



MATERIALS INVENTORY

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

MATERIALS INVENTORY OF NEMAHA COUNTY, KANSAS

by

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Prepared in Cooperation with the U. S. Department of Transportation Federal Highway Administration Bureau of Public Roads

1970

Materials Inventory Report No. 19

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.

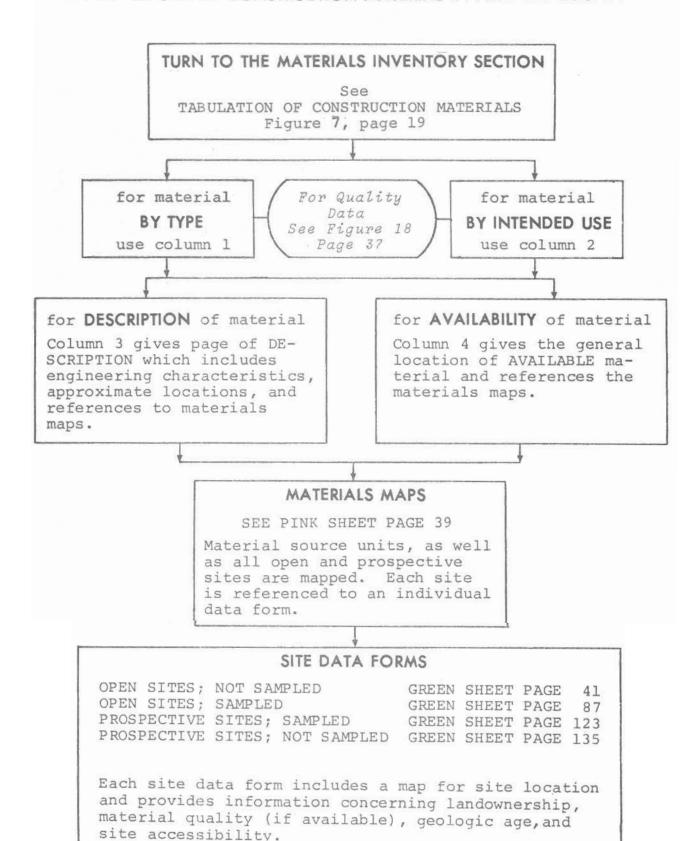
Prospective sites are areas where geologic conditions are best for finding construction material.

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.

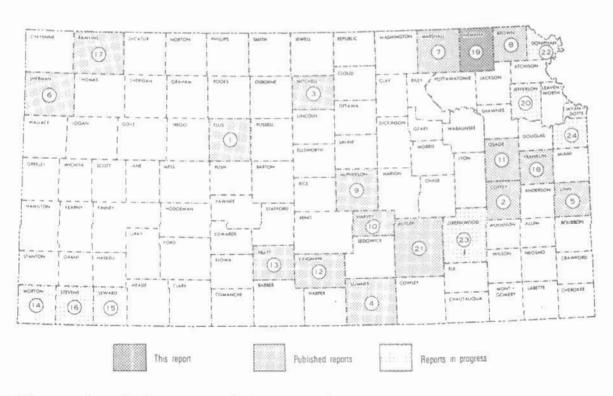


Figure 1. Index map of Kansas showing the location of Nemaha County along with the report number and location of other counties for which reports have been or are being completed.

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 T15 Bern St. Benedict Sabetha Oneida. Baileyville Seneca 💣 Weyer Creek Centralia GofT Corning Wetmore T 5 S шш ШШ ШШ R 11 R 13

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-

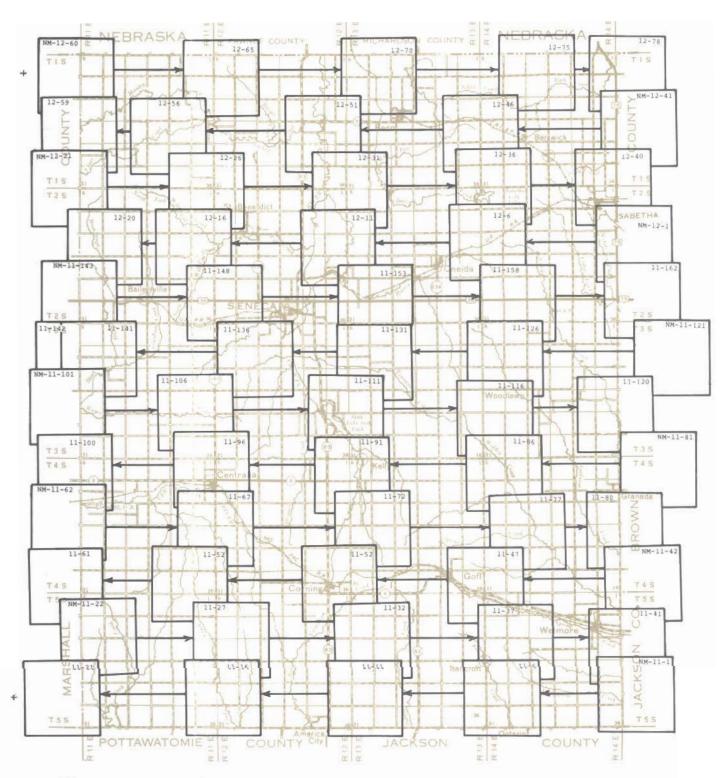
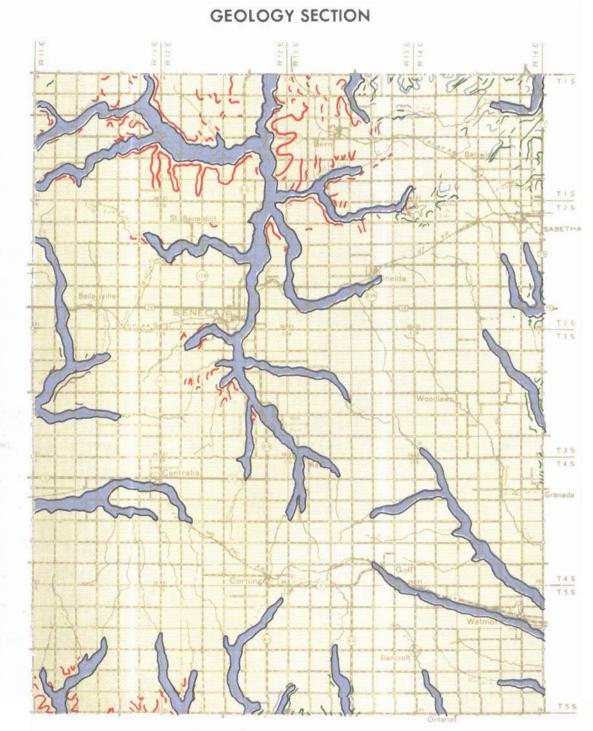


Figure 3. Aerial photographic coverage map for Nemaha County. The numbers indicate photograph numbers on flights taken by the Photogrammetry Section, State Highway Commission of Kansas, March 31 and June 9, 1964 at a scale of 1:24,000. Aerial photographs are on file in the Photogrammetry Laboratory,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



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; bento- nite; diatomaceous marl; opaline sand- stone.	Sand and gravel; volcanic ash; diatomaceous marl; water.		
MESOZOIC	CRETACEOUS	70,000,000	Chalky shale, dark shale, vari-colored clay, sandstone, con-glomerate; outcropping igneous rock.	Concrete and bituminous aggregate, light type surfacing, shoulder and subgrade material, riprap, and building stone; ceramic materials; water.		
	JURASSIC	25,000,000	Sandstone and shale, chiefly subsurface.			
	TRIASSIC	30,000,000	chiefly subsulface.			
	PERMIAN EST	25,000,000	Limestone, shale, evap- orites (salt, gypsum, anhydrite), red sand- stone and siltstone, chert, and some dolo- mite.	gregate, light type sur- facing, shoulder and sub- grade material, riprap, and		
010	PENNSYLVANIAN	25,000,000	Alternating marine and non-marine shale; lime-stone, sandstone, coal, and chert.	Concrete and bituminous aggregate, light type surfacing, shoulder and subgrade material, riprapand limestone and shale for cement; ceramic materials; oil, coal, gas, and water.		
PALEOZO	MISSISSIPPIAN	30,000,000	Mostly limestone, pre- dominantly cherty.	Chat and other construction materials; oil, zinc, lead, and gas.		
	DEVONIAN	55,000,000	Subsurface only. Lime- stone and black shale.	011.		
-	SILURIAN	40,000,000	Subsurface only. Lime- stone.	011.		
	ORDOVICIAN 80,000,000		Subsurface only. Lime- stone, dolomite, sand- stone, and shale.	Oil, gas, and water.		
	CAMBRIAN T	80,000,000	Subsurface only. Dolo- mite and sandstone.	011.		
CAMBRIAN	(Including PROTEROZOIC and ARCHEOZOIC ERAS)	1,600,000,000	Subsurface only. Gran- ite. other igneous rocks, and metamorphic rocks.	Oil and gas.		

Figure 4. Geologic timetable.

000000	Serres	Stage	Group,	Formation	Member	Thick- ness	Graphic Legend		Description	Material Usage		
T	inoisan	Wisconsinan		Alluvium and Terrace Deposits		0- 65'±			Gray-brown clay, silt, sand, and gravel. The coarser material is generally found in the lower part.	Road surfacing ma- terial, base course aggregate, mineral filler.		
		M 1 s	1	Loess		0-	1111111		Tan-brown, clayey silt, with zones and nodules of caliche. May have buried soil zones.	None		
Fan	otene	1				A		may have buried soil zones.				
Quaternary Pleistocene Illinoisan Sangamonian	Sanga					0		Brown and tan-brown clay, silt,	Concrete and bi- tuminous aggregate,			
			Glacial Drift		0- 300'±	120		sand, gravel, cobbles, and boulders. Much of this material lacks sorting. (e.g. Boulders	road surfacing ma- terial, base course			
	1	raskan		DELLE		300-1	100		may be found in silt and clay).	aggregate, mineral filler.		
Nebrask Kansan	Kans											
+	+		+		Schroyer Limestone	10.0	10.101		The Threemile and Schroyer Limestone Members are com-			
			Chase	Wreford Limestone	Havensville Shale	17.0			posed of light gray, cherty limestone. When weathered, the material may be chert			
			D		Threemile Limestone	8.0	0000		rubble. The Havensville Shale Member is a tan-	Limited use as road surfacing material.		
				Speiser Shale		17.0	471717	1	gray calcareous shale, but may locally change to a limestone ("Havensville			
			-	Funston Limestone		6.0	11111	/	Reef").			
				Blue Rapids Shale		20.0	44744					
				Crouse Limestone		11.0	L'L'L'L'L					
				Easly Creek Shale		16.0	1111		1			
					Middleburg Limestone Hooser Shale	11.0	PICFIFF					
				Bader Limestone	Eiss Limestone	10.0	111-					
				Stearns Shale		16.0	HH					
				Beattie Limestone	Morrill Limestone Plorena Shale	3.0						
			1		Cottonwood Limestone	5.0	277774	\	Gray to tan-gray soft porous limestone with scattered chert nodules. Generally con-	Road surfacing and shoulder material, base course aggre-		
				Eskridge Shale		37.0	17177	/	tains abundant fusulinids (fossils that look like grains of wheat).	gate, riprap, structural stone.		
	an		900				1111					
midn	Permi	Gearyan	1 Grove		Neva Limestone Salem Point Shale	11.0		1	Light gray, medium-hard to soft limestone with thin shale partings. A massive porous	Road surfacing and shoulder material, base course aggre-		
reimian	Lower Permian	Gea	Council	Grenola Limestone	Burr Limestone Legion Shale Sallyards Limestone	2.0		1	zone is often found which lowers the quality.	gate.		
1	ă		0	Roca Shale	odilyards Limestone	15.0	117527					
				Red Eagle Limestone	Howe Limestone Bennett Shale	3.0 7.0	7-1-1-1					
					Glenrock Limestone	1.2						
				Johnson Shale	Long Creek Limestone	7.0						
								,				
				Poraker Limestone	Hughes Creek Shale	32.0						
			Н		Americus Limestone	2.6	1- 1- 1	,				
					Hamlin Shale	42.0	777777					
							7+7+7+7 7+7+7+7		1,			
				Janesville Shale	Five Point Limestone	1.5		}				
			Admire		West Branch Shale	30.0	212		,			
			A	Falls City Limestone		8.0	7.F					
				rails city bimseone	Hawxby Shale	10.0	1,41,47					
				Onage Shale	Aspinwall Limestone Towle Shale	20.0	7.7.7.7.7					
+	+				Brownville Limestone	2.3	1 + 1 + 1 + 1	}				
					Pony Creek Shale Grayhorse Limestone	7.0	THIFF					
				Woodsiding	Plumb Shale	13.0						
					Nebraska City Limestone							
				Root Shale	Prench Creek Shale Jim Creek Limestone	0.6						
							Priedrich Shale	25.0±	7.77			
					Grandhaven Limestone	2.0	1 1 1)				
				Stotler Limestone	Dry Shale Dover Limestone	14.0						
					Pillsbury Shale		25.0					
					Maple Hill Limestone	1.0	17777					
				Zeandale Limestone	Wamego Shale Tarkio Limestone	18.0	11777	,		Road surfacing and		
	an		9		January Manager Control	210		1	Tan-brown to brown, massive limestone containing large fusulinids (fossils that look	shoulder material, Limited use as con- crete and bituminous		
nian	lvani	r.		9	9	e	Willard Shale		35.0		1	like grains of wheat).
nnsylvanian	Pennsylvanian	rgilian	abaunsee						The lower member (Reading Lime- stone) is a gray-brown dense limestone which weathers into	Road surfacion		
5	6 4 5	Wab	Emporia Limestone	Elmont Limestone Harveyville Shale	3.0		3	four aggregate beds. Gen- erally contains large Crinoid columnals. The Harveyville	Road surfacing and shoulder material, limited use as bitum-			
				Reading Limestone	15-30	cI	1	Shale is a gray-green calcar- eous shale which varies in thickness. The Elmont Lime-	inous and concrete aggregate, base course aggregate,			
			Auburn Shale	Wakarusa Limestone	2.5	- 2B	1	stone may be one bed or several beds with thin shale partings. When the Harveyville Shale is	(Reading only).			
				Bern Limestone	Soldier Creek Shale	8.0		11	thin, the Reading and Elmont Limestone Members can be quarried together.			
					Burlingame Limestone	9.0	2777	1	dantina coloniari	Possibly concrete and bituminous aggregate,		
					Silver Lake Shale	12-27	45.7	1	Tan-brown soft to medium-hard limestone which may be one,	road surfacing and shoulder material, base course aggregate,		
				Scranton Shale	Rulo Limestone	1.3	i i T	1	two, or three beds.	(limited exposure area and heavy over-		
					White Cloud and Cedar Vale Shales, Undiffer-	105.0	B	1		burden limits use).		
					Vale Shales, Undiffer- entiated	1.03.0	CXD CXD					
				Howard Limestone	Utopia Limestone Church Limestone	0-1,6			Blue-gray, hard, dense,	Concrete and bitum-		
				noward Limestone	Aarde Shale	4.5		1	fossiliferous limestone. Has a more limited exposure area than any of the other material pro-	inous aggregate. Road surfacing and shoulder material, base course		
				Severy Shale		22.0				aggregate.		
			Shawnee		Coal Creek Limestone	2.8						
- 1			1.8	Topeka Limestone	Holt Shale	3.7						

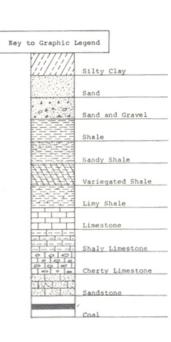


Figure 5. Generalized geologic column of the surface geology in Nemaha County.

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, Illinoisan, 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.

		Division	s of the Quaternary Period	
Period	Epoch	Age	Estimated length of age duration in years	Estimated time in years
		Recent		10,000
		Wisconsinan Glacial	45,000	55,000
		Sangamonian Interglacial	135,000	190,000
, >	e C	Illinoisan Glacial	100,000	290,000
Quaternary	e i s t o c e	Yarmouthian Interglacial	310,000	600,000
0	9.	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 Wisconsinan 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 Wisconsinan 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	AYAILABILITY
<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 of the flanks of the major drainage. Outcrop shown on plates I, II, II 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 ma- terial.	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. Outcro shown on plate II.
Sand and Gravel Glacial Drift	Bituminous aggregate. Base course material. Shoulder material. Light type surfacing material.	32	Blankets most of the county but i 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.
Boulders 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.
Silt Glacial Drift	Mineral Filler.	34	Prominent in a buried valley (Atchison Formation) found along the southern boundary of Nemaha County. Glacial Drift is shown or plates I through VI.
Loess	Not a source of aggregate or mineral filler. It is a source of subgrade,em- bankment, 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 lime-stone exposed only along the Nemaha Anticline in extreme northern Nemaha County. In sections 1, 12, 24, and 25, TlS, Rl2E, 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 riprap. Quality test results on samples of the Church show that the Los Angeles wear ranged from 23.7 to 35.3 percent, the soundness

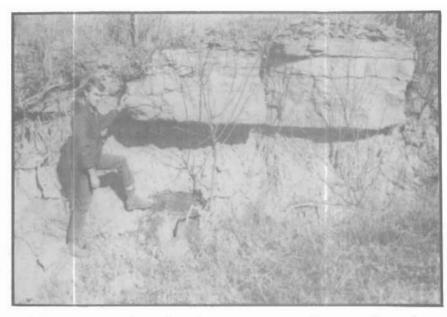


Figure 8. Church Limestone Member and underlying Aarde Shale with Nodaway Coal zone, SW's sec. 1, T1S, R12E. Mans toe by Nodaway Coal.

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 SE½ 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).

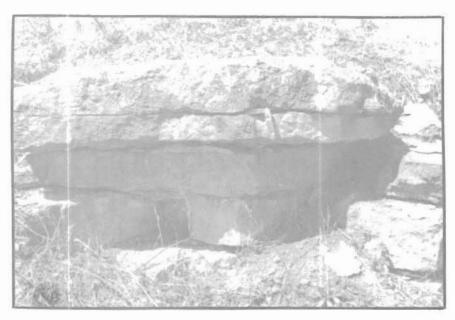


Figure 9. Typical bedding of the Reading Limestone Member, SW% sec. 29, T1S, R12E.

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

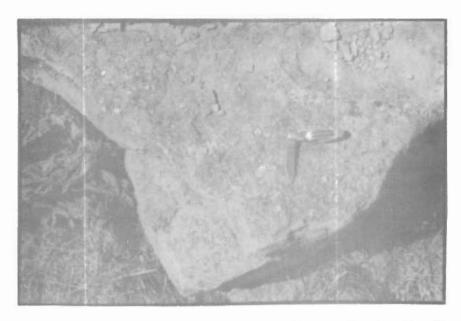


Figure 10. Large crinoid columns typical of the Reading Limestone Member, SW' sec. 29, T15, R12E.

beds in one operation (e.g. SW\ sec.29, TIS, 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' sec. 29, T15, 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% sec.18, T15, 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 overlie 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 southcentral 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

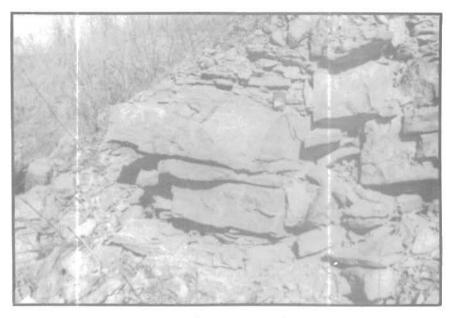


Figure 13. Neva Limestone in a quarry face, SW4 sec. 36, T5S, R11E.

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

(N½ 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).

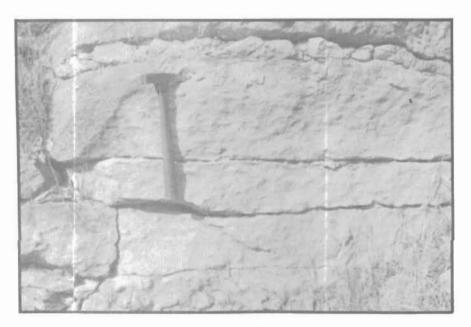


Figure 14. Cottonwood Limestone in a quarry face, SW4 sec. 36, T5S, R12E.

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% sec.14, TlS, Rl4W, 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 (SW4 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. 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.

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% 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% sec.11, TIS, 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% sec. 27, Tls, 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.

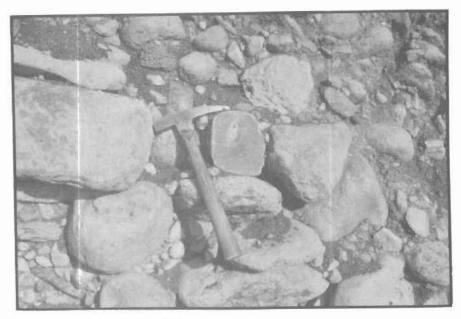


Figure 16. Boulder pit in Glacial Drift, NE% Sec. 27, TIS, R12E.

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), SW4 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.

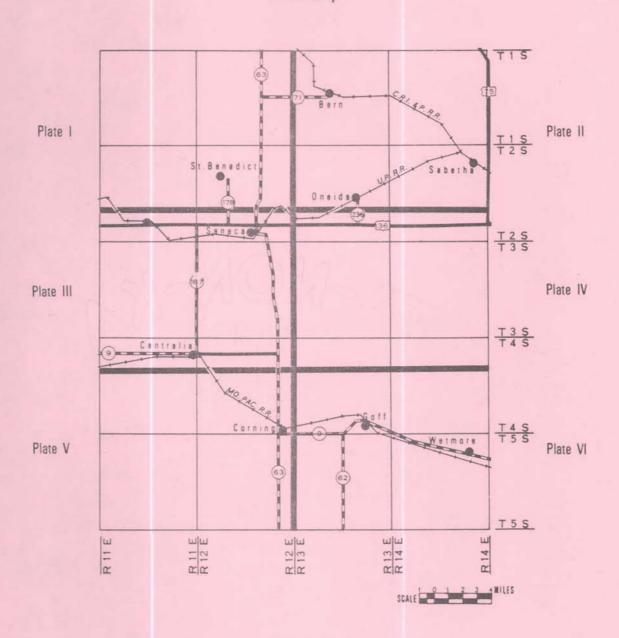
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LS-51	Limestone	1				- 1										2,43	2.32		35.0(A)		4.85	SHC form 645, Lab. No. 65429
LS-52	Limestone	1				- 1										2,45	2.33		32.4(A)	0.87	5.20	SHC form 645, Lab. No. 65430
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																2.53	2.42		35.7(8)	0.89	4.42	SHC form 619 No. 66-21
LS+50	Limestone															2.56	2.46		35.8(B)		3.95	SHC form 633, Lab. No. 67-1529
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LS+80	Limestone						- 1									2.51	2.43		34.2(A)		3.58	SHC form 645, Lab. No. 64452
LS-72	Limestone						- 1						1			2.47	2.36		46,5(A)		4.64	SHC form 645, Lab. No. 63652
LS+67	Limestone															2.43	2.32		39.7(B)		4.81	SHC form 645, Lab. No. 96177
LS-57	Limestone															2.40	2.24		45.4(B)		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
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SG+53	Sand & Gravel		7			-		- 1					1000			2.62		122.7	23.8(C)		0.5	SHC form 619 No. 66-20
5G-59	Sand & Gravel					27	40	51	70	8.2	90	8.0	3.85			2.53		91.2	29.0(D)	100000000000000000000000000000000000000		SHC form 619 No. 66-23
5G+60	Sand & Gravel		10				27	40	56	78	85	14.0	3,30			2.59		108.5	25.3(D)		1.5	SHC form 633, Lab. No. 99194
SG+61	Sand & Gravel		3			23	35	5.0	70	B 5	90	8.5	3.68			2.60	2,58	113.41	29.7(C		0.91	SHC form 633, Lab. No. 65-2031
SG-62	Sand & Gravel		6			23	30	43	61	82	92	2.B	3,51			2.62	2,30	124.8	37.6(B)			SHC form 633, Lab. No. 63991
G+63	Sand & Gravel		9				52	64	73	84	89	9.0	4,36			2.02	5555	124.0	37.0(0,	0.72		No. Mal in Geo. Survey Bull. 106
G+64	Sand & Gravel		1			5	-	15	-	-	B5	13.0					2,56	93.0			~~~~	No. Ca3 in Geo. Survey Bull. 106
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G+66	Sand & Gravel		1			10	16	26	56	77	92	6.0	2,88			(115,832,014				2222		SHC form 619 No. 66-26
G+68	Sand & Gravel		-			1	2	5	26	65	91	5.0	1.90									Av. SHC form 619 No. 66-15
G-69	Sand & Gravel		1.7			1	3	12	43	79	89	9.0	2.40									Av. SHC form 619 No. 66-16
G-70	Sand & Gravel		-			4	9	19	44	72	85	13.0	2.35			12 PM 200 C		90.7				SHC form 633 Lab. No. 66437
SG-71	Sand & Gravel		1			3	6	12	31	76	91	5.6	2.20	155	14.	2.58		30.7				SHC form 619 No. 66-28
51+73	Silt	-	185	2 1 2			- T	1.5	-	- 6	1	49.0		22	1	- 66		110,19	24.4(D)		2.77	SHC form 619 No. 66-33
G+74	Sand & Gravel		-				-	. 7			-		2 70			2.56		99.34	29.4(C		2.0	SHC form 619 No. 66-29
G+76	Sand & Gravel		-			13	32	60	86	9.2	93	6.2	3.79			2.60	5555	108.3	23.5(C		2.0	Av. SHC form 619 No. 66-13
G+77	Sand & Gravel		1	1		3	9	19	43	67	87	10.0	2.30			2.61		93.0	27.0(A		~~~	SHC form 633, Lab. No. 66439
G-81	Sand & Gravel					16	24	34	52	72	89	7.0	3.02			2.56		93.0	27.0(A	0.90	2010	Av. SHC form 619 No. 66-18
G-82	Sand & Gravel		-			1	. 3	5	34	63	90	8.0	2.05	1						5555		Av. SHC form 619 No. 66-14
G+83	Sand & Gravel		-			8	13	20	45	61	84	13.0	2.35		200			83.0				SHC form 623 Lab. No. AA6086
31-84	Silt	-	15			-	-	-	-		-			33	11	7.7 7.595		87.9				SHC form 623 Lab. No. 66440
51+85	Silt	-	-			-	-	-	-	1	6	66.0				2.63		07.3				SHC form 619 No. 66-27
G+86	Sand & Gravel	-	-	(j. 1	1	2	5	21	23	37	66	25.0			3	10000						
ource of	Material: All	uvium	an	d Te	rra	ce l	Depo	sits	- (alt												
Salara Ora		-	13								93	6.3	5.67						36.0	0.89		No. Cgl in Geo. Survey Bull. 106
G-78	Chert Gravel	-	1 3	3 3	- 1 5	u u				Land Co.				1	1	1	1				4	4

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.

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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



SG - Sand & Gravel SI - Silt _ Material Type

LS - Limestone

CG - Chert Gravel

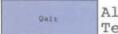
Estimated Quantity

+ indicates more than 20,000 cubic yards - indicates less than 20,000 cubic yards

Reference to the site number on the following data forms.

Geologic Age and Unit.

EXPLANATION OF MAP SYMBOLS



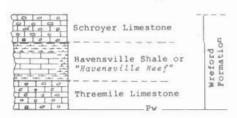
Alluvium and Terrace Deposits

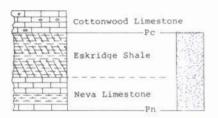


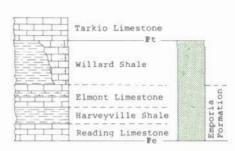
Loess

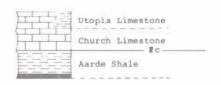
Glacial Drift

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.

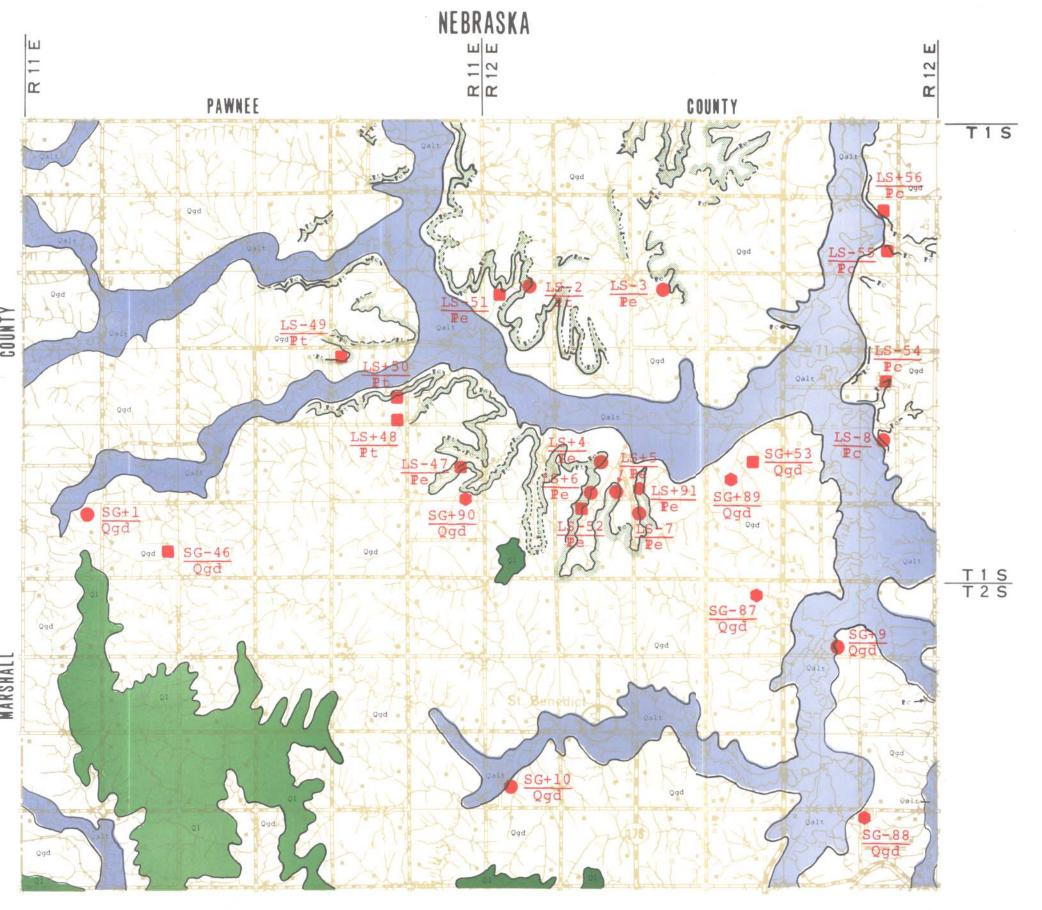


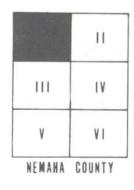






4 Miles

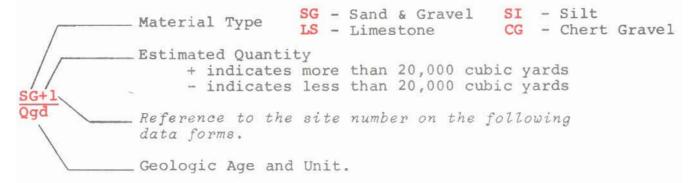




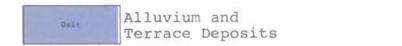
PLATE

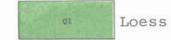
EXPLANATION OF MATERIALS SITE DESIGNATIONS

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



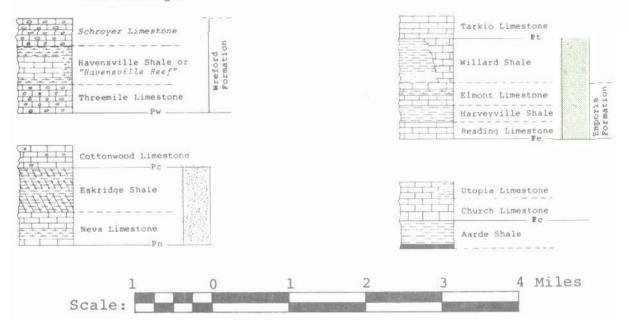
EXPLANATION OF MAP SYMBOLS

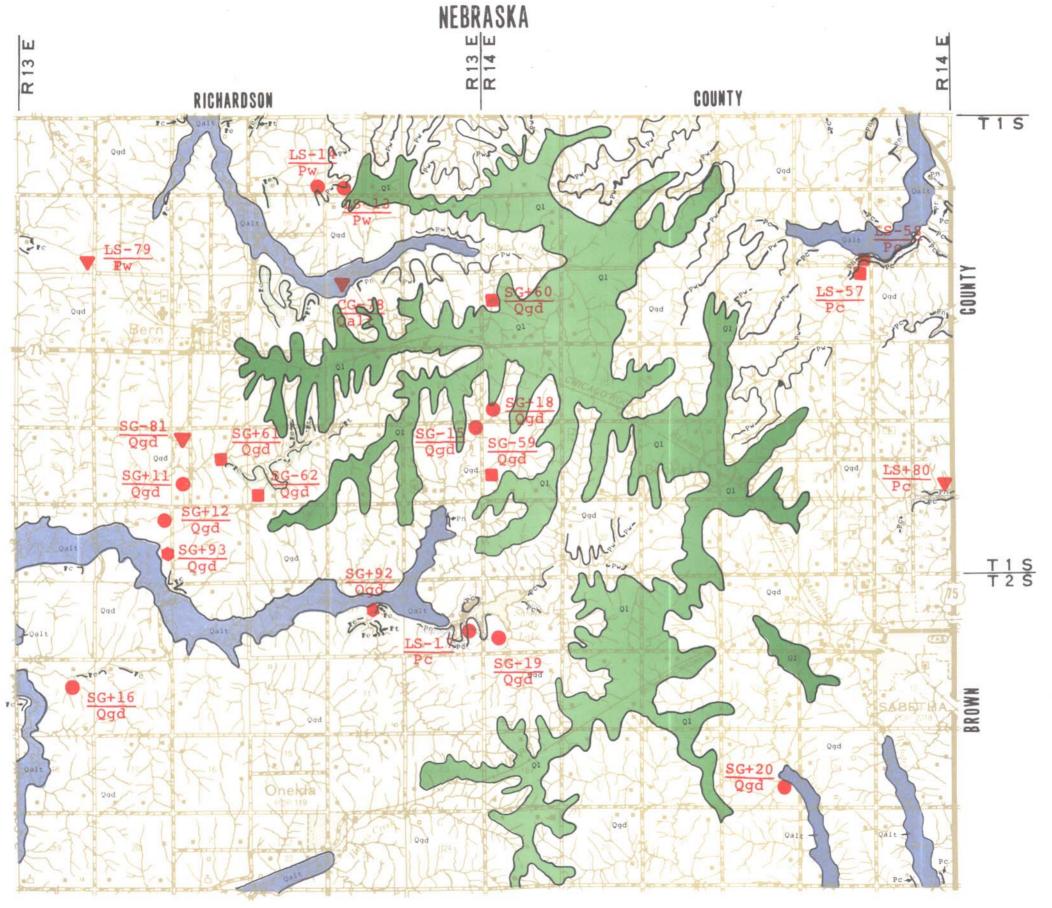




Glacial Drift

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.



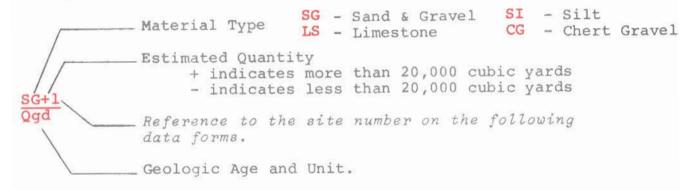


1	
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NEMAHA	COUNTY

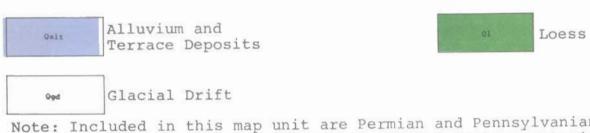
PLATE II

EXPLANATION OF MATERIALS SITE DESIGNATIONS

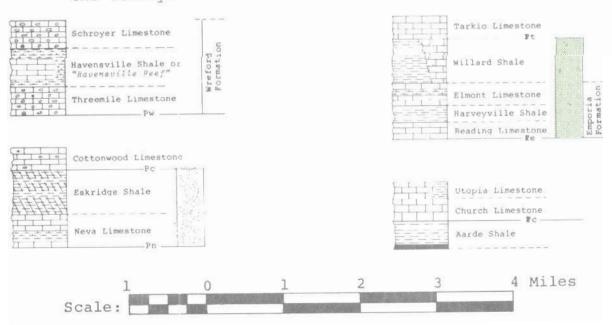
- Open site; not sampled
- Open site; sampled
- Prospective site; sampled
- Prospective site; not sampled

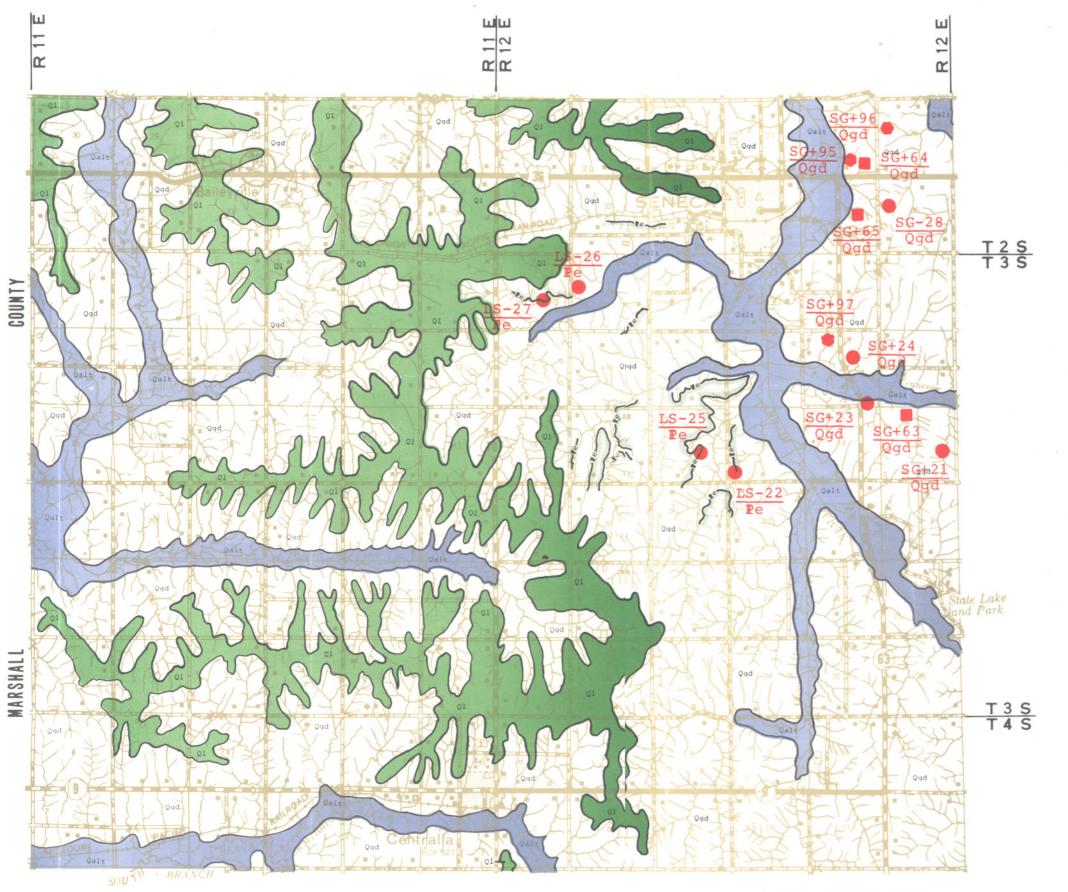


EXPLANATION OF MAP SYMBOLS



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.





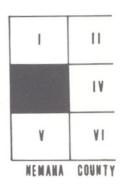
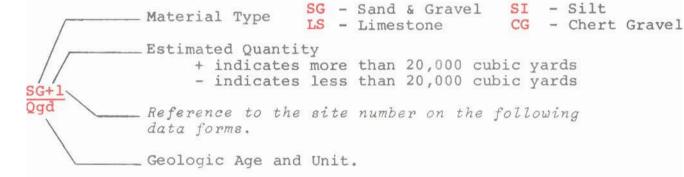


PLATE III

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

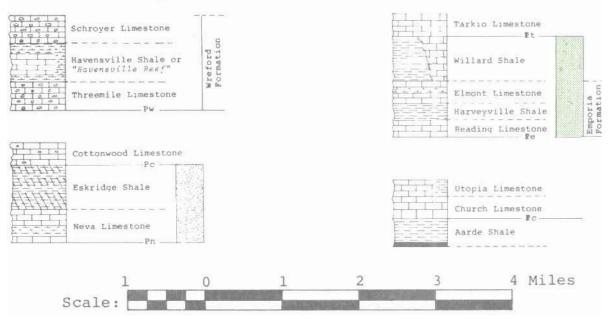


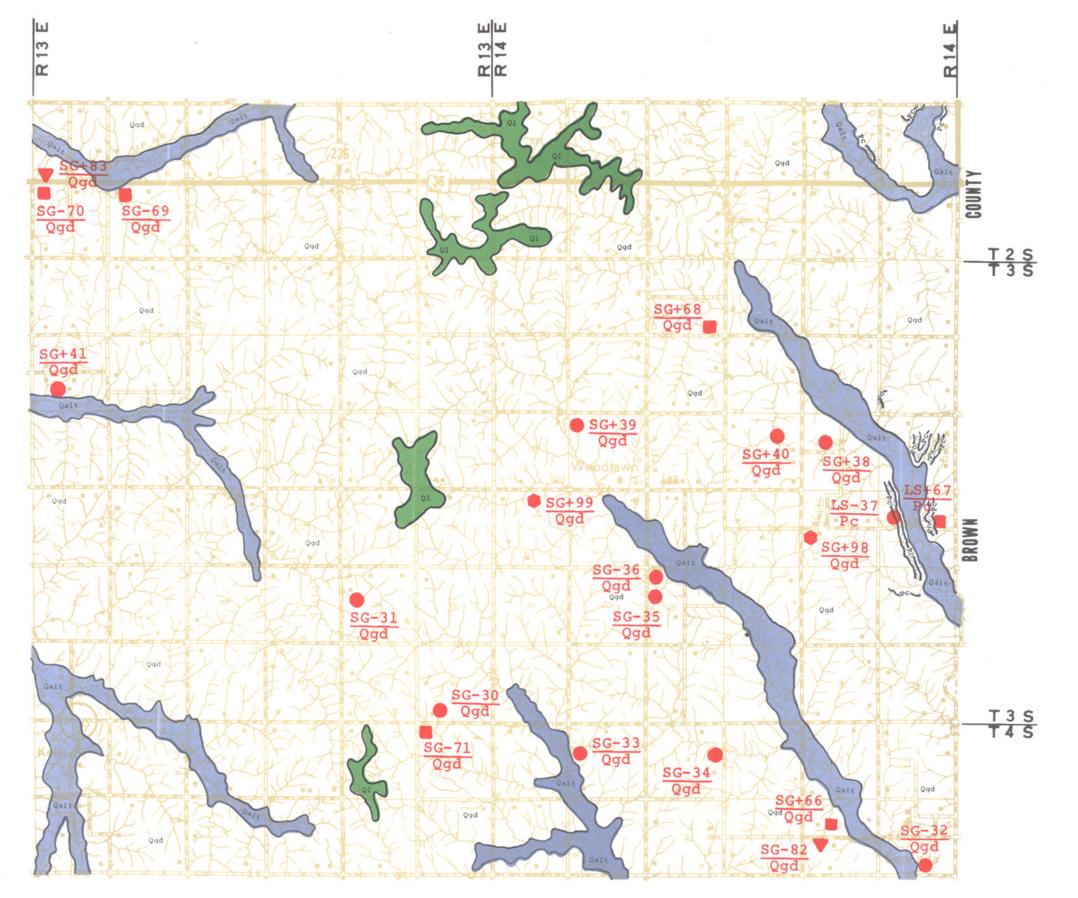
EXPLANATION OF MAP SYMBOLS



Glacial Drift

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.





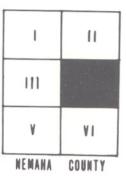
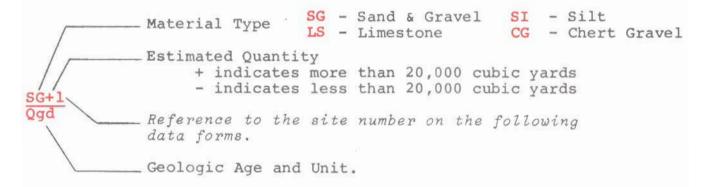


PLATE IV

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

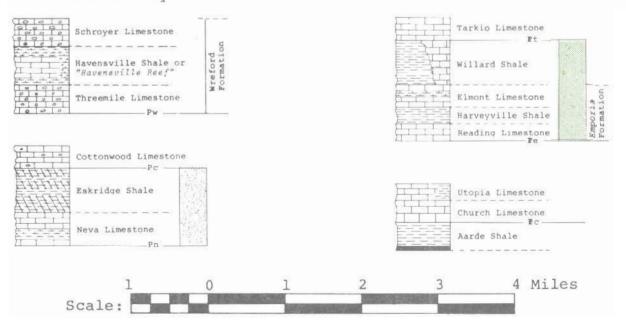


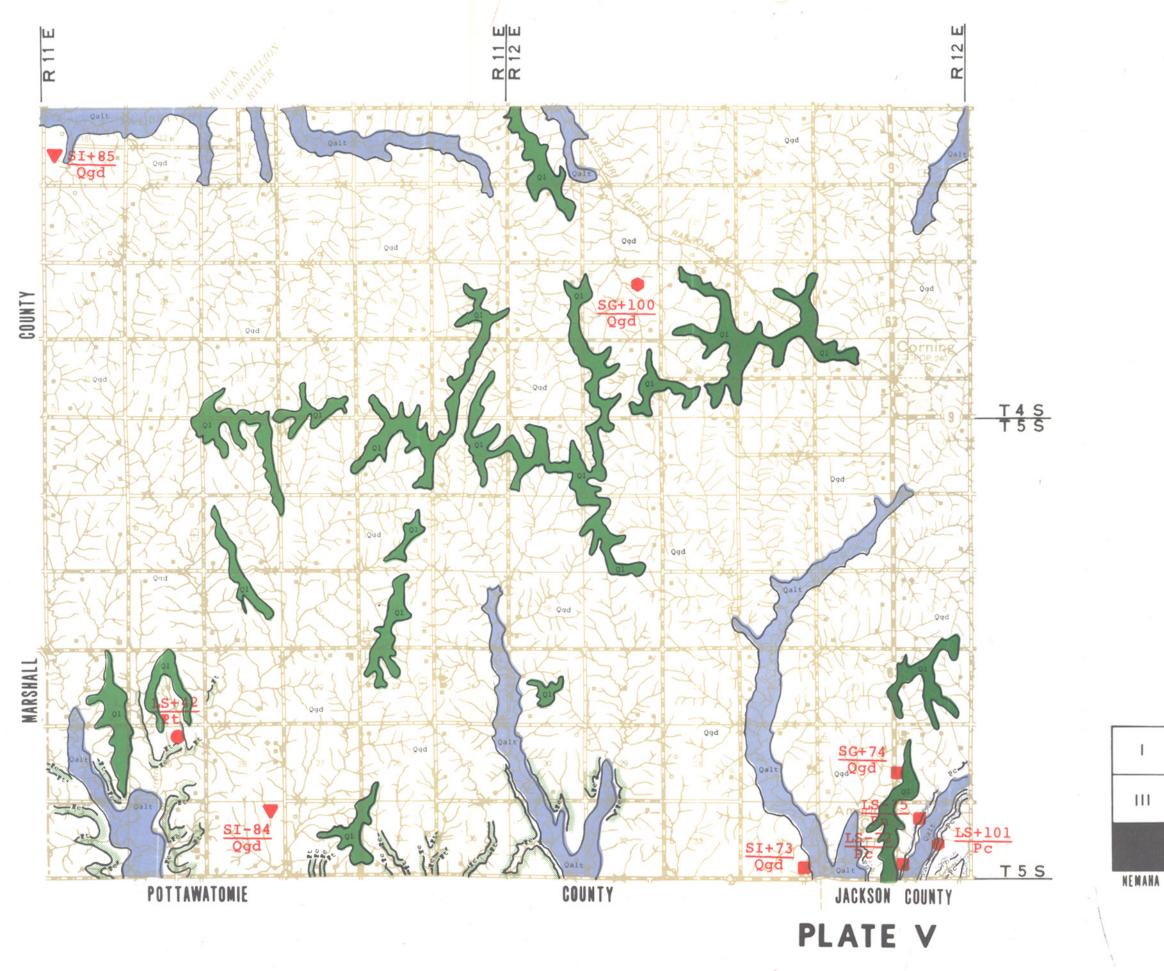
EXPLANATION OF MAP SYMBOLS



Glacial Drift

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.





11

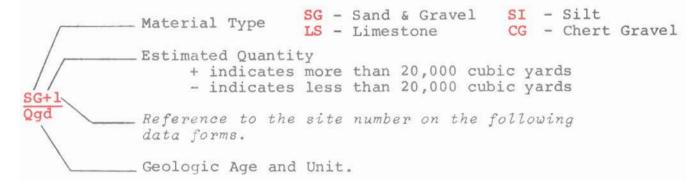
11

VI

COUNTY

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

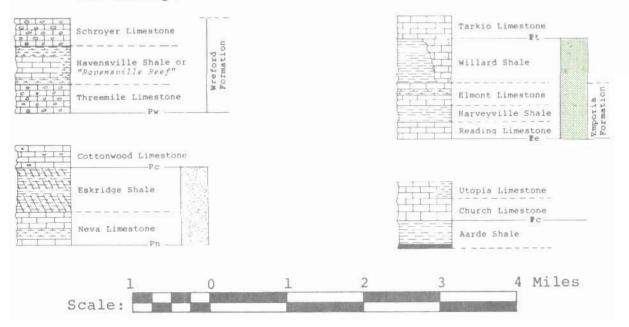


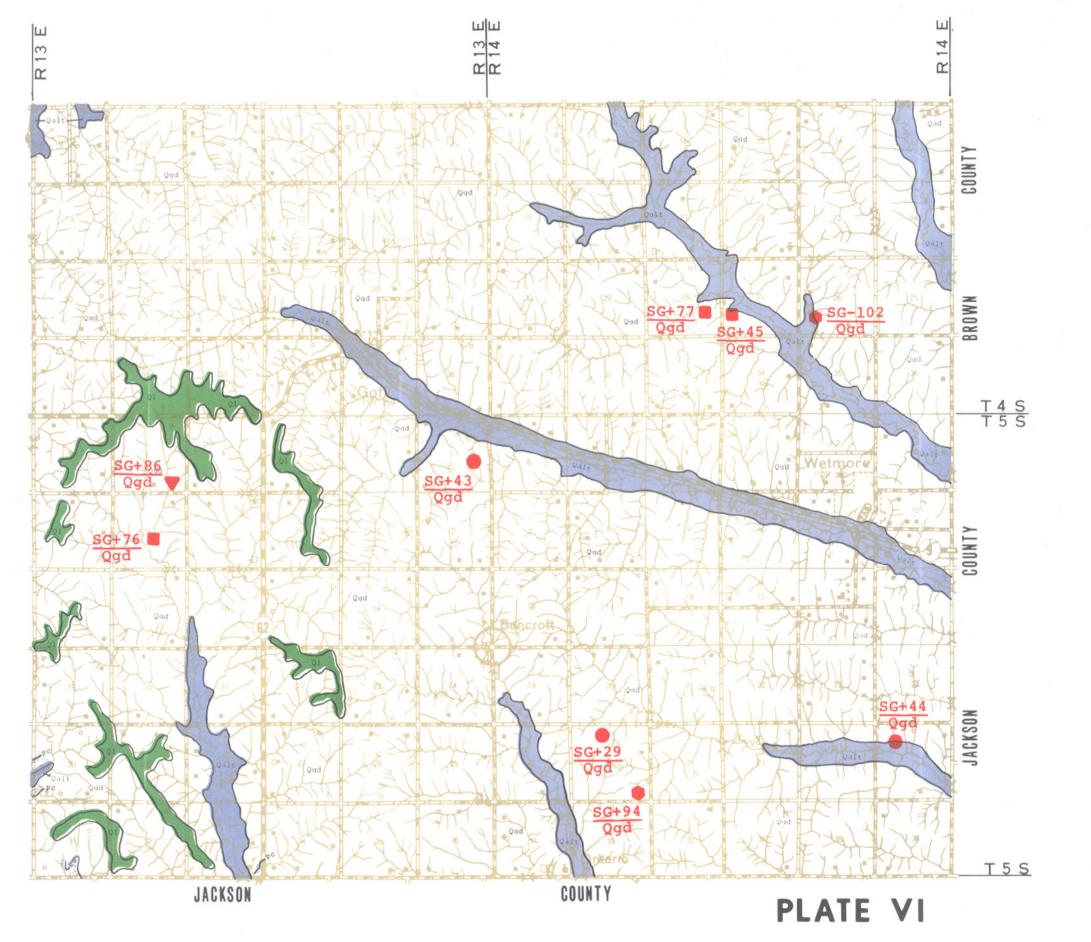
EXPLANATION OF MAP SYMBOLS

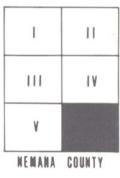


Glacial Drift

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.



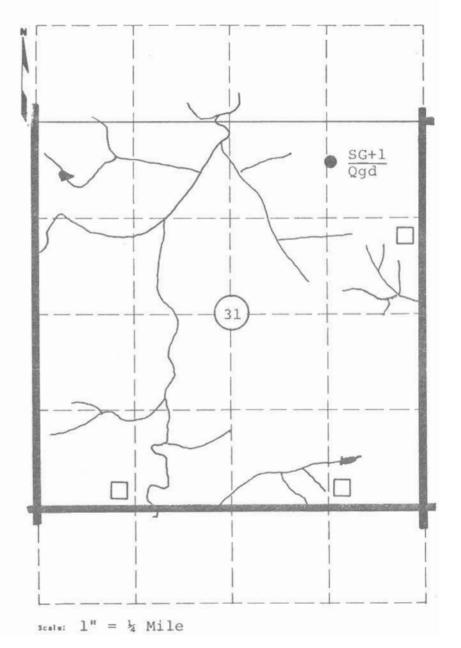




	Trail or lane	•	Open materials site; not sampled
	Road		Center of section
+++++++	Railroad		Dwelling
~~~~	Hedge or trees		
—×——×—	Fence	+	Cemetery
	Major stream	5	School
>>>	Intermittent streams	†	Church
	Pond or lake		Town or city

41

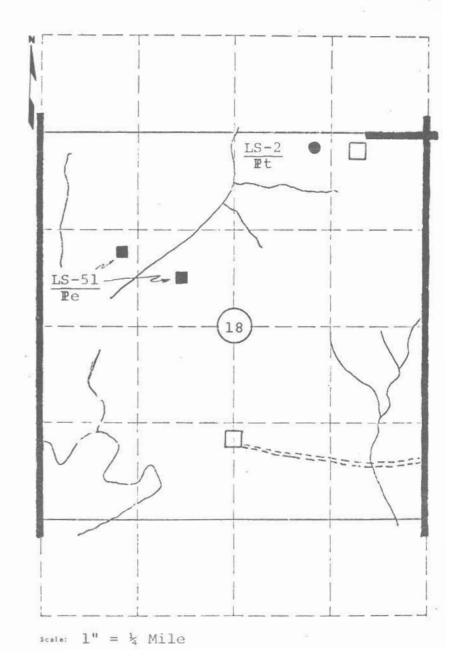
	Qc	qd						Date		A	pri	11,	19	68		
ateri	Sar	nd a	nd Gr	cav	e1			_ Co	unty -	N	ema	aha				
ocatio	11	NE				. Sec		31		Twp.	_15	5	R	ange	llE	
wher -	Clare	ence	W. 8	W	il:	lis	E.	. F	ord	1		Ax	tel:	1, K	ansa	S
ature	ot Deposi	t_D	ry		ccess		t y	Go	od	_						
tatus	of Site —	Upi	en si	te	; 1	100	50	quip	Tec	1						
						£	XPLOR	KOITA	DATA							
Test	Haterial	Depth	Depth				Perce	nt Ret	ained				Wash	G.F.	1.1.	P. I.
Hole	Bottom of Hole	over- Burden	of Haterial	1 1/2	3/4	3/8	4	8	16	30	50	100	200	6.7.	1.1.	F. 1.
			-					-							-	_
										_					1	
	ical Age —	. G	lacia	ar	y Dri	ft		000000	261 (10)							
	at Similar															
	al Similar															
ateri	al Similar	(Sat.)								. (Dr)	)					
ateri.										. (Dr)	)					
ateri	ic Gravity										)					



## 44

#### HATERIAL SURVEY REPORT

		LS-2								Ap	ril		1968	3		
Site Nu	I															
																111-11-11-1
											1wa. 1S ****g* 12E					
Owner -	John	Α.	Wiss	le:	r				-	Kar	isas					
Hatura	of Depusi	t Di	су		C C & B L		(r	Go	bc		Site	LOCAL	ed on	Plate -	I	
	of Site -															
					90		APLOR									
	Material	Death				_	Paice	nt Ret	arned							
fost	at Bottom	over- aurden	Depth of Material	1 1/2	3/4	1/8	4	b	16	30	50	100	Wash 200	G.F.	1.1.	P. I.
	or note	Dar uch														
							-									
-	F186-18-11		-			-			-		-	-				
					_		_			_						
									2							
Goologi	cal Age —	Per	nsyl	vai	nia		RELAT	10H 3	ATA							
Geologi	cal Source	• <u>T</u> a	arkio	L.	ime	sto	one	Me	emb	er						
Materia	l Similar	To														
											- 2					
Specifi	c Gravity	(Sat.)								(Dry	)					
Los Ang	eles bear											-				
Absorpt	ion ——	1			_			Sour	dness							
Wt. Cv.	Ft							\$1	r. Re	tic -		-				



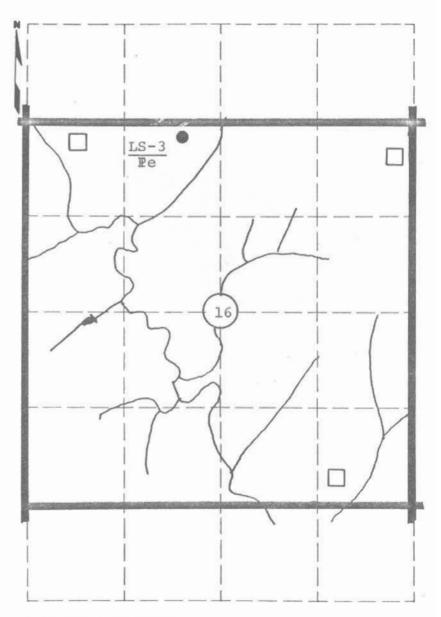
No.	LS	5-3 Pe			Date	April,	1968	
rial	Lir	nest	one		Cou	nt, Nem	aha	
ation	NE4	NW ¹				1wp 1S		12E
) f	Bern	ice	Brede	emeier		Seneca,	Kansas	
are of	Deposit -	Dr	Y.	Accessibility	Go	od_site i	cated on Plate	_ I
tus of	site —	0pe	n sit	te; not	samp.	Led		

EXPLORATION DATA

			1505 75				ained	t Ret	Percer				Depth	Depth	Haterial	_
L. 1	L.L.	G.F.	Wash 200	100	50	30	16	8	ц	3/8	3/4	1 1/2	of Material	of over- Burden	at Bottom of Hole	Test Hole
1																
-	-												-			
+	-		-	-	-	-										
+	-		-	-				-	-							
	-															

#### CORRELATION DATA

n.(Reading Member)
(Dry)
Soundness
— Str. Ratio



Scale: 1" = 1 Mile

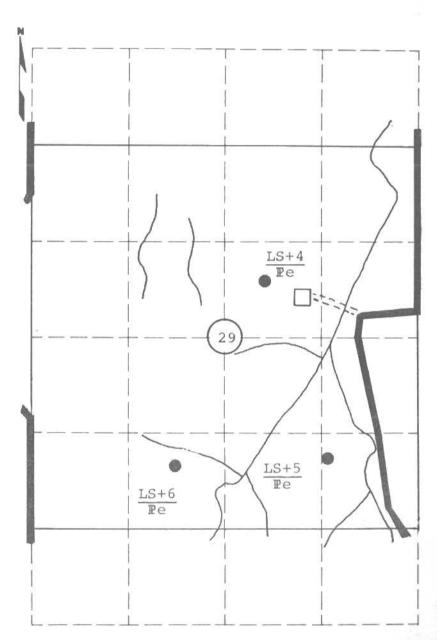
	LS+4		4-1111	0.60	
Site No.	₽e	Date —	April, I	968	
Material	Limestone	Count	, Nemaha	a	
Location	SW4 NE4	sec. 29	Twp1S	Ranga	12E
Owner	Clarence R. Haug		Seneca,	Kansas	5
Mature of	Deposit Dry Accessit	Fair	r 3.te Locate		
Status of	Open site; n	ot sample	ed		

#### EXPLORATION DATA

# V	Material	Depth	Depth				Perce		Wash			Í				
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	1.1.	P.1.
			-													_
																_

#### CORRELATION DATA

Geological	Age -	Pennsyl	vani	an				
Geological	Source	Emporia	Ls.	Form.	(Elmont	&	Reading	Members)
Material S	imilar I	0						
Los Angele	s Wear							
Absorption					Soundness —			
Wt. Cu.Ft.				- 2	— Str. Ratio —			
Remarks								



Scale: 1" = 1/4 Mile

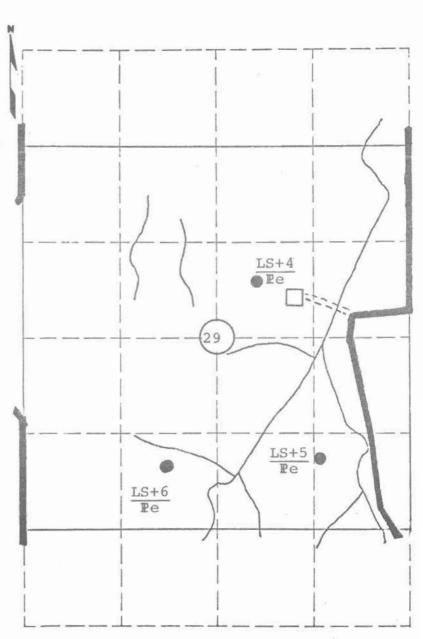
0	LS+5 Pe	Date	April, 196	58
al -	Limestone	Cornt	,Nemaha	
on .	SE½	sec29	_ txp. 1S	- Range 12E
	Clarence & Loui	s Hauq	Seneca,	Kansas
	Deposit Dry see	Fair	r	I

## EXPLORATION DATA

Service of the servic	Haterial	Pepth	Depth				Perce									
Test Hole		ot over- burden	Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q.F.	L.L.	P. 1.
														11		
	-							-	-							_
																-

#### CORRELATION DATA

Seelogical Age Pennsyl	vani	an				
Geological Source Emporia	Ls.	Form.	(Elmont	&	Reading	Members)
Material Similar To						
	-			-		
Specific Gravity (Set.)			(Dry)	_		
Los Angeles Wear -						
Ausorption —	-		Soundness			
wt. Cu.ft.			→ Str. Ratio —			
Reaarks						



scale: 1" = 1/4 Mile

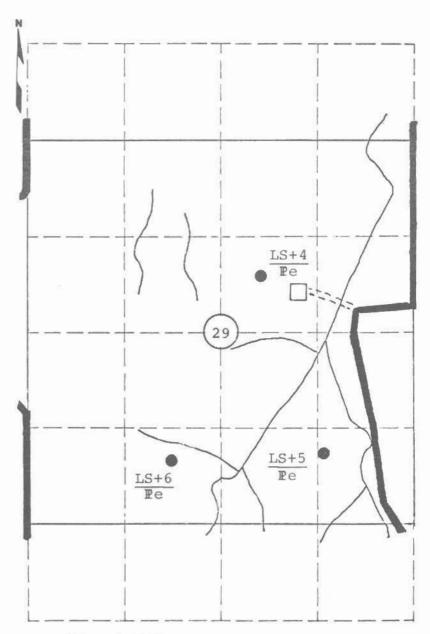
LS+6 Pe	April, 1968
Limestone	
SE¼ SW¼	sec. 29 Twp. 1S Range 12E
Owner Clarence Hauq	Seneca, Kansas
	Poor Site Located on Plate
Status of Site Open site; n	ot sampled

#### EXPLORATION DATA

	Haterial	Pepth	Depth				Perce			68024	18					
Hale	Setton of Hole	over- Burden	ot Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
															_	
						-										
-												_			-	
					-	-	_									
												-				

#### CORRELATION DATA

Geological Age Pennsylvan	ian	
Geological Source Emporia Ls.		
Material Similar To		 
Specific Gravity (Set.)		
Los Angeles Wear		 
Absorption —	Soundness	
Wt. Cu.Ft	Str. Ratio	 
Remarks		 

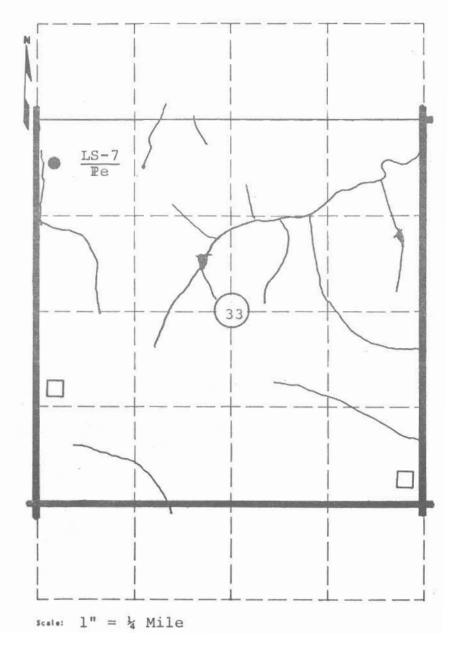


Scale: 1" = 1/4 Mile

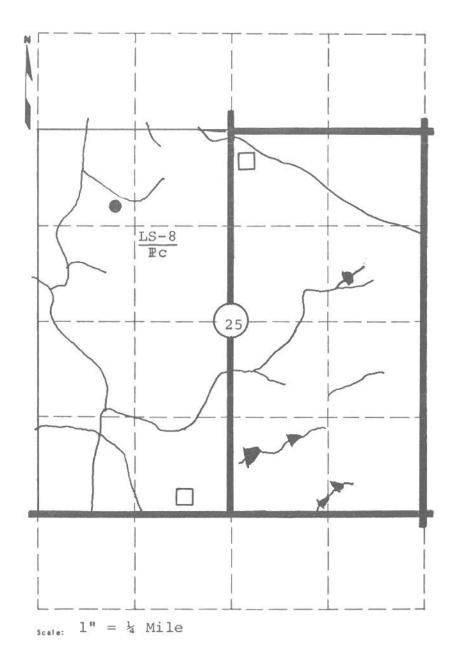
LS-7

#### HATERIAL SURVEY REPORT

lite No		Pe						Date		Ap	ri.	1,_	196	8		
	Lin	mest														
	NW ¹ ₄															
004110	Fr	ank	Tange	ema	n e	etu	ıx			Se	ne	ca,	Kai	nsas		
	ot Deposi															
tatus	of Site -	Ор	en s	ite	; 1	not	S	amp	lec	1						
						£	XPLOR	ATION	DATA	6						
	Material	Pepth	Depth				Perce	nt Ret	ained							
Test	Bottom of Hole	of over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
	01 11010	00.00														
				-	-							-			-	
						_					-		_		-	
- 2																
								l į								
eologi	cal Age cal Sourc	• _ E	mpori	a	Ls	ian F	orn	n . (	Rea	adi	ng	Ме	mbe	r)	- 1	
os Ang	c Gravity			2												
bsorpt	( on		-					. Soun	dness	_						
t. Cu.	Ft							\$t	r. Ra	tio -	_					
enarka												_				



Site No	ı	LS-	8					Date	2	Apr	il	, 1	968			
Hateria	L.	imes														
Locatio	n NW	NW	1/4			_ Sec		25	10	Two.		ls	R	ange	12E	
Owner -	See	Rema	rks										addres			
Mature	of Deposi	t_D	ry												I	
	of Site -															
							XPLOR	-								
	Material	Pepth	Depth	1			Perce	nt Ret	ained				1 1		1 1	
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	ц	8	16	30	50	100	Wash 200	6.F.	L.L.	P.1.
Geologi	cal Age - cal Sourc	C	hurch	ı L	ime	an est		e M	emb							
Los Ang	c Gravity															
	ion —															
	Ft															
Remarks	Ali															
	8 1	kaymo	ond I	<1 T	inc	ger	, 8	en	eca	,	Kan	sa	S			



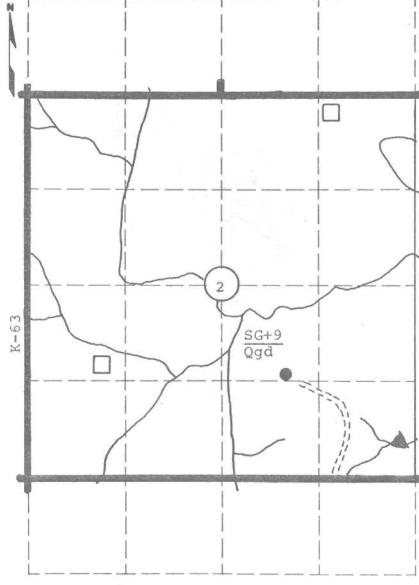
Site No. Ogd	April, 1968
Material Sand and Gravel	
Location SW4 SE4 Sec.	2 Two. 2S Range 12E
Owner Conrad F. Siess	Seneca, Kansas
3.00	Good Site Located on Plate I
Status of Site Open site; not s	ampled

#### EXPLORATION DATA

	Haterial at	Pepth	Death		Percent Retained					name of						
Test Hole	Bottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q.F.	L.L.	P. I

#### CORRELATION DATA

Geological Age Quaternary	
Goological Source _ Glacial Dri	ft
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	



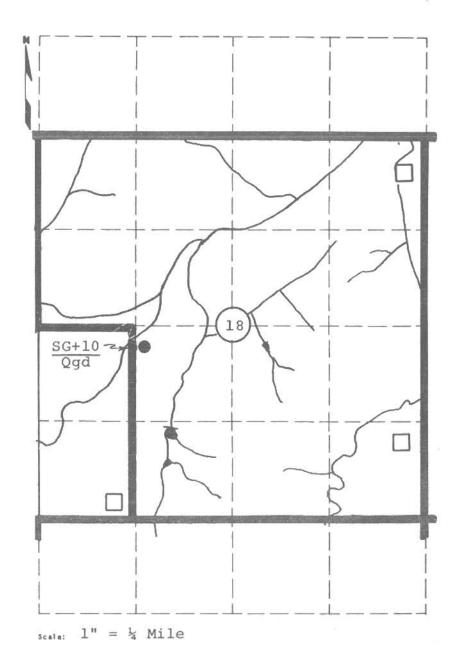
scale: 1" = ½ Mile

U

## N

#### MATERIAL SURVEY REPORT

		SG+1						8		An	ri.	1.	196	8		
Materia	saSa	nd a	na G	rav	eı	-	-	_ co	unty	IN	ema	ana				
Locatio	nN	E⅓ S	Wł		_	- Sec		18		Twp.	_25	3	R	ange	12E	
Owner -	Clar	ence	Rall	Eng	el	ken	e:	tux		S	ene	eca	K	ansa	S	
	of Deposi															
Status	of Site -	0	pen :	sit	e;	no	ts	sam	ple	ed						
									DATA							
	Material	Depth	Depth			-	Pesce	nt Ret	ained							
Test	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	ц	8	16	30	50	100	Wash 200	G.F.	L.L.	P.1.
	-															
			0112+	· ~ ~	2 701		RELAT									
	cal Age —															
Geologi	cal Sourc		Glaci	Lal	Di	Cli	t_		-							
Materia	ıl Similar	To												-		
				-		-										
Specifi	c Gravity	(Sat.)								. (Dry	)					
Los Ang	peles Wear				_						_					
Absorpt	ion							Soun	dness							
Wt. Cu.	Ft. —							st	r. Ra	tio –						



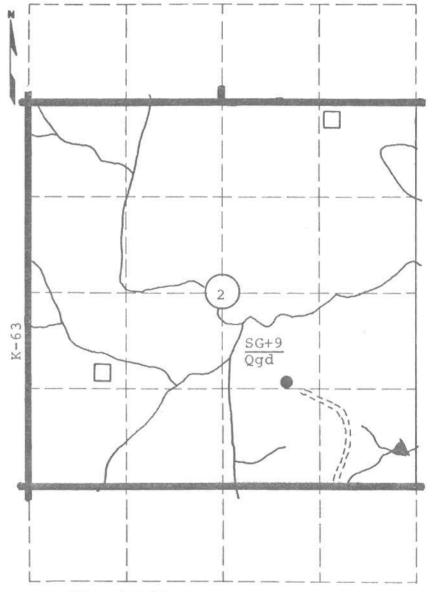
SG+9 Ogd	Date April, 1968
Material Sand and Gravel	
Location SWL SEL Sec.	2 Twp. 2S Range 12E
Owner Conrad F. Siess	Seneca, Kansas
Nature of Deposit Dry accessibility _	Good Site Located on Plate I
Status of Site Open site; not sa	ampled

#### EXPLORATION DATA

Material at Bottom of Hole	Depth	Denth				Perce									
	of over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
	at Bottom of Hole	at of Bottom over- of Hole Burden	at of Bottom over- of Hote Burden Haterial	at of of over- of Hole Burden Material I 1/2	at of Bottom over- of Hole Burden Material I 1/2 3/4	at of Bottom over- of Hole Burden Material I 1/2 3/4 3/8	at of Bottom over- of Hole Burden Material I 1/2 3/4 3/8 4	at of Bottom over-of Hoterial I 1/2 3/4 3/8 4 8	at of Bottom over- of Hole Burden Material   1/2 3/4 3/8 4 8 16	at of Bottom over- of Hole Burden   1 1/2 3/4 3/8 4 8 16 30	at of orer- of Hole Burden of Material I 1/2 3/4 3/8 4 8 16 30 50	at of or of Bottom over- of Hole Burden	at of of of over- of Hole Burden	at of or of sole Burden of Material I 1/2 3/4 3/8 4 8 18 30 50 100 200 G.F.	at of of Bottom over- of Hole Burden   1 1/2 3/4 3/8 4 8 16 30 50 100 Mash 200 G.F. L.L.

#### CORRELATION DATA

1
(Dry)
- Soundness
Str. Ratio
sibilities to the east of



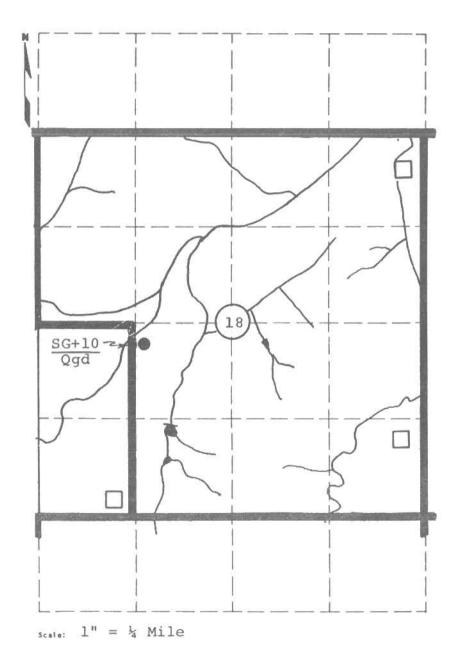
Scale: 1" = ½ Mile

5

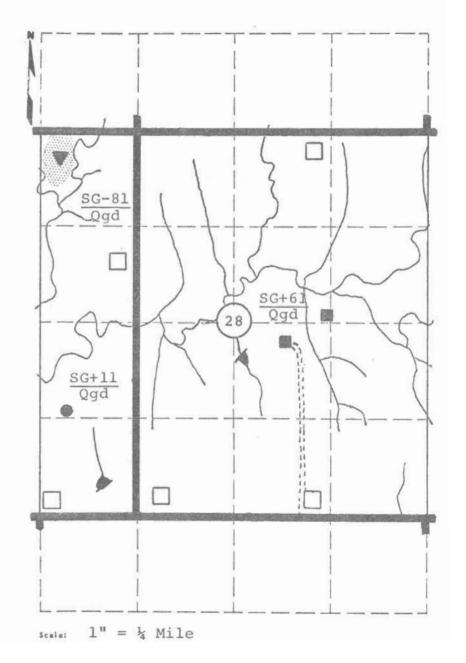
## 52

#### MATERIAL SURVEY REPORT

	3	SG+1														
Site No		Qgd												8		
Nateria	saı_Saı	nd a	nd G	rav	el			_ c	unty	N	ema	aha				
	n N															
Owner -	Clare	ence	R.	Eng	ell	ken	e.	tux		S	ene	ca	K	ansa	S	
	of Deposi															
Status	of Site -	0	pen :	sit	e;	no	t s	sam	ple	ed						
	9					Ε	XPLOR	ATION	DATA							
	Haterial	Depth	Depth				Perce	nt Ret	ained					-	T	
Test Nole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	6. F.	L.L.	P. 1.
			-												-	
			_					ION								
	cal Age -							_								
Geologi	cal Sourc		Glac:	ial	Di	rif	t									
Materia	l Similar	To														
		. 200														
Specifi	c Gravity	(Sat.)								- (Dry	)					
to to the second	jelas Vear															
	ion —												58			
	Ft. ——							— St	r. Ra	tio -						
Remarks	-						-									



Site No	0		+11 gd					Date	F	pr	il,	. 1	968			
Materia	Sa. Sa	and a	and (	Gra	vel			_ 0	unty		Nen	nah	a			
	w W															
17.50	Eli									32						S
			11 10 11 10													
	ot Deposi													Plate -	TT	
Status	of Site -	Ope	en si	te	, II	Ot	Sa	qmı	red	-	-					
						Ε	XPLOR	ATION	DATA							
Test	Material	Depth	Depth				Perce	nt Rol	ained				Wash			0.0
Hole	bottom of Hole	OVOF-	et Material	1 1/2	3/4	3/8	4	8	16	30	50	100	200	G.F.	L.L.	P. I.
				24												
											-					
							_									
			-	-								-				
	-		-		-				-	-		-				_
									_							
	ical Age —															
	ical Sourc															
															-	
	ic Gravity									11-00						
Los Ang	gales Wear	-			_								-	-		
Absorpt	tion ——							- Sour	dness	-						
Mt. Co.	£1,							S1	r. Ro	tia -					-	
Lowark																



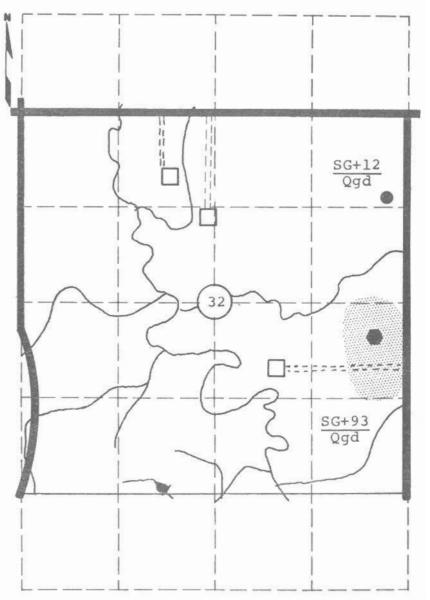
SG+12 Qgd	April, 1968
Material Sand and Gravel	
NE¼ 3ec	
Ruth & William Perkin	Bern, Kansas
Mature of Deposit Dry Accessibility	Good Site Located on Plate II
Status of Site Open site; not sa	mpled

#### EXPLORATION DATA

-	Material at Bottom of Hole	Pepth	Depth				Perce	nt Ret	ained	- 61						
Test Hole		of over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
															-	
			- 0											72.72		
												100				

#### CORRELATION DATA

Geological Age	Juatern	ary		
Geological Source	Glacial	Drift		
			(Dry)	
Los Angeles Wear				
Absorption —			Soundness —	
Wt. Cu.Ft	-11		Str. Estio	
Remarks				



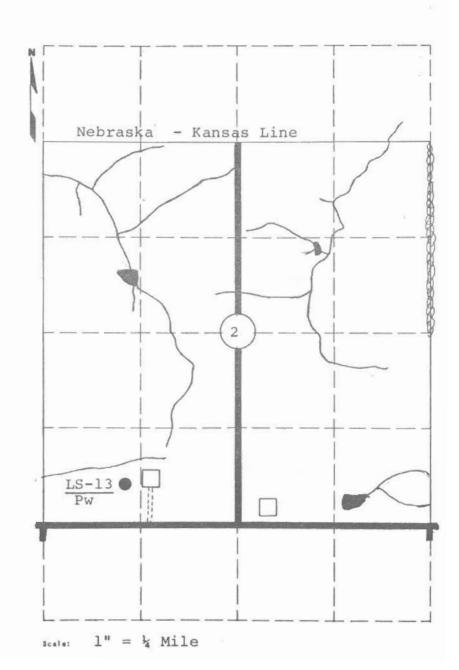
Scale: 1" = 1/4 Mile

54

## UI

#### MATERIAL SURVEY REPORT

iite No	. —	LS-1 Pw	<u> </u>					Date		Ap	ri	L,	196	8		
lateria		Lime	stone	9				county Nemaha								
ocatio	, SI	NI				- Sec		2	2 Twp. 1S Range 13E							
wner -	Vic	tor	M. K	rai	nb:	111			16	В	err	1,	Kans	sas		
	o1 Deposi													*:		
	of Site -												eg 0*	riate -		
itatus	of Site -								DATA							
	Material	Depth	Depth			_	Perce	nt Ret	ained							
Test Hole	at bottom of Hole	of over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	0.f.	t.t.	P. I
											io.					
ieológi	cal Age — cal Sourc	. Wr	efor	l L	ime	est	one		orm							
	c Gravity									(Dry	) —					
	ion —			(4)				Soun	dness	_						
	Ft. ——															
	The													site	is	a
OB GIR			ed ch													



# 6

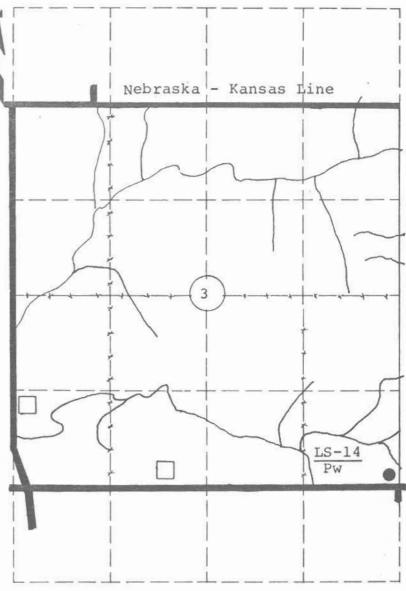
# MATERIAL SURVEY REPORT

Site No.	LS-14 Pw	Date -	April, 1968
	Limestone		Nemaha
	SE¼ SE¾ Sec.		
wner D	onald Lee Ehrsam		Bern, Kansas
	Deposit Dry Accessibility -		
Status of	Site Open site; not sa	mpled	

# EXPLORATION DATA

3200000	Material	Depth	Depth				Perce	nt Ret	ained				7		100	
Test	at sottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I
			_													
				2												

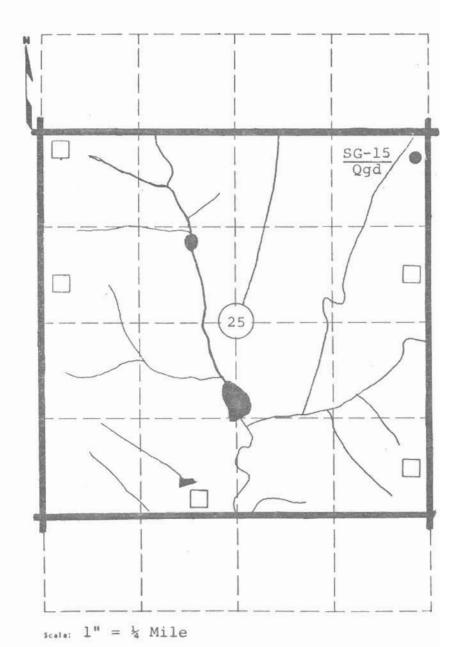
Geological Age Permian						
Seological Source Wreford Limes	tone Form	mation	1		10	
Material Similar To						
Specific Gravity (Sat.)						
Los Angeles Wear						
Absorption —	Soundnes				-	
Wt. Cu.Ft.	Str. Re	atio —		-		
Remarks The material being	removed	from	this	site	is	a
weathered cherty 1:	imestone.	e:				



scale: 1" = ¼ Mile

Romarks -

SG-15
Site No. Qqd Date April, 1968
Material Sand and Gravel Nemaha
Location NE NE NE Sec. 25 Twp. 1S Range 13E
Clayton J. Strahm etux Sabetha, Kansas
Meture of Deposit Dry Accessibility Good Site Located on Plate II
Status of Site Open site; not sampled
EXPLORATION DATA
Material   Depth   Depth   Of   Depth   Of   Of   Of   Of   Of   Of   Of   O
Of note survey.
CORRELATION DATA
Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To
Reterial similar to
Specific Gravity (Sat.) ————————————————————————————————————
Los Angeles Wear
Absorption — Soundness —
Wt. Cu.Ft. Str. Ratio

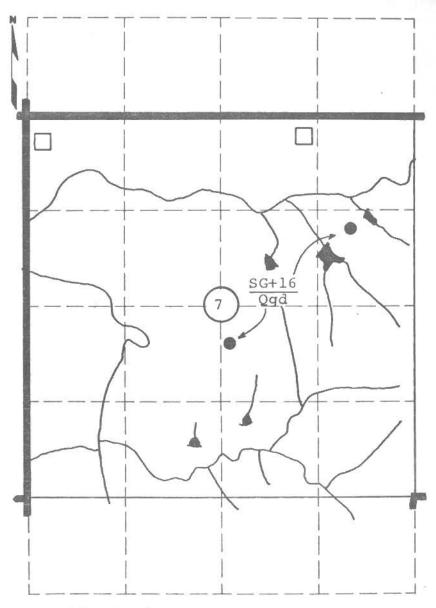


$\frac{\text{SG+16}}{\text{Qgd}}$					
Ε½				Range	131
See Remarks				ddress	
Deposit Dry Access	bility_	Fair	r	d on Plate	II

# EXPLORATION DATA

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

Geological Age	Quaternary	
Geological Source —	Glacial Drift	
		(Ory)
Los Angeles Wear		
Absorption		Soundness
Wt. Cu.Ft.		Str. Ratio —
Romarks NE 4 Go	ordon Mosteller,	Bern, Kansas
SE½ Je	esse A. Hunzeker,	Bern, Kansas



scale: l" = ½ Mile

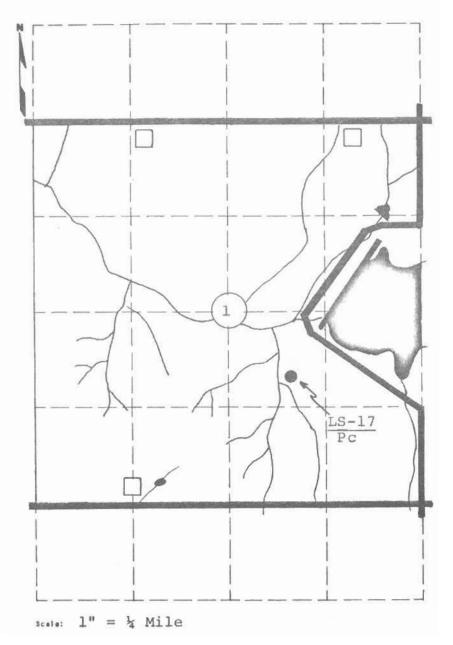
Lin	est	cone		- County	Nemaha		
SE			Sec	1	Two. 25	Range -	13E
John	W.	Plattner	etux		Sabetha,	Kar	ısas
		月香雨草			addr Site Located o	0.00	

# EXPLORATION DATA

ss 10 /	Haterial	Depth	Depth				Perce	nt Ret	ained							
Test	at Bottom of Hole	ot over- Burden	0.0	1 1/2	3/4	3/8	4	8	1.6	30	50	100	Wash 200	G.F.	L.L.	P. I
																_
								_	_							

#### CORRELATION DATA

Geological Age	Permian			
			Member	
			(Dry)	
Los Angeles Wear				
Ausorption		Soundness .		
wt. Cu.Ft.		Str. Ret	io	
Rosarks				



U

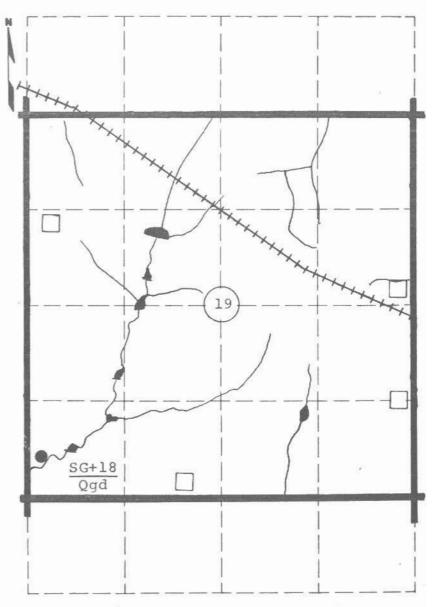
ite No.	SG+18 Qgd			_ Date	April,	1968	
	Sand and						
ocation	SW4 SW4		Sec	19	Twp. 1S	Range	14E
wner -	Willis J.	Gerber		Sak	betha, K	ansas	
	Dry Deposit Dry	Accessi			Site Locat	ed on Plate	
itatus o	open Open	site; n	ot s	sample	11		

# EXPLORATION DATA

w m l	Material	Depth	Depth				Perce	nt Ret	ained							
Test	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I
			-			-										-

#### CORRELATION DATA

Geological Age Qua	ternary		
Seological SourceGl	acial Drift		
		(Dry)	
Los Angeles Wear			
Absorption —		Soundness —	
Wt. Gu.Ft.		- Str. Ratio	
Romarks -			



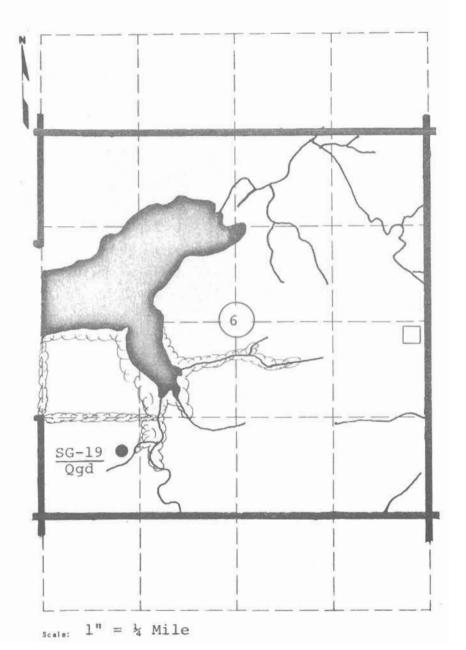
Scale: 1" = 1/4 Mile

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٩,	ú	r	

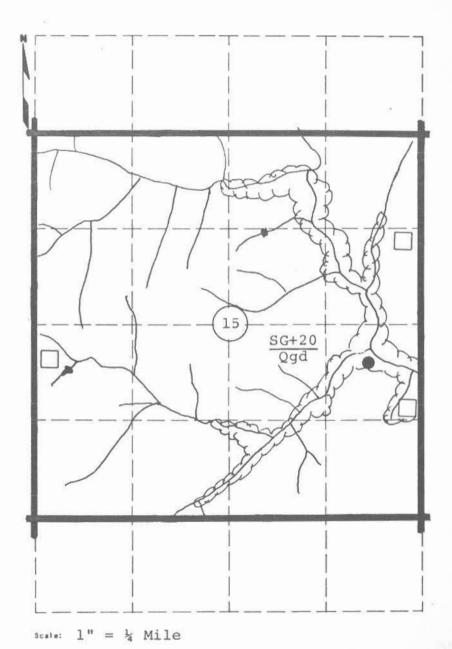
SG-19 Qgd	April, 1968
Material Sand and Gravel	
Location SW1 SW1 Sec.	6 Twp. 2S Renge 14E
Namer Harry W. Edelman	Sabetha, Kansas
Nature of Deposit Dry Accessibility	
Status of Site Open site; not s	sampled
EXPL	ORATION DATA

	Material	Pep1h	Depth				Perce	it Ret	ained							
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G. F.	t.L.	P. I.
				-								-				

Goological Age Quaternary	
Geological Source Glacial Drift	
	(Dry)
Los Angeles Wear	
Absorption	Soundness
	much potential.
AUG SIP S	



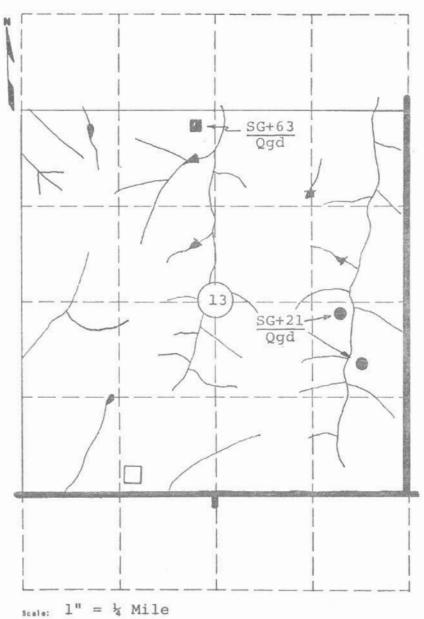
2777 121		SG+2 Qgd	0					0-1-		Ap	ri:	l,	196	8		
	Sai															
Materia	NE¼	SEL						- co	unty		-	25			14E	
Owner -	Marv.	ın L	. SCO	yac		. 6 1 1 +	1, _I	ai	r	ab —	Site	la,	address	nsas Plate -	II	
	of Site -					ot		npl	ed							
	Material	Depth	_			_		nt Ret								
Test	at Bottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.f.	L.L.	P. I.
	_															
	ical Age -					104500		anne a								
Materi	al Similar	To														
Specifi	ic Gravity	(Sat.)								· (Dry	)					
Los Ang	gelea Wear		0													
Absorpt	tion ——							Soun	dness	_						
Wt. Cu.	Ft							st	r. Ra	tio -	-					
Remarks																



SG+21 Ogd	Date	April, 19	68	
Material Sand and Gravel	County	Nemaha		
NE' SE' NE' SE' NE' SE' NE' NE' SE' NE' NE' NE' NE' NE' NE' NE' NE' NE' N				
Nature of Deposit Dry Access		800	1 6 6 5	
Status of Site Open site; no				
	EXPLORATION DATA			
[ ] Hotelat [ Books ]	Barrant Batained			7

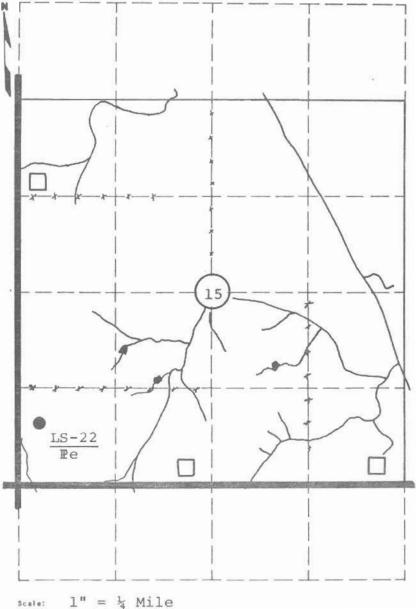
200-100-1	Material	Dopth	Depth				Perce	nt Ret	ained				02/03/20			
Test Hole	at Bottom of Noie	ot over- Burden		1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q. F.	LeLi	P. 1.
															-	
			-			-			-	-					-	
-			-		-											

Geological Age	Quaternary		
Geological Source	Glacial Drift		
Naterial Similar To			
Specific Gravity (Se	it.)	(Ory)	
Los Angeles Wear-			
Absorption -		- Soundness	
Wt. Cu.Ft.		Str. Ratio	
Remarks .			



Remarks -

	MATERIAL SUR	VET KEPUKI		
LS-22 Pe		Apr	il, 1968	
Limestone				
Location SW1				
Daniel J. He				20
Mature of Deposit Dry Status of Site Open S:	Accessibility F	air ,		
Status of Site		TION DATA		
Test at or of Notes Bottom over-	Percent	t Retained	50 100 Wash 200	G.F. L.L. P.1.
of Hole Burden Material	374 370 4	0 10 30	50 100 200	
Geological Age Pennsy	correcati ylvanian	ON DATA		
Seological Source Empori		.(Readin	ng Membe	r)
Material Similar To				
Specific Gravity (Sat.)		(Ory)		
Los Angeles Wear		11.00		
Absorption —		Soundness — —		
Wt. Gu.Ft.		- Str. Ratio -		

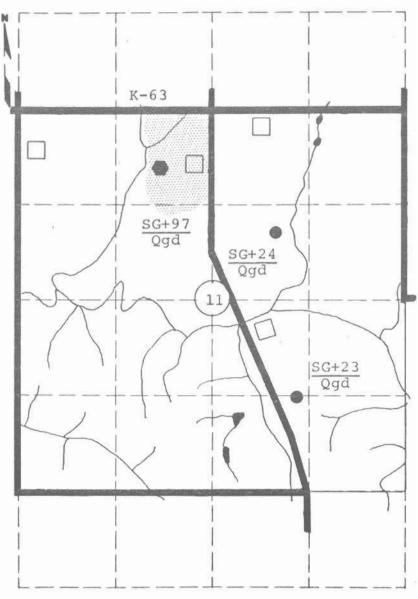


SG+23 Qgd	Date	April, 1	1968
daterial Sand and Gravel	County	Nemaha	
ocation SE4	Sec	Twp. 3S	Range 12E
Mathias C. Rochel	etux	Seneca	Kansas
Sature of Deposit Dry Accessib			on Plate III
Status of Site Open site; no	ot sampled	I .	

#### EXPLORATION DATA

525 ES	Material	Dopth	Depin				Perce	nt Ret	ained				255 27			
Test	at Bottom of Hole	aver- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I

	med the second s	
Geological Source Glacial Dr.	ift	
	(Dry)	
os Angeles Wear		
bsorption	Soundness	
t, Cu.Ft	Str. Ratio	-
enarks		



Scale: 1" = 1/4 Mile

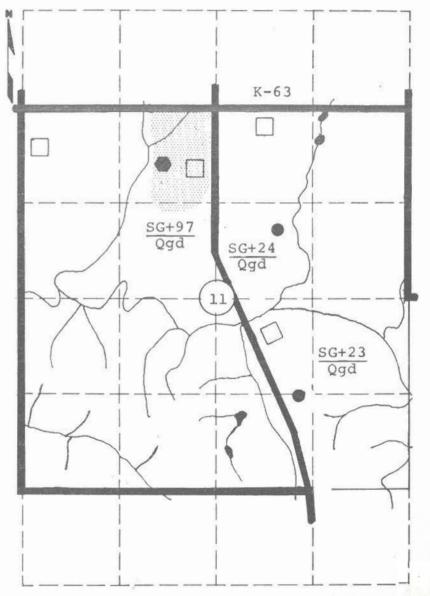
Sand and Gravel	Nemaha
1 61	_ County
SW4 NE4 Sec.	11
Frank Kuckelman etux	Seneca, Kansas
re of Deposit Dry accessibility	address

# EXPLORATION DATA

0000000	Material	Depth	Death				Perce	nt Ret	ained							
Test Nole	at Bottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G. F.	L.L.	P. 1
														-		

#### CORRELATION DATA

Geological Age Quaternary		
Glacial Drif	<u>t</u>	
Material Similar To		
Specific Gravity (Sat.)		
Los Angeles Wear		
Absorption —	Soundness	
Wt. Gu.Ft.	Str. Ratio	
Remarks -		



Scale: 1" = 1/4 Mile

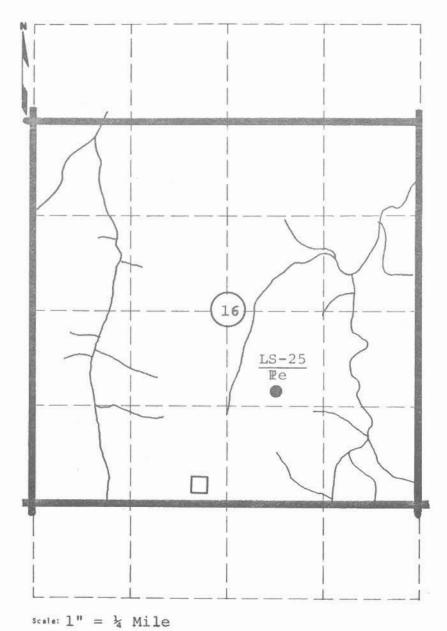
66

Wt. Cu.Ft. ---

# MATERIAL SURVEY REPORT

ite No		Pe					_	Date	-	Ap	ri.	L,_	196	8		
ateri	Li	mest	one					_ Co	unty	N	ema	aha				
ocatio	NW	4 SE	14			- Sec		16		Twp.		35	R	ange 1	2E	
WD OF	Ber	nard	W . 1	Kam	pe:	rt	et	ux			Sei	nec	a, I	Kans	as	
ature	of Deposi	t	Dry	A	c c e s b	. 5 . 1 .	t y	P	001		Site		address			
						Ε	XPLOR	NOITA	DATA							
Test	Material	Pepth	Depth			_	Perce	nt Ret	ained		_					
Test	at Bottom of Hole	or over- Burden	of Material	1 1/2	3/4	3/8	4	8	àl	30	50	100	Wash 200	0.F.	L.L.	P. I.
		D	onn a r	.1	200			ION D	ATA							
	cal Age —								D	2.7	5	14	1			
eologi	cal Sourc	eE	mpor	La	Ls.	F	ori	n. (	Rea	aaı	ng	Me	mbei	-)		
ateria	l Similar	To														
pecifi	c Gravity	(Sat.)								(Dry	)					

_ Str. Ratio -



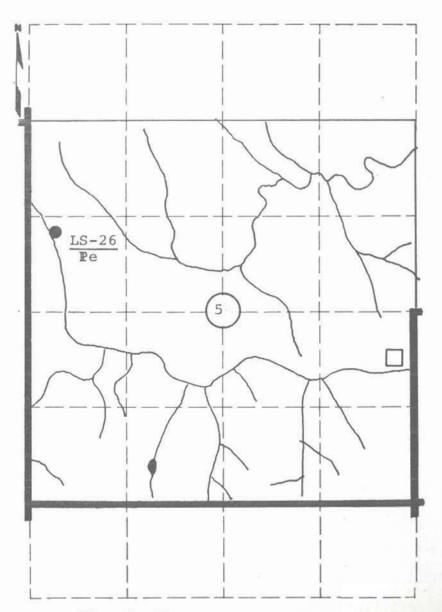
	L:	S-26 Pe			5000	Anri	1 10	168	
	Limes								
Location	SW1/4	NW4							12E
Owner ——	Donald	d J.	Uphaus	etux		Se	neca,	Kan	sas
Nature of	Deposit —	Dry	Access	.b:1:ty	Fair	S.t.	Located	on Plate	_III_
Status of	Site	Open	site; n	not sa	ample	1			

# EXPLORATION DATA

2.83	Material	Popth	Depth		Percent Retained				35 15							
Test Hole	at Bottom of Nole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
															-	
_															-	

#### CORRELATION DATA

Seological	Age Pennsylvanian	-
Geological	Source Emporia Ls. Form. (Reading Member)	
	Similar To	
	Gravity (Set.)	
Los Angeles	os Wear	
Absorption	3 Soundness	
Wt. Gu.Ft.	Str. Ratio	
Remarks	This site reported in Geological Survey	
	Bull. No. 1060D.	



Scale: 1" = 1/4 Mile

5

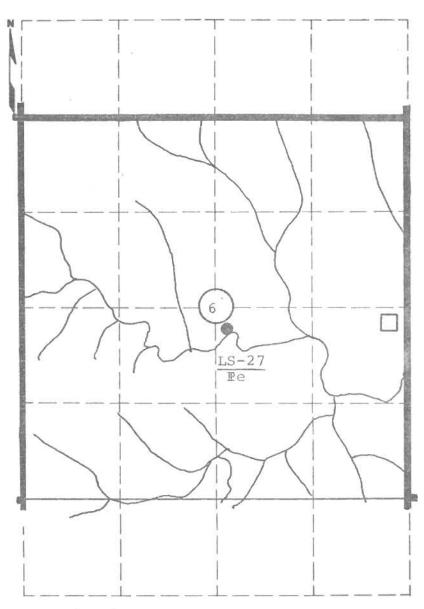
Site No.	LS P	-27 e			Date	Apri	1, 19	68	-
Materia)	Lim	esto	ne		County	Ne	maha		
Location	NW 4	SE4		Sec	6	_ Twp	3S	Range	12E
0 wner	Norbe	rt A	Stal	lbaumer	etu	x	Sene	ca,	Kansas
Mature of	Deposit —	100	0.00	55+011+ty	Poor	5			· III
Status of	Site	Open	site;	not sa	mple	d			

# EXPLORATION DATA

Material at Bottom of Hole	Pepth of over- Burden	Depth of Material				Perce		-		5 0					
			1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P.1.
		-						-							_
								-							
	Bottom of Hole	Bottom over- of Hole Burden	Stitom over- of Note Burden Material	of Note Burden of Material I 1/2	of Mole Burden Material I 1/2 3/4	of Mole Burden over- of Mole Burden Material I 1/2 3/4 3/8	of Mole Burden Material I 1/2 3/4 3/8 4	Stom over- of Note Burden Material I i/2 3/4 3/8 4 8	of Mole Burden Material I 1/2 3/4 3/8 4 8 16	Stom over- of Mole Burden Material I 1/2 3/4 3/8 4 8 16 30	Stom over- of Note Burden Material I 1/2 3/4 3/8 4 8 16 30 50	### Dottom over- of Note Burden   Material   1 i/2 3/4 3/8 4 8 16 30 50 100	Bottom of Nole Burden Material I 1/2 3/4 3/8 4 8 16 30 50 100 200	Stom over- of Note Burden	Bottom over- of Nole Burden

# CORRELATION DATA

Geological	Pennsylvanian
	Emporia Ls. Form. (Reading Member)
Material Si	imilar To
	mental and the second s
Specific Br	ravity (Sat.)
Los Angeles	s Wear
Absorption	Soundness
Wt. Cu.Ft	Str. Ratio
Remarks -	This site reported in Geological Survey
	Bull. No. 1060D.



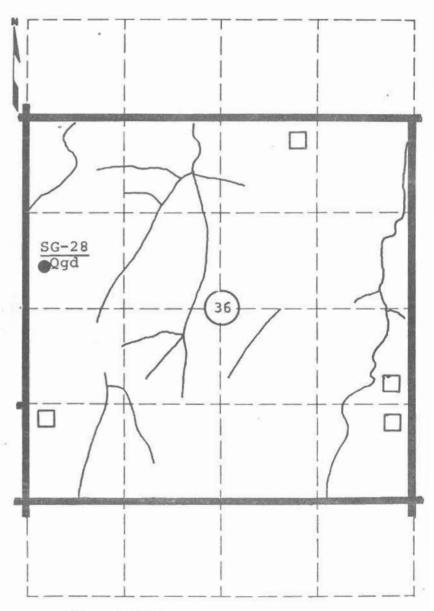
scale: 1" = ⅓ Mile

SG-28 Qgd	Pate April, 1968
Material Sand and Gravel	
Location SW NW Sec.	36 Twp. 2S Range 12E
Guner Mary Sudbeck	Seneca, Kansas
Mature of Deposit Dry Accessibility	Good Site Located on Plate III
Status of Site Open site; not s	ampled
EAP	LORATION DATA

	Material	Depth of over- Burden	peptn				Perce									
Test Hole	at Bottom of Hole			1 1/2	3/4	3/8	, "	8	16	30	50	100	Wash 200	G. F.	L.L.	P. I.
															2	
								39								

#### CORRELATION DATA

Geological Age	Quatern	ary		
Geological Source —				a de la companya de l
			(Dry)	
Los Angeles Wear				
Absorption —			Soundness -	
Wt. Cu.Ft			Str. Ratio	
Remarks				

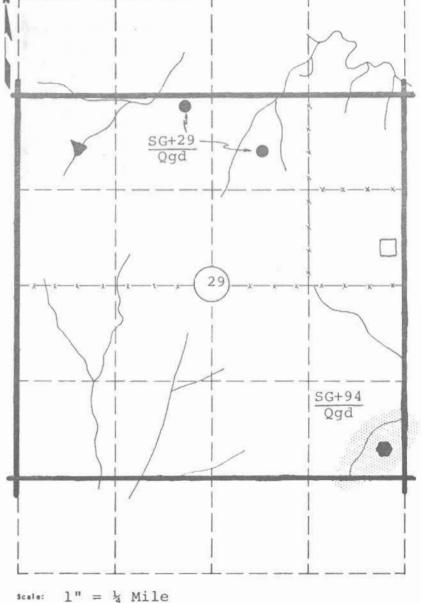


Scale: 1" = 1 Mile

70

# STATE HIGHWAY COMMISSION OF KANSAS

		. —	Q											19				N	i.			T	
	Materia	si_S	and	and (	Gra	ve]	4		_ co	unty		Ner	nah	a				1	15			i	
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	ûwner —	Lloy	d Pf	rang					G	off	E,	Kar	ısa	S				1			Medical	-	SECTION S.
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		of Site -																- 1			/	1	
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	Test	Material at	Pepth	Depth		1		-	ot Ret	ained	1	_		Wash				- 1				+	
	Hola	bottom	over- Burden	o1 Material	1 1/2	3/4	3/8	4	8	16	30	50	100	200	G.F.	L.L.	P.1.					î	
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		cal Source													-7-1-7-2								
	Materia	1 Similar	то —																				
	Speciti	c Gravity	(tat.)	-							- (Dry	)						4	_			+	1
	Los Ang	eles Ves				_				-							-						1
	Apsorpt	ion					_		Soun	dness												1	
	wt. Cu.	Ft. ——					_		St	r. Ra	itio —				- A				ĺ			į	
	Remarks																		L -			1	

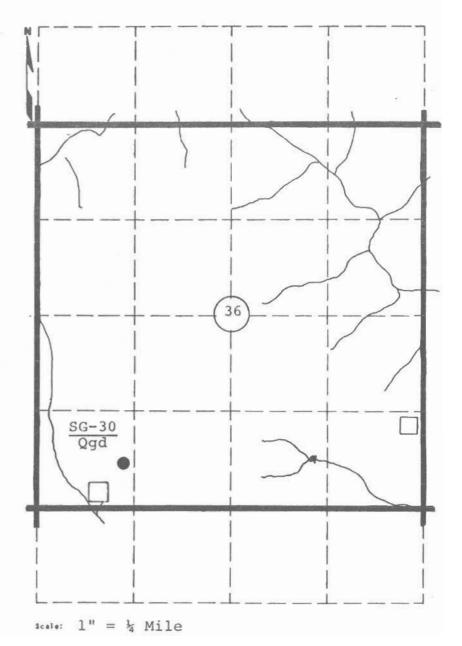


	SG-30 Qgd		Date	April,	1968	
	Sand and					
	SE¼ SW¾					13E
wner	Francis J.	Levret		Goff,	Kansas	
	t Deposit Dry	4			address	IV
****	site Open	site: not	sampled	_		

# EXPLORATION DATA

Material	Pepth of over- Burden	Depth of Material				Perce		T							
bottom of Nole			1 1/2	3/4	3/8	. 4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
		-													
	at bottom	at of bottom over-	at of of of	bottom over-	at of of of bottom over-	at of of of   1 1/2 3/4 3/8	at of of of   1 1/2 3/4 3/8 4	at of of of   1 1/2 3/4 3/8 4 8	at of of of bottom over-	at of of of   1 1/2 3/4 3/8 4 8 16 30	at of of of 1 1/2 3/4 3/8 4 8 16 30 50	at of of of of   1 1/2 3/4 3/8 4 8 16 30 50 100	at of of   1 1/2 3/4 3/8 4 8 15 30 50 100 200	at of of of of of 1 1/2 3/4 3/8 4 8 16 30 50 100 200 6.F.	at of of of 1 1/2 3/4 3/8 4 8 16 30 50 100 200 6.f. L.L.

Goological Ago Quaternary	
Geological Source Glacial Drift	
Material Similar To	
Specific Gravity (Sat.)	
Los Angeles Wear	
Absorption —	- Soundness
Wt. Cu.Ft.	- Str. Ratio
Romarks This site is reported	in the Geological Survey
Bull. No. 1060D,	



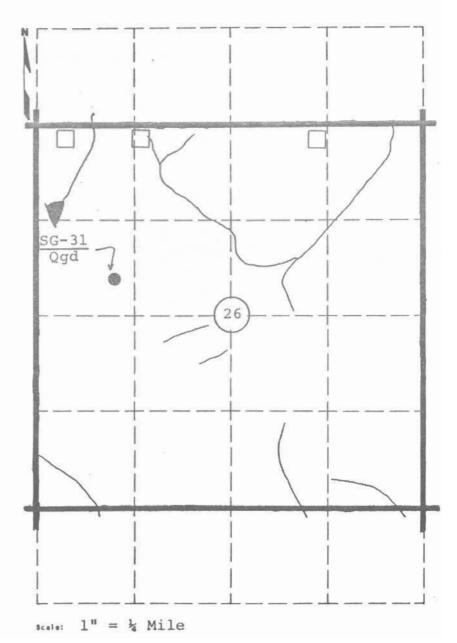
Site No	SC	G-31 Qgd				Date -	April	, 1968	
							, Nema		
								S Range -	
Owner	John	E. 3	Swart,	96	Carl	D.	Swart,	Seneca,	Kansas
		n	40.6					address ocated on Plate	
Status of S	Sita (	Open	site;	n	ot sa	mp1	ed		

# EXPLORATION DATA

Material	Popth	of Material				Perce	5 5								
et boitom of Hole	ot over- Burden		1 1/2	3/4	3/8	ų	8	16	30	50	100	Wash 200	G.F.	Lil.	P. 1.
	ŭ.														
	at boiltom	at of boilom over- of Hole Burden	at of othors of hoto of Material	at of of or over- of Hole Burden Haterial 1 1/2	at of bottom over- of Hole Burden Material I 1/2 3/5	at of bottom over- of Hole Burden Material 1 1/2 1/4 3/8	at of perhodical of over-of Hole Burden Material 1 1/2 1/4 3/8 4	at of or of of of of Material I 1/2 1/4 3/8 4 8	at of of bottom over- burden burden l 1 1/2 3/4 3/8 4 8 16	at of of bottom over- of Hole Surden Haterial I 1/2 1/4 3/8 4 8 16 30	at of or over- of Hole Burden Material I 1/2 1/4 3/8 4 8 16 30 50	at of or over- of Hole Burden Haterial I 1/2 1/4 3/8 4 8 16 30 50 100	at of of bottom over- of Hole Burden at erial 1 1/2 1/4 3/8 4 8 16 30 50 100 200	at of or over- of Hole Burden of Haterial I 1/2 1/4 3/8 4 8 16 30 50 100 Wash 6.F.	at of or over- of Hole Surden surden of Haterial I 1/2 X/4 3/8 4 8 16 30 50 100 200 G.F. L.L.

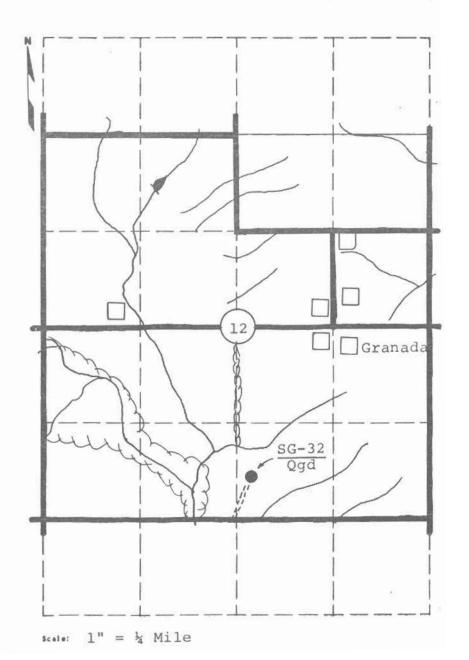
# CORRELATION DATA

Seclogical Age	Quaternary		
Geological Source	Glacial Drift		
	)		
Los Angeles Wear			
Absorption —		- Soundness -	
#t. Cu.Ft		Str. Ratio	
Remarks			



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SG-32
Site No. Ogd Pate April, 1968
Material Sand and Gravel Nemaha
Location SW SE Sec. 12 Tup. 4S tange 14E
Robert F. A.chten Wetmore, Kansas
name address  Nature of Daposit Dry accessibility Good Site Located on Plate IV
Status of Site, Open site; not sampled
EXPLORATION DATA
Test at of Depth Percent Retained Wash or
Set   Set   OT   OT   OT   OT   OT   OT   OT   O
CORRELATION DATA
Geological Age Quaternary
Glacial Drift
Material Similar To
Specific Gravity (Sat.)
Los Angeles Wear
Absorption Soundness
Wt. Cu.Ft. Str. Retio
Remarks

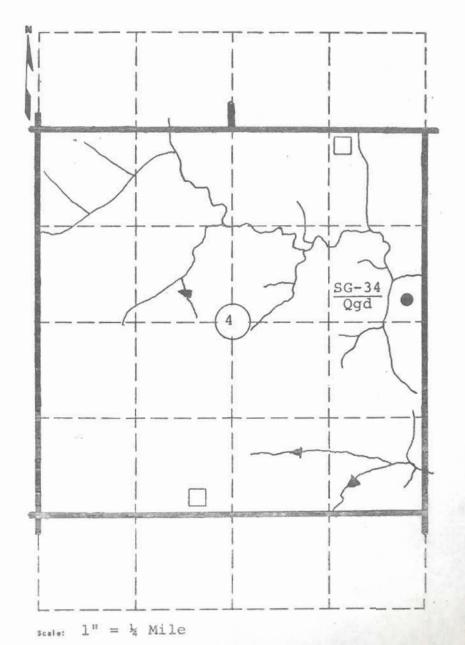


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Geolog	ical Source	G	laci	al	Dr	ift	1	-											R H	8	11 /
Materi	al Sinilar	r To													-					ĺ	1)
																				<u></u>	is 2
Specit	ic Gravity	(Sat.)								- (Dr)	)								THE AND THE	Land to the Control of the Control o	
Los An	geles Wear	·																	i		1/
	tion							- Sout	ndnes												
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	S															
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	cal Age —													-		
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Materia	l Similar	To														
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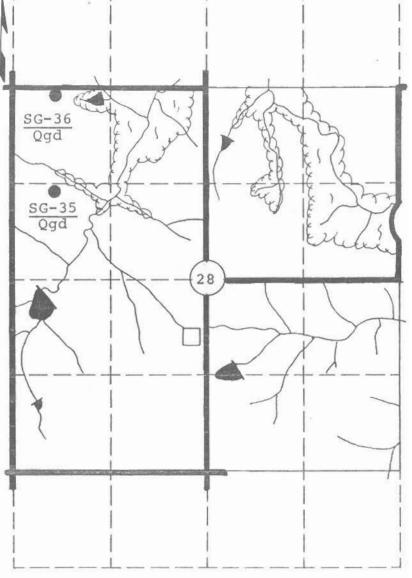
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	on															
Owner -	Euge	ene .	& Vic	ole	et I	Kis	tn	er,	10	113	5 t	h	Ave	.,Sh	eldo	on,
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						0	EXPLO	RATIO	DAT	A						
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Los Ang	eles Vear				·											
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MATERIAL	SURVEY	REPORT

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	Materia)	Pepth	Depth				Perce	nt Ret	ained	_						
Test Hole	bottom of Hole	or over- Burden	of Material	1 1/2	3/4	3/8	ч.	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
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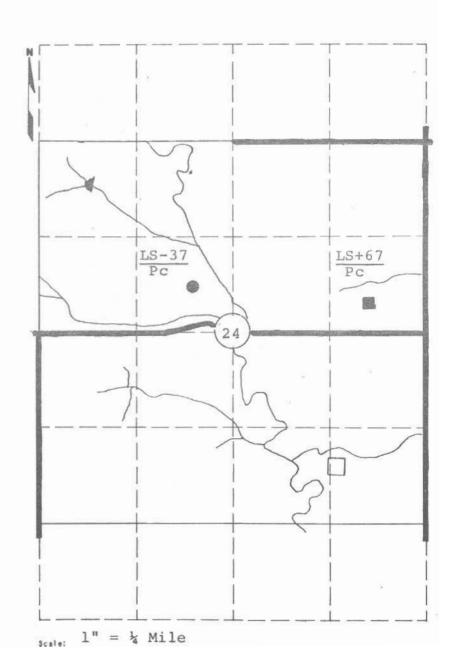
Scale: 1" = 1/4 Mile

used as a pond.

LS-37 Pc		_ Date _	Apri	1, 19	968	
Limestone			Ne:			
SE¼ NW¼	_ \$ec				Range	14E
Edward A. Barben		1	Fairv	iew,	Kansas	
ere of Deposit Dry Acces	sibility_	Good	ds.	te Locate	d on Plate	IV
or site Open site;	not s	sample	ed			
	EXPL	ORATION DA	ATA			

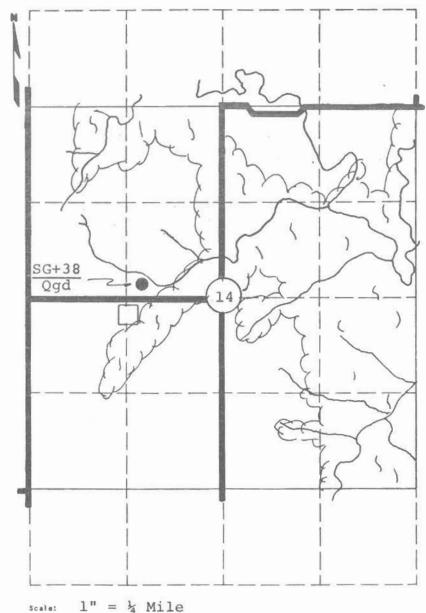
92	Material	Dopth	Depth	-			Perce	nt Ret	ained							
Test	at Bottom of Hole	ot over- Burden		1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.

Geological Aga	Permian		
Seological Source —	Cottonwood	Limestone	Member
			(Dry)
Los Angeles Wear			
Absorption —		Soundness	1
wt. Gu.Ft		Str. Re	atio
Remarks -			



Remarks -

ite Ma		SG+3 Qgd	8					Date	·	Ap	ri.	L,	196	8		
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	SE!															
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	Material	Pepth	Depth			-	Perce	nt Ret	eined						T 1	
Test Nois	st Bottom of Hole	at aver- Burden	of Material	1 1/2	3/4	3/8	5	8	16	30	50	100	Wash 200	G.F.	L.L.	P, 1,
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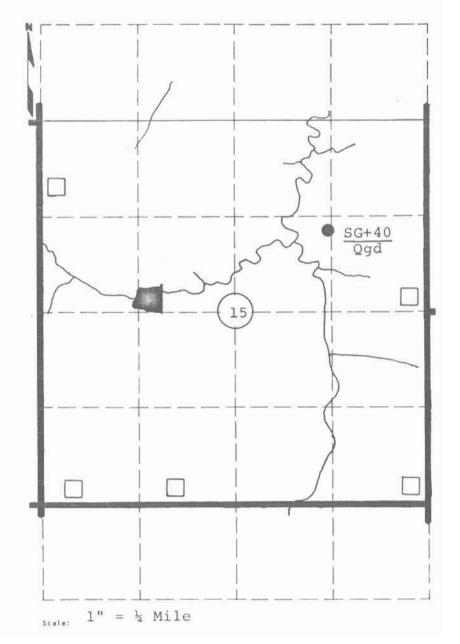
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Owner.	Ralph	E.	Bart	ile	Ϋ́E	etu	X	20	9 h	۰.	115	tn	, Kal	nsas	CI	LY	MO .
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	peles Wear																
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scale: l" = 1/4 Mile

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Remarks -

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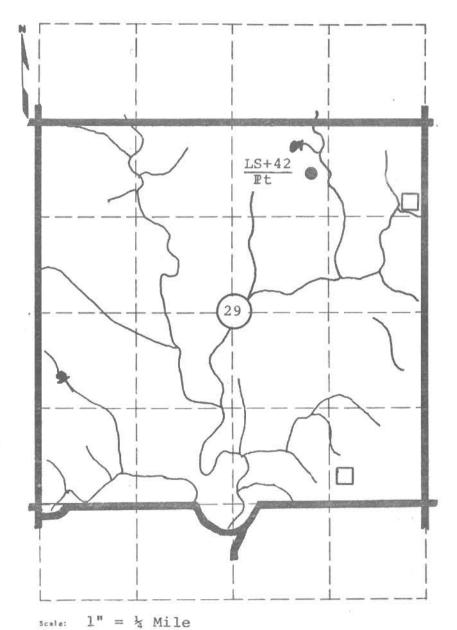
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Quaternary Quaternary	
Glacial Drift	
	(Dry)
Los Angeles Wear -	
Absorption	Soundness
Wt. Gu.Ft.	Str. Ratio
This site is reporte	d in the Geological Survey
Bull. No. 1060D	
	s Lepper, % Albert J.

SG+41 Qgd Scale: l" = ¼ Mile

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

		LS+	42													
Site No		Pt						Date		Apr	il	, 1	968			
Materia	L	imes	tone					_ co	unty.		Ner	nah	a			
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Materia	l Similar	То ——														
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Los Ang	eles Wear															
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Specific Gravity (Sat.) -

Los Angeles Wear -

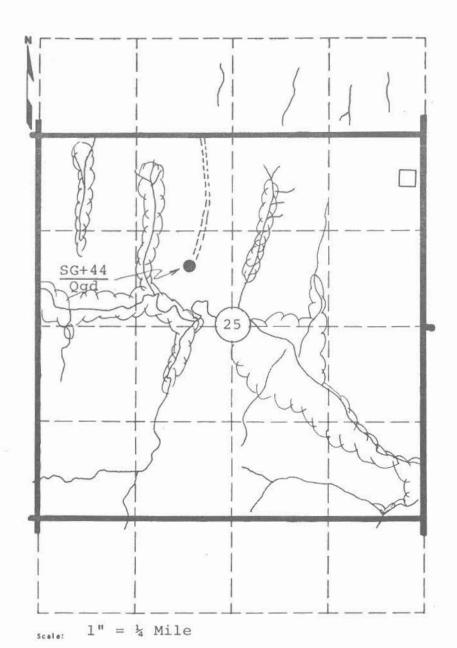
Apporption -Mt. Cu.ft. -Remarks -

te No.		SG-						Date		Ap	ril	. ,	196	8		
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SG+43 scale: 1" = 1 Mile

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Sectori	cal Age -		Qua	te	rna	ry										
	ical Source		01-													
				TO OF												
Materia	l Similar	To							_		-					
			-	-							-					
Speciti	c Gravity	(Sat.)								(Dry	)					
Los Ang	eles Wear															
	ion —								v 11							
Mt. Cu.	Ft. ——			7.	-	-		- \$1	r. Ra	tio -			-			-
Remarks				-		_		-	-							-



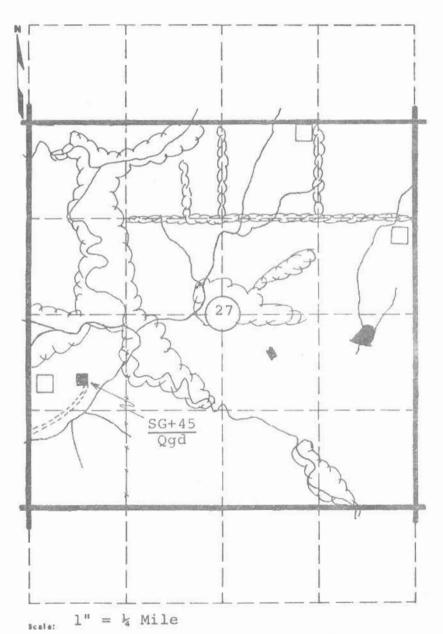
	Trail or lane	-	Open materials sites; sampled
American	Road	0	Center of section
+++++++	Railroad		Dwelling
~~~~	Hedge or trees		
_xx	Fence	+	Cemetery
	Major stream	ď	School
>>>	Intermittent streams	đ	Church
	Pond or lake		Town or city

SG+45 Qgd Sand and Gravel		April, l	
ocstion NW4 SW4			
Harry A. Scott et	ux	Wetmore,	Kansas
Mature of Deposit Dry Access			001032

EXPLORATION DATA

ttom ov	of ver-	Depth of Material	1.112	and the					17.0			Mach			
		110001101		3/4	3/8	4	В	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
25	4	9			1	3	5	8	25	54	85	10	1.94		
	6	6			3	4	.7	14	48	73	91	7	2.40		
	4	4					2	8	26	45	67	28	1.48		
						6 6 3	6 6 3 4	6 6 3 4 7	6 6 3 4 7 14	6 6 3 4 7 14 48	6 6 3 4 7 14 4873	6 6 3 4 7 14 4873 91	6 6 3 4 7 14 4873 91 7	6 6 3 4 7 14 4873 91 7 2.40	6 6 3 4 7 14 4873 91 7 2.40

Geological Age	Quaternary
Geological Source	Glacial Drift
	Material reported on SHC Form 619 2 Lab. No. 10440
	25.3(C) (Bry)
Assorption -	Noundness 0.94
ut. co.ft. 118.	8 str. Batio 1-day 1.23,3-day 1.28
Bonarks Gradat	ion data for holes 2 and 3 represent
the finest	and coarsest material that has been
tested at	this site.



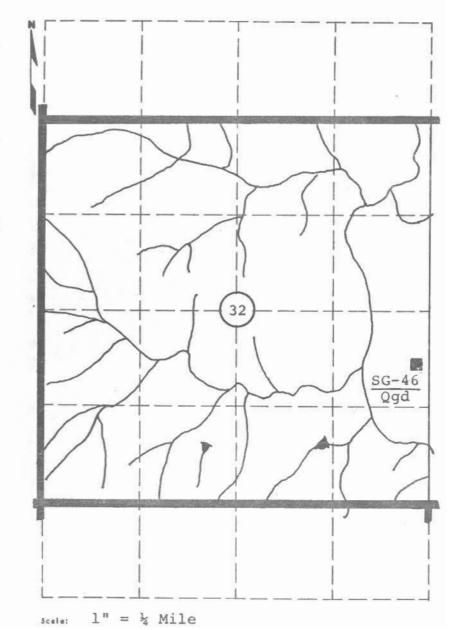
SITE No. SG-46	Date A	pril, 1968	
Material Sand and Gravel	County	Nemaha	
Location NE% SE% Sec.	32	TwpIS Range.	11E
Owner Wilbert A. Wassenberb		Baileyville,	Kansas
Mature of Deposit Dry Accessibility		address	
Status of Site Open site; sampl			

EXPLORATION DATA

Material	Depth	Depth				Perce	nt Ret	ained							
t at of of Bottom over- of Hole Burden Hateri	0.0	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I	
			2	5	11	19	32	51	75	90	94	5.7	3.78		
														-	
															_
			-				-								
	at Bottom	at of Bottom over-	at of Depth of Bottom over-	at of of over- of Hole Burden Material I 1/2	at of Bottom over- of Hole Burden Material I I/2 3/4	at of OPPTH OF OF OF Noterial 1 1/2 3/4 3/8	at of Bottom over- of Hole Burden Haterial I 1/2 3/4 3/8 4	at of Bottom over- of Hole Burden Haterial 1/2 3/4 3/8 4 8	at of Bottom over- of Hole Burden Material I I/2 3/4 3/8 4 8 16	at of Bottom over- of Hole Burden Haterial I 1/2 3/4 3/8 4 8 16 30	at of Bottom over- of Hole Burden Haterial 1 1/2 3/4 3/8 4 8 16 30 50	at of Bottom over- of Hole Burden 1 1/2 3/4 3/8 4 8 16 30 50 100	at of Bottom over- of Hole Burden Naterial 1 1/2 3/4 3/8 4 8 16 30 50 100 200	at of of Bottom over- of Hole Burden 1 1/2 3/4 3/8 4 8 16 30 50 100 200 G.F.	at of Bottom over- of Hole Burden Depth of Haterial 1 1/2 3/4 3/8 4 8 16 30 50 100 200 G.F. L.L.

CORRELATION DATA

Geological Age							
Geological Source -	Glacial I	Drift					K
Material Similar To			on	SHC	Form	619	No.
66-24 L							
Specific Gravity (3	at.) 2.60						
Los Angeles Wear -							
Absorption —		\$ou	ndness	(90		
wt. Cu.Ft. 1	01.0		tr. Ra	atio			
Renarks							



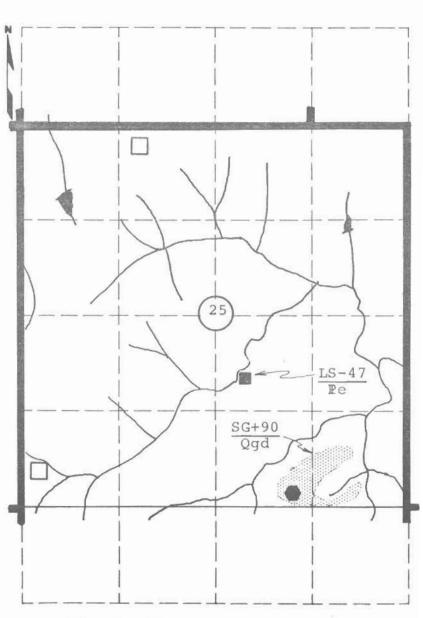
9

te No. —		6-4 Pe	<u></u>	Date	April,	1968
erial -	Li	imes	stone	co	unty Nemaha	
cation —	NW4	SE	4	_ sec. 25	INP 1S	Range
C]	larer	ice	Schmitz		Seneca, K	
	Deposit —	Dry	name / tcces	Po	or site Locati	ed on Plate I
atus of S	Site -	Ope	en site;	sampled		

EXPLORATION DATA

Section 1	Material	Pepih	Depth		Percent Retained											
Test at of of Hole Burden Hater	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1		
														-		

Geological Age Pennsylvar	iian
Emporia Ls.	Form. (Reading Member)
	reported on SHC Form 645
	(Dry) 2.45
Los Angeles Wear 35.2(B)	
Absorption 3,48	Soundness 0.80
Wt. Cu.ft.	Str. Ratio
Romarks	



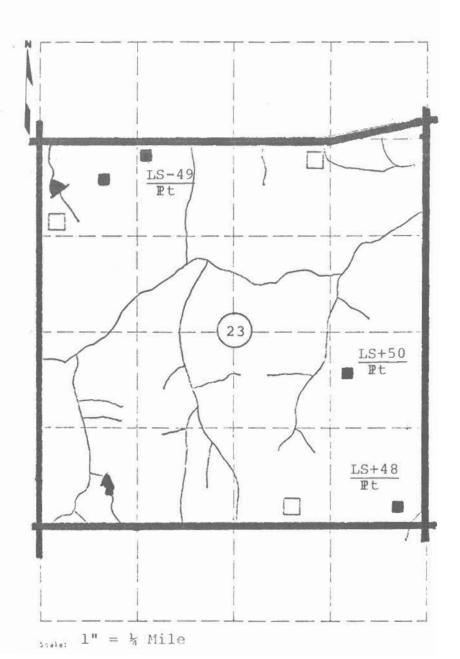
Scale: 1" = ¼ Mile

Limestone	Nemaha
22-22-21 (22-22-22-22-22-22-22-22-22-22-22-22-22-	23 _{Twp.} 1S _{Range} 11E
	Baileyville, Kansas
ature of Besonit Dry	Good Site Located on Flate I

EXPLORATION DATA

(STORES)	Material	(tauen	Dopth				Perce	ni kat	ned						1			
Hole	Botion of hore	GVIT- Material		Botion over- of Scie duran Metarial		1 1/2	3/4	3/8	, 4	á	16	30	LO	100	Wash 200	G.F.	L.L.	P. 1
													1					
			-												-			
																_		

Goulogica: Age	Pennsylvanian	
ueologica, Source -	Tarkio Limestone	Member
Mulecial Similar To-	Material report	ced on SHC Form 619
	66-22 Lab. No.	
Specific Gravity (Sa	2.52	(0ry)
	1.5(B)	
Absorption3	.63	Soundness 0.85
Wt. Gw.Ft.		— Str. Ratio —
Remarks -		

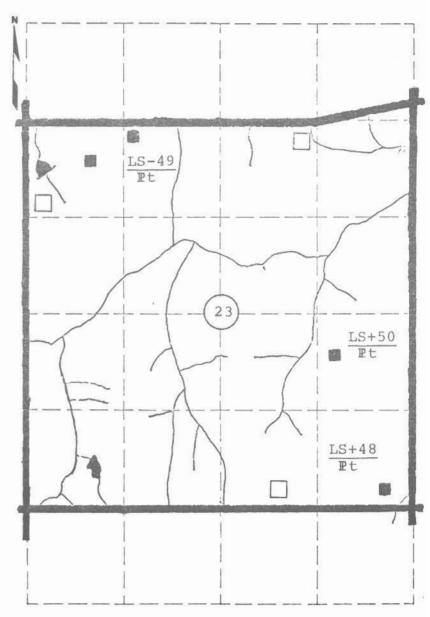


Limestone	Nemaha
	23 Twp. 1S Range 11E
	Baileyville, Kansas
D WW G	Good Site Licated on Plate

EXPLORATION GATA

	Muticial	Posth	Depth				Perse	nt ket	3:ned							
Fest Hole	al Collina Ol Otle	of Lyrr- Bardon	ot Material	1 1/2	3/4	3/6	, Sq.	8	16	30	50.	100	Wash 200	G.F.	L.L.	P.1.
			-												-	_
-				-				-	-,							_
											-					

Geological Age	Pennsyl	vanian			
Geological Source ——	Tarkio 1	Limestone	Meml	ber	
daterial Similar To -					633
Lab. No.	67-1529		4.5		
Specific Gravity (Sat.	2.56		(D	2.40	5
Lue Angeles Wear - 3!	5.8(B)				
Autoroption 3.95			nass —	0.84	
Wt. Cu.Ft		\$1r	. Ratio		
iozarka					



scale: 1" = 1/4 Mile

10

MATERIAL SURVEY REPORT

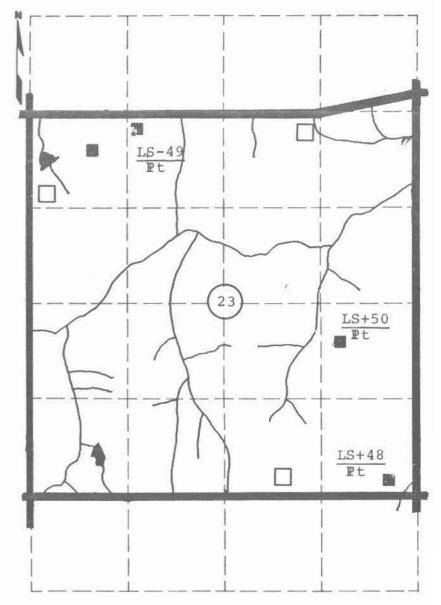
Limestone	Nemaha
	. 23 Twp. 1S Range 11E
Edwin J. Schmitz	Baileyville, Kansas
	ty Fair Site Located on Plate I

EXPLORATION DATA

	Material	Depth	Depth				Perce	nt Ret	ained							
Test Kole	at Bottom of Hole	of over- Burden	0.4	1 1/2	3/4	3/8	4	8	15	30	50	100	Wash 200	G.F.	L.L.	P. 1.
															-	
	-															

CORRELATION DATA

Geological Age -	Pennsylvai	nian	
Seological Source -	Tarkio Lir	mestone Member	
		reported on SHC Form 619	
No. 66-2	1		
		(Dry) 2,42	
Los Angeles Wear	35.7(B)		
Absorption 4.42		Saundness 0.89	
		Str. Ratio	
Romarks			

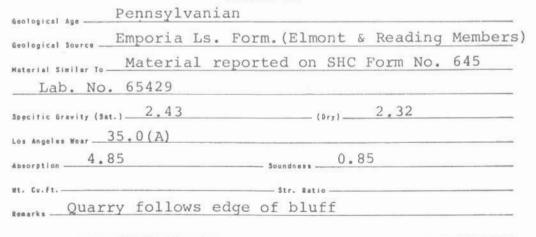


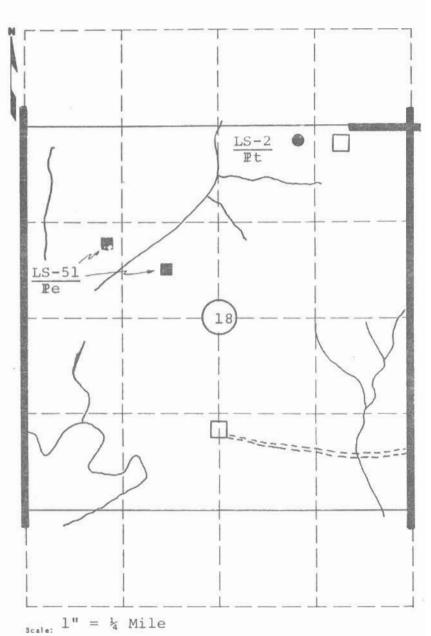
Scale: 1" = ½ Mile

te No	LS-51 Pe		Date	April,	1968	
aterial -	Timostono			Nemaha		
		3ec		Two. 1S		12E
	Emmett & Cyril F	angma	in	Sene	ca, Ka	nsas
ature of	Deposit Dry Access	ability	Fair			I
	Open site;					

EXPLORATION DATA

	Material	Depth	Depth				Perce	nt Ret	ained					2.00		
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L-L.	P. I
	10															
											a i					
	-															





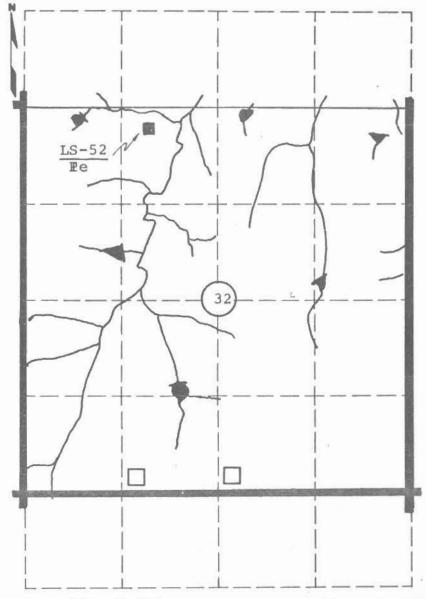
Limestone	Nemaha
ation NE's NW's so	32 Twp. 1S Range 1
Frances Heiman	Baileyville, Kans
n all e	Poor Site Located on Plate -

EXPLORATION DATA

527 W	Material	Depth	Depth				Perce	nt Ret	ained							
Test Nols	st Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q.F.	L.L.	P. 1.
				_		-										
-	-		-													
	0.5															

CORRELATION DATA

	ian
Geological Source Emporia Ls.	Form. (Elmont & Reading Members)
Material Similar To Material	reported on SHC Form No. 645
~ 1 (5.4.2.0	
Specific Gravity (Sat.) 2.45	(Pry) 2.33
Los Angeles Wear 32,4(A)	
Absorption 5.20	\$oundness0.87
Wt. Cu.Ft.	Str. Ratio
Remarks	



Scale: 1" = ½ Mile

96

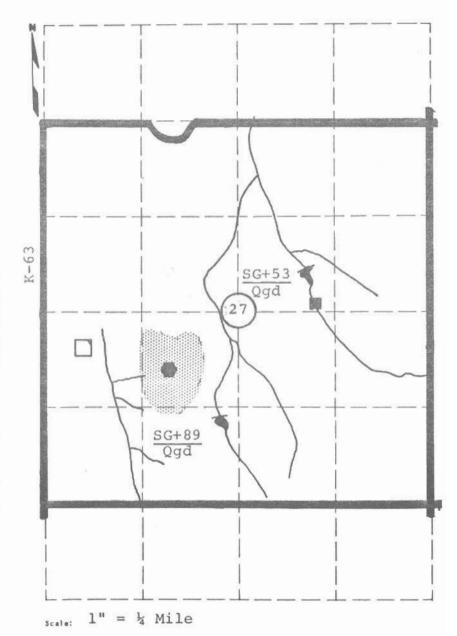
Status of Site -

ite No.	-	GG+53 Qgd	3		_ Date	April,	1968	
						Nemah		
						Iwp. 1S		
wner	Alber	rt A.	Rotti	nghaus	5	Seneca,	Kansa	as
		Dry				Site Locat	ed on Plate	<u>I</u>
	Sita	Oper	site;	samp	led			

EXPLORATION DATA

ags 19 1	Material	Pepth	Death				Perce	nt Ret	ained				227177			
Test Hole	est at of of of old of Hole Burden Mater	Depth of Haterial	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1	
																_
					-											_
											18					

Geological Age	Quat	cerna	cy						
Seological Source -	Glad	cial I	rift	<u> </u>					
Material Similar To	Mate	erial	repo	orte			Form 619		
Specific Gravity (Sa	t.)	2.62				(0ry)_			
os Angeles Wesr									
nt. cu.ft110									
The me	ateri	al fi	com t	this	site	is	obtained	by	the
crush	ing c	of gla	acia:	L bot	ılder	s.			

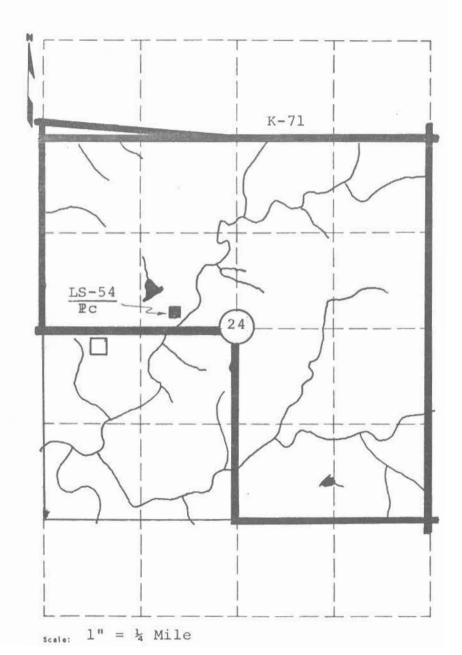


LS-54 PC	April, 1968
Material Limestone	Nemaha
SE¼ NW¼ sec.	24 Iwp. 1S Range 12E
Herman Lange	Sabetha, Kansas
Mature of Deposit Dry accessibility	, Good Site Located on Plate I
Status of Site Open site; sar	

EXPLORATION DATA

Material	Depth	Depth				Perce	nt Ret	ained							
at at of over- of Nole Burden	er- unterior	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.	
							_								
	at bottom	at of bottom over-	at of of bottom over-	at of of of bottom over-	at of of of bottom over-	at of of of of bottom over-	at of of of of ot of ot of ot of ot	at of of of ot 1 1/2 3/4 3/8 4 8	et of of bottom over-	at of of of bottom over-	at of of of of bottom over-	at of of of of bottom over-	at of of of 1 1/2 3/4 3/8 4 8 16 30 50 100 200	at of of of of 1 1/2 3/4 3/8 4 8 16 30 50 100 200 6.f.	at of of of of of of of other of the other other of the other othe

Pennsylvanian	
Geological Source Church Limest	one Member
Material Similar To Material rep	
Lab. No. 49191	
Specific Gravity (Set.) 2.76	(Dry) 2.72
Los Angeles Wear 23,7(A)	
Absorption 1.24	50undness 0.93
Wt. Gu.Ft.	Str. Ratio
Some Nodaway Coal	is exposed in this quarry.



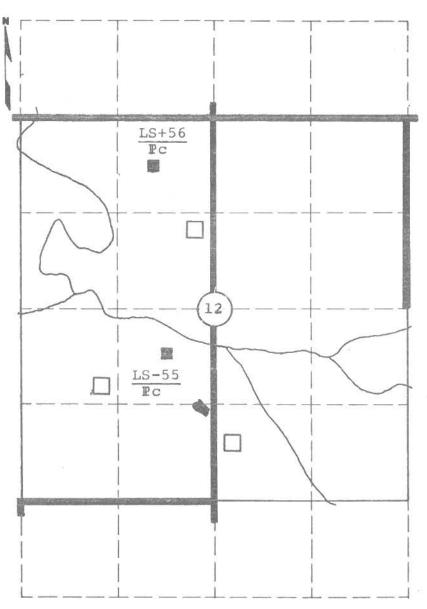
No]	LS-55 Pc		_ Date	April, 1	968					
			County Nemaha								
		4			Twp. 1S		12E				
		Korber			Kansas						
		Dry				address ed on Plate	I				
a of	Site —	Open sit	te; samp	oled	-2 May 1816-27						

EXPLORATION DATA

-	Material	Dopth	Depth				Perce	nt Ret	ained			-				
Test Nois	Note Bottom ove	of over- Burden	of Material	1 1/2	3/4	3/8	ц	8	16	30	50	100	Wash 200	G.F.	1.1.	p. (

CORRELATION DATA

Geological Age	Pennsylvanian
	Church Limestone Member
Material Similar To-	Material reported on SHC Form 645
	No. 49190
Specific Gravity (Sa	(pry) 2.72 (pry) 2.67
os Angeles Wear	35.3(A)
usorption	76 Soundness 0 , 89
The No	odaway Coal has been mined at this site.



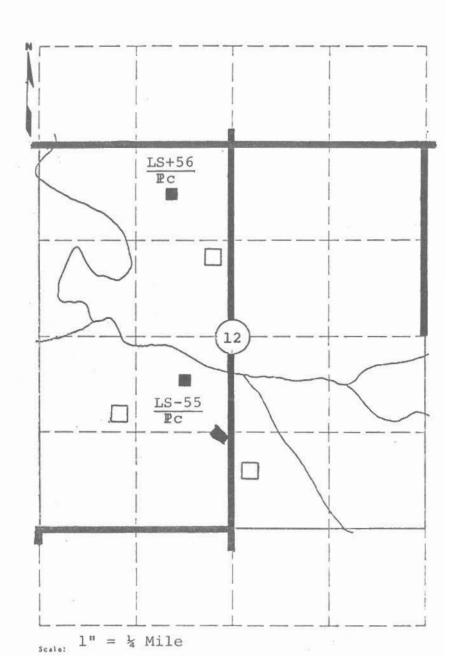
scale: 1" = ½ Mile

April, 1968

LS+56

Site No. -

Materia	1	Lime	estor	ie			Nemaha									_
Locatio	NE 2	NW1	4			- Sec		12		Twp.		18	. R	an an	12E	
	Alvi											Kar	nsas	3		
	ot Deposi		D. datal ex										address			
	of Site -										2116	LOCAL	eu on .			
314104	01 3116 -				1				DATA							
-	Hateriai	Peeth	Death				Perce	nt Ret	ained	_						_
Tost	at Bottom of Hole	or over- auraen	of Material		3/4	3/8	4		16	30	50	100	Wash 200	G.F.	L.k.	Р.
										1						
icologi	cal Age -	Pe	ennsy	lva	ani	an	RELAT									
	cal Sourc													eng Hari		_
lateria	al Similar	10 _ N	Mater	ia.	l r	epo	ort	ed	on	SI	HC	For	rm 6	45		_
	Lab.	No.	6216	1_										_	_	_
Spacifi	c Gravity	(Sat.)	2,	71						- (Dry)	2.6	55			
Los Ang	eles Wear	25.	6(A)													
Ausorpt	ion	3.	75_)			
wt. Cu.	Ft							S1	r. Ra	tio -						
Romarki	Th	e No	odawa	у (Coa	1 h	ıas	be	een	mi	ine	d a	at t	his	sit	e.
								5								



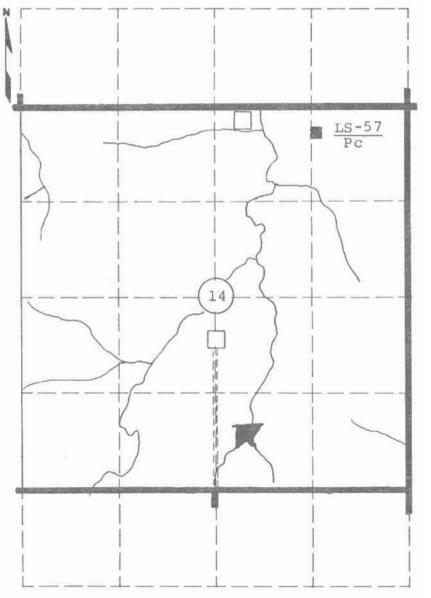
Limestone		Nemaha
NE¼	Sec	14 Twp. 15 Range 14
Kate Ott		Sabetha, Kansas
паме		Sabetha, Kansas address Good Site Located on Plate -

EXPLORATION DATA

Server Common	Material	Pepth	Depth				Perce	nt Ret	ained							
Test Nole	e Bottom over- of Hole Burden	over- Material	1 1/2	3/4	3/8	ц	В	16	30	50	100	Wash 200	G.F.	t.L.	P. I	
															-	
																0

CORRELATION DATA

Geological Age	Permian	
Geological Source -	Cottonwoo	od Limestone Member
		reported on SHC Form 619
No. 66	5-32	
Specific Gravity (Se	at.) 2,40	(Dry) 2.24
Los Angeles Wear	45.4(B)	
Absorption 7.3	L 3	5oundness 0.73
Wt. Gu.Ft.		Str. Retio
Romarks		



scale: 1" = ½ Mile

TOT

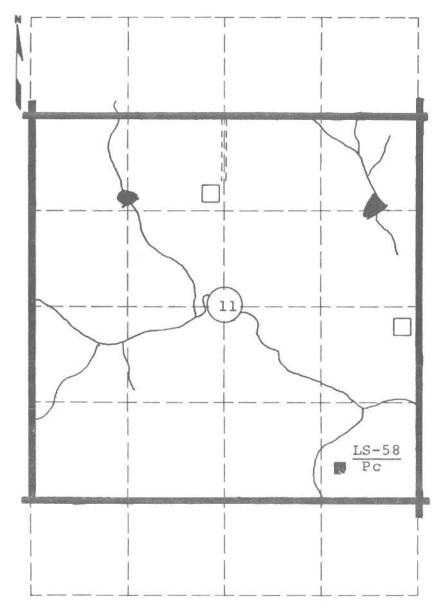
LS-58 PC	Date	April, 196	8	
Limestone		Nemaha		
ocation SE¼ Sec.	11	Twp. 1S	Ranga	14E
Harvey F. Bechtelheim	er			sas
name Dry Accessibility	Good	addr		_II
Open site; sample	d	EAS 10 TELEVIS 1		

EXPLORATION DATA

a 이	Material	Depth	Depth				Perce	nt Ret	ained							
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
			-													
			-													_

CORRELATION DATA

Geological Age	Permian
	Cottonwood Limestone Member
Material Similar	Material reported on SHC Form 619
No.	66-25 Lab. No. 14658
	(sat.) 2.42 (Dry) 2.29 40.7(B)
Absorption 5.	92 Soundness 0.77
ft. Cu.Ft.	Str. Ratio —
Ronarks	



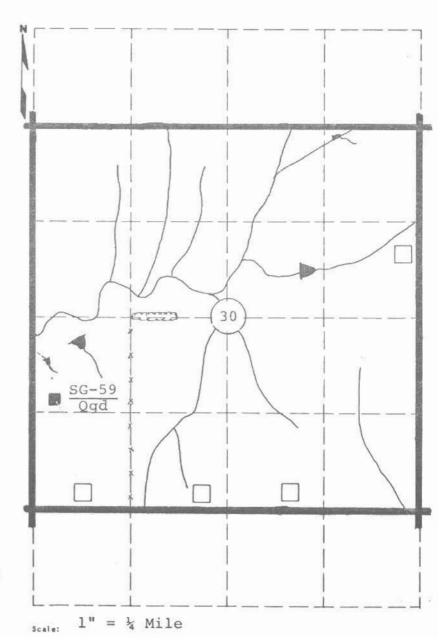
Scale: 1" = \ Mile

sterial Sand and Grave	1	Count	N N	emaha		
ocation SW4	\$ec	30	Тир	1S		14E
wner R. B. Rokey		Sab	etha	, Kan	sas	
sture of Deposit Dry acces	schility -	Go	od ,	ita incata	d on Plate	II

EXPLORATION DATA

Material	Depth	Depth				Perce	nt Ret	ained	-			0			
st Sollow of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I
				7	18	27	40	51	70	82	90	8	3.85		
					-										
		-		_		-	-								
	at Sottom	at of Bottom over-	at of of of bottom over-	at of of of 1/2	at of of of of of of Material 1 1/2 3/4	at of bottom over- of Nole Burden Material 1 1/2 3/4 3/8	at of bottom over- of Mole Burden Haterial 1 1/2 3/4 3/8 4	at of bottom over- of Mole Burden Haterial 1 1/2 3/4 3/8 4 8	at of bottom over- of Mole Burden Material 1 1/2 3/4 3/8 4 8 16	at of Bottom over- of Hole Burden Haterial 1/2 3/4 3/8 4 8 16 30	at of bottom over- of Mole Burden 1 1/2 3/4 3/8 4 8 16 30 50	at of of bottom of Material 1 1/2 3/4 3/8 4 8 16 30 50 100	at of bottom over- of Mole Burden	at ot of of of othole Burden of Material I I/Z 3/4 3/8 4 8 16 30 50 100 Wash 200 G.F.	at of bottom over- of Hole Burden Of Material 1 1/2 3/4 3/8 4 8 16 30 50 100 200 G.F. L.L.

Geological Age Ouaternary	
Geological Source Glacial Drift	
Material Similar To Material rep	
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
Renarks -	



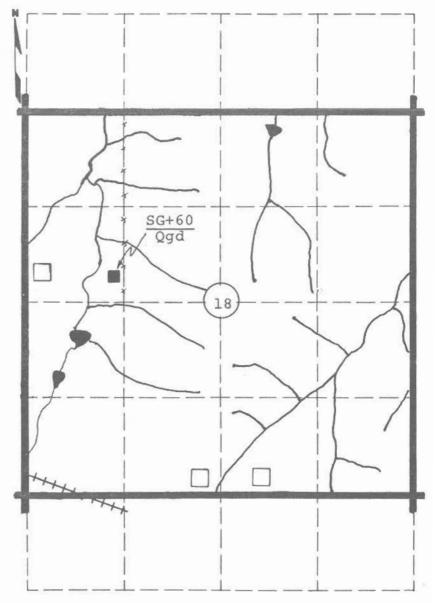
104

MATERIAL SURVEY REPORT

SG+60 Qgd		_ Date	April,	1968			
Material Sand and Grav	vel	County	Nemah	a			
Location SW4 NW4	Sec	18	Twp. 1S	R	ange 14	E	
Clayton J. Stra	ahm etu:	K	Bern,	Kan	sas		
Nature of Deposit Dry				addres	5	II	
Status of Site Open site;	sample	ed					_
	EXPL	RATION DAT	A				
Test at of of		ent Retained	1 1 1	Wash	G.F.	L.L.	Р.

_	Material	Depth	Depth				Perce	nt Ret	ained				28.3		L.L.	
Test Hole	Bottom of Hole	of over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.		P. I
				4	10	13	18	27	40	56	78	85	14	3.30		
	-		-		_			_						-		

Geological Age Qua	iternary		
Geological SourceGla	acial Drift		
No. 66-23 I	ab Na	on SHC Form 619	
	2.53 (D)	(Dry)	
Weblieb to Belliebe to the factor than the con-		undness 0.96	
wt. cu.ft. 91.2	8	Str. Ratio —	
Remarks -			_



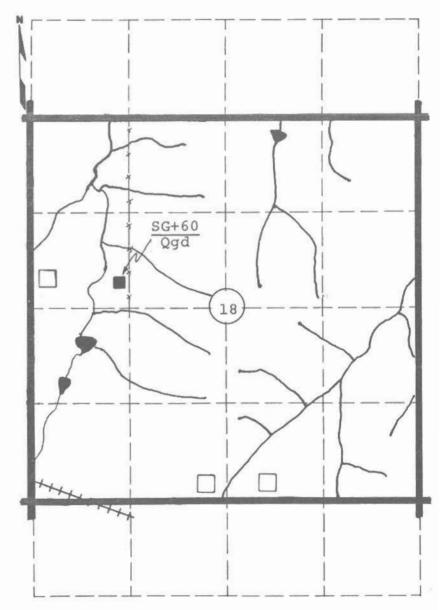
Scale: 1" = 1/4 Mile

ite No	SG+60 Qgd	2		Date -	April,	1968	
		d Gravel					
							ξE
wner_Clay	yton J	. Strahm	etux		Bern,	Kansas	
ature of Depoi	Dry	name Access	bility	Fair	Site Loca		II
Status of Site	Open	site; s	ample	d			

EXPLORATION DATA

	Material	Depth	Depth				Perce	nt Ret	ained				10 07			
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
				4	10	13	18	27	40	56	78	85	14	3.30		

Geological Age	Quaternary		
		ift	
Material Similar To	Material re	eported on SHC Form 619	
No. 66-	23 Lab. No.		
Specific Gravity (8	at.) 2.53	(Dry)	
Los Angeles Wear —	29.0(D)		
Absorption —		Soundness 0 . 96	
Wt. Cu.Ft. 9	1.2	Str. Ratio	
Remarks			



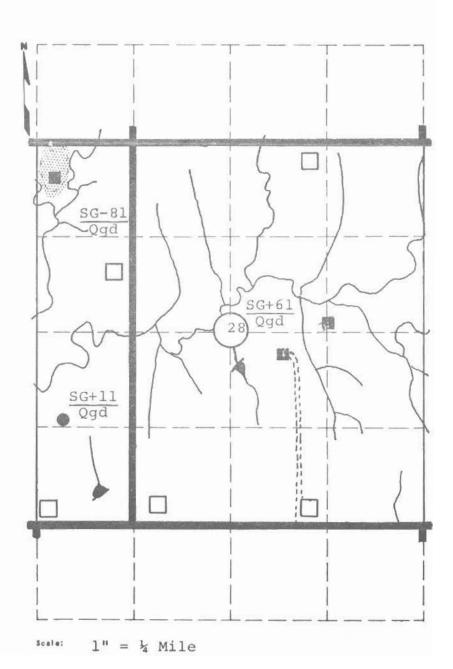
Scale: 1" = 1/4 Mile

Site No. SG+61	April, 1968
Haterial Sand and Gravel	
LocationE½	Sec. 28 Twp. 1S Range 13E
Owner See Remarks	address
	Good Site Located on Plate II
Status of Site Open site; s	ampled

EXPLORATION DATA

-21180 W	Material	Depth	Depth				Perce	nt Ret	ained							
Test Hole	Bottom of Hole	ot over- Burden	of Material	1 1/2	1/2 3/4	3/8	4	B	16	16 30	50	100	Wash 200	G.F.	L.L.	P. I.
					3	12	23	35	50	70	85	90	8.5	3.68		
			-													
								1								

Geological Age	Ouaternary
Geological Source	Glacial Drift
	Material reported on SHC Form 633
Lab. No.	99194. Tested 9-6-67
Specific Gravity (Sat.	.) 2.59 (Dry)
os Angeles Wear 2	5.3(D)
beorption 1.5	\$oundness 0 . 9 4
t. cv.ft. 108.	5 Str. Ratio
NE RO	y Ehrsam, Bern, Kansas
Why SE%	Waymer G. Esslinger, Bern, Kansas

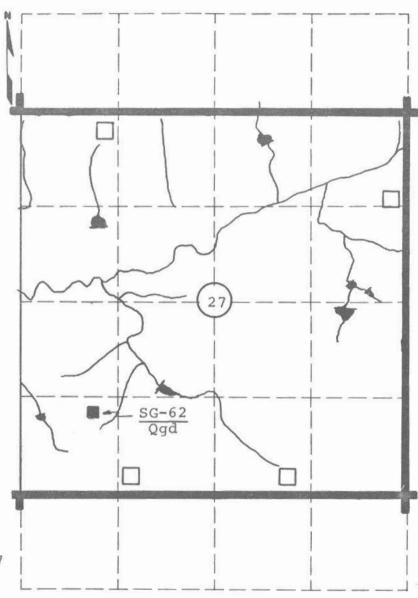


SG-62 Qgd	April, 1968
	Nemaha
	c. 27 Twp. 1S Range 13E
Owner Pearl L. Meyer	Bern, Kansas
Mature of Deposit Dry Accessibili	
Status of Site Open site; san	npled

C#MINE !	Material	Depth	Depth				Perce	nt Ret	ained					6.F.	L.L.	P.1.
Test Nole	Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200			
				1	6	13	23	30	43	61	82	92	2.8	3.51		
												(

CORRELATION DATA

### Geological Source Glacial Drift Material Similar To Material reported on SHC Form 633 Lab. No. 65-2031	Geological Age Quaternary	
Lab. No. 65-2031 Specific Gravity (Set.) 2.60 (Dry) 2.58 Los Angeles Wear 29.7(C) Absorption 0.91 Soundness 0.95	Goological Source Glacial Drift	
Specific Gravity (Set.) 2.60 (Dry) 2.58 Los Angeles Wear 29.7(C) Absorption 0.91 Soundness 0.95	Material Similar To Material report	ed on SHC Form 633
Los Angeles Wear 29.7(C) Absorption 0.91 Soundness 0.95	Lab. No. 65-2031	
Absorption 0.91 Soundness 0.95	Specific Gravity (Set.) 2,60	(Dry) 2.58
	Los Angeles Wear 29.7(C)	
wt. cu.ft. 113.41 str. Ratio 1-day 0.68, 3-day 0.87	Absorption 0.91	Soundness 0.95
	Wt. Cu.ft. 113.41	str. Ratio 1-day 0.68, 3-day 0.87
Remarks	Remarks	



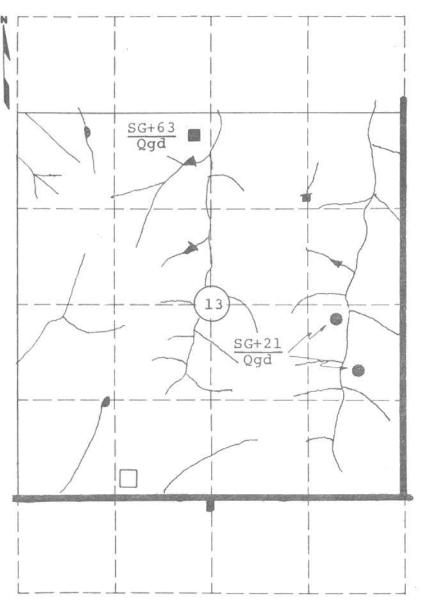
scale: 1" = ½ Mile

oate April, 1968
countyNemaha
c. 13 Two. 3S Range 12E
etux Seneca, Kansas
Poor Site Located on Plate III
pled

EXPLORATION DATA

	Material	Depth				Perce			100.000							
Hole Bottom	at Bottom of Hole	ot over- Burden	- 4	1 1/2	3/4	3/8	4	В	16	30	50	100	Wash 200	G.F.	L.L.	P. I
					9	26	39	52	64	73	84	89	9	4.36		

Geological Age	Quateri	nary						
Geological Source	Glacia:	l Drift						
Material Similar To Ma	terial	reported	on	SHC	Form	No.	633	
Lab. No.								
Specific Gravity (Sat.) -				(0ry)_				
Los Angeles Wear 37	.6(B)							
Absorption —		\$ou	ndness		0.92			
wt. cu.ft. 124.8								1.60
Remarks -								



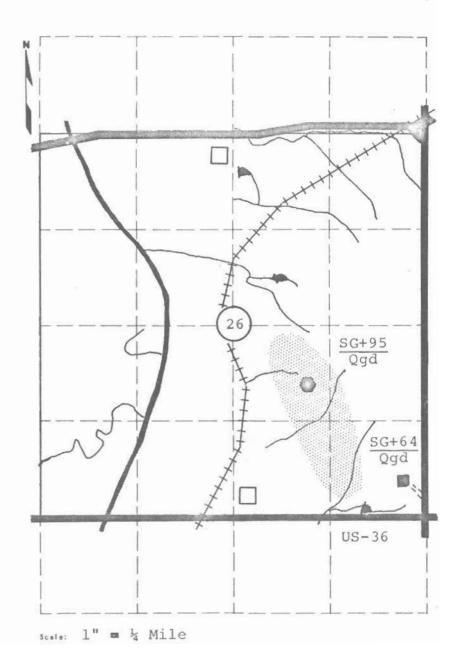
Scale: l" = 1/4 Mile

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ľ				Ι	
(ζ)	
,	,	١	,	,	

Site No	SG+64 Ogd	Date April, 1968
Material -	Sand and Gravel	countr Nemaha
Location -	SE¼ SE¼	Sec. 26 Twp. 2S Range 12E
Owner	A. E. Vitt	Seneca, Kansas
	Deposit Dry Access	ibility GOOd Site Located on Plate III_
Status of	Open site;	sampled

#1000E	at of Bottom over-	Pepth	t of	-			Percer									
Test Hole		ot over- Burden		1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
Mal							5		15			85	13			
								li i								

Geological Age Ouaternary	
Geological Source Glacial Drift	
Material Similar To Material report	ed in Geological Survey
Bull. No. 1060D	
Specific Gravity (Sat.)	(Ory)
Los Angeles Wear	
Absorption —	Soundness
Wt. Cu.ft.	Str. Ratio
Remark, This site was tested	for the Geological Survey
by the State Highway Commi	ssion of Kansas.



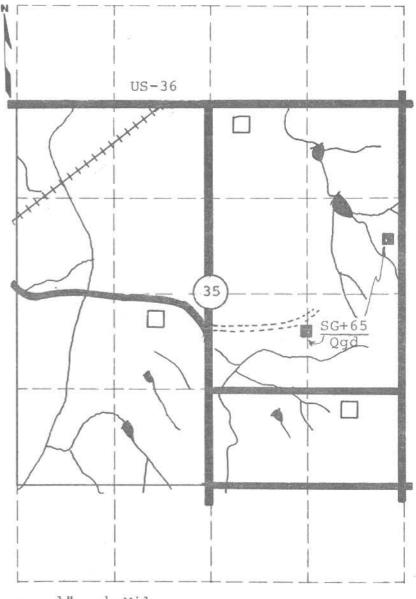
Site No	SG+65 Qgd		Date	Apı	cil, l	L968				
Material -	Sand and	Gravel	county Nemaha							
Location —	E	Sec	35	Тыр. —	2S	Range _	12E			
Owner S	ee Remarks				Ad	dress				
Mature of De	posit Dry	- Accessibility -	Fair	5:			III			
Status of 51	open sit	e; sample	ed							

EXPLORATION DATA

	Material	Depth	Depth				Percer	t Ret	ained							
Test Hole	at Bottom of Hole	ort over- Burden	of Haterial	1 1/2	3/4	3/8	ч	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
Ca3					3	10	24		63			95	5.0	3.01		

CORRELATION DATA

Geological Age	Quaternary	
Geological Source —	Glacial Dri	.ft
Material Similar To	Material re	reported in Geological Survey Lab. No. 21951
Specific Gravity (S	at.)	(Bry) 2.56
Absorption		Soundness
wt. Cu.Ft. 93	.0	str. Ratio 1-day .80, 3-day .8
Remarks Test	ed for the Ge	Geological Survey by the State
Highwa	. Commission	in October, 1933



scale: 1" = \ Mile

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

LIO

MATERIAL SURVEY REPORT

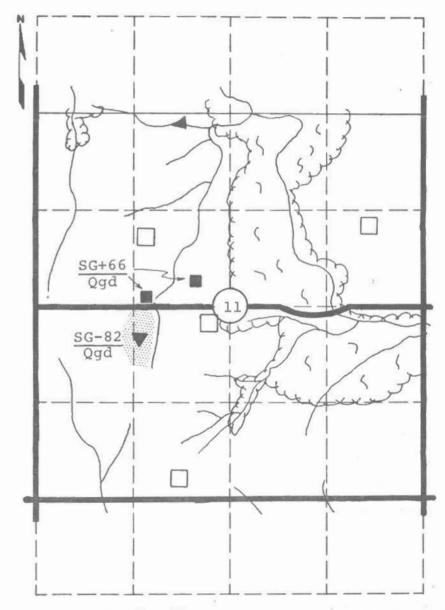
aterial -	San	d an	d Gravel	63	County	Nemaha		
		NW1				Twp. 4S	Itanga	14E
Ge	orge	W.	McDaniel	eti	ux	Wetmore	, Kan	sas
		n	800			add	743S	

EXPLORATION DATA

Material at	Pepth	Depth				Perce	nt Ret	ained	Percent Retained							
st sottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	В	16	30	50	100	Wash 200	Q. F.	L.L.	P. I	
	8	8	2	4	6	10	16	26	56	77	92	6	2.88			
	7	9	6	9	11	20	27	37	60	78	87	10	3.35			
	. 8	9		×		1	4	12	44	77	95	3	2.33			
	at sottom	et Bottom of Hole over- Burden 8	at bottom over- of Hole Burden 8 8 8 7 9	8 8 2 7 9 6	at bottom of hole Burden 1 1/2 3/4	at bottom over- of Hole Burden 8 8 2 4 6 7 9 6 9 11	at bottom over- of Hole Burden 8 8 2 4 6 10	8 8 2 4 6 10 16 7 9 6 9 11 20 27	Story of Hole Surden Sur	8 8 2 4 6 10 16 26 56 7 9 6 9 11 20 27 37 60	at bottom over- bo	Second S	at bottom bottom over- of Hole over- of Hole over- of Hole li/2 3/4 3/8 4 8 16 30 50 100 Wash 200 8 8 2 4 6 10 16 26 56 77 92 6 7 9 6 9 11 20 27 37 60 78 87 10	Story of Hole Story of Hol	Story of Hole Story of Hol	

CORRELATION DATA

Geological Age						
Geological Source —	Glacial D	rift				
Material Similar To-	Materia	l reported	d on SH	C Form	619	
No. Ms						
Specific Gravity (Sa	t.)		(Dry)			
Los Angeles Wear						
Absorption —		Sound				
wt. Cu.ft.		str	. Ratio			
Remarks Test	lata for t	est holes	1 and	3 repr	esents	the
_ finest an	nd coarses	t materia	l teste	d at t	his si	te.

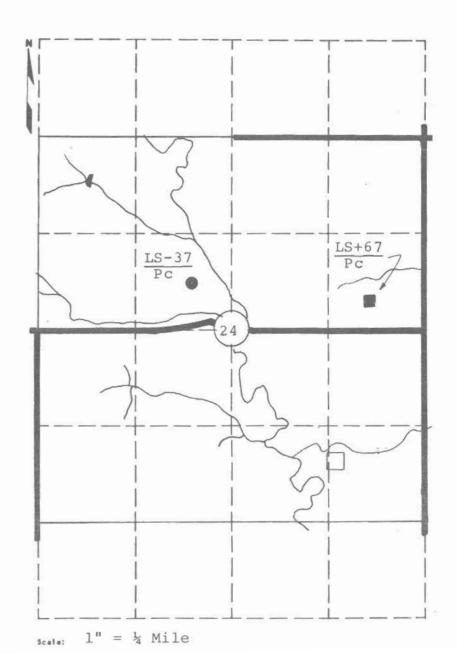


scale: 1" = ½ Mile

Limestone	- April, 1968 - Nemaha
SE¼ NE¼ Sec.	24 Two. 3S Range 14E
Edward A. Barben	Fairview, Kansas
name Dry Accessibility	Good Site Located on Plate

145000	Material Pepth	Pepth	epth Depth				Perce	nt Ret	ained							
Test Nole	at Bottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
								-			_				\vdash	-
							-	-								

Seological Source Cottonwood	d Limestone Member
Material Similar To Material	reported on SHC Form 645
	(Ory) 2.32
Los Angeles Wear 39.7(B)	
Absorption 4.81	0.88
Remarks	

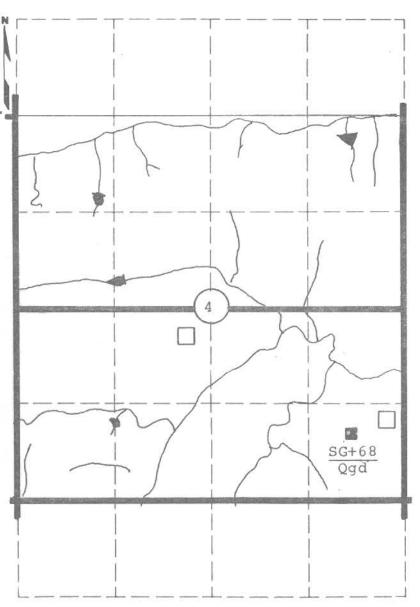


Site No.		G+61 2gd	8		Date -	Ap:	ril, 19	68		
			and Grave							
Location	SE	4 SI	E 4	\$ec	4	_ Two	_3S	_ Range	1	4E
Owner -	Ralph	E.	Bartley	etux,	209	W.	115th,	Kans	as	City, Mo
Mature o	t Deposit —	Dry	name Acces	sibility	Good	d				IV
State of the state			en site;				CN314-24-44			

EXPLORATION DATA

	Material I		Depth				Perce	nt Ret	ained							
Test Hole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
6		9	3			0	1	2	5	26	65	91	5	1.90		
								-	-							

Geological Age	laternary
Geological SourceG]	lacial Drift
	Material reported on SHC Form 619
Specific Gravity (Sat.) -	(Ory)
Los Angeles Wear	
Absorption	Soundness
Wt. Cu.ft.	Str. Ratio
Remarks This p	pit has been virtually worked out.

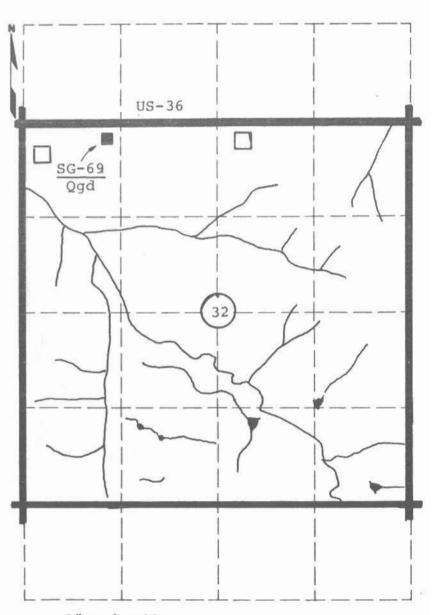


Scale: 1" = 1/4 Mile

ite No	5	SG-6 Qgc	69 d			Date	Ap	ril, 196	8	
				Gra	vel	County		Nemaha		
ocation -	NW 1	NW3	4			sec32	Twp.	2SR	anga	13E
			&	Rose				Seneca	,	
			n am	e:		Good		addres		IV
						ampled		5.1e Located on	Plate	

D 19	Material	Pepth	Depth				Perce	nt Ret	ained				125 6.9			
Test Hole	Bottom of Hole	Bottom over- Material		1 1/2	1/2 3/4 3/8 4		8	B 16 30		0 50 100		Wash 200	G.F.	L.L.	P. I	
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		
									V							

eological Age Quaternary
eological Source Glacial Drift
No. 66-15
pecific Gravity (Sat.)
os Angeles Wear
bsorption ———— Soundness ———————————————————————————————————
Gradation data for test holes 2 and 10 re-
presents the coarsest and finest material tested



Scale: 1" = 1/4 Mile

ateria	Sa	nd a	ind G	rav	re1							, 1 mah				
														tange 1	3E	
eture	of Deposi	, Dr	name	_ ^	ccess	ebili	t y	Go	pod		Site	Locat	addres	ISAS	IV	
tatus	of Site -	Op	en s	ite	1	san	npl	ed								
	**********								DATA							
	Haterial		1					nt Ret	- Bankin							
Test	at Bottom of Hole	Pepth of over- Burden	Depth of Material	1 1/2	3/4	3/8		8	16	30	50	100	Wash 200	G.F.	L.L.	P. I
av		10	6			2	4	9	19	44	72	85	13	2.35		
												AHEC				
												110				
					- 10						-					_
						COR	RELAT	ION	ATA							
eologi	cal Age —		Qua	ate	rna	ry										
eologi	cal Sourc		Gla	aci	al	Dr	ift									
	1 Similar								or	S	HC	Fo	rm	619		
	. 66-		10000		-	<u>. U P</u>	04.						au ***			
	. 00-	T 0														

__ Soundness ___

- Str. Ratio ---

Wt. Cu.Ft. -

Remarks -

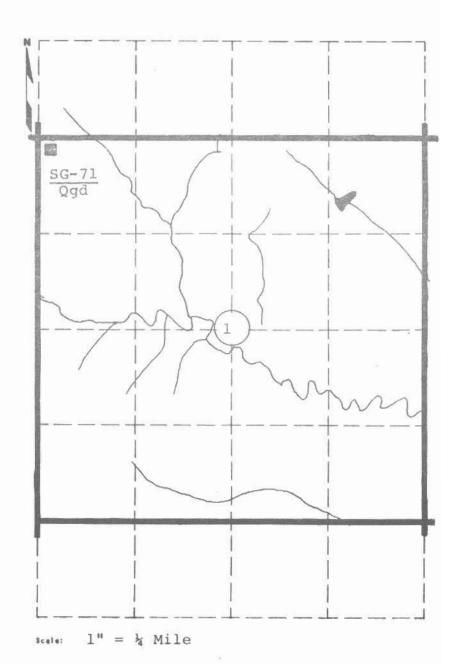
	US-36		
SG-70 Qgd	5		2
	(3	31)———-	
	_	 	
5cale: 1" =		L	

1	_	_
1		
1	_	_
,		
- 1		n

ite No	SG-71 Qgd		April, 1	968	
i aterial -	Sand and Gravel	_ County	Nemaha		
	NW4 NW4 sec.			Ranga	13E
wner	Albert & John Niehue	S	Goff,	Kansa	ıs
ature of	Deposit Dry Accessibility	Good	- Site Located		IV
tatus of	Open site; sample	ed			

	Haterial	Peath	Depth				Perce	nt Re	tained							
Test at of Hole bottom over- of Hole Burden	over- Material	1 1/2	3/4	3/8	4	-	16	30	50	100	Wash 200	6.f.	L.L.	P. 1.		
						1	3	6	12	31	76	91	5.6	2,20		
											_					
			-													-
					. 4								100			

Beological AgeQuaterna	ry	
Glacial Glacial	Drift	
	reported on SHC Form 633	
	(Dry)	
os Angeles Wear ————————————————————————————————————		
	Soundness	
re. Cu.Ft. 90.7	Str. Ratio	
esarks		

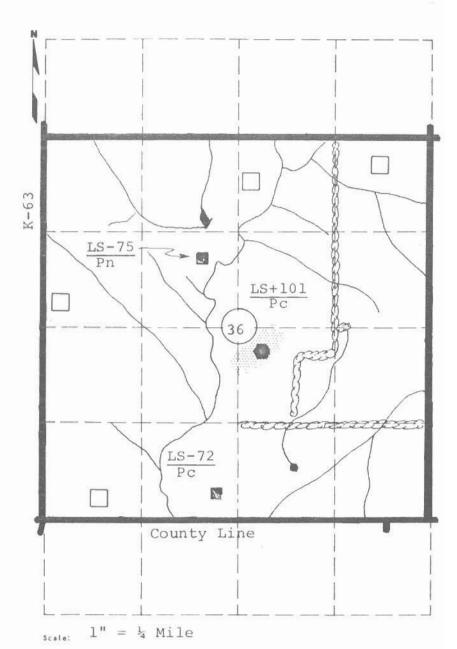


LS-72 PC Date April, 1968 Material Limestone County Nemaha Location SE¼ SW¼ Sec. 36 Twp. 5S Range 12E Owner Hiram W. Channel Soldier, Kansas Mature of Deposit Dry Accessibility, Good Site Located on Plate V Status of Site Open site; sampled

EXPLORATION DATA

	Material	Pepth	Depth				Perce	nt Ret	ained				CONTRACTOR OF			
Test at Hole bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	ų	8	16	30	50	100	Wash 200	G. F.	1.1.	P. I.	
															-	

Geological Age Permian	
Geological Source Cottonwood & Nev	va Limestone Members
Material Similar To Material reports Lab. No. 63652	ed on SHC Form 645
Specific Gravity (Sat.) 2.47 Los Angeles Wear 46.5 (A)	M ST ST
Absorption 4,64	Scundness 0.78
wt. Cu.Ft.	Str. Ratio
Remarks Overburden has become	e very heavy. Site
appears to be worked out.	

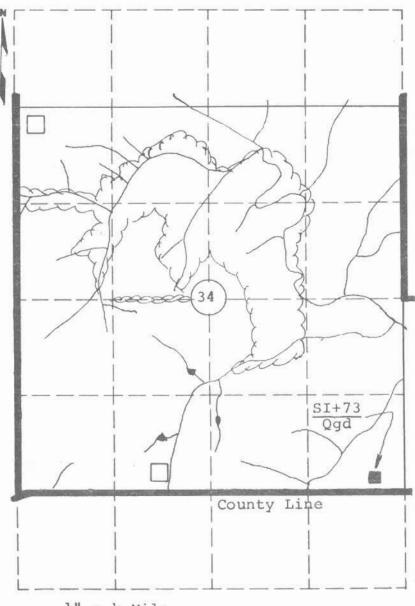


	D ₀				
	sec 3				
Herbert Post e	tux	Havens	ville,	Kans	as
ature of Deposit Dry	G	ood .			V

	Material	Pepth	Depth			77.5	Perce	nt Ret	ained							
Test Nole	at Bottom of Hole	m over- Uster al		1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
											0	1	49		22	1
								_	0						-	
								_							-	

CORRELATION DATA

eological Age	Quaternary
eological Source	Glacial Drift (Atchison Formation)
	Material reported on SHC Form 619 Lab. No. 1-62-1000
pecific Gravity (Sat.)	(Dry)
os Angeles Wear	
bsorption —	Soundness -
t. Cu.ft.	- Str. Ratio -
esarks	



scale: 1" = 1/4 Mile

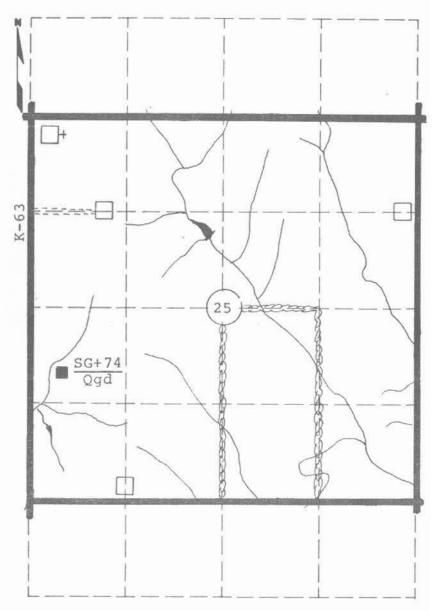
SG+74 Qqd	April, 1968
Material Sand and Gravel	
Location SW1 Sec.	25 Twp. 5S Range 12E
ewner Evelyn C. Haug	Seneca, Kansas
Mature of Deposit Dry Accessibility	
Status of Site Open site; sample	đ

EXPLORATION DATA

	Material	Pepth	Depth				Perce	nt Ret	ained							
Test Mole	est at of of bottom over- of Hole Burden Material		1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I	
				_												
												-				

CORRELATION DATA

Geological Age	Quatern	ary
Seological Source —	Glacial	Drift
Material Similar To-	Material	reported on SHC Form 619
No. 66-33	Lab. No.	38055
Specific Gravity (Sa	2.56	(Ory)
Los Angeles Wear	24.4(D)	
Absorption 2.7	7	Soundness 0.94
Wt. Cu.Ft. 11(0.19	Str. Ratio
Remarks		



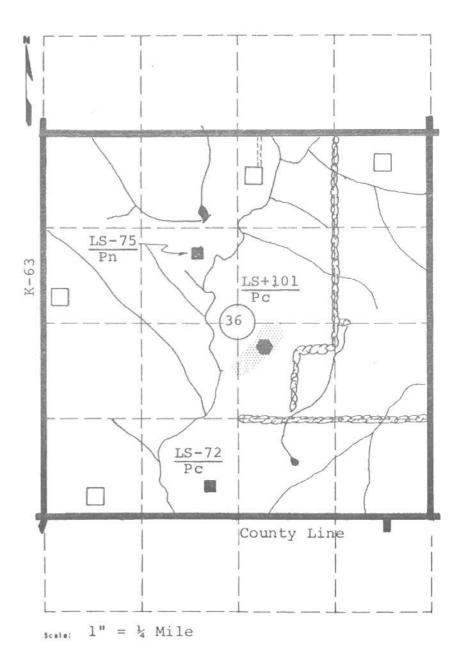
Scale: 1" = 1/4 Mile

LS-75 Pn	April, 1968
Material Limestone	_ countyNemaha
	36 _{Twp.} 5S _{Range} 12E
Morris Molineux	Soldier, Kansas
Mature of Deposit Dry Accessibility	
Status of Site Open site; sample	d

EXPLORATION DATA

68 39	Material	Pepth	Depth				Perce	nt Ret	ained				00.000			
lest hole	nt of of of solution of Mole Burgen Material	1 1/2	3/4	3/8	ч	8	16	30	50	100	Wash 200	g.f.	L.L.	P. 1		

Geological Age Po	ermian
	eva Limestone Member
Material Similar To	Material reported on SHC Form No. 645
Lab. No. 6	
Specific Gravity (Set.)	2.48 (01) 2.38
Los Angeles Wear3:	8.7(A)
Absorption 4.19	30undness0.80
	Str. Ratio
This qu	uarry has been abandoned for several
years.	

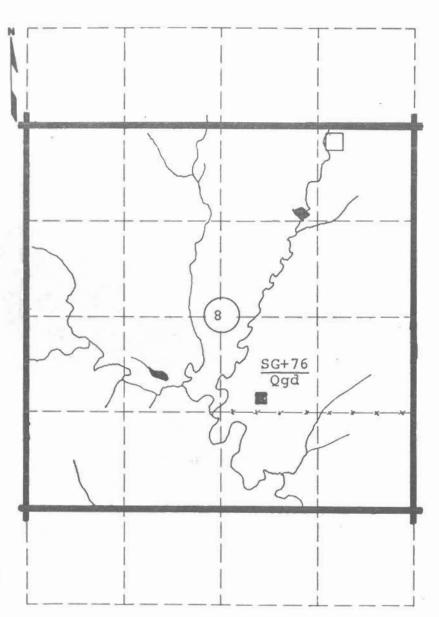


terial -	Qgd Sand and	Gravel		County	Nem	aha	
cation.	NW4 SE4		Sec	8	Тыр. 5	S Range _	13E
ner	Lester V.	Deters	etux		Goff,	Kansas	
	n at	n e				address	-07000

EXPLORATION DATA

	Material	Pepth	Depth		172		Perce	nt Ret	ained					-		
Test Hole	ole Bottom over- of Hole Burden Materia		of Material	1 1/2 3/4	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I
						3	13	32	60	86	92	93	6.2	3.79		
							- 0.2									
			-													
			-													
													. N.			

Geological Age Quaternary	
Geological Source Glacial Drift	
	ed on SHC Form 619
	(Dry)
Absorption 2.0	- Soundness 0 • 9]
	str. Ratio 1-day 0.84,3-day 0.96
Renarks	

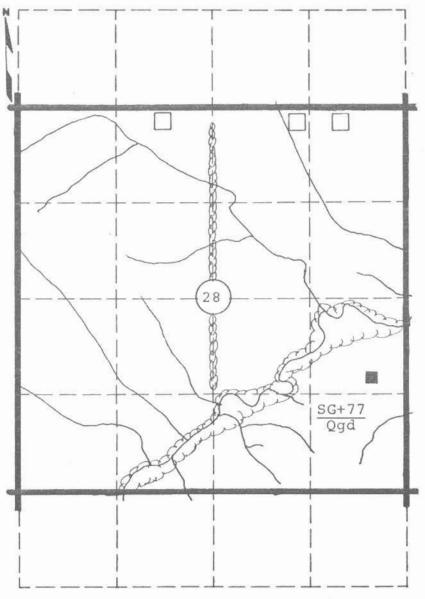


Scale: 1" = ½ Mile

No. Qqd Sand and Gravel	County	Nemaha	
E½ SE¼			14E
Fannie Vernon		Goff, Kansas	
e of Deposit Dry		address	. VI

	Material	Pepth	Depth				Perce	ent Ret	ained							
Test Hole	at bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	ů.F.	L.L.	P. 1.
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		

Beological Age Qualernary	
Geological Source Glacial Drift	
Material Similar To Material reports	ed on SHC Form 619 No.
66-13 Lab. No. 10441	
Sascific 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
Test data for holes 10	and 16 represents the
finest and coarsest materia	al that has been tested at
this site.	



Scale: 1" = 1/4 Mile

LEGEND

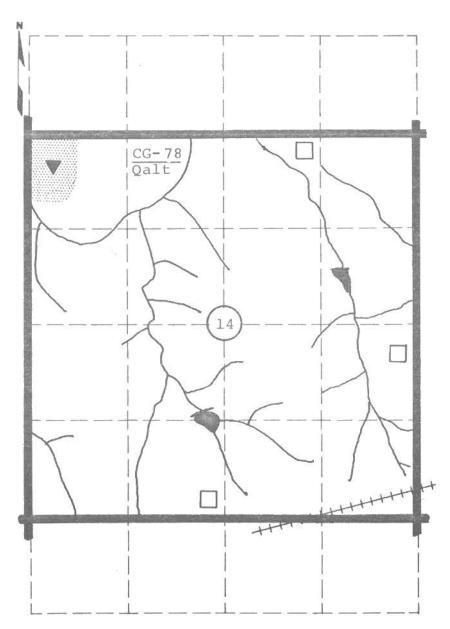
	Trail or lane	(y)	Prospective materials sites; sampled
	Road		Center of section
	Railroad		Dwelling
~~~~	Hedge or trees		
	Fence	+	Cemetery
	Major stream	P	School
>>>	Intermittent	±.	Church
	Pond or lake		Town or city

ite No	CG-78 Qalt	April, 1968
	Chert Gravel	Nemaha
ocation -	NW¼ NW¼ sec.	141SRange13E
	David Lortscher	Bern, Kansas
	FI SEME	Good Site Located on Plate II
tatus of	7.7	

#### EXPLORATION DATA

	Material	Pepth	Depth				Perce	nt Ret	ained							
Test Hale	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
Cgl					39	52	60		74			93	6.3			

Geological Age -	juaternary	
Geological Source	Terrace Deposit	[Illinoisan?]
Material Similar To	aterial reported	in Geological Survey
Bull. No.	1060D.	
Specific Gravity (Sat.)		(Dry) 5.67
Absorption —	\$ou	ndness89
Wt. Cu.Ft.		tr. Ratio —
Remarks		



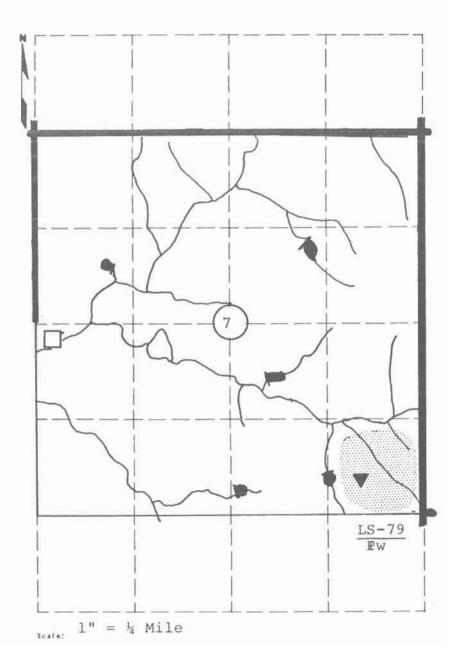
Scale: 1" = 1/4 Mile

Limestone		County	April, Nemal		
SEL SEL	_ Sec	7	Twp1S	Range	13E
Jesse A. Hunzeker	e e		Bern,	Kansas	
ture of Deposit Dry Access	isbility —	Good	Site Loca		II

#### EXPLORATION DATA

D# 7/6	Material	Depth	Depth				Perce	nt Ret	ained							
Test Nole	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q.F.	L.L.	P. I.
															-	
								_								

Material Similar To Material reported on SHC Form 645  Lab. No. 66442  Specific Gravity (Sat.) 2.64 (Bry) 2.60	Geological Age —	Pennsylvar	nian					
Lab. No. 66442  Specific Gravity (Sat.) 2.64 (Bry) 2.60	deological Source —	Wakarusa I	Limestone	Memb	er			
Specific Gravity (Sat.) 2,64 (Dry) 2.60	Material Similar To-	Material	reported	on Si	HC ]	Form	645	
	Lab. No.	66442						
Los Angeles Wear 23.4 (A)	Specific Gravity (Sa	.) 2,64		(Dry	)	2.60		
	Los Angeles Wear	23.4(A)						
Absorption 1.65 Soundness 0.93	Absorption 1.6	5	Soundr		0.9	93		
Wt. Cu.Ft. — Str. Ratio	Wt. Cu.Ft		Str.	Ratio —	-			
Remarks	Remarks							



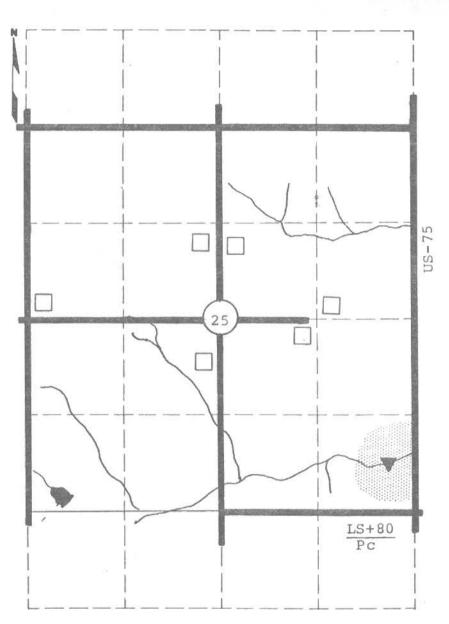
terial -	L	Lmes	sto	one		_ County	N	Vemaha		
cation	SE ¹	4			Sec	25	Two	18	Range	14E
ner —	Lee	A.	&	Esther	White		Sa	betha	, Kan	sas
turn of	Denosit	D		ame Acce	as and other	Good	5:		15.7.7	II

#### EXPLORATION DATA

	Material	Depth	Genth				Perce	nt Ret	ained							
Test Hole	at Bottom of Hole	ot over- Burden	Depth of Material	1 1/2	3/4	3/8	ч	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1
				¥17 1												

#### CORRELATION DATA

Geological Age	Permian				
		d Limest	one Me	ember	
Material Similar 1	Materia	l report	ed on	SHC Form 645	
	0. 64452				
Specific Gravity (	Sat.)	2.51	(	Ory) 2.43	
Los Angeles Wear —	34.2(A)				
Apporption ———	3.58		Soundness -	0,84	
Wt. Cu.ft.			- Str. Rati	0 ———	
Remarks The	<u>ledge is e</u>	xposed :	n the	backslope of	
U.S. 75	highway.				



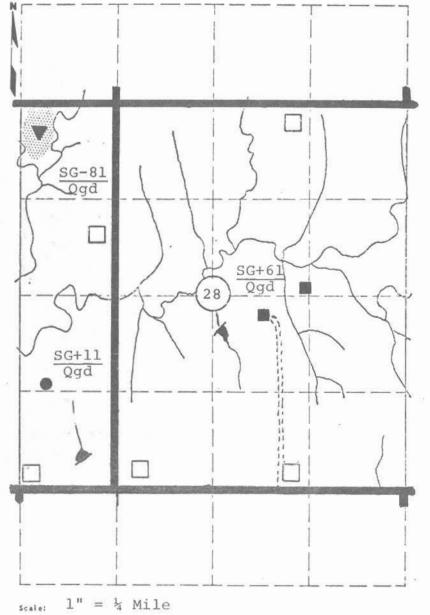
scale: 1" = ¼ Mile

SG-81 Ogd	Pate April, 1968
Sand and Gravel	Nemaha Nemaha
ation NW4 NW4 sec	28 Tws. 1S Range 13E
Leonard L. Grose	Bern, Kansas
	ty Good Site Located on Plate II
Prospective sit	e; sampled

Maierial funth		Deeth	Parcent Retained						114470707							
Test of hole byrden Mater	of Haterial	1 1/2	3/4	3/8	4	В	16	30	50	100	Wash 200	G.F.	L.L.	P. I		
					1	9	16	24	34	52	72	89	7	3.02		
				-												-
			-				-						_		-	

#### CORPELATION DATA

Guological Age Quaternary	
Geological Source Glacial Drift	
The state of the s	ted on SHC Form
	(Dry)
Absorption -	
wt. Cu.ft. 93.0	str. Rotio 1-day 0.55,3-day 0.65
Senarks	

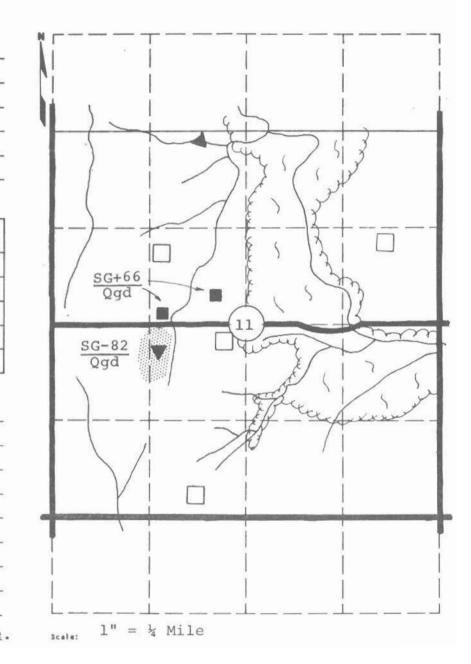


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COMPACTAL TO SECURITION AND ADMINISTRATION OF THE PROPERTY OF	
Location NE' SW sec. 11 Twp. 4S Range 14E	
personal control of the control of t	
George W. McDaniel Wetmore, Kansas	
name address	
Mature of Deposit Dry Accessibility Good Site Located on Plate II	7
Status of Site Prospective site; sampled	

Test Material	('epth at over- Burden		Percent Retained												
st sottom of Hole			1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	Q.F.	L.L.	P. I.
	7	4				1	3	5	34	63	90	8	2.05		
	13	0					25		12	36	87	9	1.36		
	3	4				1	7	12	56	69	86	13	2.54		
	at bottom	at of source of Mole Burden	at Bottom over- of Mole Burden Material  7 4  13 0	at Bottom over-of Material 1 1/2  7 4  13 0	at Bottom over- of Material 1 1/2 3/4  7 4  13 0	at Bottom over- of Material 1 1/2 3/4 3/8  7 4  13 0	at Bottom over- of Material 1 1/2 3/4 3/8 4 7 4 1 1 13 0	1   3   0   1   3   8   8   8   8   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   1   3   3	at bottom over- of Hole   ov	1   1   2   3   4   8   16   30   30   3   4   8   16   30   3   4   3   5   3   4   4   5   5   5   5   5   5   5   5	13   0   1/2   3/4   3/8   4   8   16   30   50   13   13   14   15   16   16   16   16   16   16   16	1   1   2   3   4   8   16   30   50   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   100   1	1   3   5   34   63   90   8   1   1   1   2   3   4   8   1   1   2   3   4   8   1   1   2   3   4   8   1   1   2   3   4   8   1   1   2   3   3   4   8   1   1   3   5   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   6   3   9   1   3   3   4   3   4   6   3   9   1   3   3   4   3   4   4   4   4   4   4	at Bottom over-of Hole     or Over-of Hole     of Haterial     i 1/2     3/4     3/8     4     8     16     30     50     100     Wash 200     G.F.       7     4     1     3     5     34     63     90     8     2.05       13     0     12     36     87     9     1.36	1   1   2   3   4   3   5   3   4   6   3   9   8   2   0   5   1   3   6   7   1   1   2   3   4   3   6   8   7   9   1   3   6   8   7   9   1   3   6   8   7   9   1   3   6   8   7   9   1   3   6   6   6   6   6   6   6   6   6

Geological Age	Quatern	ary				
Geological Source —						
Material Similar To			on SHO	Form	619	
No. MS 6	6-18					
Specific Gravity (3s	t.)		(Dry)			
Los Angeles Wear						
Assorption -		\$0	undness			
Wt. Cu.Ft.			Str. Ratio			
Remarks Test	data for	test hole	s 6 and	d 4 re	present	
the finest	and coar	sest mate	rial to	ested	at this	site.



# T30

#### MATERIAL SURVEY REPORT

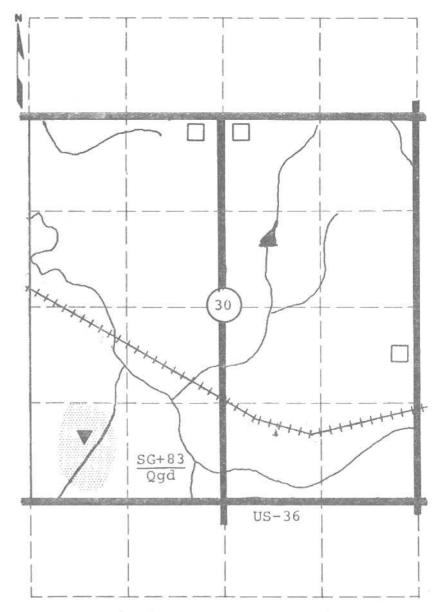
SG+83 Qgd	April, 1968
Material Sand and Gravel	County Nemaha
Location SW4 SW4	sec. 30 TMP. 2S Range 13E
	Bern, Kansas
name	Good Site Located on Plate IV
Status of Site Prospective s	

#### EXPLORATION DATA

	Material	Depth	Depth				Perce	nt Ret	ained							
Test	at Bottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/4 3/8 4 8 16 30	50	100	Wash 200		L.L.	P. I.				
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

eological Age Quaternary
eological Source Glacial Drift
Material Similar To Material reported on SHC Form 619
No. 66-14
ippcific Gravity (Sat.)
os Angeles Wear —
bsorption ————————————————————————————————————
ft. Gu.Ft \$tr. Ratio
Gradation data for test holes 1 and 13 re-
presents the finest and coarsest material tested at



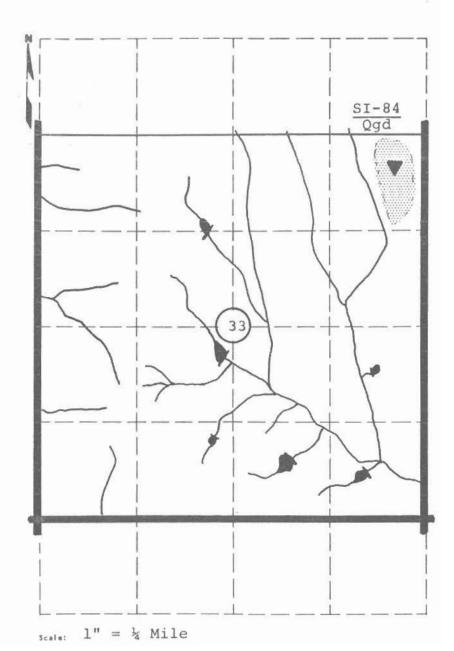
Scale: 1" = ½ Mile

Site No	SI-84 Qgd			Data	April, 1	968	
Haterial -	Silt			County	Nemaha		
ocation -	NE NE	4	. Sec	33	5S	Range	11E
mer F	lossie M	ay Peters	son		Onaga	, Kans	as
Asture of		name Access	ibility~	Fair	Site Locate	iddress	V
Status of	site Pros	pective s	site;	samp	led		

### EXPLORATION DATA

21 %	Material	Depth	Depth	-			Perce	nt Ret	sined	17				17.75		
Test Hole	at Bottom of Hole	ot over- Burden	0.6	1 1/2	3/4	3/8	4	8	16	30	50	100	200	G.F.	L.L.	P. I.
												0	2		33	11

Geological Age Qualefilary	
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. Ra	
****** This material was tested	for use as mineral
filler	

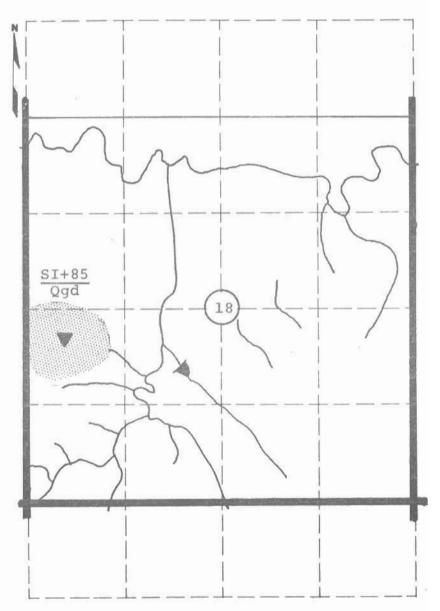


	April, 1968
Silt Silt	Nemaha
Location NW SW SW	Sec. 18 Twp. 4S Range 11E
Owner Lucy Gray	Vermillion, Kansas
Nature of Deposit Dry Acces	Soullity Good Site Located on Plate V

#### EXPLORATION DATA

332 Oct 1	Material	Depth	Depth				Perce	nt Ret	ained				55.555			
Test Hole	at Bottom of Hole		of Material	1 1/2	3/4	3/8	ų	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
									0	0	1	6	66			
									20							

Geological Age -	Quaternai	ry				
Geological Source	Glacial I	Drift				
Material Similar To -	Material	reported	on SHC	Form	No.	623
Lab. No.	66440		1			
Specific Gravity (Sat.)	2.63		(Dry)			
Los Angeles Wear -						
Absorption —		\$ound	iness ———			
Wt. Gu.Ft. 87.9		\$t:	r. Ratio ——			
filler.	aterial w	vas tested	for u	se as	mine	ral



Scale: 1" = 1/4 Mile

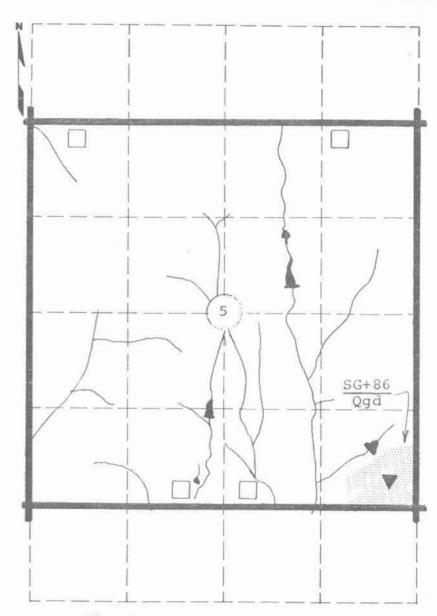
#### MATERIAL SURVEY REPORT

erial	Sand	and	d Grave	1	County	Nemah	a	
ation	SE4	SE3	4	Sec	5	- Twp. 5S	Range _	13E
er_I	Eugene		Visser	etux	<u> </u>	Goff,		
ture of	Reposit			hility	Good	Site Laca	address	VI

#### EXPLORATION DATA

2000	Material	Pepth	Depth				Perce	nt Re	tained							
Test Mole	st sottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	4	В	16	30	50	100	Wash 200	G. F.	L.L.	P.1.
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
	8.23															
							_									

Seological Age —	Quațe	rnary					
Geological Source	_Glac	ial Drif	t				
No. 66							
Specific Gravity							
Los Angeles Wear							
Absorption ———			Sour	dness —			
Wt. Cu.Ft			s	r. Ratio			
Remarks Grad	ation	data for	test	holes	1 and	5 re-	
present this sit		nest and	coars	est ma	terial	tested	at



Scale: 1" = ¼ Mile

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	Trail or lane		Prospective materials site; not sampled
No. of Concession, Name of	Road		Center of section
++++++++	Railroad		Dwelling
~~~~	Hedge or trees		
_xx	Fence	+	Cemetery
	Major stream	ď	School
>>>	Intermittent streams	<u></u>	Church
	Pond or lake		Town or city

Absorption -

Bull. No. 1060D

MATERIAL SURVEY REPORT

	SG	-87						725355		Apr	-i1	. 1	968			
0.00	sa Sa															
Locatio	NE NE	4				- Sec	. —	3		Twp.		2S	R	ange	2E	
wner -	Mary	Tan	gema	n					S	ene	ca	, K	ans	as		
lature	ot Deposi	tD	ry	a	ccess	. 6 . 1 .	t ,	Fai	r		Site	Locat	ed an	Plate -	I	
Status	of Site -	Pro	spec	tiv	e_	sit	e;	no	t	san	ple	ed				
						E	XPLOR	ATION	DATA							
	Material	Danth		_			Parce	nt Ret	ained				,			
Test Hole	st Bottom of Hole	at over-	Depth of Material	1 1/2	3/4	3/8				30	50	100	Wash 200	G.F.	L.L.	P.)
		_														
			-				-		-			-			-	-
								_							-	_
						COR	NELAT	10m D	ATA							
	cal Age -	0	uate	rna	rv											
	cal Source															
tateria	l Similar	To									_					-
Specifi	c Gravity	(Sat.)								larv	1					
e position										(***)	,					

This site reported in the Geological Survey

SG-87 Qgd scale: 1" = 1/4 Mile

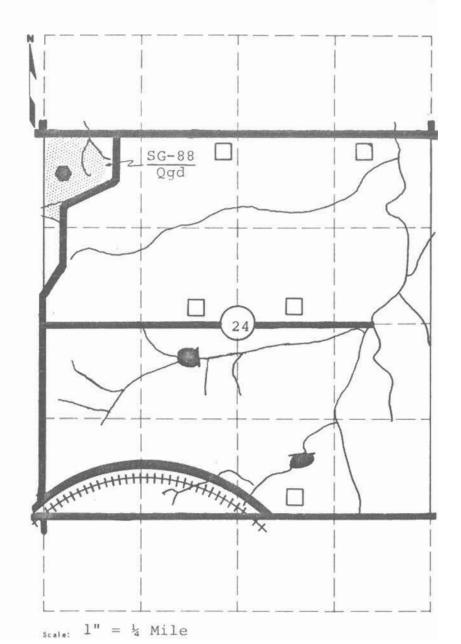
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SG-88 Qgd	Date April, 1968
Sand and Gravel	Nemaha
Location NW 4 NW 4 Sec.	24 Twp. 2S Range 12E
John A. Dalsing	Seneca, Kansas
Nature of Deposit Dry Accessibility	Good Site Located on Plate I
Prospective site	; not sampled

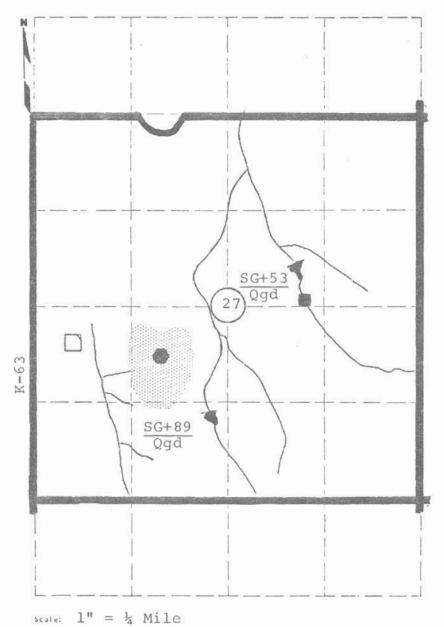
EXPLORATION DATA

12 (TIT	Material	Depth	Depth	1107			Perce	nt Ret	ained			7.7547			1	
Test	at Bottom of Mole	ot over- Burden	of Material	1 1/2	3/4	3/8	ц	В	16	30	50	100	Wash 200	G.F.	L.L.	P. I.

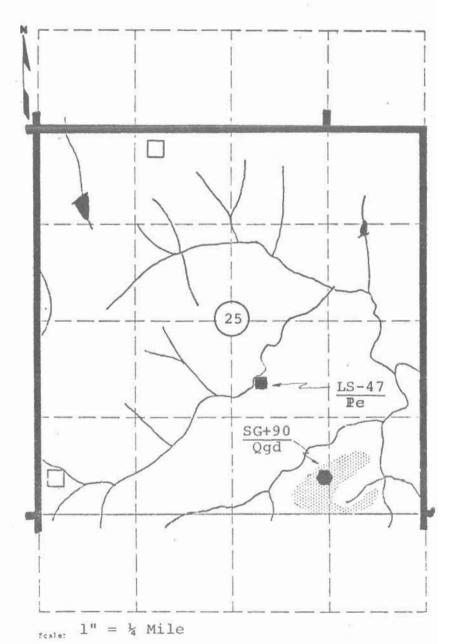
Geological Age Quaternary	
Seological Source Glacial Drift	
	(Dry)
Los Angeles Wear	
Absorption —	Soundness
Wt. Cu.Ft	Str. Ratio
Remarks This site reported i	n the Geological Survey
Bull. No. 1060D.	



SG+89 Qqd				ve.o	A	ori	1,	19	68			
Sand and Gr									aha			
											2E	
Melvin Bredeme	erer	et	ux	-		Se	nec	id,	nddres	nsas	722	
Kature of Doposit Dry												
Status of Site Prospect:	ve s	sit	e;	no	t s	am	ple	ed_				
		ξ	XPLOR	MCITA	DATA							
Two Material Capta Scoth			Parce	nt Rot	uned							
Test at o: Scoth of Hole Lotten over- Material i	1/2 3/4	3/8	8	0	āí	30	50	100	Wash 200	G. F.	L.L.	P. 1.
								-				
	-						-					
	-			-								-
Geological Age Quaterna	ary			10N D								
Geological Source Glacial	. Dri	ft										
haterial Similar To												
material Similar to												
												-
Specific cravity (Sat.)												
Los angeles Wear			200	-			-					
Absorption ————————————————————————————————————	-			- Soun	€១៩៦	-						
«L. Cu.Ft				St	r. R.	tio-						



	-	3+90								7		4	100	c 0		
	0													68		_
ateri	SaSa	and a	and C	ra	ve]		_	_ co	unty.		Ne	ema	ha			
ocatio	on	EL S	SE4			- 300	2	25		Two.]	S	R	ange	11E	
W105	Clar	cence	e Sch	mi	tz				Se	ne	ca,	K	ansa	as		
	of Deposi															
tatus	of Site -	Pro	ospec	ti	ve	si	te;	n	ot	sa	mp]	ed				
						Ε	XPLOR	ROITAS	DATA							
	Material	Pepth	Depth			_	Perce	nt Ret	ained						T	
Test Hole	at Bottom of Hole	ot over- Burden	Meterial	1 1/2	3/4	3/8	ч	8	16	30	50	100	Wash 200	G.F.	L.L.	P.1.
				9												
		624						10% 0								
	ical Age —															
eolog	ical Sourc	. (Glaci	al	Di	rif	t_									
ateri	al Similar	To-														
e e e l'ét	ic Gravity	10-4 1								/	· ·					
	geles Wear															
baorp	tion							- Strun	dness					-		-
t. Cu.	.Ft. ——			-			-	St	r. Ra	tio -						



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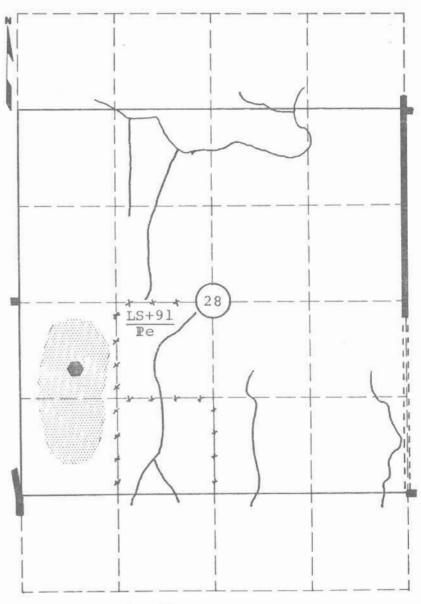
<u>LS+91</u> 		_ Date			
Limestone		Count	, Nem	aha	
SW14	Sec		_ Twp 1S		12E
Frank Tangeman			Seneca,	Kansas	
of Deposit Dry Access	ibility -	Fair	Site Lac		_Į
of Site Prospective s	site	· not	sampled		

EXPLORATION DATA

	Material	Pepth	Depth				Perce	nt Ret	ained						1	
Test	bottom of Hole	of over- Burden	0.6	1 1/2	3/4	3/8	4	8	16	30	50	100	Wash 200	G.F.	L.L.	P. 1.
															-	
						-										

CORRELATION DATA

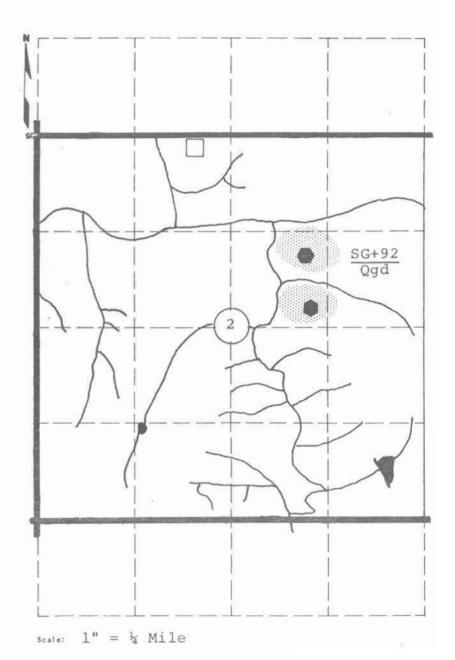
Geological Age	Pennsy.	Lvan	Lan			
			Form. (Elm	ont &	Reading	Members)
Los Angeles Wear						
Absorption -			Soundn	058		
Wt. Cu.Ft.			\$tr.	Ratio		
Renarks						



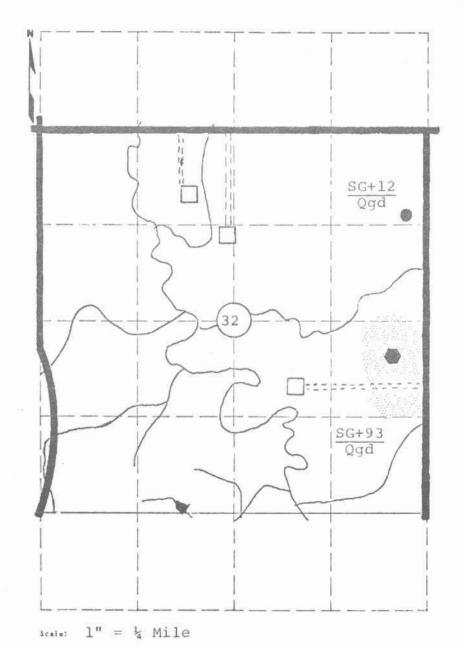
Scale: 1" = ½ Mile

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	<u>s</u>	G+92 Qgd						7-4-		Apr	il	, 1	968			
ite Mo	Saı	nd a	nd G	rav	el			DATE			Nei	nah	a			
	n N														13E	100
ocatio	Clif	ford	Ede	1ma	n	- 3ec				Sab	etl	na.	Ka	nsas		
wher —	Clif	_ D	ry		ccess	+5+1+	t y	Fa	ir		Site	Locat	addres:	Plate -	II	
tatus	of Site -	Pro	spec	tiv	e :	sit	e;	no	t	sam	ple	ed				
						ε	XPLOR	ATION	DATA	ĺ						
	Haterial	Pepth	Depth				Perce	nt Ret	ained							
Test Hole	at Sottom of Hole	ot over- Burden	of Material	1 1/2	3/4	3/8	ц	8	16	30	50	100	Wash 200	G.F.	L.L.	P. I.
										- 11-23-3	_					
					-											
-																
						COR	RELAT	ION D	ATA							
eologi	cal Age -	Q	uate:	rna	ry											
eologi	cal Source	G	lacia	al	Dr	ift										
	l Similar															
aterio	ii Similer	10														
pecifi	c Gravity	(5at.)								(Dry)					
	eles Wear															
osorpt	ion —							Soun	dness	_						
	Ft									tio —						
	This	s si	te re	po	rte	ed	in	US	GS	Bu	11.	. N	0.	1060	D	



	S															_
ocatio	NE NE	₹ SE	1/4			Sec	3.	2		Tap.	18	S	к	inge	3E	
W0 67	Ram	ond	E. M	ill	er					В	er	n,	Kan	sas		
	01 010001		11 4000										addres:		II	
	of Site -															
						Ĺ	a P L O R	ATION	ATAG							
	Material		Death				Perce	t Ret	benia						1	
Tast	at bottom of late	ot over- Burder	of Material	1 1/2	3/4	3/6	4	8	16	30	50	100	Wash 200	ű.F.	L.L.	P. 1
	-														1	
					_											
									-							
						COR	RELAT	ION D	ATA							
ieolagi	ical Age -	Qu	ater	nar	Ϋ́											-
polog	ical Source	G	laci	al	Dr	ift	-									
laturi	al Similar	10														



		212-7														
Site No		SG+						Dat	. —	Ар	ri.	L,	196	8		
Materia	.1	San	d an	d G	Gra											
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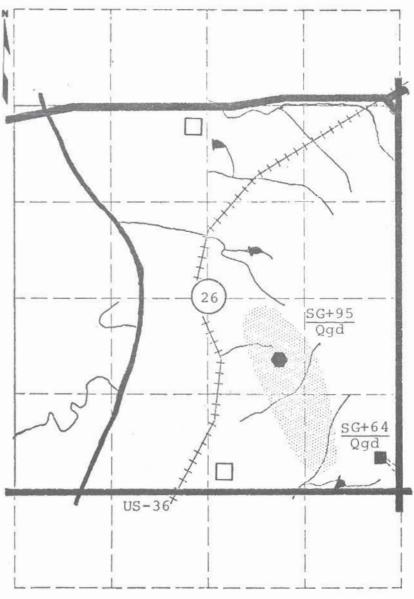
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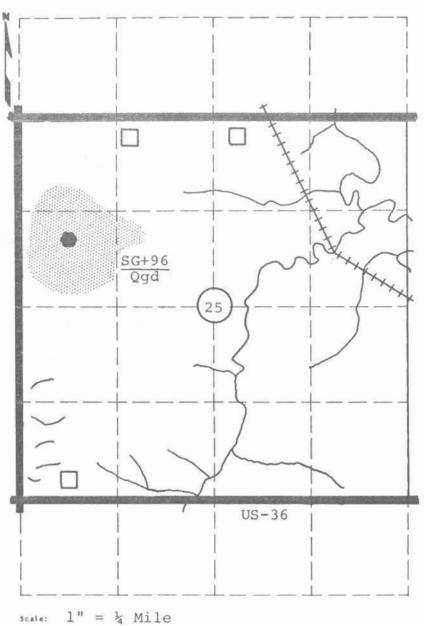
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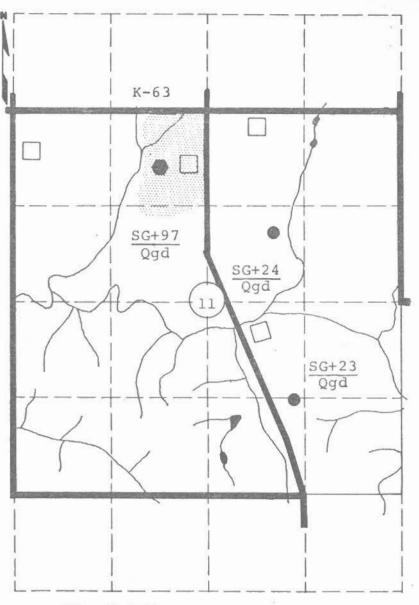


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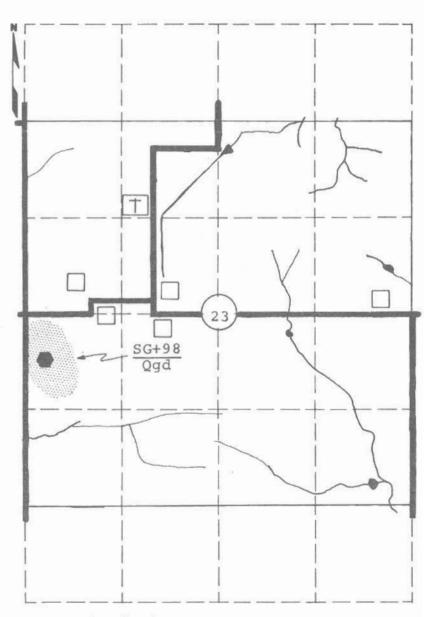
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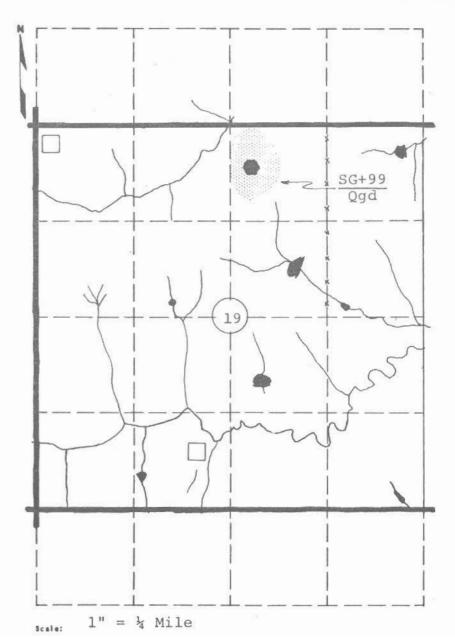
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Nature of Deposit Dry Accessibility		n Plate IV
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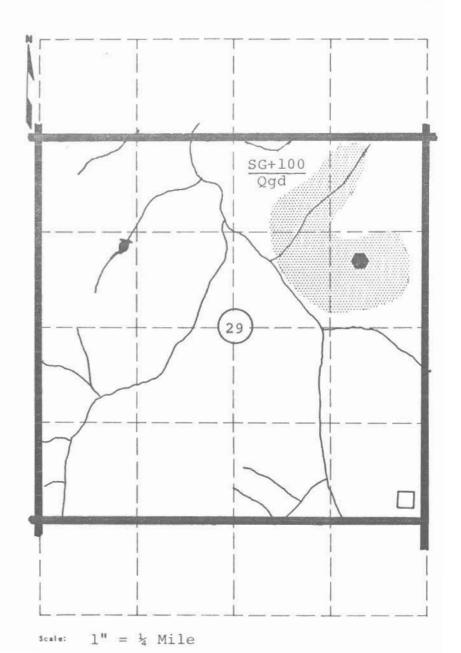
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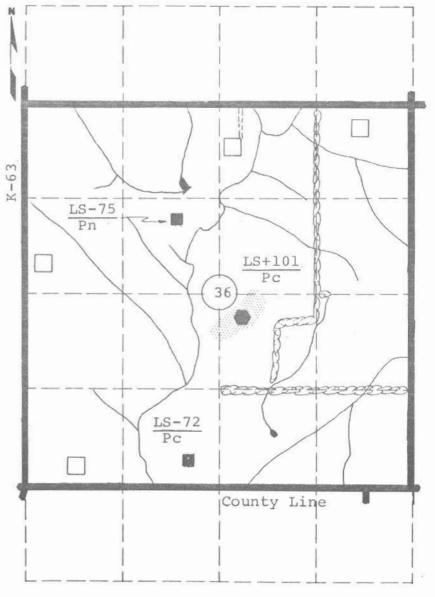


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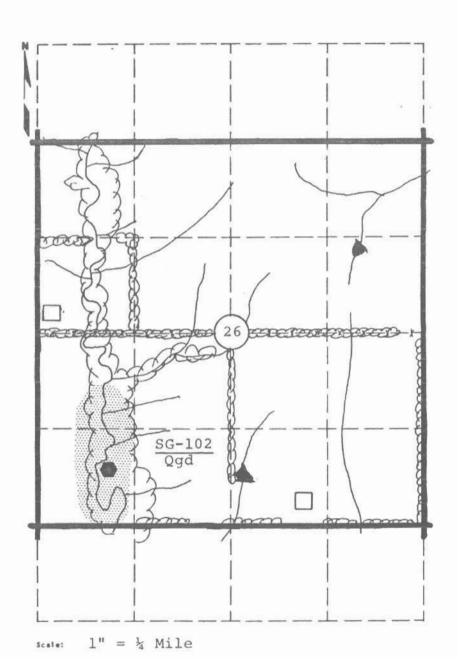
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Survey Bull. No. 1060D.



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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