MATERIALS INVENTORY OF NEMAH COUNTY, KANSAS

by

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

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

1970

Materials Inventory Report No. 19
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 NEMAH COUNTY

TURN TO THE MATERIALS INVENTORY SECTION
See
TABULATION OF CONSTRUCTION MATERIALS
Figure 7, page 19

for material
BY TYPE
use column 1

For Quality
Data
See Figure 18
Page 37

for material
BY INTENDED USE
use column 2

for DESCRIPTION of material
Column 3 gives page of DESCRIPTION which includes engineering characteristics, approximate locations, and references to materials maps.

for AVAILABILITY of material
Column 4 gives the general location of AVAILABLE material and references the materials maps.

MATERIALS MAPS
SEE PINK SHEET PAGE 39
Material source units, as well as all open and prospective sites are mapped. Each site is referenced to an individual data form.

SITE DATA FORMS
OPEN SITES; NOT SAMPLED  GREEN SHEET PAGE 42
OPEN SITES; SAMPLED  GREEN SHEET PAGE 87
PROSPECTIVE SITES; SAMPLED  GREEN SHEET PAGE 123
PROSPECTIVE SITES; NOT SAMPLED  GREEN SHEET PAGE 135

Each site data form includes a map for site location and provides information concerning landownership, material quality (if available), geologic age, and site accessibility.
# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>THE WHY, WHAT, AND HOW OF THIS REPORT</td>
<td>ii</td>
</tr>
<tr>
<td>PREFACE</td>
<td>v</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vii</td>
</tr>
<tr>
<td>GENERAL INFORMATION SECTION</td>
<td>1</td>
</tr>
<tr>
<td>Facts About Nemaha County</td>
<td>2</td>
</tr>
<tr>
<td>Methods of Investigation</td>
<td>2</td>
</tr>
<tr>
<td>GEOLOGY SECTION</td>
<td>5</td>
</tr>
<tr>
<td>General Geology</td>
<td>6</td>
</tr>
<tr>
<td>General Geo-Engineering Conditions</td>
<td>14</td>
</tr>
<tr>
<td>MATERIALS INVENTORY SECTION</td>
<td>17</td>
</tr>
<tr>
<td>Contents</td>
<td>18</td>
</tr>
<tr>
<td>GLOSSARY</td>
<td>153</td>
</tr>
<tr>
<td>SELECTED REFERENCES</td>
<td>157</td>
</tr>
</tbody>
</table>

iv
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" (1939) 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. C. 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 over 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.
Figure 8. Drainage and major transportation facilities in Nemaha County.
FACTS ABOUT NEMAH 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 2, 1964 at a scale of 1:14,000. 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 Prye 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
<table>
<thead>
<tr>
<th>Periods</th>
<th>Estimated Length in Years</th>
<th>Type of Rock in Kansas</th>
<th>Principal Mineral Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary</td>
<td>1,000,000</td>
<td>Glacial drift; river; till; sand, and gravel; loess; sand; wind-blown; colluvium; volcanic ash</td>
<td>Sand and gravel; volcanic ash; agricultural soils; water</td>
</tr>
<tr>
<td>Cenozoic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>59,000,000</td>
<td>Silt, sand, and gravel; from-water limestone; volcanic ash; bentonite; diatomaceous shale; opaline sandstone</td>
<td>Sand and gravel; volcanic ash; diatomaceous shale; water</td>
</tr>
<tr>
<td>Cretaceous</td>
<td>10,000,000</td>
<td>Chalky shale; dark shale; vari-colored shale; sandstone; concretions; overcropping igneous rock</td>
<td>Concrete and bituminous aggregate; light type surfacing; shoulder and subgrade material; riprap; and building stone; ceramic materials; water</td>
</tr>
<tr>
<td>Jurassic</td>
<td>23,000,000</td>
<td>Sandstone and shale; chiefly sandstone</td>
<td>Concrete and bituminous aggregate; light type surfacing; building stone; natural gas, salt; asphalt; water</td>
</tr>
<tr>
<td>Triassic</td>
<td>30,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pennsian</td>
<td>28,000,000</td>
<td>Limestone, shale, claystone (salt, gypsum, anhydrite); red sandstone and siltstone; chart; and some coal</td>
<td>Concrete and bituminous aggregate; light type surfacing; shoulder and subgrade material; riprap; and building stone; ceramic materials; oil; coal; gas; and water</td>
</tr>
<tr>
<td>Pennsylvanian</td>
<td>25,000,000</td>
<td>Alternating marine and non-marine shale; limestone; sandstone; coal; and chart</td>
<td></td>
</tr>
<tr>
<td>Mississippian</td>
<td>20,000,000</td>
<td>Mostly limestone, predominantly cherty</td>
<td>Chat and other construction materials; oil, zinc, lead, and gas</td>
</tr>
<tr>
<td>Devonian</td>
<td>53,000,000</td>
<td>Subsurface only, Limestone and black shale</td>
<td>Oil</td>
</tr>
<tr>
<td>Silurian</td>
<td>40,000,000</td>
<td>Subsurface only, Limestone</td>
<td></td>
</tr>
<tr>
<td>Ordovician</td>
<td>90,000,000</td>
<td>Subsurface only, Limestone and shale; Dolomite sandstone and shale</td>
<td></td>
</tr>
<tr>
<td>Cambrian</td>
<td>60,000,000</td>
<td>Subsurface only, Dolomite sandstone and shale</td>
<td>Oil</td>
</tr>
<tr>
<td>Devonian</td>
<td>40,000,000</td>
<td>Subsurface only, Granitic, and metamorphic rocks</td>
<td></td>
</tr>
<tr>
<td>Cambrian</td>
<td>1,000,000,000</td>
<td>Subsurface only, Granite, and metamorphic rocks</td>
<td>Oil and gas</td>
</tr>
</tbody>
</table>

Figure 5. Geologic timetable.
Figure 5. Generalized geologic column of the surface geology in Nemaha County.
tilted upward to varying degrees near the axis of the ridge.

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

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

The sequence of glaciation has played a controlling role in the development of Pleistocene nomenclature and classification of Pleistocene deposits throughout the state. The geologic history of the Pleistocene, as discussed here, is based chiefly on a report by Frye and Leonard (1952).
As the Nebraskan glacier started to accumulate, north-central Kansas was an area of moderate relief with many bedrock exposures. A major stream flowed east-southeast out of Marshall County in the vicinity of the Black Vermillion River and through southern Nemaha County. As the glacier increased in size, the streams in Kansas deepened their valleys. Later, as the ice retreated, the stream velocities decreased, and the streams aggraded their channels. Abundant outwash material probably covered a large part of the county at the close of the Nebraskan age.

<table>
<thead>
<tr>
<th>Period</th>
<th>Epoch</th>
<th>Age</th>
<th>Estimated length of age duration in years</th>
<th>Estimated time in years elapsed to present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleistocene</td>
<td>Quaternary</td>
<td>Recent</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wisconsinan Glacial</td>
<td>45,000</td>
<td>55,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sangamonian Interglacial</td>
<td>135,000</td>
<td>190,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Illinoisan Glacial</td>
<td>100,000</td>
<td>220,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Arenac&quot; Interglacial</td>
<td>310,000</td>
<td>600,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kansas Glacial</td>
<td>100,000</td>
<td>700,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aftonian Interglacial</td>
<td>200,000</td>
<td>900,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nebraskan Glacial</td>
<td>100,000</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>

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 Illinoian 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 Illinoian, 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 Havenville 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.

14
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 Miss 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.
<table>
<thead>
<tr>
<th>TYPE</th>
<th>USE</th>
<th>DESCRIPTION</th>
<th>AVAILABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Limestone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church Limestone Member</td>
<td>Concrete aggregate. Bituminous aggregate. Base course material. Shoulder material. Light type surfaced material. Riprap.</td>
<td>Small area in the north-central part of the county. Outcrop shown on plates I and II.</td>
<td>20</td>
</tr>
<tr>
<td>Emporia Limestone Formation (Reading and Elsmor Limestone Members)</td>
<td>Base course material. Shoulder material. Light type surfaced material. Riprap (Reading only). Structural stone (Reading only).</td>
<td>Northwest portion of the county on the flanks of the major drainage. Outcrop shown on plates I, II, III and V.</td>
<td>22</td>
</tr>
<tr>
<td>Taskir Limestone Member</td>
<td>Bituminous aggregate. Shoulder material. Base course material. Riprap.</td>
<td>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.</td>
<td>24</td>
</tr>
<tr>
<td>Hera Limestone Member</td>
<td>Base course material. Shoulder material. Light type surfaced material. Riprap.</td>
<td>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.</td>
<td>26</td>
</tr>
<tr>
<td>Cottonwood Limestone Member</td>
<td>Base course material. Shoulder material. Light type surfaced material. Riprap. Structural stone.</td>
<td>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.</td>
<td>28</td>
</tr>
<tr>
<td>Wedford Limestone Formation (Thessalle and Schroyer Limestone Members)</td>
<td>Light type surfaced material.</td>
<td>Northern portion of the northeast one-fourth of the county. Outcrop shown on plate II.</td>
<td>30</td>
</tr>
<tr>
<td><strong>Sand and Gravel</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glacial Drift</td>
<td>Bituminous aggregate. Base course material. Light type surfaced material.</td>
<td>Blasting most of the county but the most prominent on stream divide areas. Glacial Drift is shown on plates I through VI.</td>
<td>32</td>
</tr>
<tr>
<td>Alluvium and Terrace Deposits</td>
<td>Possible concrete aggregate. Possible bituminous aggregate. Base course material. Shoulder material. Light type surfaced material.</td>
<td>Major stream valleys over the county. Alluvium and Terrace Deposits are shown on plates I through VI.</td>
<td>32</td>
</tr>
<tr>
<td><strong>Boulder</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glacial Drift</td>
<td>Possible concrete aggregate. Possible bituminous aggregate. Base course material. Shoulder material. Light type surfaced material. Riprap.</td>
<td>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.</td>
<td>33</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glacial Drift</td>
<td>Mineral Filler.</td>
<td>Present in a buried valley. Atchison Formation found along the southern boundary of Nemaha County. Glacial Drift is shown on plates I through VI.</td>
<td>34</td>
</tr>
<tr>
<td>Loose</td>
<td></td>
<td>Not a source of aggregate or mineral filler. It is a source of subgrade, embankment, and slope material.</td>
<td>Most prominent in the western one-half and the northeast one-fourth of the county. Loose is shown on plates I through VI.</td>
</tr>
</tbody>
</table>

Figure 7. Tabulation of the construction material types and their availability in Nemaha County.
DESCRIPTION OF CONSTRUCTION MATERIALS

Limestone

Howard Limestone Formation, Church Limestone Member

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

The Church is a hard, dense, blue-gray, fossiliferous limestone exposed only along the Nemaha Anticline in extreme northern Nemaha County. In sections 1, 12, 24, and 25, T18S, R12E, the member is a massive limestone three to four feet thick that could be economically quarried. It is readily identified by the persistent Nodaway Coal zone, in the Aarde Shale, found one to two feet below the Church (figure 8). Exposures of the Church are shown on plates I and II.

Tests indicate that the Church Limestone Member is of good quality with the exception of marginal soundness. The crushed limestone may be suitable for concrete, bituminous, base course and shoulder aggregate, light type surfacing material, and 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
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 SE1\(\frac{1}{4}\) sec. 7, T1S, R13E; therefore, it is briefly discussed but not mapped.
Emporia Limestone Formation, Reading & Elmont Limestone Members

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

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

Figure 9. Typical bedding of the Reading Limestone Member, SW 1/4 sec. 33, T13S, R13E.

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...
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 IV.

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
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, Wanego 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, NE4 sec. 18, T13S, 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.

Granola Limestone Formation, Neva Limestone Member

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

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

The Neva Limestone Member represents the upper unit of the Granola and is the material producing bed (figure 13). It is
Figure 13. Neva Limestone in a quarry face, SW¼ sec. 36, T55S, 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 Lime- stone overlie the Neva.

Material from this source is not high quality. Its use is restricted to base course, shoulder, and light type surfacing ma- terial. A quarry in Jackson County on the Nemaha County line
(N 4 sec. 1, T6S, R12E) has produced abundant limestone from the Neva primarily for light type surfacing purposes. One test shows a Los Angeles wear value of 38.7 percent, a soundness loss ratio of 0.80 and an absorption of 4.19 percent.

**Beattie Limestone Formation, Cottonwood Limestone Member**

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

![Figure 14. Cottonwood Limestone in a quarry face, SW 1/4 sec. 36, T6S, R12E.](image)

The Florena Shale which overlies the Cottonwood is a silty, calcareous shale with abundant fossils, especially small brachiopods termed *Chonetes*. The shale is tan-gray in color and variable in
thickness; however, it averages about five feet. In the NE 4
sec.14, T1S, R14W, the shale thins to about one foot and the over-
lying 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 Lime-
stone may be utilized together in one quarrying operation. Be-
cause the primary source rock is the Cottonwood, the map unit is
termed the Cottonwood.

Exposures of the Cottonwood are limited to the northeast and
extreme south-central Nemaha County. Because the Neva and the
Cottonwood are separated by only the Eskridge Shale, the two units
are sometimes produced at the same locality. This is the case at
a quarry on the Nemaha-Jackson County line (SW 4 sec.36, T5S, R12R).
Crushed rock from the Cottonwood is marginal to poor in quality
and probably not acceptable for use as concrete or bituminous ag-
genrate. However, the Cottonwood has been used for concrete ag-
genrate in other Kansas counties. It is an important source of
base course, shoulder, and light type surfacing material. This
bed is also a source of riprap and structural stone. Representative
quality information shows the Los Angeles wear ranges from 34.2 to
46.5 percent, the soundness loss ratio from 0.73 to 0.88, and the
absorption from 3.58 to 7.13 percent. Detailed test results are
shown in figure 18, page 37. The Cottonwood exposure pattern is
shown on plates II, IV, V, and VI.
Wreford Limestone Formation, Threemile & Schroyer Limestone Members

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

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

The Havensville Shale lies above the Threemile but is not well-exposed in Nemaha County. It is about 17 feet thick and varies widely in composition; however, it is commonly a calcareous, tan-gray to olive colored shale. In some areas the shale grades into a limestone termed the Havensville Reef. The reef was not identified in any outcrop in Nemaha County, but may be present in some areas. Where found, the Havensville Reef is an important source of marginal quality rock.
The Schroyer Limestone, the youngest unit of the Wreford Formation, overlies the Havensville Shale. It is a massive, medium hard limestone that contains bands and nodules of chert. Like the Threemile, calcium carbonate has been leached out in many areas leaving chert rubble and red-brown clay. Exposures of the Schroyer are limited to sec. 5, 8, 15, and 17, T1S, R14E. If the total thickness of the unit exists in Nemaha County, it would probably be about ten feet. The type and quality of material produced from the Schroyer would be very similar to that derived from the Threemile. No test results are available on samples taken from the Wreford in Nemaha County. The use of the cherty limestone would probably be limited to light type surfacing material.
Sand and Gravel

Glacial Drift

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

Alluvium and Terrace Deposits

The materials found in the Alluvium and in Terrace Deposits is similar; therefore, the two beds are included in the same map unit. In Nemaha County, the Alluvium is composed of fine-textured material consisting of tan-brown clay, silt, and fine sand. Its thickness probably does not exceed 25 feet. Terrace Deposits consist mostly of tan-colored clay, silt, and some fine sand; however, some gravel
is present along Silver Creek in the NE\(\frac{1}{4}\) sec.11, T1S, R13E. The maximum thickness of the Terrace Deposits does not exceed 40 feet. Alluvium and Terrace Deposits are shown on plates I through VI.

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

Boulders

Glacial Drift

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

33
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).

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.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8-25</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-30</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-31</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-32</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-33</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-34</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-35</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-36</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-37</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-38</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-39</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-40</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-41</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-42</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-43</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-44</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-45</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
<tr>
<td>8-46</td>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>S.S.C. Form 649, Lab. No. 61647</td>
</tr>
</tbody>
</table>

Figure 18. Results of tests completed on samples of material from the various geologic source beds in Manaca County.
NEMAH COUNTY MATERIALS MAPS

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

index map

Plate I
Plate II
Plate III
Plate IV
Plate V
Plate VI

Note: The individual site data forms follow Plate VI.
NEMAH COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

Material Type
SG - Sand & Gravel
LS - Limestone
SI - Silt
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

Unit
Alluvium and Terrace Deposits
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.

Scale: 1 0 1 2 3 4 Miles
EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

Material Type
- SG - Sand & Gravel
- LS - Limestone
- SI - Silt
- 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.
EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

Material Type
- SG - Sand & Gravel
- 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 Pennsylvanian 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.

Scale: 1 2 3 4 Miles
NEMAH COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

**Material Type**
- SG - Sand & Gravel
- LS - Limestone
- SI - Silt
- CG - Chert Gravel

**Estimated Quantity**
- Indicates more than 20,000 cubic yards
- Indicates less than 20,000 cubic yards

**Geologic Age and Unit**

Reference to the site number on the following data forms.

EXPLANATION OF MAP SYMBOLS

- **Dit**
  - Alluvium and Terrace Deposits
- **Opd**
  - 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.

Scale: 1 0 1 2 3 4 Miles
NEMAH COUNTY MATERIALS MAP LEGEND

EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

Material Type
- SG - Sand & Gravel
- LS - Limestone
- SI - Silt
- 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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvium and Terrace Deposits</td>
<td></td>
</tr>
<tr>
<td>Glacial Drift</td>
<td></td>
</tr>
</tbody>
</table>

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.
EXPLANATION OF MATERIALS SITE DESIGNATIONS

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

Material Type
- SG - Sand & Gravel
- LS - Limestone
- SI - Silt
- 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

- Data
- Terrace Deposits
- Glacial Drift
- Loess

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 0 1 2 3 4 Miles

Scale:
OPEN MATERIALS SITES; NOT SAMPLED

LEGEND

--- Trail or lane

Road

Railroad

Hedge or trees

Fence

Major stream

Intermittent streams

Pond or lake

Open materials site; not sampled

Center of section

Dwelling

Cemetery

School

Church

Town or city
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+1
Cqg7

Date April, 1968

Material Sand and Gravel
County Nemaha

Location NE1
Sec. 31
T. 1S
R. 11E

Owner Clarence W. & Willis E. Ford
Axtell, Kansas

Nature of Deposit Dry
Accessibility Good
Site Located on Flat
Open site; not sampled

EXPLOSION DATA

<table>
<thead>
<tr>
<th>East North</th>
<th>Material</th>
<th>Depth below</th>
<th>Depth above</th>
<th>Percent Hyd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft.</td>
<td>material</td>
<td>ft.</td>
<td>ft.</td>
<td>ft.</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

COEVAL DATA

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To

Specific Gravity (Sat.) (Ing.)
Los Angeles Wear
Passage
Blends

Symbols

Scale: 1" = ¼ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-3
Fe

Site No. 16
Date April, 1968

Material Limestone
County Nemaha

Location NE NE
Sec. 16

Owner Bernice Bredemeier
Sonca, Kansas

Nature of Request: Accessibility
Accessibility: Good
Site Located on Plate: 1

Status of Site: Open site; rot sampled

EXPLANATION OF DATA

Geological Age: Pennsylvanian
Geological Source: Emoria Lg. Form. (Reading Member)
Material Rating: Fe

Specific Gravity (Sat.): [Value]
Los Angeles Wear:
Adherence:
Rrr. Calci:
Remarks:

SCALE: 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS+4
Fe

Date: April, 1968

Material: Limestone
County: Nemaha
Location: SW¼ NE¼
Sec. 29
Town 14
Range 12E

Owner: Clarence R. Haug
Seneca, Kansas

Nature of Deposit: Dry
Accessibility: Fair
Size Located: 1/4

Status of Site: Open site, not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Soil Name</th>
<th>Material</th>
<th>Reticulation of Block</th>
<th>Parent Material</th>
<th>Density (pcf)</th>
<th>U2</th>
<th>U1</th>
<th>k</th>
<th>T</th>
<th>M1</th>
<th>M2</th>
<th>M6</th>
<th>B60</th>
<th>G.P.</th>
<th>L.L.</th>
<th>F.I.</th>
</tr>
</thead>
</table>

CUTTING DATA

Geological Age: Pennsylvania
Geological Source: Emporia Limestone (Elmont & Reading Members)

Material Similar To:

Specific Gravity (計.)

Los Angeles Wear

Abrasiveness

Mo. Co. Fe:

Dr. Ball

Remarks:

Scale: 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. 0e  April, 1968  Neahah
Limestone

Location  Seneca, Kansas
Clarence & Louis Haus

Cover  Dry

Status of Site  Open site; not sampled

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material at bottom</th>
<th>Percent of coarser</th>
<th>Ballast</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>Wet 20%</th>
<th>S.P.</th>
<th>L.</th>
<th>L.F.</th>
</tr>
</thead>
</table>

Stratigraphic Unit

Pennsylvaniaian

Formation Name  Emporia Ls. Form. (Elmont & Reading Members)

Material Similar To

Specific Gravity (Dr.)

Los Angeles Test

drill size

Compaction

Notes

Diagram:

Scale: 1" = 1/2 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. 4868

Geology: Limestone

Material: Nemaha

Location: SE 1/4 SW 1/4 sec. 29 T. 1S R. 12E

Owner: Clarence Haug

Status of Site: Open site; not sampled

Pennsylvanian

Geological Age: Emporia Lg. Form. (Elmont & Reading Members)

Material: Similar to

Specific Gravity (Dry) [ ]

Los Angeles Abrasion

Water Content:

Saturated

Drained

Non-saturated

Notes:
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-7
Fe

Site No. 804

April, 1968

Material Limestone

County Nebraska

Location NW1/4 NW1/4 Sec. 33 T15S R12E

Owner Frank Tangeman et ux

Seneca, Kansas

Nature of Report Dry

Accessibility Pair

Site Located on Plato

Status of Site Open Site; not sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material of Mixture at Hole</th>
<th>Depth (Feet)</th>
<th>Gt.</th>
<th>% CaCO3</th>
<th>% SiO2</th>
<th>% Al2O3</th>
<th>% Fe2O3</th>
<th>% MgO</th>
<th>% S</th>
<th>% Cl</th>
<th>% So2</th>
<th>% CO2</th>
<th>% H2O</th>
<th>% CO</th>
<th>% SO2</th>
<th>% N2</th>
<th>% Ar</th>
<th>F.L.</th>
<th>P.L.</th>
</tr>
</thead>
</table>

CORRELATION DATA

Geological Age Pennsylvanian

Geological Source Emporia Ls. Form.(Reading Member)

Material Similar To

Specific Gravity (s.g.)

(1.4) (dry)

Los Angeles Bear

Absorption

Desiccation

Wt. Co./Fe:

Str. Ratio

Remarks

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-8

Site No. Material
Limestone

Date - April, 1968

County - Nemaha

Location - NW4 NW4 Sec. 25 Twp. 15 Range 12E

Remarks - Open site; not sampled

Exploration Data

<table>
<thead>
<tr>
<th>Total</th>
<th>Material</th>
<th>Depth of</th>
<th>Amount Retrieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Circulation Units

Geological Age - Pennsylvania

Geological Series - Church Limestone Member

Material Similar to -

Specific Gravity (Sat.)

Los Angeles Abrasion

Abrasivity - Soundness

Mo. Ex. Ft. -

Remarks - Alice Hunzeker & Ben W. Grimm

% Raymond Hilinger, Seneca, Kansas

Scale: 1" = ¼ Mile
State Highway Commission of Kansas

Material Survey Report

Site No. 0gd
Date April, 1968

Sand and Gravel
County Omaha

Location SW 1/4 Sec. 2
Town 4S Range 12E

Owner Conrad P. Siessa
Address Seneca, Kansas

Nature of Deposit Dry
Condition Good

Status of Site Open site; not sampled

Exploration Data

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material Below</th>
<th>Pounds per Cubic Foot</th>
<th>Depth Under Surface</th>
<th>I/C %</th>
<th>% S</th>
<th>% O</th>
<th>% M</th>
<th>% H</th>
<th>Permeability</th>
<th>B.P.</th>
<th>L.L.</th>
<th>P.C.</th>
</tr>
</thead>
</table>

Irrigation Data

Geological Age Quaternary
Geological Source Glacial Drift

Material Similar To

Specific Gravity (Sat.)
Los Angeles Wear
Humidity
Water Content
St. Ratio

Remarks May be expansion possibilities to the east of the present site.
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG+10
Qgd

Site No. 10
Date April, 1968

Sand and Gravel
County: Nemaha

Location: NE 1/4 SW 1/4 Sec. 18
Town 2S Range 12E

Owner: Clarence R. Engelken et ux
Seneca, Kansas

Dry
Good
I
Open site: not sampled

EXPLORATION DATA

% Percent Re-spread

TEST bore Material Material Depth Depth Test bore bore of hole of hole

Quaternary

Geological Age

Glacial Drift

Geological Source

Material Similar To

Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption

Wt. Cu,Ft.

Remarks

1" = 1/4 Mile

Scale: 1" = 1/4 Mile
MATERIAL SURVEY REPORT

SGA9
Qqqd

Site No.  
Date  

SGA9  
Qqqd  
April, 1968  

Location  
Sec.  
Town  
Range  

SW 1/4  2  26  12E  

Owner  

Conrad F. Siess  
Seneca, Kansas  

Nature of Deposit  
Accessibility  
State of Site  

Dry  
good  
Open site; not sampled  

Introduction data

Percent Material  
Depth to Material  

Percent Removal  
Depth of Material  
10'  20'  40'  60'  90'  120'  

Correlation Data

Geological Age  
Quaternary  

Geological Source  
Glacial Drift  

Material Similar To  

Specific Gravity (Sat.)  
(Dry)  

Los Angeles Durability  

Absorption  
Soundness  

Wt. Co.-%  
Dist. Ratio  

Remarks  
May be expansion possibilities to the east of the present site.
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+10  
Qgd
Mat. April, 1968
Sand and Gravel  
County Nemaha
Location NE 1/4 SW 1/4 SE 1/2 Sec. 19  
Town 26 Range 12E
Owner Clarence R. Engelken etux  
Seneca, Kansas
Drill Good  
Accessibility Site located on Plate I
Nature of Deposit Open site, not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material at Bottom of Hole</th>
<th>Depth of Hole</th>
<th>North Material</th>
<th>Unit Weight, LCB</th>
<th>Percent by Volume</th>
<th>Test No.</th>
<th>R.G.</th>
<th>L.L.</th>
<th>P.I.</th>
</tr>
</thead>
</table>

| Geological Age | Quaternary  
| Geological Source | Glacial Drift |

| Specific Gravity (Sat.) |  
| Los Angeles Wax |  
| Absorption |  
| Moist. Co-Fr. |  
| Remarks |  

Scale: 1" = ¼ Mile
STATE GEOLOGY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG+11 Ggd

Date: April, 1968

Material: Sand and Gravel

County: Nemaha

Location

Sec.: 1E

Twp.: 1S

Range: 13E

Owner: Eli Meyer, Robert Meyer

Barnett, Kansas

Nature of Deposit: Dry

Accessibility: Fair

1.5 miles located on Place II

Status of Site: Open Site; not sampled

Tstop distance

Depth of

Material

Resource

Sample

Received

Date

Geological Age: Quaternary

Geological Source: Glacial Drift

Material: Drift

Depth: 0

Sample: 1E-12

Collected: 12/14/68

Analysis: as listed

SG+61 Ggd

SG+11 Ggd

Scale: 1" = 1/4 Mile
**MATERIAL SURVEY REPORT**

**Site No.** SG+12  
**Date** April, 1968

**Material** Sand and Gravel  
**County** Nemaha  
**NE**  
**Location** Sec. 32  
**T**  
**R**  
**Range** 13E

**Owner** Ruth & William Perkin  
**Address** Bern, Kansas

**Nature of Report** Good  
**Site Located On** Plate II

**Status of Site** Open site; not sampled

### EPILOGUE Data

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material Gravel</th>
<th>Depth of Material</th>
<th>Percent Gravel</th>
<th>Material</th>
<th>Depth</th>
<th>G.S.</th>
<th>L.L.</th>
<th>P.I.</th>
</tr>
</thead>
</table>

### CORRELATION DATA

**Geological Age** Quaternary  
**Geological Source** Glacial Drift

**Material Similar To**

**Specific Gravity** (Stat.)  
**Los Angeles Tear**

**Absorption** Boundless  
**Wt. Coeff.**  
**Str. Ratio**

**Remarks**

---

**Scale:** 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-13

Pw

Site No. 2

Date April, 1968

Material Limestone

County Nemaha

Location SNW

Sec. 2

T. 1S

R. 13R

Owner Victor K. Krainbill

State Kansas

Notes of Report: Yes

Accessibility: Fair

1.4 Located on Plate

II

Status of Site: Open site not sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Layer</th>
<th>Material and Percent Distribution</th>
<th>Depth of Material</th>
<th>Height of Pile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limestone</td>
<td>10 ft.</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION DATA

Geological Age: P+ear

Geological Source: Wreford Limestone Formation

Material Similar To:

Specific Gravity (Sat.): (Dry)

Los Angeles Bear: Don't Know

St. Ca. Ft.: Don't Know

Remarks: The material being removed from this site is a weathered cherty limestone.

Scale: 1" = 1/2 Mile

Nebraska - Kansas Line

LS-13

Pw
Material Survey Report

Lo-14
Fw

File No. ___________ Date ___________ April, 1968

Location

County

Material

Limestone

Nemaha

Owner

Donald Lee Ehrsem

Bern, Kansas

Condition

Dry

Good

Open site: not sampled

Lithology Data

Geological Age

Fremian

Geological Source

Wreford Limestone Formation

Material Similar to


Specific Gravity (Stab. 3) 1.965 (approx.)

Los Angeles Abrasion


Assimilation


Wt. of Ft. 110


Remarks

The material being removed from this site is a weathered cherty limestone.
STATE HIGHWAY COMMISSION OF KANSAS

WATER SEWAGE REPORT

SG+16
Date: April, 1968
Ggd

Material: Sand and Gravel
County: Nemaha

Location:

See Remarks

Owner: Dry

Mature of Seepage: Fair
Site located on plate II

Status of Site: Open site; not sampled

EXPLORATION DATA

Layer
Material at Surface
Depth of Material
Depth of Water

Gravel

Sands

Residual Retained

100

200

200

B.F.

L.L.

P.L.

Quaternary
Geological Age
Geological Source
Material Similar To

Glacial Drift

Specific Gravity (Est.)

Los Angeles Ilar

Description

M.T. Co. Fl.

Dr. Ratio

Remarks: NE\(^{k}\) Gordon Mosteller, Bern, Kansas

SE\(^{k}\) Jesse A. Hunzeker, Bern, Kansas

Scale: 1" = ½ Mile
**MATERIAL SURVEY REPORT**

**LS-17**

**Pc**

**Date:** April, 1966

**Location:** Limestone

**County:** Nemaha

**Section:** Sec. 1

**Township:** T5

**Range:** R5 E

John W. Plattner et ux  Sabatha, Kansas

**Drainage:** Poor

**Type of Deposit:** Dry

**Site located on Plat:** II

**Status of Site:** Open site; not sampled

### Exploration Data

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material of Section</th>
<th>Depth of Material</th>
<th>Depth of Water</th>
<th>Percent Limestone</th>
<th>Percent Clay</th>
<th>Breaker</th>
<th>H.F.</th>
<th>L.L.</th>
<th>P.E.</th>
</tr>
</thead>
</table>

### Evaluation Data

**Geological Age:** Permian

**Material:** Cottonwood Limestone Member

<table>
<thead>
<tr>
<th>Specific Gravity (Wet)</th>
<th>(Dry)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Los Angeles Wear</th>
<th>Soundness</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mt. Ca.Ft.</th>
<th>Dr. Suite</th>
</tr>
</thead>
</table>

**Remainder:**

---

**Scale:** 1" = 1/4 mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG+18
Qgd

Site No.  Date April, 1968

Sand and Gravel  County Nemaha

Material SW # SW #  Sec. 19  18  Range 14E

Location  Township

Wesley Gerber  Sabatha, Kansas  County

Owner  Type  Dry  Good  Site Located on Plate IX

Nature of Deposit  Accessibility

Status of Drilling  Open site; not sampled

EXPLORATION DATA

Cores  Zoned Intervals  Material  L/F  LL  PI  Percent  Q/f.  L/L  P/L

Quaternary

Geological Age  Glacial Drift

Geological Source

Material Similar To

Density Gravity (bot.)  (Dry)

Los Angeles Wear

Absorption

Wt. Eq. ft.

Remarks

SCALE: 1" = 1/2 Mile
MATERIAL SURVEY REPORT

<table>
<thead>
<tr>
<th>Site No.</th>
<th>SG-19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>April, 1968</td>
</tr>
<tr>
<td>Material</td>
<td>Sand and Gravel</td>
</tr>
<tr>
<td>County</td>
<td>Nemaha</td>
</tr>
<tr>
<td>SW' SW'</td>
<td>Sec. 6, Tp. 2S, Rng. 14E</td>
</tr>
<tr>
<td>Owner</td>
<td>Harry W. Edelman</td>
</tr>
<tr>
<td>Location</td>
<td>Sabetha, Kansas</td>
</tr>
<tr>
<td>Status of Site</td>
<td>Open site; not sampled</td>
</tr>
<tr>
<td>Description</td>
<td>Poor</td>
</tr>
<tr>
<td>Remarks</td>
<td>Pit very small; not much potential.</td>
</tr>
</tbody>
</table>

**Calibration Data**

- **Geological Age**: Quaternary
- **Geological Source**: Glacial drift

**Material Similar To**

- Specific Gravity (Dry): [dry]
- Lime & Spinel: Soundness: [details]
- Wet & Dry: [details]
- Pit: [details]
- Remarks: Pit very small; not much potential.

**Exploration Data**

- Depth: [details]
- Material: [details]
- Percent: [details]
- Water: [details]
- L.L.: [details]
- P.I.: [details]

**Diagram**

Scale: 1" = ¼ Mile
SG+20 Qyd

Date: April, 1968

Location: NE

Location: SE

Status of Site: Open site; no samples

Explanation Data

Geological Age: Quaternary

Geological Source: Glacial Drift

Specific Gravity (dry): (dry)

Los Angeles Abrasion: (Data)

Compaction:

Remarks:
STATE HIGHWAY COMMISSION OF KANSAS
MATERIAL SURVEY REPORT

Site No. SG+21  
Qgd

Date April. 1968

Material Sand and Gravel

County Nemaha

Location NE 1/4 SE 1/4 Town 36 Range 12E

Owner Elizabeth Bethman, Mrs. R. Bethman, Seneca, Kans.

Notes of Deposit

Dry

Access to Site

Fair

Site Located on Plot III

Status of Site Open Site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Tag No.</th>
<th>Material of Deposit</th>
<th>Percent Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXSPLORATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To


Sediment Gravity (Stat.) (Dry)

Los Angeles Wear

Attraction

Mt. Eq. ft.

Remarks

Scale 1" = 4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-22  
Fe

Site No.  
Limestone

Date  
April, 1968

Remaha

County

Location  
Sec. 15  
T. 3S  
R. 12E

Daniel J. Henry etux  
Seneca, Kansas

Owner

Status of Site  
Open site; not sampled

EXPLORATION DATA

| Test Data | Range of Permeability (feet) | Depth of water-bearing strata (feet) | Material Analysis | Description of Material | B. F. | L.I. | P.F.
|-----------|-----------------------------|-----------------------------------|------------------|-------------------------|------|-----|-----|

<table>
<thead>
<tr>
<th>Consolation Data</th>
</tr>
</thead>
</table>

Geological Age  
Pennsylvania

Geological Source  
Emporia Lo. Forte (Resizing Member)

Material Similar To

Specific Gravity (Dry)  
(Dry)

Los Angeles Value

Absorption

Wt. Ca. P.

Remarks

SCALE: 1" = ½ Mile
**STATE HIGHWAY COMMISSION OF KANSAS**

**MATERIAL SURVEY REPORT**

**SG+23**

Qgd

**Site No.**

**Date:** April, 1968

**Material:** Sand and Gravel

**County:** Nemaha

**Location:** SE 1/4 Sec. 11 Twp. 3S Range 12E

**Owner:** Mathias C. Rochel erux

**Address:** Seneca, Kansas

**Nature of Deposit:** Dry

**Ogcm:** Site Located on Plate III

**Status of Site:** Open site; not sampled

**EXP. DIVISION DATA**

<table>
<thead>
<tr>
<th>Soil Code</th>
<th>Material of Surface</th>
<th>Depth of Material</th>
<th>Depth of &amp; Material</th>
<th>Percent Reclaimed</th>
<th>Atterberg Limits</th>
<th>Molding</th>
<th>Silt</th>
<th>Mud</th>
<th>Sphagnum</th>
<th>Work</th>
<th>S.I.</th>
<th>L.L.</th>
<th>P.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CORED DATA**

- **Geological Age:** Quaternary
- **Geological Source:** Glacial Drift
- **Material Similar To:**
- **Bonecrete Gravity (Est.):** (dry)
- **Los Angeles Wear:**
- **Adhesion:** Sandiness
- **Wt. Cu.Ft.:** str. Basic
- **Remarks:**

---

**Scale:** 1" = 1/4 Mile
MATERIAL SURVEY REPORT

Site No. SG+24
Qgd

Date: April, 1968

Material: Sand and Gravel
County: Nemaha

Location: SW 1/4 NE 1/4
Town: 3S Range: 12E

Owner: Frank Kuckelman etux
Seneca, Kansas

Nature of Deposit: Dry
Accessibility: Good
Site Located on Plate: III
Status of Site: Open site; not sampled

EXPLOSION DATA

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Material</th>
<th>Bottom of Hole</th>
<th>Depth of Explosive</th>
<th>Percent Deflected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXPLOSION DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To:

Specific Gravity (Est.): (g/cm³)
Los Angeles Wear: (Percent)
Sedimentary: (Percent)
Wt. Gal./Fl.: (gal.)

Remarks:

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. LS-25
Material: Limestone
Location: NNM SE16, Sec. 30, Twp. 12R, Rng. 16E, Combs, Kansas
Owner: Bernard W. Kampert etux
Nature ofDeposit: Dry
Site Located on Plate: III
Status of Site: Open site; not sampled

Explosion Data

[Table with columns for Test No., Material Depth, Diameter, Material, Depth in Material, Percent Recovered, B.P., L.L., P.I.]

[Table with columns for Correlation Data, Geologic Age: Pennsylvania, Geologic Source: Emporia Ls. Form., (Reading Member), Material Similar To: , Specific Gravity: (Tab.), Loss on Ignition: , Absorption: Soundness, Wt. % CaCO3: Str. Ratio, Remarks: ]

Scale: 1" = 1/4 Mile
### MATERIAL SURVEY REPORT

- **Site No.:** LS-26  
- **Date:** April, 1968  
- **Material:** Limestone  
- **County:** Nemaha  
- **Location:** Sec. 5  
- **Township:** 3S  
- **Range:** 12E  
- **Owner:** Donald J. Uphaus et ux  
- **Address:** Seneca, Kansas  
- **Nature of_Surface:** Dry  
- **Accessibility:** Fair  
- **Site Located on Plate:** TII  
- **Status of Site:** Open site; not sampled  

### EXPLOSION DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material</th>
<th>1/16 in.</th>
<th>1/8 in.</th>
<th>1/4 in.</th>
<th>1/2 in.</th>
<th>1 in.</th>
<th>2 in.</th>
<th>G.F.</th>
<th>L.L.</th>
<th>P.L.</th>
</tr>
</thead>
</table>

<p>| | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

### EXCLUSIONS DATA

- **Geological Age:** Pennsylvanian  
- **Geological Source:** Emporia Ls. Form. (Reading Member)  
- **Material Similar To:**  

### Specific Gravity (Both)

- **Los Angeles Wear:**  
- **Absorption:**  
- **D persistence:**  
- **Wt. Loss:**  

### Remarks

- *This site reported in Geological Survey, Bull. No. 1960p.*
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-27
Fe

Site No.     Date April, 1968

Material Limestone

Location NW 1/4 SE 1/4 Sec. 35, Tp. 36, R. 12E

Owner Norbert A. Stallbaumer etux

Notes of Deposit Dry - Poor Site Located or Plate III

State of Site Open site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material</th>
<th>Depth</th>
<th>Strength</th>
<th>Material Neighbor</th>
<th>Depth</th>
<th>Strength</th>
<th>Material Neighbor</th>
<th>Material</th>
<th>L.L.</th>
<th>P.F.</th>
</tr>
</thead>
</table>

EXPLORATION DATA

Geological Age Pennsylvania

Geological Source Emporia Ls. Form. (Reading Member)

Material Similar To

Specific Gravity (Test.)
Los Angeles Wear
Abrasiveness
Wt. Cu.Ft.

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

Scale: 1" = ¼ Mile
SG-30

Ogd

Date: April, 1968

Material: Sand and Gravel
County: Nodaway

Location: SE1/4 SW1/4 Sec. 36, Tp. 38, Range 138
Owner: Francis J. Levret
Address: Goff, Kansas

Nature of terrain: Dry
Sides of site: not sampled
Status of site: IV

Explosion Data

Quaternary

Geological Source: Glacial Drift
Material Similar To:

Report's Gravity (Foot.)
Los Angeles Hardness
Resiliency

Remarks: This site is reported in the Geological Survey Bull. No. 1050D.

Scale: 1" = 1/4 Mile
MATERIAL SURVEY REPORT

SG-31

Qgd

Date: April, 1968

Material: Sand and Gravel

County: Nemaha

Location: SW 1/4 NW 1/4 Sec. 26, Twp. 3S, Range 13E

Owner: John E. Swartz & Carl D. Swartz, Seneca, Kansas

Note: Site located on Plate IV

Status of Site: Open site; not sampled

PHYSICAL DATA

<table>
<thead>
<tr>
<th>Layer</th>
<th>Material below C.G.</th>
<th>Depth of</th>
<th>Percent Grain Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COSERATION DATA

Geological Age: Quaternary

Geological Source: Glacial Drift

Material Similar To:

Specific Gravity (Em.): (Dry)

Los Angeles (Dry):

Hardness:

Wt. G.C.F.:

Note:

Remarks:

Scale: 1" = ¼ Mile
**STATE HIGHWAY COMMISSION OF KANSAS**

**MATERIAL SURVEY REPORT**

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Material</th>
<th>County</th>
<th>Location</th>
<th>Owner</th>
<th>Nature of Deposit</th>
<th>Status of Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG-32</td>
<td>Sand and Gravel</td>
<td>Nemaha</td>
<td>SW 1/4 SE 1/4 Sec. 12, T46S R45W</td>
<td>Robert F. Lochten</td>
<td>Wetmore, Kansas</td>
<td>Dry, Accessory Site located on Plat</td>
</tr>
</tbody>
</table>

**LOADED-IN DATA**

<table>
<thead>
<tr>
<th>Test Well</th>
<th>Material from Top</th>
<th>Depth of Material</th>
<th>Material Below</th>
<th>%</th>
<th>Q</th>
<th>M</th>
<th>W</th>
<th>P</th>
</tr>
</thead>
</table>

**CORRELATION DATA**

- **Geological Age:** Quaternary
- **Geological Source:** Glacial Drift
- **Material Below:**
  - Sandstone
  - Loam
  - Sand

**Domestic Activity (Tact.)**

<table>
<thead>
<tr>
<th>City</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kansas</td>
<td>Tact.</td>
</tr>
</tbody>
</table>

**Los Angeles Heat**

<table>
<thead>
<tr>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation</td>
<td>Kansas</td>
</tr>
</tbody>
</table>

**Remarks**

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Belle</td>
</tr>
</tbody>
</table>

**Scale:** 1" = 1/2 Mile
SG-33
Ggg

Date: April, 1968

Material: Sand and Gravel
Location: SW 1/4 NW 1/4 Sec. 5, T. 4S, R. 14E, Nemaha Co., Nemaha
Owner: Jimmy McDaniel

Nature of Deposit: Dry
Accessibility: Fair
Site Located on Plate: IV

Status of Site: Open site; not sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Soil Name</th>
<th>Material of Bottom</th>
<th>Depth of Bottom Below Surface</th>
<th>Percent Material</th>
<th>Texture</th>
<th>B.P.</th>
<th>L.L.</th>
<th>P.L.</th>
</tr>
</thead>
</table>

QUADRATURE DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To:


density gravity (gauge): (Dgr)

Loss on Ignition

Drift Rate:

Remarks:

Scale: 1" = 1/2 Mile
STATE HIGHWAY COMMISSION OF IOWA

MATERIAL SURVEY REPORT

SG-35

Ogd

Site No. 014

Data  April, 1968

Material  Sand and Gravel

County  Nemaha

Location  SW1, NW1

Sec. 28

Twp. 36

Range 14E

Owner  Eugene & Violet Kistner, 1013 5th Ave., Sheldon, Iowa

Nature of Deposit  Dry

Stability  Good

Category  Site located on Plate

Status at Site  Open site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Soil Code</th>
<th>Material at Depth of Hole</th>
<th>Percent of Material</th>
<th>Depth of Material</th>
<th>1/2</th>
<th>1/4</th>
<th>1/8</th>
<th>1/16</th>
<th>B</th>
<th>S</th>
</tr>
</thead>
</table>

CROSS-CORRELATION DATA

Geological Age  Quaternary

Geological Source  Glacial Drift

Material Similar to

AHERTICA Gravity (Bt-T)

Los Angeles Brittleness

Cation Exchange Capacity

WATER CONTENT

NOTES

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG-36 Date April, 1963

Material Sand and Gravel County Nemaha

Location NW 1/4 SW 1/4 Sec. 28 Tp. 38 Rng. 14E

Owner Eugene & Violet Kistner 1015 5th Ave., Sheldon, Iowa

Nature of Deposit Wet

Accessibility Good

Site located on Plate IV

Shape of Site Open Site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material</th>
<th>Depth</th>
<th>Per cent. Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

G.F.      L.L.      P.I.
T8

CORRELATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To

Specific Gravity (Sat.) (Dry)

Los Angeles Wear
Roundsness

Gravel, Gravel

Remarks This pit is abandoned and is currently being used as a pond.

Scale: 1" = 1/4 Mile
Site No: 79

Date: April, 1963

Material: Limestone

County: Nemaha

Location: SE 1/4 Sec. 24 T. 38 R. 14 E

Owner: Edward A. Barben

Fairview, Kansas

Nature of Impact: Good

Accessibility: Site located on Plate

Status of Site: Open site, not sampled

Limestone Report

Correlation Data

Geological Age: Permian

Geological Source: Cottonwood Limestone Member

Material Similar To:

Specific Gravity (MMF): (hr)

Los Angeles Abr.:

M. C. R.:

Sieve:

Scale: 1" = 1/4 Mile
SG 38
Qgd
NL 14
TM 15
Range 14E
Nemaha County, Kansas

Site No.: April, 1968
Location: SE 1/4 NW 1/4
Owner: Carl W. Evans et al.
Nature of deposit: Dry
Distance of site: Open site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Task Date</th>
<th>Material at bottom of hole</th>
<th>Depth of sample</th>
<th>Percent Air-Dry</th>
<th>Size</th>
<th>M</th>
<th>Mx</th>
<th>D</th>
<th>B.F.</th>
<th>L.C.</th>
</tr>
</thead>
</table>

Correlation Data

Geological age: Quaternary
Geological source: Glacial Drift
Material similar to:

Specific gravity (dry): 
Los Angeles wear
Gradation
Bu. Co.-ft. 
Embankment

Scale: 1" = ½ Mile
Material Survey Report

SG+39
Gsd

Date: April, 1968

Site #: Sand and Gravel
County: Nemaha
Location: NW4 NW4
Sec.: 17
Town.: 3S
Range.: 14E
Owner: Ralph R. Bartley et ux
Address: 209 W. 115th, Kansas City, Mo.
Nature of Report: Fair
Accessibility: Open site; not sampled

Exposed-Drill Data

<table>
<thead>
<tr>
<th>Test Site</th>
<th>Material Below Site</th>
<th>Depth 110' Under Surface</th>
<th>Depth 110' Below Surface</th>
<th>Depth 110' Below Water</th>
<th>Depth 110' Below Groundwater</th>
<th>S.P.</th>
<th>L-L</th>
<th>P-I</th>
</tr>
</thead>
</table>

Correlation Data

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To:

Specific Gravity (wet): [an unspecified value is mentioned]
Specific Gravity (dry): [an unspecified value is mentioned]
Soil Analysis: [an unspecified value is mentioned]
Soil Texture: [an unspecified value is mentioned]
Soil Moisture: [an unspecified value is mentioned]
Soil Compaction: [an unspecified value is mentioned]
Soil Type: (dry)

Remarks:

Scale: 1" = 1/4 Mile
**MATERIAL SURVEY REPORT**

**Site No.:** SG+40  
**County:** Nemaha  
**Date:** April, 1968  
**Location:** Sec. 15 T. 36 S. R. 14E  
**Driveway:** J.K. Brownlee etux  
**Owner:** Sabatha, Kansas  
**Nature of Deposit:** Dry  
**Site Condition:** Fair  
**Status of Site:** Open site; not sampled

### EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test 1</th>
<th>Material in Contact</th>
<th>Depth</th>
<th>Below Material</th>
<th>Form.</th>
<th>Permeability</th>
<th>G.F.</th>
<th>L.L.</th>
<th>P.I.</th>
</tr>
</thead>
</table>

**Quaternary**

**Geological Age:** Glacial Drift

**Material Similar To:**

**Specific Gravity (Sat.):** (dry)

**Los Angeles Wear:**

**Absorption:**

**Min. St. Fe.:**

**Remarks:**

Scale: 1" = ½ Mile
LS+42

Site No. 11E

Material Limestone

County Nemaha

Location NE 29, Sec. 29, T. 5S, R. 4E, Kansas

Owner Walter Bonjour

Weather Dry, Fair

Suitability Open site; not sampled

EXPLANATION DATA

Pennsylvanian

Tarkio Limestone Formation

Geological Age

Geological Source

Material Similar To

Specific Gravity (int.)

Los Angeles Abrasion

Hr. Ex. Ft.

This site reported in the Geological Survey Bull. No. 10600.

Remarks

Sofle: 1" = 1/2 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG+44
Qgd
April, 1968

Site No. 9

Material Sand and Gravel
County Nemaha
Location 25° 58' 14E
Donald E. Hostetler
Netawaka, Kansas

Material Present Dry

Material Source Open site; not sampled

EXPLANATION

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material Present</th>
<th>Percent of Material</th>
<th>Specific Gravity</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
<th>SHR</th>
</tr>
</thead>
</table>

| CORRELATION DATA |

Geological Age Quaternary

Geological Stage Glacial Drift

Specific Gravity (Typ.)

Los Angeles Wear

Moisture Content

Description

Gr. Eq. Ft.

Remarks

Scale: 1" = ¼ Mile
**MATERIAL SURVEY REPORT**

- **Site No.** SG+45  
- **Qqd**  
- **Data** April, 1968  
- **Material** Sand and Gravel  
- **County** Nemaha  
- **Location** NMMI SWA  
- **Sec.** 27  
- **Top.** 48  
- **Range** 14E  
- **Owner** Harry A. Scott et ux  
- **Address** Wetmore, Kansas  
- **Drivability** Good  
- **Accessibility** Good  
- **Open site: sampled**

### EXPLANATION DATA

<table>
<thead>
<tr>
<th>Type</th>
<th>Depth of Material</th>
<th>Resistivity</th>
<th>Density</th>
<th>Inc.</th>
<th>SHR</th>
<th>SHR</th>
<th>18</th>
<th>25</th>
<th>90</th>
<th>180</th>
<th>B.F.</th>
<th>L.I.</th>
<th>P.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>9</td>
<td>1</td>
<td>35</td>
<td>8</td>
<td>2354</td>
<td>85</td>
<td>10</td>
<td>1.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>4873</td>
<td>91</td>
<td>7</td>
<td>2.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>2645</td>
<td>67</td>
<td>28</td>
<td>1.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### GEOLOGICAL DATA

- **Geological Age:** Quaternary  
- **Geological Source:** Glacial Drift  
- **Material:** Material reported on SHC Form 619
  - **No.** 66-12 Lab. No. 10440
- **Specific Gravity (Est.)**: 3.83
- **Los Angeles Wear**: 25.3(C)
- **Absorption**: 0.24
- **M. Grt.**: 118.8
- **1-day**: 1.23
- **3-day**: 1.28

**Scale:** 1" = 1/4 Mile

**Note:** Gradation data for holes 2 and 3 represent the finest and coarsest material that has been tested at this site.
Material Survey Report

SG-46  
Qgd

Date: April, 1968

Sand and Gravel  
Nemaha

County

Location:  
NE

Sec: 32  
Twp: 18  
Range: 11E  

Home of Deposit:

Wilbert A. Wassenberg  
Baileyville, Kansas

Name

Accessibility:

Good

Status of Site:

Open site; sampled

Exploration Data

<table>
<thead>
<tr>
<th>Test Nos.</th>
<th>Material</th>
<th>Depth of Borings</th>
<th>Depth of Material</th>
<th>Per cent. Material</th>
<th>Unit Weight</th>
<th>V.F.</th>
<th>S.F.</th>
<th>G.S.</th>
<th>R.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 5 11 5</td>
<td>11 5 12 5 1 7 5 9 0</td>
<td>94 5 73 78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Corelation Data

Geological Age: Quaternary  
Material: Glacial Drift

Material Similar to:

Material reported on SHC Form 619 No. 66-24 Lab. No. 89223

Specific Gravity (S.G.) 2.60 (Dry)

Los Angeles Abrasion 28.4(C)

Absorption 0.30

Mt. C. (ft.) 101.0

Remarks
**MATERIAL SURVEY REPORT**

**Site No.**: LS-47  
**Perm.**: April, 1968

**Material**: Limestone  
**County**: Nemaha

**Location**: NW 1/4 SE 1/4  
**Sec.**, **Tpp.**, **Rng.** 25  
**Township**, **Range**: 14E

**Owner**: Clarence Schmitz  
**Seneca, Kansas**

**Nature of Deposit**: Dry  
**Accessibility**: Poor  
**Site Location or Plate**: I

**Status of Site**: Open site; sampled

### Exploration Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Examination Data

**Geological Age**: Pennsylvanian  
**Emporia Ls, Form. (Reading Member)**  
**Material reported on SHC Form 645**  
**Lab. No.**: 1015

**Specific Gravity (Sol.)**: 2.54  
**Specific Gravity (Dry)**: 2.45

**Los Angeles Wear**: 35.2 (B)  
**Hardness**: 3.48  
**Percussion**: 0.80

**wt. Cu.Pt.**: Sir, Beinj

**Remarks**: 

---

**Scale**: 1" = 1/2 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS+50
Site No. PE

Limestone
Material
Nemaha
County

NE 1/4 SE 1/4 Sec. 23 T13 S1 Range 112 W
Location

Edwin J. Schmidt
Baileyville, Kansas
Owner

Dry
Nature of Deposit

Fair
Site Located on Plains

Open site; sampled
Status at Site

EXPLANATION DATA

Geological Age
Pennsylvania

Material Similar To
Tarkio Limestone Member

Material reported on SHC Form 619
No. 66-21

Specific Gravity (amt.) 2.53

density 2.42

Los Angeles Wear 35.7(B)

Absorption 4.12

S.G. 0.80

Per. Ca Co

Str. Basis

Remarks

CUMULATION DATA
MATERIAL SURVEY REPORT

Site No. 75-52  
Fe  
Date: April, 1968

Limestone  

Nemaha

County

Location:  
NE1/4 NW1/4 Sec. 32  
Twp. 1S  
Range 12E

Frances Heiman  
Baileyville, Kansas

Owner

Dry  
2oor

Nature of Deposit: Accessibility:  
Open located on Plate

Status of Site: Open site; sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Work</th>
<th>Material to Horizon</th>
<th>Depth of Horizon</th>
<th>Lithology</th>
<th>Percent Difference</th>
<th>Percent Moisture</th>
<th>Moisture</th>
<th>Ice</th>
<th>L.F.</th>
<th>L.T.</th>
<th>P.L.</th>
</tr>
</thead>
</table>

CORRELATION DATA

Geological Age: Pennsylvania

Geological Source: Emporia Lg. Form. (Elmont & Reading Members)

Material:  
Material reported on SHC Form No. 645

Lab. No. 65430

Specific Gravity (Sol.)  
2.45  
(dry) 2.33

Los Angeles Abr.  
32.4(A)

Absorption  
5.20  
Goodness 0.87

Notes:  

Scale: 1" = 1/4 Mile
SG+53
Ogd

SG+89
Ogd

Material: Sand and Gravel
County: Nemaha
Locaton: Sec. 27
Top: 18
Range 13E
Albert A. Rottinghaus
Seneca, Kansas

Type: Dry
Accessibility: Fair
Site located on Plate 1

Open site; sampled

Explosive Data

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material of Blast</th>
<th>Depth of Material</th>
<th>Percent of Test</th>
<th>G.F.</th>
<th>L.L.</th>
<th>N.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quaternary
Glacial Drift

Material similar to Material reported on SHC Form 619
No. 66-33 Lab. No. 22679

Sediment Gravity (dry): 2.62

Los Angeles Abrasion: 20.8 (D)

Porosity: 1.86

We. Co. Ft.: 119.14

Notes: The material from this site is obtained by the crushing of glacial boulders.
State Highway Commission of Kansas

Material Survey Report

LS-54

Ec

Site No.  Date  April, 1968

Material  Limestone

County  Nemaha

Location  T40 S

N44 W

Owner  Herman Large

Return of Report  Dry  Accessibility  Good

Sabetha, Kansas

Sampled  Open site

Table of Data

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material Similar to</th>
<th>Color</th>
<th>Organic Matter</th>
<th>LFT</th>
<th>O.L.</th>
<th>C.O.</th>
<th>CaO</th>
<th>MgO</th>
<th>K2O</th>
<th>Na2O</th>
<th>Loss</th>
<th>Bulk</th>
<th>G.F.</th>
<th>L.L.</th>
<th>P.L.</th>
</tr>
</thead>
</table>

Geological Age  Pennsylvania

Geological Source  Church Limestone Member

Material Similar to  Material reported on SHC Form 645

Lab. No. 49191

Specific Grav. (Dry)  2.76

Los Angeles %  23.7 (A)

Absorption  1.24

Wt. Co.Ft. 0.93

Some Vodaway Coal is exposed in this quarry.
**STATE HIGHWAY COMMISSION OF KANSAS**

**MATERIAL SURVEY REPORT**

**Site No.:** LS-55  
**Res.:** April, 1968  
**Material:** Limestone  
**County:** Nemaha  
**Location:** SW\#  
**Township:** 12  
**Range:** 1S  
**Section:** 12E  
**Owner:** Paul Korber  
**Address:** Bern, Kansas  
**Nature of Deposit:** Dry  
**Accessibility:** Good  
**Site Located or Plated:** I  
**Status:** Open site; sampled

**EXPLORATION DATA**

| Test Data | Material of Site | Depth below grade | Percent Water | 1/4 | 1/10 | 1 | S | B | 15 | 20 | 50 | 100 | R.R. | G.F. | L.I. | P.L. |
|-----------|-----------------|------------------|---------------|-----|------|---|---|---|----|----|----|-----|------|------|-----|-----|-----|
|           |                 |                  |               |     |      |   |   |   |    |    |    |     |      |      |     |     |     |

**CORRELATION DATA**

- **Geological Age:** Pennsylvanian  
- **Geological Source:** Church Limestone  
- **Material Similar To:** Material reported on SHC Form 645  
- **Lab. No.:** 49190  
- **Specific Gravity (SG):** 2.72  
- **Los Angeles Abrasion:** 35.3(A)  
- **Adhesiveness:** 1.76  
- **Mt. Ca.Fe.:** St. Cain  
- **Remarks:** The Nodaway Coal has been mined at this site.
SITE HUNGRY COMMISSION OF KANSAS

MINERAL SURVEY REPORT

Site No. LN+56
Material Limestone
Date April, 1968
County Nemaha
Location NE 1/4 NW 1/4 Sec. 12 Tp. 1 S, Range 12 E
Owner Alvin Korber
Address Bern, Kansas
Nature of Report Dry
Accessibility Good
Site Location on Plate 1
Status of Site Open site; sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Test Data</th>
<th>Material</th>
<th>Depth of Hole</th>
<th>Bulk Density</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GEOLOGICAL DATA

Geological Age Pennsylvanian
Geological Source Church Limestone Member
Material Similar to Material reported on SHC Form 645
Lab. No. 62161
Specific Gravity (in.) 2.71
Specific Gravity (dry) 2.65
Los Angeles wear 25.6 (A)
Abrasiveness 3.75
Mo. Hard.

Remarks The Nodaway Coal has been mined at this site.
## MATERIAL SURVEY REPORT

**Site No.**  
LS-57  
PC

**Date**  
April, 1968

**Material**  
Limestone

**County**  
Nemaha

**Location**  
NE¼ Sec. 14  
T. 18 S  
R. 14 E

**Owner**  
Kate Ott  
Sabetha, Kansas

**Nature of Deposit**  
Dry  
Accessibility: Good  
Site located on flat  

**Shades of Site**  
Open site; sampled

### EXPLOSIVE DATA

<table>
<thead>
<tr>
<th>Unit</th>
<th>Material</th>
<th>Percentage of Blast</th>
<th>Depth of Holes</th>
<th>Amount Explosive</th>
<th>Percent Retained</th>
<th>G.F.</th>
<th>L.L.</th>
<th>P.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CORRELATION DATA

- **Geological Age:** Permian
- **Geological Source:** Cottonwood Limestone Member
- **Material Reported on SHC Form 619:** No. 66-32
- **Specific Gravity (wet):** 2.40  
  **Specific Gravity (dry):** 2.24
- **Los Angeles Hardness:** 45.4 (B)
- **Reactivity:** 7.13  
  **Sensitiveness:** 0.73

**Wt. Ca.C.:**  
**Other:**

**Remarks:**

---

**Scale:** 1" = ½ Mile
STATE OF KANSAS COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG-59
Qgd

Site No. 80
Date April, 1968

Material Sand and Gravel
County Nemaha

Location SW 1/4 Sec. 30 Tp. 15 Rng. 14E

Owner R. B. Rokey
Sarpa, Kansas

Nature of Deposit
Dry

Quality
Good

Site Located in Plate II

Status of Site
Open site; sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material at Point of Test</th>
<th>Depth of Material</th>
<th>Bearing</th>
<th>Density</th>
<th>Percent Cemented</th>
<th>S.F.</th>
<th>L.L.</th>
<th>P.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Dry</td>
<td>7</td>
<td>18.25</td>
<td>7</td>
<td>60.45</td>
<td>70</td>
<td>82</td>
<td>90</td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To Material reported on SEC Form 619
No. 66-20

Specific Gravity (Sat.) 2.62 (Dry)

Los Angeles Wear 21.52\% (C)

Absorption 0.5

Soundness 0.96

Wt. En.Ft. 122.7

1-day 1.22, 3-day 1.23

Remarks

Scale: 1" = 1/4 Mile
SG+60
Qgd

Site No. 147
Date April, 1968

Material Sand and Gravel
County Nemaha

Location SW 1/4 NW 1/4 Sec. 13 Town 1S Range 14E

Owner Clayton J. Strahm etux

Nature of Support Dry

Site Located or Placed

Open site; sampled

Expansive Data

<table>
<thead>
<tr>
<th>Test Nate</th>
<th>Material from</th>
<th>X-Fracs</th>
<th>X-Wt</th>
<th>Y-Fracs</th>
<th>Y-Wt</th>
<th>Z-Fracs</th>
<th>Z-Wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td></td>
<td>4</td>
<td>10</td>
<td>13</td>
<td>1</td>
<td>18</td>
<td>17</td>
</tr>
</tbody>
</table>

Correlation Data

Geological Age Quaternary
Geological Source Glacial Drift

Material Similar To Material reported on SHC Form 619
No. 56-23 Lab. No.

Specific Gravity (dry) 2.53
Los Angeles Abrasion 29.0 (Dry)

Assorption 91.2

NRE. E. R. H. 0.96

Remarks
SG+60
Gqd

Site No.: SG+60
Date: April, 1968

Material: Sand and Gravel
County: Nemaha
Location: SW 1/4 NW 1/4
Town: 18
Range: 14E
Owner: Clayton J. Straum et ux
Municipality: Bern, Kansas
Nature of Deposit: Dry
Site Quality: Fair
Deposition: Site located on Plate II
Status of Site: Open site sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material on surface</th>
<th>Depth</th>
<th>Material beneath</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>10</td>
<td>13</td>
<td>18</td>
<td>27</td>
</tr>
</tbody>
</table>

Sediment Data

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To: Material reported on SHC Form 619
No. 66-23 Lab. No.

Specific Gravity (B.): 2.53 (Dry)
Los Angeles Abrasion: 29.0 (D)

Summary: Wet, 14 ft.

Remarks:

Scale: 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG-62
Ygd

Site No. 46
Date April, 1968

Material Sand and Gravel
County Nemaha

Location SW 1/4 SW 1/4 Sec. 27 Twp. 1S Range 13E

Soil Pearl L. Mayor Bern, Kansas

Exposure of Deposit Open sides; sampled

Weather at Deposit Dry

Note: Site located on flats II

EXPLANATION DATA

Drift Group

Drift Subgroup

Drift Type

Drift Morphology

Drift Age

Drift Origin

Geological Unit

Geological Source

Material Similar to Material reported on SRC Form 613

Lab. No. 65-2011

Specific Gravity (dry) 2.60
Specific Gravity (wet) 2.58

Los Angeles Wear 29.7(C)

Strength 0.91

Swellability 0.95

Water Content 113.41

St. Gall 1-day 0.68, 3-day 0.87

Summary

Correlation Data

Forestal age Quaternary

Correlation Source Glacial Drift

Material Similar to Material reported on SRC Form 613

Lab. No. 65-2011

Specific Gravity (dry) 2.60
Specific Gravity (wet) 2.58

Los Angeles Wear 29.7(C)

Strength 0.91

Swellability 0.95

Water Content 113.41

St. Gall 1-day 0.68, 3-day 0.87

Summary
MATERIAL SURVEY REPORT

Site No. SC-63
Date April, 1968

Material Sand and Gravel
County Nemaha

Location NE 4 NW 4 Sec. 13 Twp. 3S Rge. 12E

Owner Albert B. Hermesch et ux

Nature of Soil: Dry
Site Location: Poor

Status of Site: Open site; samples

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Unit</th>
<th>Material</th>
<th>Density of Material</th>
<th>Tests of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>92539 5264738489 9</td>
<td>4.36</td>
</tr>
</tbody>
</table>

CHEMICAL DATA

Geological Age: Quaternary
Geological Source: Glacial Drift

Material Similar to: Material reported on SHC Form No. 633
Lab. No. 63991

Specific Gravity (Rec.) 2.62 (dry)
Los Angeles Wear 37.6 (B)
Adhesiveness 0.92
St. Dr. C/in. 124.8

Remarks

Scale: 1" = ¼ Mile
<table>
<thead>
<tr>
<th>Site No.</th>
<th>SG+64 Qgd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>April, 1968</td>
</tr>
<tr>
<td>Material</td>
<td>Sand and Gravel</td>
</tr>
<tr>
<td>County</td>
<td>Nemaha</td>
</tr>
<tr>
<td>Location</td>
<td>SE 26 SE 26 Range 12E</td>
</tr>
<tr>
<td>Owner</td>
<td>A. E. Vitt</td>
</tr>
<tr>
<td>Town</td>
<td>Menoac, Kansas</td>
</tr>
<tr>
<td>Water Content</td>
<td>Dry</td>
</tr>
<tr>
<td>Access</td>
<td>Good</td>
</tr>
<tr>
<td>Site Type</td>
<td>Open site; sampled</td>
</tr>
</tbody>
</table>

**Explanation Table**

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Material</th>
<th>Fineness</th>
<th>Percent</th>
<th>Percent</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>108 Mal</td>
<td></td>
<td></td>
<td>5</td>
<td>15</td>
<td>85</td>
</tr>
<tr>
<td>108 Mal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Geological Age:** Quaternary

**Geological Service:** Glacial Drift

**Material:** Material reported in Geological Survey Bull. No.: 0600D

**Specific Gravity (Ord.):** (Dry)

**Los Angeles Number:** 0

**Absorption:** Soundness

**Win. Loss:** Mr. Data

**Remarks:** This site was tested for the Geological Survey by the State Highway Commission of Kansas.
SG+65
Q gd

Site No.  

Quaternary
Geological Age  

Sand and Gravel
Geological Source  

Date: April, 1968

Material: Sand and Gravel

Location: Nemaha

Elk

Test No.

Material:

Property:

Percent of Gravel:

Number

Unit Weight:

Specific Gravity:

Los Angeles Abrasion

Material:

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

Tested for the Geological Survey by the State

Highway Commission in October, 1933

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

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material</th>
<th>Property</th>
<th>Percent of Gravel</th>
<th>Number</th>
<th>Unit Weight</th>
<th>Specific Gravity</th>
<th>Los Angeles Abrasion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>93.0</td>
<td></td>
<td>2.56</td>
<td></td>
</tr>
</tbody>
</table>

Scale: 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SUPPLY REPORT

SG+56
Qg'd

April, 1968

Material
Sand and Gravel
County
Nemaha

Location
SE1 NW1
Sec. 11
T44S
R36E

George W. McDaniel et ux
Netmore, Kansas

Status of Site
Open site; Sampled

Explosion Data

East
8 8 2 6 120 56 77 92 6 2.88
Was
1 7 9 6 9 1120 1737 60 78 87 3.35

Quaternary

Material reported on SHC Form 619
No. Ms 66-19

Geological age
Glacial drift

Material Depth (ft.)

6

Specific Gravity (Sat.)

(Dry)

Los Angeles

1

Dolomite

1

Mfi.

40-50

Test data for test holes 1 and 3 represents the finest and coarsest material tested at this site.
MATERIAL SURVEY REPORT

Site No. 7c

Material: Limestone

Location: 24 3S 14E

Owner: Edward A. Berbee

Date: April, 1968

County: Nemaha

State: Open site; sampled

Geological Age: Permian

Geological Source: Cottonwood Limestone Member

Material Survey No.: Lab. No. 96177

Material reported on SSIC Form 645

Spec.: Gravel (Std.) 2.4

Spec.: Gravel (corr.) 2.32

Los Angeles Wear Spec.: 39.7%

Spec.: 4.81

Permeability: 0.88

Remarks:

Scale: 1" = ¼ Mile
**MATERIAL SURVEY REPORT**

**SG-68**  
**Qad**  

**Site No.**  
**Qad**

**Date**  
April, 1968

**Material**  
Sand and Gravel

**County**  
Nemaha

**Location**

**NEM**

**Town**  
4

**Range**  
35

**Township**  
14E

**Owner**

Ralph E. Bartley etux, 209 W. 115th, Kansas City, Mo.

**Nature of Request**

Dry

**Address**

115th

**Site Located or Plate**

IV

**Status of Site**

Open site; sampled

---

### EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material of Soils at Surface</th>
<th>Depth of Soils at Bank</th>
<th>Percent Retained</th>
<th>G.F.</th>
<th>L.I.</th>
<th>L.P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td>9</td>
<td>3</td>
<td>0</td>
<td>1.90</td>
<td></td>
</tr>
</tbody>
</table>

---

### COMMENTS DATA

**Geological Age**
Quaternary

**Geological Source**
Glacial Drift

**Material Similar To**
Material reported on SHC Form 619 No. 66-26

**Specific Gravity (Sat.)**
(Dry)

**Los Angeles Wear**

**Description**

** Ib. Co. Ft.**

**St. Rate**

**Remarks**
This pit has been virtually worked out.
MATERIAL SURVEY REPORT

SG-69
Qgd

Date: April, 1968

Site No.

Material: Sand and Gravel
County: Nemaha

Location: NW ¼ NW ¼ Sec. 32, Tp. 2S, Range 13E
Ambrose & Rose A. Koelzer Seneca, Kansas

Status of Site: Open site, sampled

EXCAVATION DATA

| Depth | Material at Bottom in Feet | Depth of
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3,250</td>
<td>40</td>
</tr>
<tr>
<td>1.0</td>
<td>3,250</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>3,250</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th>Sorpt.</th>
<th>Unit Weight</th>
<th>Voids</th>
<th>%</th>
<th>C.B.</th>
<th>D.B.</th>
<th>M.D.</th>
<th>S.D.</th>
<th>G.L.</th>
<th>L.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material: Similar to Material reported on SIC Form 619 No. 66-15

Specific Gravity (D.): (Dry)

Los Angeles Wear: Good
Absorption: Good

Size, Gradation data for test holes 2 and 10 represents the coarsest and finest material tested at this site.
Material Survey Report

SG-70 Qgd

Site No.: Date: April, 1968

Sand and Gravel

Material: Nemaha

Location: NW ¾ NW ¼ Sec. 31 Tm. 28 Range 13E

Mathias J. Lierz Sencoa, Kansas

Nature: Dry Accessibility: Good Site Location: Plate

Status of Site: Open site; sampled

EXPLANATORY DATA

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Material</th>
<th>Depth of Material</th>
<th>Percent Entrainment</th>
<th>%</th>
<th>4</th>
<th>9</th>
<th>19</th>
<th>44</th>
<th>72</th>
<th>85</th>
<th>13</th>
<th>2.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV</td>
<td>10</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>9</td>
<td>19</td>
<td>44</td>
<td>72</td>
<td>85</td>
<td>13</td>
<td>2.35</td>
<td></td>
</tr>
</tbody>
</table>

EQUATION DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar to: Material reported on SHC Form 614 No. 66-16
Specific Gravity (Sat.)
Los Angeles wear

Remarks:

Scale: 1" = ¼ Mile
Material Survey Report

Site No. 8G-71

Location: NW 1/4 Sec. 1
County: Nemaha
Owner: Albert & John Niehues

Data: April, 1968

Material: Sand and Gravel

Goff, Kansas
Nature of Site: Open site sampled

Expansive Data

<table>
<thead>
<tr>
<th>Soil Code</th>
<th>Material &amp; Material</th>
<th>Percent Sandy</th>
<th>Depth of Material</th>
<th>Int.</th>
<th>ML</th>
<th>Bl.</th>
<th>Ps.</th>
<th>S.F.</th>
<th>S.P.</th>
<th>R.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 6 12</td>
<td>32 70 915</td>
<td>6 2.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cementation Data

Geological Age: Quaternary

Geological Source: Glacial Drift

Material Similar To: Material reported on SHC Form 633 Lab. No. 66437

Specific Grav. (Sat.) 2.58

Log Angle: 90.7
Acidity: 90.7

Remarks
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

<table>
<thead>
<tr>
<th>Site No.</th>
<th>LS-72</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>April, 1968</td>
</tr>
<tr>
<td>Materials</td>
<td>Limestone</td>
</tr>
<tr>
<td>County</td>
<td>Nemaha</td>
</tr>
<tr>
<td>Location</td>
<td>SE¹ SW²</td>
</tr>
<tr>
<td>Description</td>
<td>36</td>
</tr>
<tr>
<td>Size</td>
<td>58</td>
</tr>
<tr>
<td>Range</td>
<td>12E</td>
</tr>
<tr>
<td>Hiram W. Channel</td>
<td>Soldier, Kansas</td>
</tr>
<tr>
<td>Nature of Deposit</td>
<td>DRY</td>
</tr>
<tr>
<td>Accessory Soil</td>
<td>Good</td>
</tr>
<tr>
<td>Site located on Plat</td>
<td>V</td>
</tr>
<tr>
<td>Sampled</td>
<td>Open site</td>
</tr>
</tbody>
</table>

EXPLANATION OF DATA

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Description</th>
<th>Depth Below Surface</th>
<th>Test Material</th>
<th>Density, g/cc</th>
<th>Intergrade, %</th>
<th>Initial Water</th>
<th>G.I.</th>
<th>L.L.</th>
<th>P.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1111</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1112</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1113</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1114</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1115</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1116</td>
<td>ISC</td>
<td>1 1/2</td>
<td>0.8</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td>1 1/2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EXPLANATION PATH

Geological Age: Permian

Geological Source: Cottonwood & Neva Limestone Members

Material Similar to: Material reported on SHC Form 645

LAB. NO. 63652

Relative Permeability: 2.47

Porosity: 4.64

Permeability: 2.36

Compressibility: 4.64

Shrinkage: 0.78

Remarks: Overburden has become very heavy. Site appears to be worked out.
SI-73
Qgd

Silt
Silt
Nemaha
34 58 12E
Herbert Post et al
Havensville, Kansas

Dry
Good

Open site sampled

EXPLOSIVE DATA

<table>
<thead>
<tr>
<th>Test Site</th>
<th>Material at Bottom of Boring</th>
<th>Depth of Material</th>
<th>Depth of Boring</th>
<th>Pore Water Pressure</th>
<th>V</th>
<th>S</th>
<th>M</th>
<th>H</th>
<th>F.P.</th>
<th>L.L.</th>
<th>P.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>49</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age: Glacial Drift (Atchison Formation)
Geological Source: Material reported on SHC Form 679
No. 66-28 Lab. No. 1-62-1000
Specific Gravity (Soln.)
Los Angeles Wear

Scale: 1" = \( \frac{1}{4} \) Mile
SG+74
Qgd

Date: April, 1968

Material: Sand and Gravel
County: Nemaha

Location: 25T 58R 12E
Owner: Evelyn C. Hauq

Status of Site: Open site; sampled

Explanation Data

Geological Age: Quaternary
Geological Source: Glacial Drift

Material Source: Material reported on SHC Form 619 No. 66-33 Lab. No. 38055

Specific Gravity (Dry): 2.56
Los Angeles Abrasion: 24.4 (D)

Scale: 1" = 1/8 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-75
Pn

Site No.  Limestone
Date  April, 1968

Material  Survey  Count  36  58  12E
Location  SE NW  4

Owner  Morris Molineux

Return of Deposit  Poor  Site Location on Plat

Status of Site  Open site; sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Explo. Test</th>
<th>Material</th>
<th>Shell</th>
<th>Core</th>
<th>Percent Shell</th>
<th>Spirit Level</th>
<th>Measured</th>
<th>1-foot</th>
<th>5-foot</th>
<th>10-foot</th>
<th>20-foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age  Permian

Geological Source  Newa Limestone Member

Material Similar To  Material reported on SHC Form No. 645

Lab. No.  68422

Density (ft.3)  2.48

Los Angeles Abrasion  38.7(A)

Whit. Co. Ft.  4.07

Remarks  This quarry has been abandoned for several years.

Scale  1" = 1/4 Mile
SG+76
Qgg

Material Survey Report

Site No.: SG+76
Date: April, 1968

Material: Sand and Gravel
County: Nemaha

Location: NW 9th SE 1
Sec.: 8
Twp.: 55 S
Range: 13 E

Owner: Lester V. Deters etux
Address: Goff, Kansas

Nature of Deposit: Near
Accessibility: Fair
Site Located on Plat: VI
Status of Site: Open site; sampled

Exploration Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32.60</td>
<td>8692</td>
<td>936, 23, 79</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation Data

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Source: Material reported on SWC Form 619
No.: 66-29

Specific Gravity (dry): 3.60
Los Angeles Hardness: 29.4(C)

Absorption: 2.0
Density: 0.91

Mo. Co. F.: 99.14

Scale: 1" = ½ mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site No. SG+77
Qad

Date April, 1968

County Nemaha

Location E1/2 SE1/4 Sec. 28 T04S R04E 14E

Owner Fannie Vernon

GoFit, Kansas

Site Classification Dry

Drainage Good

Drainage Area Site located on Flats VI

Status of site Open site; sampled

Subsoil data:

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material %</th>
<th>Depth (in. or ft.)</th>
<th>Sampled Material</th>
<th>U12</th>
<th>U24</th>
<th>U48</th>
<th>U72</th>
<th>U120</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV</td>
<td></td>
<td>1 3 9 1943 6787</td>
<td>10 2,30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>7 16</td>
<td>1 6 11 24 58 81 92</td>
<td>7 2,73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td>8 12</td>
<td>2 5 20 5 32 3 1,49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation Data

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To Material reported on SHC Form 619 No.
66-13 Lab. No. 10441

Specific Gravity (Stat.) 2.61

Loss Degree 23.5 (C)

Aggregate Base A + P 0.97

WT. Cu.-ft. 108.3

Dr. Ratio l-day 0.83, 3-day 0.80

Remarks Test data for holes 10 and 16 represents the finest and coarsest material that has been tested at this site.
**STATE HIGHWAY COMMISSION OF KANSAS**

**MATERIAL SURVEY REPORT**

**CG-78**

**Qalte**

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>April, 1968</td>
</tr>
</tbody>
</table>

**Material**

Chert Gravel

**Location**

NW 1/4 NW 1/4

Sec. 14

Twp. 15

Range 13E

**Owner**

David Lortscher

**Remarks**

- DRY
- Good

- Site located on Plate II
- Prospective site; sampled

**EXPLANATION DATA**

| Test Hole | Material Section Date | Depth (ft.) | Bearing | Material | 1/12 | 1/14 | 1/18 | 1/20 | 1/24 | 1/30 | 1/36 | 1/40 | 1/45 | 1/50 | 1/60 | 1/100 | G.I. | L.I. | P.I. |
|-----------|-----------------------|------------|---------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Cgl       |                       | 39 52 60   | 74      | 93.63    |

**CONSIDERATION DATA**

**Geological Age**

Quaternary

**Geological Source**

Terrace Deposits (Illinoian?)

**Material Similar To**

Material reported in Geological Survey Bull. No. 1060D.

**S specific gravity (sl) **

2.67

**Los Angeles Bear **

36.0

**Association**

- Soundness: 89

**Remarks**

- W. Co. Ft.

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS-79

Ev

April, 1960

Limestone

Nemaha

Material

Sec. 7

Top

1S

Range

13E

Jesse A. Hunzeker

Bern, Kansas

Owner

Dry

Good

Nature of Deposit

Prospective site; sampled

Status of Site

14

EXPLOSION DATA

Test Date

Material Quality at Mix

Depth of Mix

Material

L.C

S.F.

E

% E

W

R.C.

Per Cent Blasted

11

L.L.

L.P.

13

OBSERVATION DATA

Geological Age

Pennsylvanian

Geological Source

Wakarusa Limestone Member

Material Similar to

Material reported on SHC Form 645

Lab. No. 66442

Specific Gravity (Sat.)

2.64

(Syr.)

2.60

Los Angeles Wear

23.4(A)

Absorption

1.65

Soundness

0.93

M. C. (%)

- Dir. Calcs

Remarks

-
**State Highway Commission of Kansas**

**Material Survey Report**

**LS+80**

**Pct.**

<table>
<thead>
<tr>
<th>Date</th>
<th>April, 1968</th>
</tr>
</thead>
</table>

**Material**

<table>
<thead>
<tr>
<th>Limestone</th>
</tr>
</thead>
</table>

**Location**

<table>
<thead>
<tr>
<th>SE 25</th>
<th>Twp. 1S</th>
<th>Range 14E</th>
</tr>
</thead>
</table>

**Owner**

<table>
<thead>
<tr>
<th>Lee A. &amp; Esther White</th>
</tr>
</thead>
</table>

**Address**

<table>
<thead>
<tr>
<th>Sabetha, Kansas</th>
</tr>
</thead>
</table>

**Nature of Exposure**

<table>
<thead>
<tr>
<th>Dry</th>
</tr>
</thead>
</table>

**Site Located on Plate**

<table>
<thead>
<tr>
<th>II</th>
</tr>
</thead>
</table>

**Status of Site**

<table>
<thead>
<tr>
<th>Prospective site; sampled</th>
</tr>
</thead>
</table>

**Explosion Data**

<table>
<thead>
<tr>
<th>Test Block</th>
<th>Material at Bottom 2 ft. of Rock</th>
<th>Degree of Hardness</th>
<th>Percent Disturbed</th>
<th>Density 250</th>
<th>B.T.</th>
<th>L.L.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1/4</th>
<th>1/2</th>
<th>3/4</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>20</th>
<th>50</th>
<th>100</th>
<th>D.B.</th>
<th>B.T.</th>
<th>L.L.</th>
<th>P.T.</th>
</tr>
</thead>
</table>

**Geological Age**

| Permian |

**Geological Source**

| Cottonwood Limestone Member |

**Material Similar to**

| Material reported on SHC Form 645 |
| Lab, No. 64452 |

**Specific Gravity (dry)**

| 2.51 |

**Los Angeles Hardness**

| 34.2(A) |

**Absorption**

| 3.58 |

**Wt. of Fl.**

| Str. Ratio |

**Remarks**

| The ledge is exposed in the backslope of U.S. 75 highway. |

**Scale:** 1" = ½ Mile
State Highway Commission of Kansas

Material Survey Report

Site No. SG-81

County

Location

Leonard L. Gross

Dry

Prospective site; sampled

Date: April, 1968

Sand and Gravel

Nemaha

Sec. 28

1S

Range 13E

X


Material: Qgg

Depth of Deposit

Geologic age

Quaternary

Material Source

Glacial Drift

Material Survey In

Material reported on SHR Form

No. 633 Lab. No. 66439

Specific Gravity (Dry)

2.56

Los Angeles Abrasion

27.0 (A)

Extraction

1.0

Ult. Comp. Ft.

93.0

Dr. Ratio:

1-day 0.55, 3-day 0.65

Remarks

Dry

Construction

1 to 4 Located on Flat

Width

11

Sample

1

10

9

8

7

6

5

4

3

2

1

Scale 1" = 1/2 Mile

Note: This document contains a map and a table with data regarding a material survey site. The site is located in Nemaha County, Kansas, with a depth of deposit. The material is classified as Qgg, and the geological age is Quaternary. The survey was conducted by Leonard L. Gross. The table includes data on specific gravity, Los Angeles abrasion, and other geotechnical properties.
**MATERIAL SURVEY REPORT**

**Site No.:** SG-82
**Date:** April, 1968

**Material:** Sand and Gravel
**County:** Omaha

**Location:** NE 1/4 SW 1/4 T35 R44S Range 14E

**Owner:** George W. McDaniel
**Address:** Wetmore, Kansas

**Nature of Project:** Dry, Accessory (No data provided)

**Status of Site:** Prospective site; sampled

### Exploration Data

| Test Hole | Material Below | Density @ 6 in. | Material Underneath | Unit Weight | Gravel Content | Gravel % | Gravel #200 | Gravel #100 | Gravel #20 | Gravel #5 | Gravel #2 | Gravel #1 | Gravel #50 | Gravel #100 |
|-----------|---------------|----------------|-------------------|-------------|----------------|---------|-------------|-------------|------------|-----------|-----------|----------|----------|----------|----------|-----------|
| 6         | 13            | 12 3687 9      | 1.36              |             |                |         |             |             |            |           |           |          |          |          |          |
| 4         | 3             | 17 2561,6986 13 2.54 |              |             |                |         |             |             |            |           |           |          |          |          |          |

### Correlation Data

**Geological Age:** Quaternary

**Geological Source:** Glacial Drift

**Material Source:** Material reported on SHC Form 619

**No. MS 66-18**

**Specific Gravity (Sat.)** [Data]

**Los Angeles Wear** [Data]

**Description:** [Data]

**Wt. Gr. ft.:** [Data]

**Min. Ratio:** [Data]

**Notes:** Test data for test holes 6 and 4 represent the finest and coarsest material tested at this site.

[Map and diagram with scale: 1" = 1/2 Mile]
MATERIAL SAMPLE REPORT

SG+83 Qgd

Date: April, 1968

Material: Sand and Gravel
County: Nemaha

Location: SW 4 SW 4
Sec.: 30
Twp.: 28
Range: 13E

Owner: Mabel Ehram

State: Kansas

Status: Prospective site; sampled

EXPLANATION DATA

<table>
<thead>
<tr>
<th>Material</th>
<th>Depth</th>
<th>Percent Material</th>
<th>Total Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>av</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To: Material reported on SHC Form 619 No. 66-14
Specific Gravity (Sat.) (Dry): 3.30
Los Angeles Wear: 300

Description: Graded material for test holes 1 and 13 represents the finest and coarsest material tested at
SI-84
Wqtd
Silt
NE\NW
Sec. 33
SS
11E
Flossie May Peterson
Onaga, Kansas
Dry
Forecast
Site Located on Top of V
Prospective Site: Sampled

Exploration Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>2</td>
<td>33</td>
<td>111</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlation Data

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To: Material reported on SHC Form 623
Lab. No. AA6086
Specific Gravity (Tet.):
Los Angeles Abrasion:
Absorption:
Mo. % CaCO3: 83.0

This material was tested for use as mineral filler.
SI+85

Site No. Ggd  Date April, 1969

Material: Silt County: Nemaha
Location: NW 1/4 SW 1/4 Sec. 18 T40N R45E Range 11E
Owner: Lucy Gray
Address: Verillion, Kansas

Nature of Deposit: Dry  Accessibility: Good  Site Located on Plains: V  Prospective site sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Test Hole</th>
<th>Material below</th>
<th>Depth of</th>
<th>Percent Soil</th>
<th>Width</th>
<th>B.R.</th>
<th>L.D.</th>
<th>F.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>0</td>
<td>1.6</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORELATION DATA

Geological Age: Quaternary
Geological Source: Glacial Drift
Material Similar To: Material reported on SHC Form No. 623 Lab. No. 66440
Specific Gravity (Dry): 2.63
Los Angeles Wear: 87.9

Remarks: This material was tested for use as mineral filler.

Scale: 1" = ¼ Mile
## Prospective Materials Sites; Not Sampled

### Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trail or lane</td>
<td>Prospective materials site; not sampled</td>
</tr>
<tr>
<td>Road</td>
<td>Center of section</td>
</tr>
<tr>
<td>Railroad</td>
<td>Dwelling</td>
</tr>
<tr>
<td>Hedge or trees</td>
<td>Cemetery</td>
</tr>
<tr>
<td>Fence</td>
<td>School</td>
</tr>
<tr>
<td>Major stream</td>
<td>Church</td>
</tr>
<tr>
<td>Intermittent streams</td>
<td>Town or city</td>
</tr>
<tr>
<td>Pond or lake</td>
<td></td>
</tr>
</tbody>
</table>

---

**Note:** The legend provides a visual representation of different geographical features and their corresponding symbols. The symbols are used to mark specific locations on maps or plans.
Material Survey Report

SG-87
Qgd

Site No. 10600D

Survey Date: April, 1968

Material: Sand and Gravel

County: Nemaha

Location: NE 4

Sec. 3

T. 26 S

R. 52 E

Owner: Mary Tangeman

Seneca, Kansas

Nature of Deposit: Dry

Accessibility: Fair

Site Located on Plate: I

Status of Site: Prospective site; not sampled

Explosion Data

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material wet at Start</th>
<th>Depth of Material</th>
<th>Depth of Material</th>
<th>Percent Refracted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Consolidation Data

Geological Age: Quaternary

Geological Source: Glacial Drift

Material Similar to:

Specific Gravity (Int.):

Los Angeles Durability:

Min. Ratio: None

Remarks: This site reported in the Geological Survey Bulletin No. 10600D

Scale: 1" = ¼ Mile
Site No. Sg-89
Section 27 T. 18 R. 12E
Location: Melvile, Bredenfel et ux
Name: Sg-89 Qgd
Info: Site located on Plan I
Status of Site: Prospective site not sampled

Exploration Data

Geological Age: Quaternary
Geological Source: Glacial drift
Material Similar To:

Soil Properties:
- Sensitive (Loam)
- Low organic layer
- Moderate moisture
- Depth: 2 ft
- Dr., 1.5 ft
- 2 ft

Map Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

LS+91
Fe

Site No. 28
Date April, 1968

County: Nemaha

Limestone

Material SW4

Inc. 28, Fe. 15, Range 12E

Location

Frank Tangeman, Seneca, Kansas

Owner: Tangeman

Nature of Deposit: Dry

Accessibility: Fair

Site Located on Plate: I

Prospective Site: not sampled

EXPLANATION DATA

|---------|--------------------|------------------|--------------------|-----------------|-------------|------|------|------|------|

| 1 | | | |

CORELATION DATA

Geological Age: Pennsylvania

Emporia Ls. Form., (Elmont & Reading Members)

Material Similar to:


Specific Gravity (Sat.): (Dry)

Los Angeles Abrasion

Absorption

Wi. Cu.Ft.

Remarks

Scale: 1" = 1/4 Mile
**MATERIAL SURVEY REPORT**

*SG-92*  
Qgd  
April, 1968

**Location Data**
- *Material*: Sand and Gravel  
- *County*: Nemaha  
- *Neighborhood*: 2E  
- *Sec.*: 2  
- *Twp.*: T2S  
- *Range*: R13E  
- *Owner*: Clifford Edelman  
- *Address*: Saboch, Kansas  
- *Soil Type*: Fair  
- *Weather Conditions*: Site Located on Plate II  
- *Prospектив Site*: Not sampled

<table>
<thead>
<tr>
<th>Test Site</th>
<th>Depth of Material</th>
<th>Material of Material</th>
<th>Depth of Gravel</th>
<th>Material of Gravel</th>
<th>Percent Gravel</th>
<th>Percent Sand</th>
<th>Percent Clay</th>
<th>Percent Residue</th>
<th>Rock</th>
<th>G.T.</th>
<th>P.E.</th>
<th>L.L.</th>
</tr>
</thead>
</table>

**Correlation Data**
- *Geological Age*: Quaternary  
- *Geological Source*: Glacial Drift  
- *Material Similar To*:  
- *Specific Gravity (S.G.)*:  
- *Los Angeles Abrasion*:  
- *Absorption*:  
- *M.F. Co. Fr.*:  
- *Netting*:  

*This site reported in USGS Bull. No. 1060D*

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG+94
Qyd

Site No. Date April, 1968
Material Send and Gravel County Nemaha
Location SE# Sec. 29 Twp. S5 Range 14E
Owner Lloyd Pfrang Goff, Kansas
Nature of Soil Dry Accessibility Good Site located on Pk Ave
Status of Site Prospective site; not sampled

EXPLORATION DATA

<table>
<thead>
<tr>
<th>Soil No.</th>
<th>Material</th>
<th>Method</th>
<th>Depth</th>
<th>Percent Gravel</th>
<th>MOE</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LTLZ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age Quaternary
Geological Source Glacial Drift
Material Similar To

Specific Gravity (SG.) [Dry]
Los Angeles Heater
Absolute Compressibility
Hr. Com. Fric.
Remarks

Scale: 1" = ¼ Mile
**Material Survey Report**

**Site No.** SG+95  
**Quadrant:** Qqd  
**Date:** April, 1968

- **Material:** Sand and Gravel  
- **County:** Omaha

**Location:**  
- **SE4:** Sec. 26  
- **Twp.:** 25  
- **Range:** 12R

- **Owner:** A. E. Witt  
- **Address:** Seneca, Kansas

**Nature of Deposit:** Dry  
**Accessibility:** Fair  
**Site Located on Map:** III  
**Prospective Site not Sampled:**

### Explosivity Data

<table>
<thead>
<tr>
<th>Feat. Bldg.</th>
<th>Material of Deposit</th>
<th>Depth (ft.)</th>
<th>Parent Material</th>
<th>Percent Reinforcement</th>
<th>% 24</th>
<th>36</th>
<th>4</th>
<th>8</th>
<th>16</th>
<th>32</th>
<th>50</th>
<th>100</th>
<th>Depth (mm)</th>
<th>C.H.</th>
<th>L.L.</th>
<th>F.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sand Gravel</td>
<td>10</td>
<td>10</td>
<td>50</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Correlation Data

- **Geological Age:** Quaternary  
- **Geological Source:** Glacial Drift  
- **Material Similar To:**

**Specific Gravity (Sat.)**  
**Specific Gravity (Dry.)**

- **Los Angeles Number:**

- **Absorption:**

- **Mo. Co. Fl.**

- **St. Rat.:**

- **Remarks:**

**Scale:** 1" = 1/2 Mile
SG+96
Ggd

Date: April, 1968

Material: Sand and Gravel
County: Nemaha

Location:
Sec. 25
T. 28 N.
R. 63 E.

Owner:
Clarence Ronnebaum
Seneca, Kansas

Nature of Deposit:
Dry

Accessibility:
Good

Site Located on Plate III

Status of Site:
Prospective site; not sampled

Exploration Data:

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material</th>
<th>Width of Deposit</th>
<th>Depth of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent Replaced</th>
<th>L L</th>
<th>L L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Quaternary

Geological Source: Glacial Drift

Material Similar to:

Specific Gravity (Dry):

Los Angeles Bear:

Absorption:

Wt. % Hy.:

This site reported in the Geological Survey Bull. No. 1060D.
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

Site no. SG+97

Qgd

Date April, 1968

Material Sand and Gravel

County Nemaha

Location NE\(4\) NW\(4\)

Township 36 Range 12 E

Owner Louis B. Roneshue

Address Seneca, Kansas

Nature of Deposit Dry

Accessibility Good

Site Located on Plate III

Status of Site Prospective site; not sampled

EXPLOSION DATA

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Material of Bottom</th>
<th>Depth in</th>
<th>Permeability</th>
<th>N</th>
<th>O</th>
<th>N</th>
<th>O</th>
<th>N</th>
<th>O</th>
<th>N</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age Quaternary

Geological Source Glacial Drift

Material Similar To

Specific Gravity (Sat.)

Los Angeles wear

Absorption

Wt. % CaCO3

Remarks This site reported in the Geological Survey Bull. No. 1060D.
**SG+98**

**Qgd**

**Site No.**

**Date:** April, 1968

**Material Survey Report**

**Sand and Gravel**

County: Nemaha

**Location:** Sec. 23, T. 3S, Range 14E

**Owner:** J. A. Bockenstette

**Address:** Sabatha, Kansas

**Nature of Deposit:**

- **Dry**
- **Good**

**Site Located on Plate**

**Status of Site:**

- **Prospective site; not sampled**

**Exploration Data**

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Material Mixture</th>
<th>Depth (in.)</th>
<th>Percent_1</th>
<th>Percent_2</th>
<th>Percent_3</th>
<th>Percent_4</th>
<th>Percent_5</th>
<th>Percent_6</th>
<th>Percent_7</th>
<th>Percent_8</th>
<th>Percent_9</th>
<th>Percent_10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Correlation Data**

**Geological Age:** Quaternary

**Geological Source:** Glacial Drift

**Material Similar To:**

- **Specific Gravity (Br.):**
- **Los Angeles Wear:**
- **Sieve Analysis:**
- **Wi. Co. Ft.:**
- **Str. Ratio:**

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

**Scale:** 1" = ½ Mile
SG-99
Qgd

April, 1968

Material: Sand and Gravel

Location: Nemaha

Owner: Carl E. Baumgartner & Keith Hailey, Coff, Kansas

Exposure: Good

Status: Prospective site, not sampled

Correlation Data

Geological Age: Quaternary

Geological Source: Glacial Drift

Density: (Not specified)

Los Angeles Hardness: Descriptive

Notes: This site reported in the Geological Survey Bull., No. 1066D.
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG-100

Dated April, 1968

Site No. 100

Material Sand and Gravel

County Nemaha

Location NE 29, NW 48

Owner Alva M. Mood

Nature of Deposit Dry

Site Located or Plate V

Status of Site Prospective site; not sampled

Description Data

Geological Tax Quaternary

Geological Source Glacial Drift

Material Similar To

Specific Gravity (Sat.) (Dry)

Los Angeles Wear

Absorption

Moisture Content

Remarks

CONCLUSION

Scale: 1" = ½ Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

ILE+101
Locality: 36

Date: April, 1968

Material: Limestone
County: Nemaha

Location: NW1/4 SE1/4 Sec. 36 T40S R54E Range 12E

Owner: Thelma Eisenpach

Soldier, Kansas

Nature of Deposit: Dry
Accessibility: Poor

Status of Site: Prospective site; not sampled

EXPLORE ON DATE

Geological Age: Permian

Geological Source: Cottonwood Limestone Member

Material Source: 14

Section Size: 36

Density of Water: 64

Mudstone: 10

Sandstone: 50

Shale: 40

Siltstone: 10

Bedrock: 10

H.F.: 1

L.L.: 1

P.L.: 1

CUMULATIVE DATA

Geological Age: Permian

Geological Source: Cottonwood Limestone Member

Material Source: 14

Specific Gravity (Oak): 2.63

Los Angeles Abr.: 1

Adherence: Boundless

Mo. Co.Fr.: N

Remarks: This site was reported in Geological Survey Bull. No. 1060D.

Scale: 1" = 1/4 Mile
STATE HIGHWAY COMMISSION OF KANSAS

MATERIAL SURVEY REPORT

SG-102
Qqd
Site No.  Data  April, 1968

Material  Sand and Gravel  County  Nemaha

Location  SW²  Sec.  26  Top.  48  Range.  148
Freddie J. Shumaker  Wetmore, Kansas

Owner  Name  Address

Nature of Deposit  Dry  Accessibility  Fair  Site located on Plate  VI

Status of Site  Prospective site; not sampled

EXPLOSION DATA

<table>
<thead>
<tr>
<th>Test Site</th>
<th>Material</th>
<th>Depth of Material</th>
<th>Percent Blasted</th>
<th>N.P.</th>
<th>L.L.</th>
<th>P.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CORRELATION DATA

Geological Age  Quaternary
Geological Source  Glacial Drift
Material Similar To

Specific Gravity (water) (-)  (-)

Los Angeles Hardness

Drill Core  Str. Ratio

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

Scale: 1" = ¼ Mile
GLOSSARY OF SIGNIFICANT TERMS


Absorption: Determined by tests performed in accordance with A.A.S.H.O. designation T 85.

Agrade: 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 granites.

Caliche: Term used in this report for secondary accumulations of calcium carbonate in unconsolidated deposits.

Chert: A dull, flint-like, siliceous rock.

Cenozoic: Small fossil brachiopod 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.

Foraminifid: 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.

153
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 \( \frac{1}{2''}, \frac{3}{4''}, \frac{5}{8''}, 4, 8, 16, 30, 50, \) 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.


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.


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.

Specific gravity: Determined by tests performed in accordance with A.A.S.H.O. designation T 84 for sand and gravel and T 89 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.

Variegated 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.


5. -------- and Merriam (1962) Progress report of the Kansas basement rocks committee and additional Pre-Cambrian wells.


