 2. a geologic member, and 3. an unconsolidated deposit of Pleistocene age.

Glacial deposit: Deposits of clay, silt, sand, gravel, and boulders laid down by glaciers or glacial meltwater.

Gradation factor: The value obtained by adding the percentages of material retained on the 1 1/2", 3/4", 3/8", 4, 8, 16, 30, 50, and 100 sieves respectively and dividing the sum by 100.

Igneous rocks: Rocks produced under conditions involving great heat such as rocks crystallized from a molten material.

Light type surfacing: A surface course constructed from aggregate which is not bound by water, cement, or bituminous material.

Liquid limit: Determined by tests performed in accordance with section Y1-18 of the State Highway Commission of Kansas Standard Specifications, 1966 edition.

Loess: A wind-lain deposit of clay-bound silt.

Los Angeles wear: Determined by tests performed in accordance with A.A.S.H.O. designation T 96 as modified by section Y1-14 of the State Highway Commission of Kansas Standard Specifications, 1966 edition.

Material source bed: A particular geologic unit, consolidated or unconsolidated, that provides material for construction purposes.

Matrix: Sometimes termed the groundmass. The material which forms the binder for the coarse constituents of a consolidated rock or an unconsolidated deposit.

Member: A division of a formation, generally of distinct lithologic character or of any local extent.

Metamorphic rock: Rock which has been crystallized or otherwise altered by intense heat and pressure.

Open materials site: A pit or quarry which has produced or is producing material suitable for some phase of road construction.

Plastic index: Determined by tests performed in accordance with section Y1-18 of the State Highway Commission of Kansas Standard Specifications, 1966 edition.

Pleistocene Series: Deposits laid down during the Quaternary Period.

Prospective materials site: A geographical location where the geologic conditions are favorable for the discovery of construction material.

Soundness: Determined by tests performed in accordance with section Y1-15 of the State Highway Commission of Kansas Standard Specifications, 1966 edition.

Specific gravity: Determined by tests performed in accordance with A.A.S.H.O. designation T 84 for sand and gravel and T 85 for crushed stone.

Terrace: A plain built up by the deposition of sediments by water.

Unconsolidated deposits: Deposits of clay, silt, sand, or gravel. These deposits may be laid down by wind or water action.

Varigated shale: Variable coloring of red, green, and gray.

Wash: (Material passing the No. 200 sieve) Determined by tests performed in accordance with A.A.S.H.O. designation T 11.

Weight per cubic foot: Determined by tests performed in accordance with A.A.S.H.O. designation T 19-45.

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