AIRPHOTO INTERPRETATION OF ENGINEERING SOILS OF INTERSTATE HIGHWAY ROUTE I-65 IN NEWTON, JASPER, WHITE AND TIPPECANOE COUNTIES

JULY 1964

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by

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Joint Highway Research Project

PURDUE UNIVERSITY
LAFAYETTE INDIANA

[illegible] INTERPRETATION OF ENGINEERING SOILS OF [illegible]

[illegible] NEWTON, JASPER, WHITE AND TIPPECANOE [illegible]

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Project C-36-51E
File 1-5-5

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Purdue University

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FINAL REPORT

AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

INTERSTATE ROUTE I-65: NEWTON, JASPER WHITE AND TIPPECANOE COUNTIES, INDIANA

TO: K. B. Woods, Director
Joint Highway Research Project

July 22, 1964

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

File: 1-5-5
Project: C-36-51E

The attached report entitled "Airphoto Interpretation of Engineering Soils of I-65: Newton, Jasper, White and Tippecanoe Counties, Indiana," completes a portion of the project concerned with engineering soils mapping of the Interstate system from aerial photographs. This project was prepared as a part of an investigation conducted by Joint Highway Research Project in cooperation with the Indiana State Highway Commission, the Soil Conservation Service and the Bureau of Public Roads. The report was prepared by P. T. Yeh, Research Engineer, Joint Highway Research Project.

The soil mapping of I-65 between Kankakee River and SR43 was done entirely by airphoto interpretation technique. To increase the value, the soil strip map was prepared on a photographic base with annotation to show soil areas. The generalized soil profiles were prepared from the available literature.

Respectfully submitted,

H. L. Michael
Associate Director

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AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

INTERSTATE ROUTE I-65: NEWTON, JASPER, WHITE AND TIPPECANOE COUNTIES

INTRODUCTION

This report and series of photographic strip maps presents the airphoto interpretation of engineering soils for a section of Interstate 65 from the Kankakee River at the northern border of Newton County southeast to SR 43 about five miles north of Lafayette in Tippecanoe County. The section includes parts of Newton, Jasper, White and Tippecanoe Counties, Indiana. The photographic strip map portrays an area about one and one half miles wide on each side of the center line along the proposed route.

Unrectified aerial photographs of a scale of 1/20,000 obtained in the Fall of 1938 and Spring of 1939 by the United States Department of Agriculture were used in this study. The reader should be aware of the fact that many cultural or surface features in the area have changed since the aerial photography was taken.

The aerial photographic strip map is presented at a mosaic at an approximate scale of one inch representing 1500 feet (1/18,000). Since unrectified aerial photographs were used the aerial mosaic may not be matched perfectly from one to the other.

The engineering soil maps were prepared by airphoto interpretation methods. The procedures used are similar to those employed in county mapping projects previously completed by the staff of the Joint Highway Research Project (1).* No field check and no soil exploration was made for this mapping study. However, available literature concerning this area was searched and used to complement the interpretation (2). Reference was made to the agricultural Soil Surveys for Newton County (3) Tippecanoe County (4) and White County (5); The Formation, Distribution and Engineering Characteristics of Soil (6); and two airphoto interpretation thesis (7,8).

DESCRIPTION OF AREA

Location

The area of interest along I-65 starts at the Kankakee River on the border between Lake and Newton Counties about eight tenths of a mile west of the border with Jasper County. The centerline of the route extends almost due south for about 14 miles then heads southeasterly toward Lafayette. The section ends at SR 43 about five miles north of Lafayette in Tippecanoe County. The strip is about three miles wide and approximately 50 miles long.

Physiography

The entire area of interest is situated in the Central Lowland Province of the United States (9). The northern part of the area of study is located on the Northern Morsine and Lake Section and the southern portion is included in the Till Plain Section (9).

On the local basis, the area can be subdivided into the following

* Figures in parentheses refer to references appearing in the bibliography.

sections: the Kankakee Basin, the Marsailles (Iroquois) Moraine, the Iroquois Lacustrine Section and the Tipton Till Plain. Several end moraines (undifferentiated) occur as local ridges in the Tipton Till Plain section.

Topography

The overall topography of the area is a relatively flat plain. Locally, however, the topography varies from a nearly level lowland to sand dunes or moraines rising 30 feet or more above the ground surface. Undulating to rolling topography may be found in the moranic sections. In the Iroquois Lacustrine section the topography is nearly level. A gently undulating surface is exhibited on the Tipton Till Plain especially in White County.

The northern end of the route starts at an elevation of about 640 ft. above sea level at the Kankakee River and gradually increases to 700 ft. on the Marsailles Moraine. The grade then descends to an elevation of about 650 ft. at the Iroquois River and again increases to about the 700 ft. elevation on the till plain section near Goodland. The proposed route then gradually rises to an elevation of about 750 ft. before it drops to an elevation of 600 ft. near the Wabash River.

Geology

The surface materials of the study area are chiefly the result of glacial deposition. Subsequent wind and water action has modified some of the deposits to a considerable extent. The bedrock geology is of academic interest only because no rock exposure is known to outcrop along the route. The underlying bedrocks are primarily of Devonian

and Silurian Age. However, a small portion of the route in Jasper County overlies bedrock (sandstone) of Mississippian Age. Bedrocks are deeply covered in the section within Tippecanoe County (10). They are expected to vary in depth from less than 50 ft. to more than 150 ft. in the northern portion of the route. The thinest overburdens are expected near the Iroquois River and along the creek near Remington in Jasper County (11). Mostly limestones, dolomites and shales are expected at depth within the area of survey.

The unconsolidated surficial materials were deposited by several different substages during the Wisconsin glacial period. The Tipton Till Plain section is associated with the Bloomington Morainic System of the Early Wisconsin period (9). The Marsailles (Iroquois) Moraine and associated till plain Moraine were the products of the late Wisconsin glacial deposit (9). Wayne includes all of these glacial drifts in the Trafalgar formation (12). The glacial drift material is composed of unstratified boulders, gravel, sand, silt and clay. In some areas, a thin loess mantle was deposited by wind on top of the glacial drift.

Extensive glaciafluvial outwash deposits were formed south of the Valparaiso Moraine. This outwash material is a stratified coarse to medium-textured sand with little or no gravel. Many sand ridges or dunes were formed within the area. The outwash and dune facies are in the Atherton formation proposed by Wayne (12).

Between the Marsailles (Iroquois) Moraine and the Tipton Till Plain there is a lacustrine deposit. This lacustrine material was

deposited over drift material similar to that forming the Tipton Till Plain. The deposit is composed chiefly of sand and silt and is relatively thin. Sand dunes were formed in this area also. This deposit is also included in the Atherton formation of Wayne (12).

Climate

The study area is situated in a continental, humid and temperate belt. There is wide variation in temperature during the year (from -33° F to 105° F). The extremes of temperature are usually of short duration. Rainfall is fairly well distributed throughout the year. The average annual precipitation is about 38 inches.

LAND FORMS AND ENGINEERING SOIL AREAS

Engineering soils along the proposed route of I-65 are, in general, sandy in texture in the northern portion and silty clay in texture in the southern half. Variation in the soil profiles is expected as the land forms change or as topography varies on the specific land forms.

Twenty-one soil areas are differentiated and numbered as such on the engineering soil strip maps attached. The soil areas generally designate land forms such as outwash plains (1 and 2), dunes (3), ridge moraines (6,7), ground moraines (9, 10, 11), lacustrine plains (14, 15), terraces (16), floodplains (17), depressions (18, 19, 20) and eskers or kames (21). A few soil areas represent transition zones such as dunes on lacustrine or glacial deposits (4,5) or loess on glacial deposits (8, 12, 13). Because of significant topographic differences within certain land form areas, a total of 33 soil profiles are portrayed. These profiles are believed to be representative of soil conditions expected along the proposed route.

The discussion that follows is a brief description of each soil area portrayed on the aerial photographic strip maps.

1. Sandy Outwash Deposit

This deposit occurs at the northern part of the section and is designated as soil area 1. It is the major soil in the Kankakee Outwash Plain. The topography of this deposit is nearly level. No natural surface drainage system is found on this deposit; however, drainage ditches are commonly used to lower the ground water in this area.

The surface soil as shown in soil profile 1 varies from fine sand to fine sandy loam with comparatively high content of organic matter at the surface in the slightly lower topographic positions. The subsoil is a rather uniform sand classified as A-3 soil.

The major engineering problem in this soil area is that of drainage.

2. Sandy Outwash Deposit, Organic

These soil areas are associated with the sandy outwash deposits and are shown as area 2 on the maps. They occupy the lowest topographic position on the Kankakee outwash plain.

The surface soil is a fine organic sand or organic fine sandy loam that may extend to a considerable depth. The organic content is highest near the surface and generally, decreases with depth. In some areas, a layer of muck may be found beneath the organic sandy surface soil. The subsurface soil is a loose sand classified as A-3

soil.

Due to the unfavorable topographic position this deposit is poorly drained. Numerous drainage ditches are employed to reclaim this low, swampy land. The major engineering problem involved in this soil area is essentially the problem of lowering the water table.

3. Sand Dune Deposit

The sand dune deposits are concentrated on the Kankakee outwash plain and the Iroquois lacustrine plain in the northern and central portion of the route surveyed. The dunes are irregular and appear in many forms. Ridge type dunes are most common in this area. However, crescent shapes and even mound shapes are found. The dunes vary in height from a few feet to 30 feet or more. Many of the dunes are still active today. The dunes are outlined with dotted lines and are marked with the symbol 3.

Soil profile 3 shows that a uniform sand (A-3 soil) is found along the dunes where the deposit of the windblown material is deep. Occasionally a faintly coherent fine sand is developed with layers of loose sand below the surface. Near the toe of the sand dune an organic fine sand or organic fine sandy loam is found on the surface. A sandy loam texture is found beneath the organic surface soil and this grades into a loose sand. At variable depths beneath the surface, the buried organic sand of the outwash plain or the plastic soil of the glacial drift is found depending on where the sand dune is located.

Cuts are generally required through the dunes but the sands are

deep and no change in texture is involved. A definite problem with these sands is the matter of stabilization as the sand is susceptable to wind erosion.

4. Incipient Sand Dune Deposit

The incipient sand dune areas (mapped as area 4) are regions where some wind erosion and deposition has occurred but no distinct dunes have formed.

The most extensive incipient sand dune deposit lies on the northern end of the route within the Kankakee Outwash Plain. This deposit is interspersed with the low lying, organic, sandy outwash deposits on one hand and the high, irregular oriented, sand dune deposits on the other. Other incipient sand dune deposits are located along the southern border of the Iroquois lacustrine plain and further south on the ground moraine. The incipient sand dune deposit has an undulating to slightly rolling topography.

The soil profile on the high shows that the surface soil varies from fine sand to organic fine sandy loam. The subsoil is generally a loose medium sand or fine sand. However, a sandy clay loam may be found which in turn rests on a loamy-textured glacial drift. This situation is common in the area bordering the ground moraine. In the depressions, a deeper, organic, sandy loam topsoil is usually found overlying the sandy subsoil.

Two soil samples (No. 2308 and 2309 shown on the map) were previously obtained in White county (8). Sample No. 2308 was secured near the southwest section corner of section 13, T.26N., R.6W.

The other site is located about two miles east. Sample No. 2308 was taken three feet below the surface while sample No. 2309 was obtained approximately five feet below the ground surface. Both samples show less than six percent of fines snd are identified as a non-plastic sand that is classified as A-3.

5. Sand Dunes on Ridge Moraine

Area 5 represents a zone where windblown sand overlies glacial drift in the form of ridge moraine. The area exhibits an undulating topography with a few sand dunes and shallow depressions. The thickness of the sand deposit is generally from three to five feet. Due to the porous nature of the surface layer, a natural drainage system is poorly developed. A few drainage ditches exist.

A fine sand or sandy loam texture is expected for the topsoil on the high topographic position. The subsoils are either sands or sandy loams. The underlying glacial drift varies from loam to clay loam.

The topsoil in the depressions (Low of Profile 5) varies from an organic loam to an organic silty clay loam. Silty clay and clay are the subsurface materials. The texture of the drift also varies from a loam texture to a clay texture in this area.

6. Ridge Moraine of Silt Loam

This deposit (area 6) is located in White County. It is a weak ridge moraine surrounded by a ground morsine (soil area 10). The ridge moraine is only slightly higher than the ground moraine and exhibits a very gently undulating topography.

The topsoil consists of silt loam to silty clay loam under timber cover. A high organic content is expected in the prairie area. Subsurface soil varies from silty clay to clay. The glacial drifts varies from loam, to silt loam to clay loam. In the depressions, the topsoil varies from an organic silty clay to an organic clay.

7. Ridge Moraine of Organic Loam

Soil area 7 is the main ridge of the Marseilles moraine. This region shows undulating topography. The surface, in many places, is modified somewhat by a layer of sand. Occasionally sand dunes are formed on this deposit. Surface drainage systems (gullies) are better developed in this area than in area 5. However, some ditching is evident.

The surface soil on the highs (profile 7) varies from a slightly organic loam to organic clay loam underlain by clayey subsoils. The texture of the parent material ranges from a loam to a clay loam. In the lows, the surface soils are finer in texture and have a higher percentage of organic matter. Silty clay or clay textures are found in the subsoil. The parent material consists of either a loam, a clay loam or a clay.

A soil sample taken previously (soil sample No. 2331 in reference 8) shows the sandy texture of the glacial drift. The soil was sampled at two feet from the surface at a point about one mile east of the proposed route along county road at section 22 as indicated on the map. The sample showed 14.5 percent passing the 200 sieve and a plastic limit of 39.7 percent with a plastic index of 19.3 percent. It is classified

as A-2-6.

The undulating nature of the topography in this soil area indicates that cuts through the shallow sands and into the underlying drift may be expected. The zone of intersection of different texture is likely to show evidences of poor performance.

8. Thin Loess on Ridge Moraine

A ridge moraine with a thin loess cover occurs in Tippecanoe County. It is shown as area 8 on the maps. Undulating to rolling topography is predominent in this area.

The drift deposit is covered by loess with a depth ranging from 18 to 36 inches. The surface soil, therefore, is generally classified as a silty clay loam, a soil containing a high percentage of silt. The subsoil is clayey in texture. The parent material varies from a loam to a clay loam with increasing amount of sand and gravel with depth. In the depressions or basins a higher organic content occurs in the surface soils.

9. Ground Moraine of Silty Clay Loam

Several ground moraines are differentiated on the aerial photographic strip maps. Area 9 embraces a deposit showing a gently undulating topography with well developed gully systems.

The topsoil in this soil region varies from a silt loam to a silty clay loam in the high positions to an organic silty clay texture in the low positions. The subsoil ranges from silty clay to clay. The parent material shows a loam or clay loam texture.

10. Ground Moraine of Organic Silt Loam

This deposit (area 10 on the maps) lies along the central portion of the study strip. It is a large plain that is extremely flat to locally undulating. Natural surface drainage systems are not well developed, but man-made ditches occur frequently.

The surface soil varies from a highly organic silt loam to an organic clay. The subsoil is of a silty clay to clay texture. The parent material is a till that varies from a loam to a clay.

11. Ground Moraine of Organic Loam

In the vicinity of the junction of Jasper, White and Benton Counties there are a few slightly higher areas of ground moraine shown as area 11. The surface soil is coarser than the surrounding ground moraine shown as area 10. It consists of an organic loam or an organic clay loam. This may be the result of the admixture of sand thinly spread over the silty prairie. The subsoil is clay and the parent material is a loam or clay loam.

12. Loess on Ground Moraine

Along the border between White and Tippecanoe counties there is an area (Number 12) of ground moraine that is covered with a mantle of loess. The soil is developed under the influence of prairie vegetation. The topography is undulating and many infiltration basins occur.

The loess cover on the ground moraine varies in depth from about 18 to 36 inches. The soil profiles are characterized generally by a slightly organic silty clay topsoil, a clay subsoil and a clay loam parent material. However, the topsoil may vary from an organic

silt loam to a silty clay loam and even clay depending on the topographic position. The parent material also varies from a loam to a lean clay.

13. Thin Loess on Ground Moraine

This deposit occurs near the southern end of the strip in Tippecanoe County. The deposit is essentially the same as the one previously discussed except it has developed soils influenced by timber cover. The soil profile differs from those for area 12 in that a negligible amount of organic matter occurs in the topsoil. The subsoil and parent material are essentially the same as discussed for area 12.

14. Lacustrine Deposits of Sands and Silt

A large lacustrine deposit (soil area 14) is located along the Iroquois River basin between the Marseilles Moraine and the Tipton Till Plain. In general it is a large, flat plain. Subsequent wind action has created well developed sand dunes and numerous incipient dunes. The topography, therefore, is level to gently rolling. Field investigation in Newton County reported by McGregor (7) discloses that the material underlying the stratified sand and silt of the lacustrine deposit is glacial drift. The thickness of the lacustrine deposits varies from place to place. Sometimes the underlying drift is exposed especially along the rivers.

The surface soil of this lacustrine deposit varies from a slightly organic sandy loam in the high positions to an organic silty clay in the low positions. The subsoil also varies widely from a sandy clay loam to a clay. The parent material is composed of stratified silt and sand with thin layers of clay and fine gravel. In the low areas a deeper, more organic, material is likely to occur. A soil sample (sample No. 2330 in reference 8) obtained more than four feet from the ground surface at a point about one-half mile west of the proposed route in section 9,T.28N., R.7W. illustrates the sandy and silty texture of the deposit. The test data show that it is a non-plastic A-2-4 soil containing about 20 percent fines.

15. Lacustrine Deposits of Clay

A few areas in this study strip can be classified as lacustrine deposits of clay. These soils occupy low topographic positions within the lacustrine area previously discussed. The proposed route does not cross this type of deposit. The soil profile shows that the surface material varies from an organic silt loam to an organic clay. This is underlain by a clay subsoil and a clay parent material with thin lenses of sand and silt.

16. Terraces

The terraces recognized on the aerial photography in this study all are located in Tippecanoe County. The larger terraces occur along the Wabash River. Some smaller terraces are located along Burnetts Creek which is tributary to the Wabash River. The topographic break between the valley wall and the terrace surface are conspicuous.

The soil profile on the terraces consists of a surface horizon that varies from a sandy loam to a silty clay loam. The depth of the horizon varies from zero on the steep terrace face to about 18 inches on the level surface. The subsoil shows generally an increase of clay and plasticity with respect to the layer above. The amount of sand

and gravel increases with depth. The parent materials are stratified sands and gravels.

17. Alluvial Plains

All drainage channels in the area surveyed possess recent alluvial plains or floodplains. The largest floodplain is located in Newton County along the Kankakee River. The stream channels frequently have been straightened by ditching especially along the Kankakee River and along Carpenter Creek and Curtis Creek, both tributaries of the Iroquois River.

The texture of the alluvial deposits varies greatly from one place to the other depending on the nature of the drainage basin. The surface soil varies from a sandy loam to a silt loam or a clay loam. In the swales and depressions of the floodplain a highly organic silty loam, silty clay loam, silty clay or clay topsoil may be found. The subsoil varies from a silt loam to a silty clay or stratified silt, sand and clay may be present. Occasionally the subsoil may contain thin layers of sandy or gravelly material. Along the major rivers coarse textured deposits frequently occur at depth. A sandy texture is found at shallow depth throughout the Kankakee River floodplain.

18. Organic Depressions

Many small depressions in the study area are mapped as organic depressions. They are the results of accumulation of organic matter in poorly drained topographic positions. The majority of these areas occur on the ridge moraine and on the ground moraine located in

Tippecanoe County. A few are identified in the sandy outwash areas.

The soil profile consists of an organic silty clay or organic clay topsoil, a plastic silty clay or clay subsoil and a clay or clay loam parent material.

19. Muck and Peat Deposits

Most of the muck and peat deposits are located on the ridge and ground moraines mapped along the route in Tippecanoe County. In fact, the proposed route crosses a few large deposits just south of the Tippecanoe County border. Others are located on the Kankakee Outwash plain near the Kankakee River and a few occur on the Iroquois lacustrine plain. Most of the peat is derived from mosses, sedges and wood. In some kettles, a soft layer of marl, ranging from a few inches to 12 inches or more in depth, is found under about 12 to 42 inches of muck. The marl is an earthly material composed principally of an amosphous form of calcium carbonate. Since it is also undesirable from the engineering standpoint, no separation is made from the peat and muck in the soil profile illustrated.

The depth of these cumulose deposits varies greatly from one location to another; therefore, field investigation of each individual deposit is required. Treatment of each deposit will be directed accordingly.

20. Clay Depressions

The clay depressions are mapped within the portion of the route in Tippecanoe County. They occur in the deeper parts of the elongated swales and depressions and in some of the shallow kettles.

The surface soil is a highly plastic clay containing very little organic matter. The subsoil as well as the parent material are essentially the same as those mentioned for area 18.

21. Eskers and Kames

Only a few eskers and kames are located in the study route. All of them are located in the southern portion. The proposed route crosses one near the border of White and Tippecanoe Counties. The eskers and kames are low ridges and hills and are not conspicuous.

The soils developed on eskers and kames vary considerably. The surface horizon varies from a sandy loam to a silty clay loam. In areas of severe slope erosion the surface soil may be entirely removed and the subsoil exposed. The subsoil varies from a clay loam to a clay with varying amounts of sand and gravel. The amount of sand and gravel increases very rapidly with depth. Clean stratified, coarse material is found in the parent material zone and sand textures predominate in the study region.

SUMMARY

The proposed route starts at the Kankakee River near the northeastern corner of Newton County. It proceeds southeastward across the floodplain onto the sandy outwash plain. It then crosses a well defined sand dune (Area 3) and enters the incipient sand dune area. About one mile after crossing the Newton-Jasper county line the route heads directly south and crosses another narrow, sandy outwash plain with organic surface soils and reenters a zone of incipient sand dune deposits. The route alternately crosses outwash plains, dunes and areas of organic surface soils until it encounters the glacial drift surmounted with sand dunes (Area 5). This deposit of sand continues for a distance of about 2½ miles as the route proceeds southeasterly. The rolling topography continues along a segment of the Marsailles Moraine designated as Area 7.

The route then traverses the slightly undulating Iroquois Lacustrine Plain for a distance of about 9 miles. Within this plain, the route crosses a number of sand dunes and the floodplains of Carpenter Creek and the Iroquois River. On the southern edge of the lacustrine plain an area of dunes is crossed about three miles north of Remington.

The proposed route then enters upon a large ground moraine that extends for about eight miles. Much of the soil of this ground moraine developed under a prairie condition and organic content of surface soils may be high (Area 10, and 11).

Further to the south, superimposed on the ground moraine, a sand dune area (about one mile wide) occurs in White County. The route then continues on the ground moraine for another few miles. Southeast of the proposed crossing of U.S. route 231 a low ridge moraine (Area 6) is encountered that extends for about two miles. The route continues across another ground moraine for (Area 10) several miles. A portion of this ground moraine exhibits a loess cover designated as soil area 12. About two miles north of the White-Tippecanoe County line, a low esker is crossed. This esker is sandy in texture.

A loess covered ridge moraine (Soil area 8) is encountered

shortly after the route enters Tippecanoe County. Within the ridge moraine, several small muck deposits are crossed. South of the ridge moraine the route is located on a gently undulating, loess covered, ground moraine (Soil area 13) for a distance of about three miles. It crosses a large muck deposit shown as soil area 19 and the narrow floodplain of Burnetts Creek. South of the creek the proposed route lies on a fine textured ground moraine (Area 9) which continues to the end of the project at the intersection of SR 43.

ACKNOWLEDGMENTS

All airphoto used in connection with the preparation of this report automatically carry the following credit lines: "photographed for United States Department of Agriculture."

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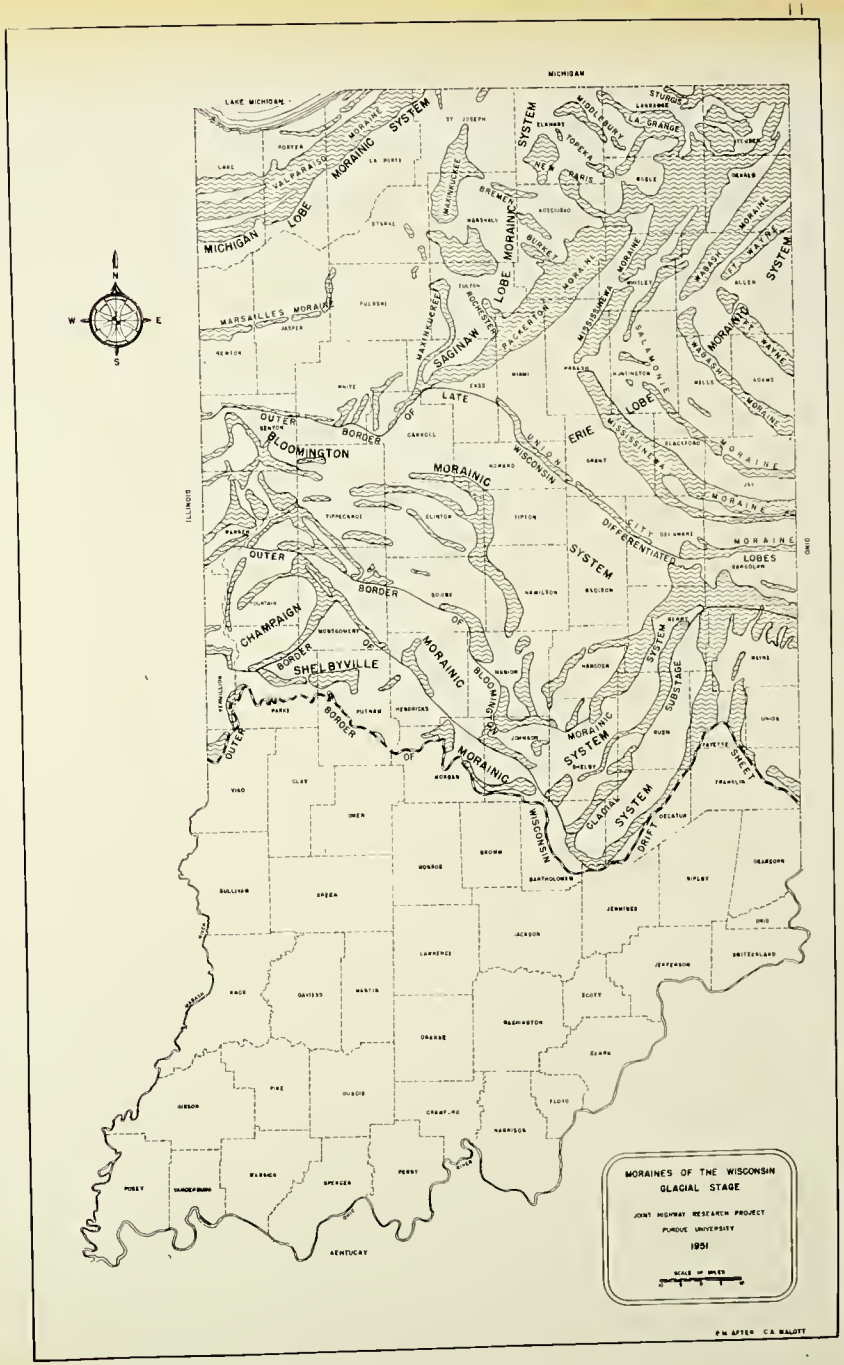
SOIL CLASSIFICATION AND PROFILE SYMBOLS

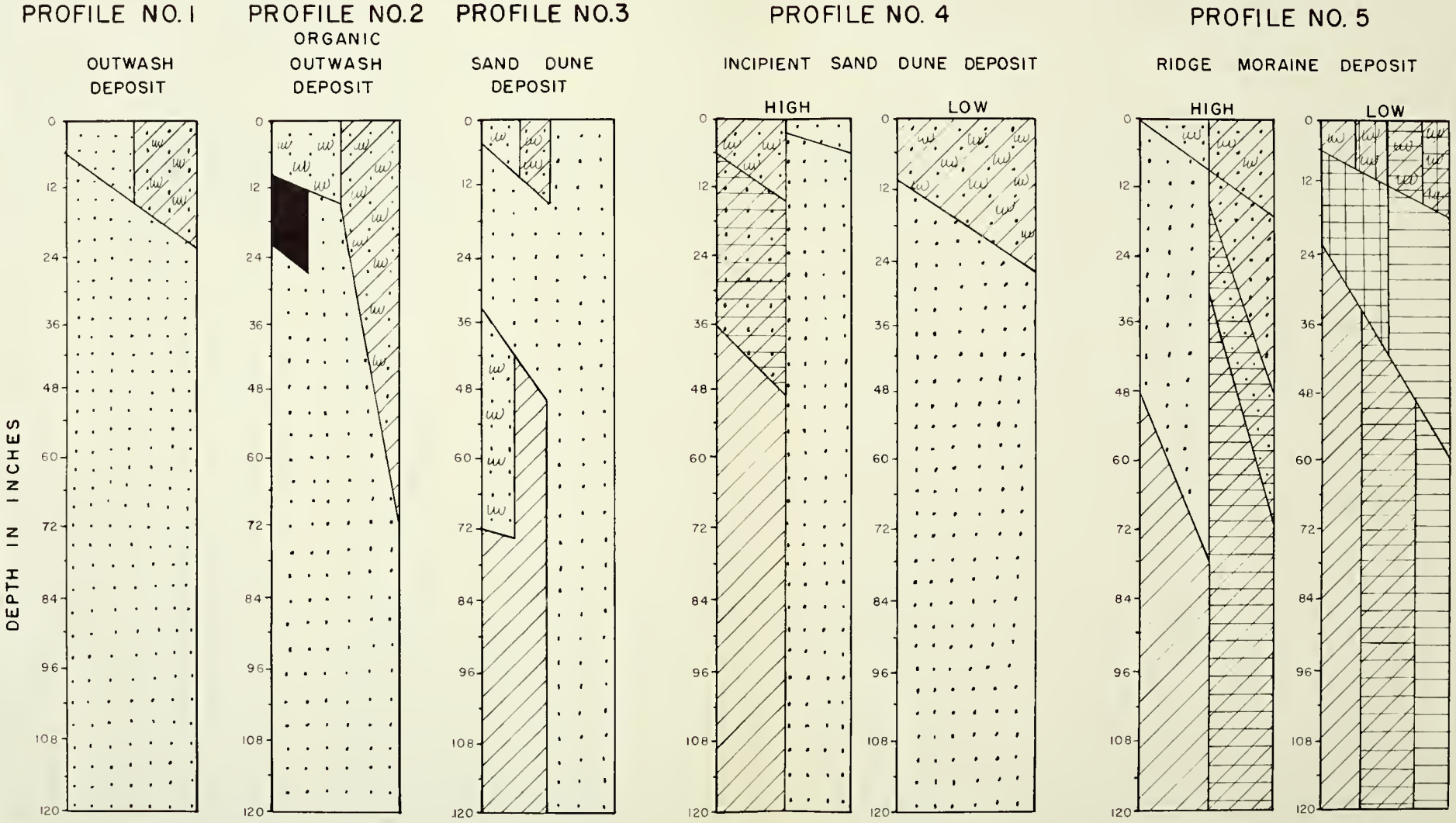
Description	Grain Size Distribution				Plastic Index	Symbol
	Gravel % Retained on #10	Sand #10–#200	Silt 0.05–0.005mm	Clay Less than 0.005mm		
Gravel	85–100	0–15	0–10	0–10	NP	
Sandy Gravel	50–85	15–50	0–10	0–10	6 Max.	
Sand	0–15	85–100	0–10	0–10	NP	
Gravelly Sand	20–49	45–85	0–10	0–10	6 Max.	
Sandy Loam	0–19	50–80	0–50	0–20	6 Max.	
Sandy Clay Loam	0–19	50–80	0–30	20–30	10 Max.	
Sandy Clay	0–19	55–70	0–15	30–45	11 Min.	
Loam	0–19	30–50	30–50	0–20	10 Max.	
Silt Loam	0–19	0–50	50–100	0–20	10 Max.	
Silty Clay Loam	0–19	0–30	70–100	20–30	11 Min.	
Silty Clay	0–19	0–15	55–70	30–45	11 Min.	
Clay Loam	0–19	20–50	50–80	20–30	11 Min.	
Clay	0–19	0–55	0–55	30–100	11 Min.	
Peat or Muck						
Limestone						
Sandstone						
Shale						
Stony Fragments						
Organic Matter						
Topsoil						

Classification of Gravelly Soils

85%–100% gravel plus finer material – Gravel
50%–84% gravel plus finer material – Clayey, silty or sandy gravel
20%–49% gravel plus finer material – Use fine classification and called gravelly sand, gravelly silt or gravelly clay
0%–19% gravel plus finer material – Use fine classification only



GENERAL SOIL PROFILES



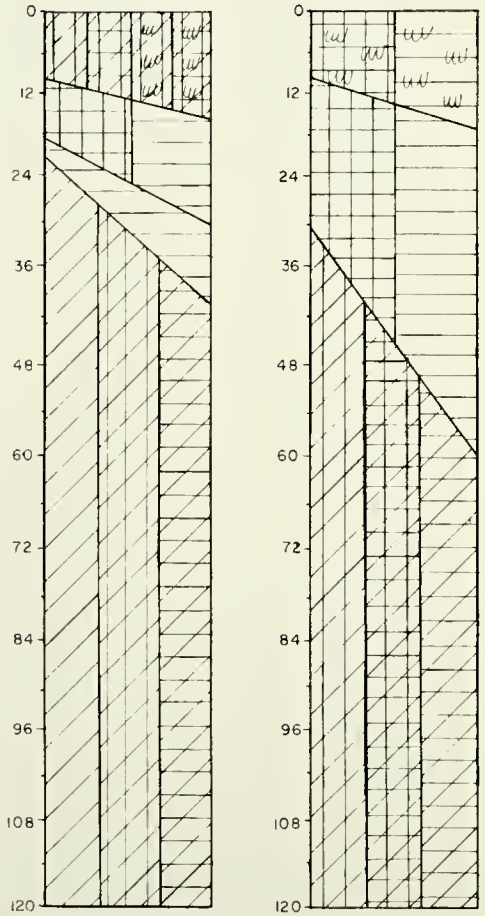
GENERAL SOIL PROFILES

PROFILE NO. 6

RIDGE MORAINE DEPOSIT

HIGH

LOW

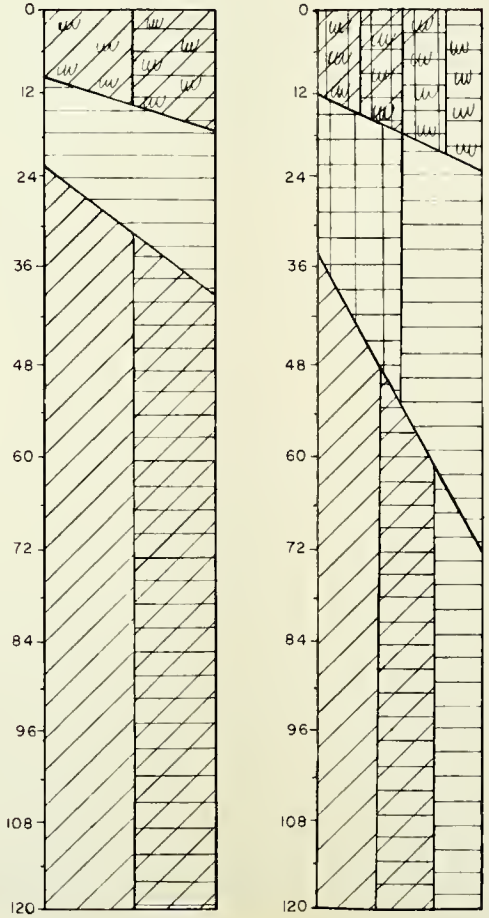


PROFILE NO. 7

RIDGE MORAINE DEPOSIT

HIGH

LOW

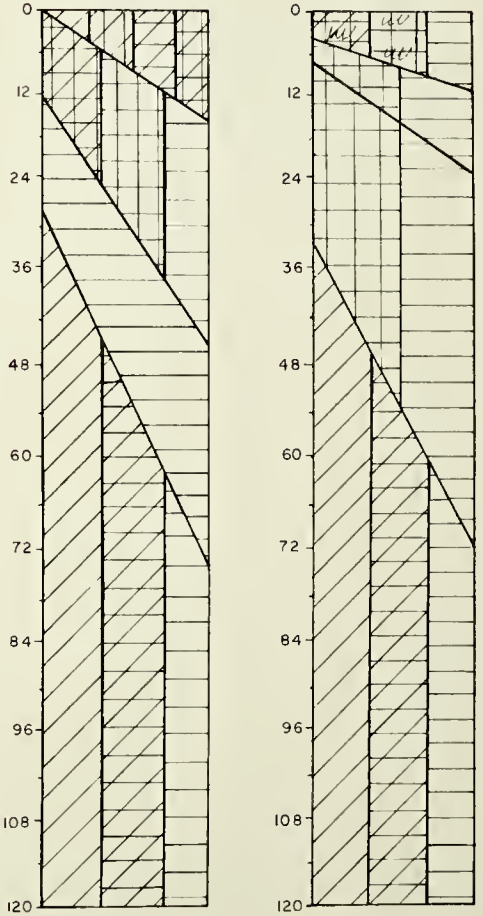


PROFILE NO. 8

RIDGE MORAINE DEPOSIT

HIGH

LOW



GENERAL SOIL PROFILES

PROFILE NO. 9

GROUND MORAINE DEPOSIT

HIGH

LOW

PROFILE NO. 10

GROUND MORAINE DEPOSIT

HIGH

LOW

PROFILE NO. 11

GROUND MORAINE DEPOSIT

PROFILE NO. 12

GROUND MORAINE DEPOSIT

HIGH

LOW

DEPTH IN INCHES

0 12 24 36 48 60 72 84 96 108 120

GENERAL SOIL PROFILES

PROFILE NO. 13

GROUND MORAINE DEPOSIT

PROFILE NO. 14

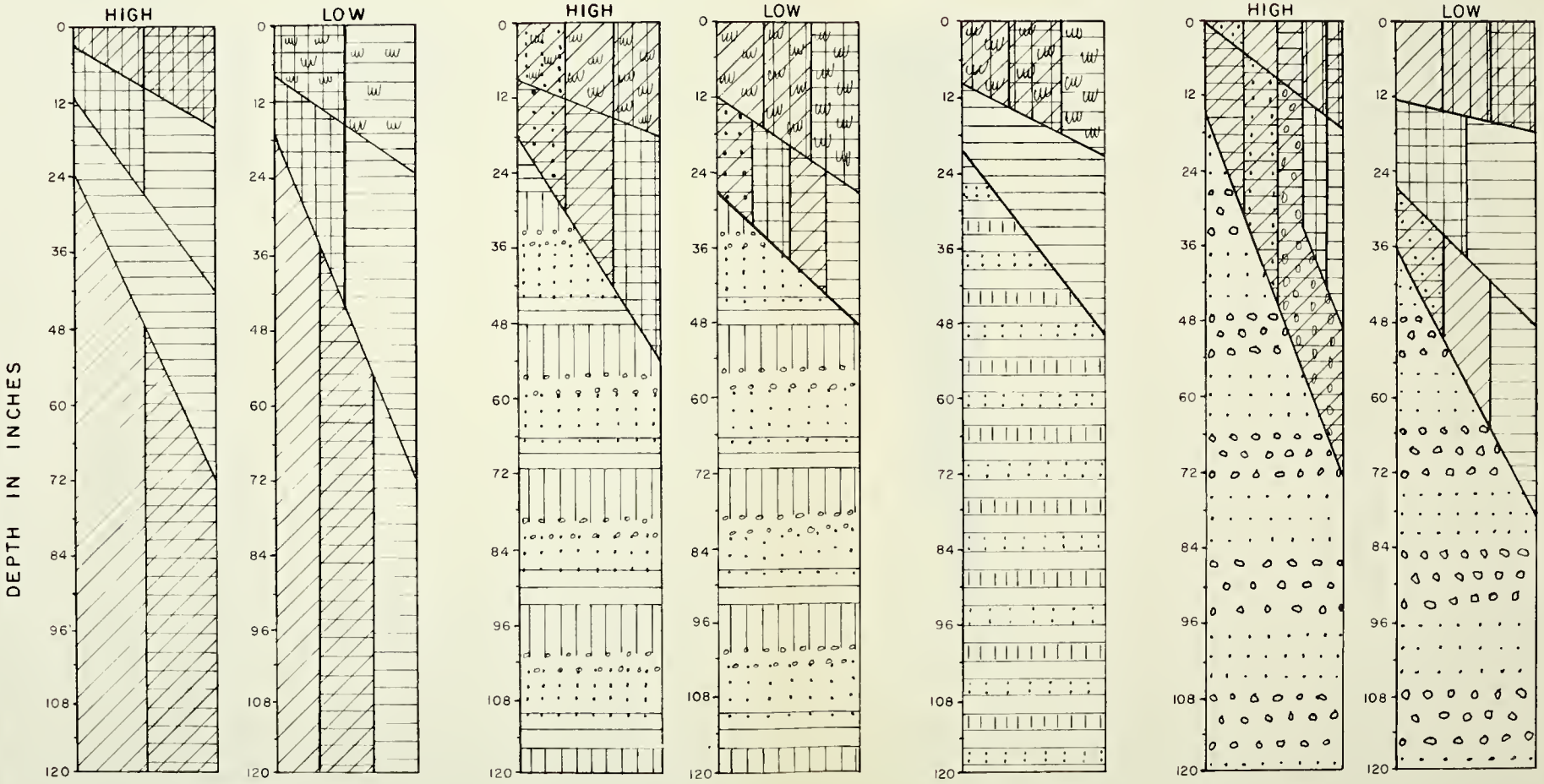
LACUSTRINE DEPOSIT

PROFILE NO. 15

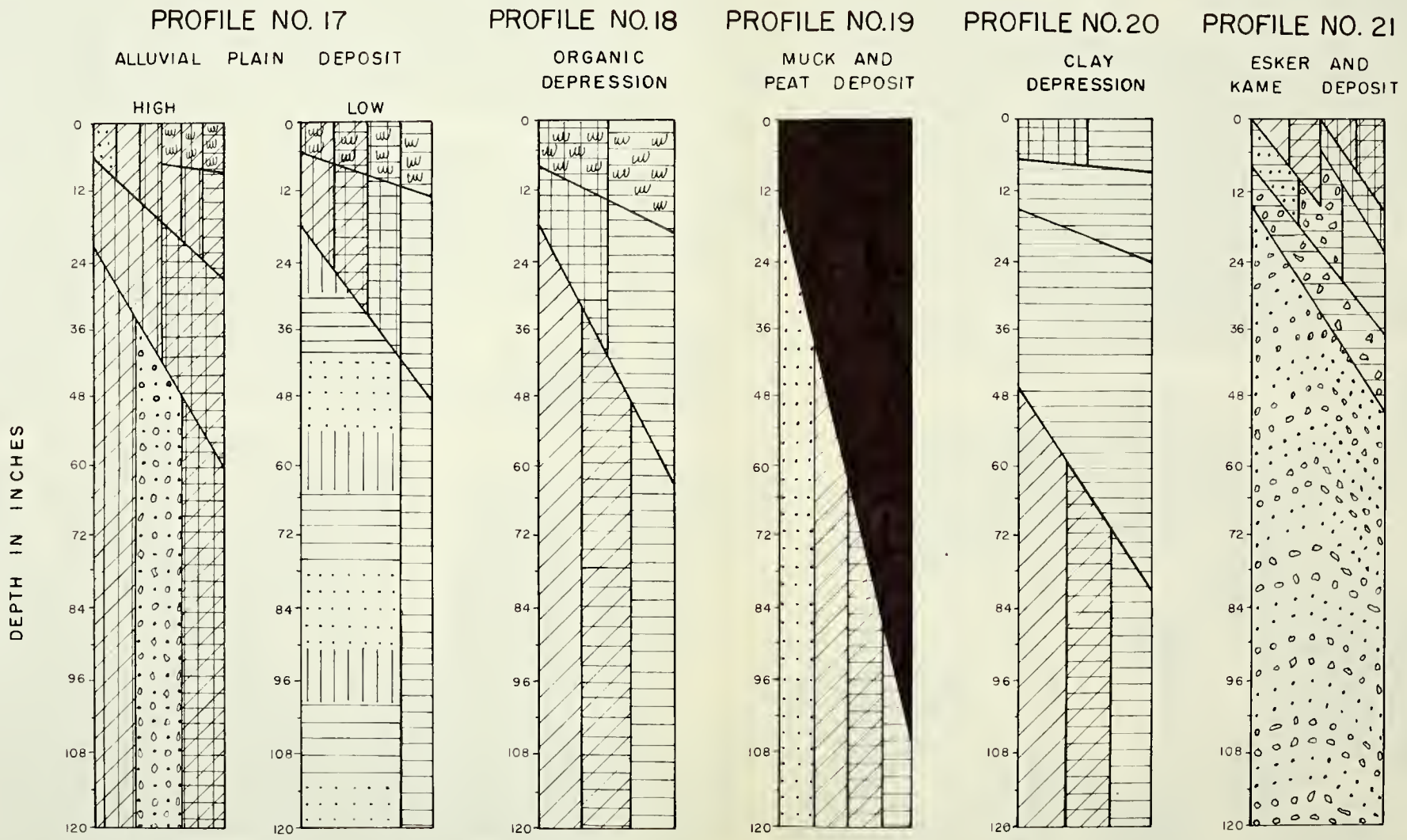
LACUSTRINE DEPOSIT

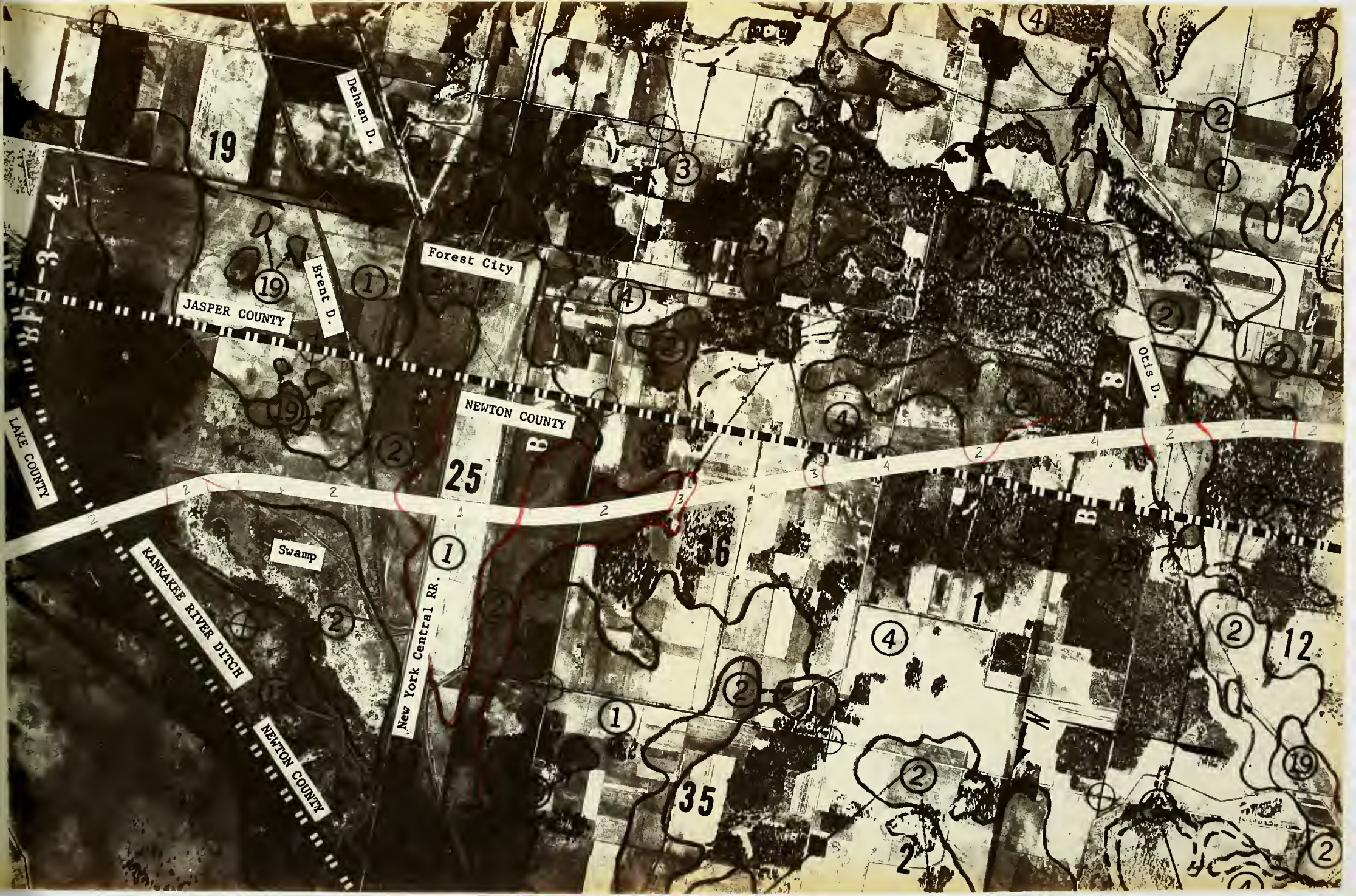
PROFILE NO. 16

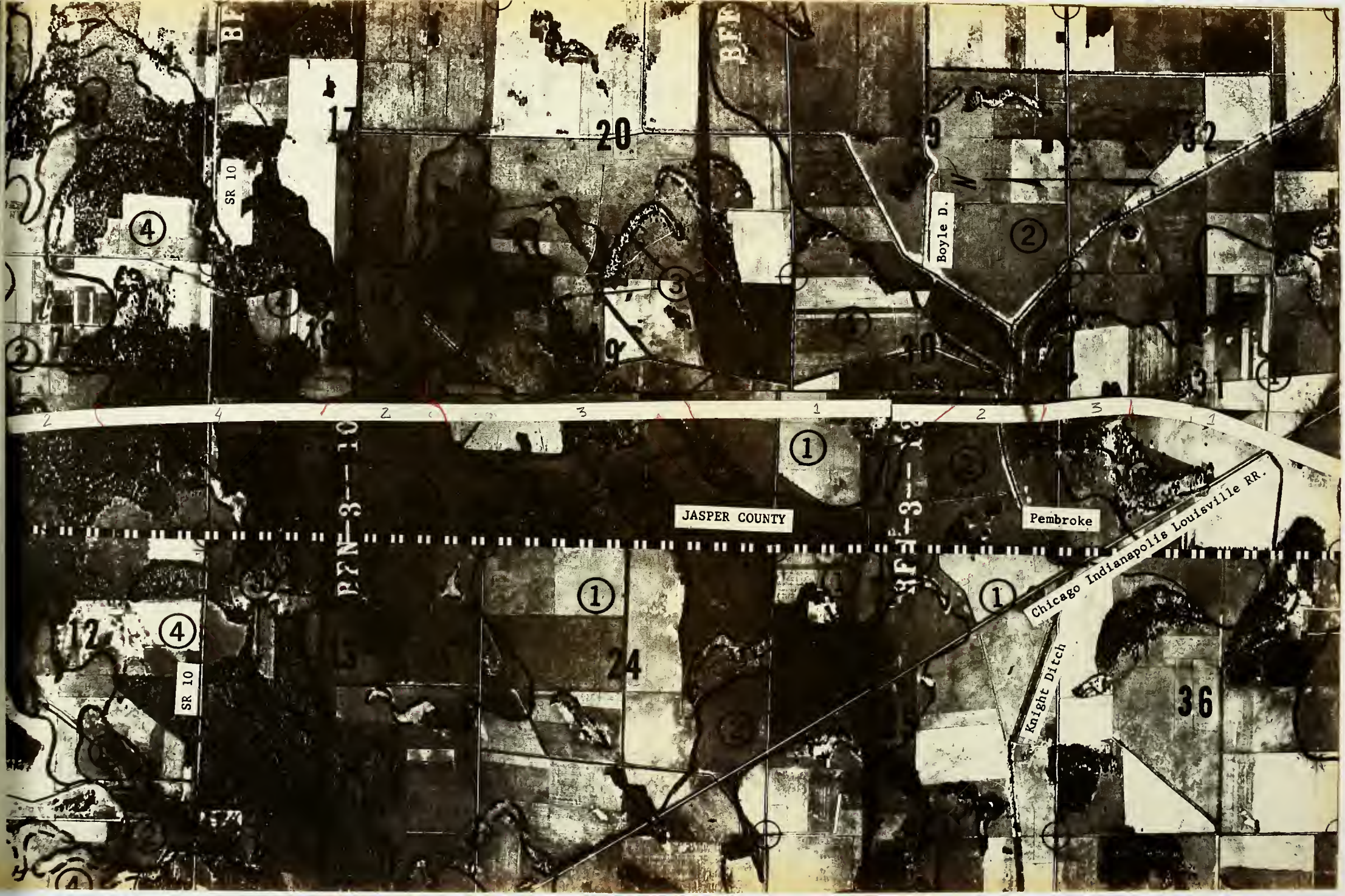
TERRACE DEPOSIT



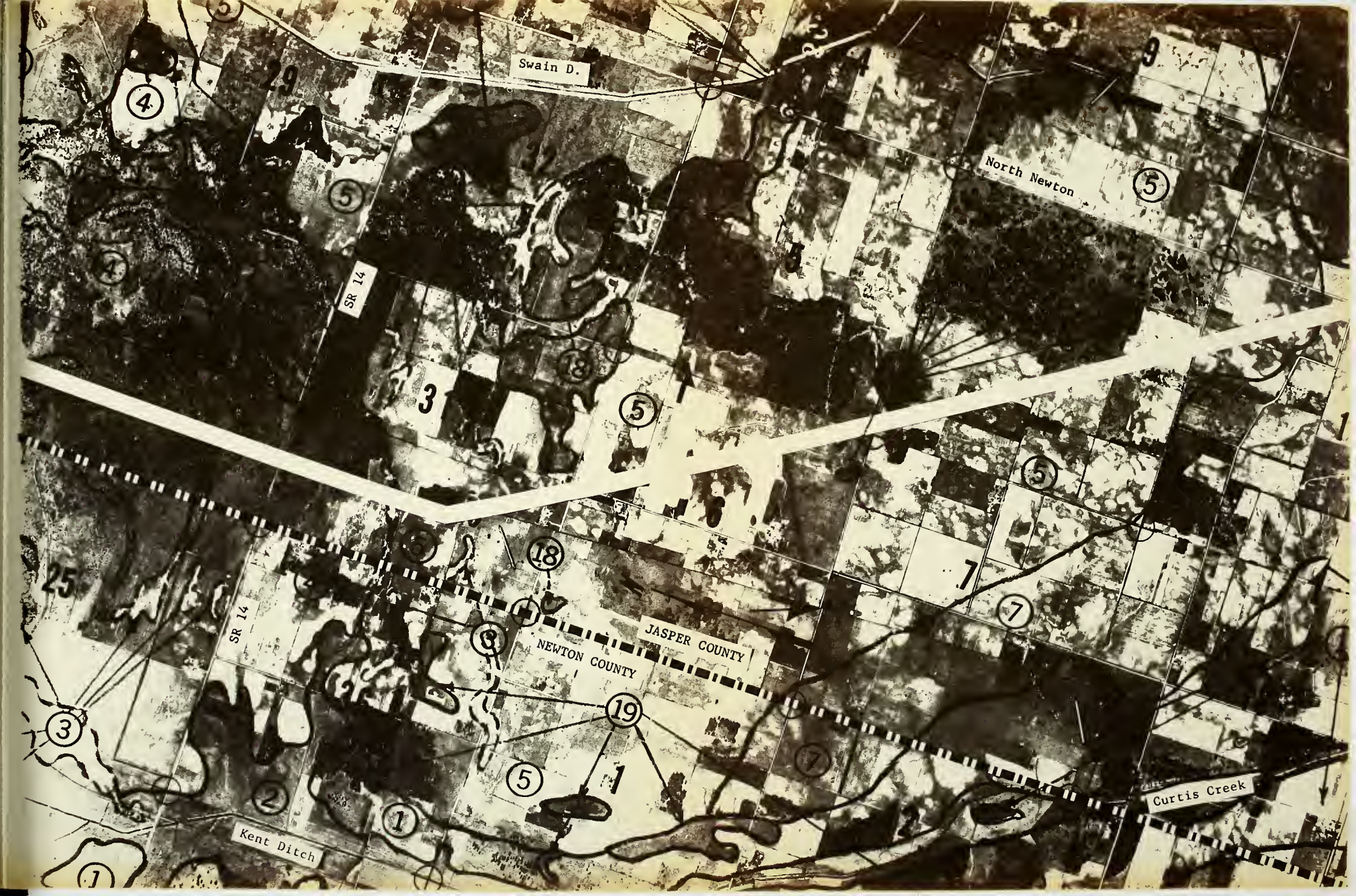
GENERAL SOIL PROFILES



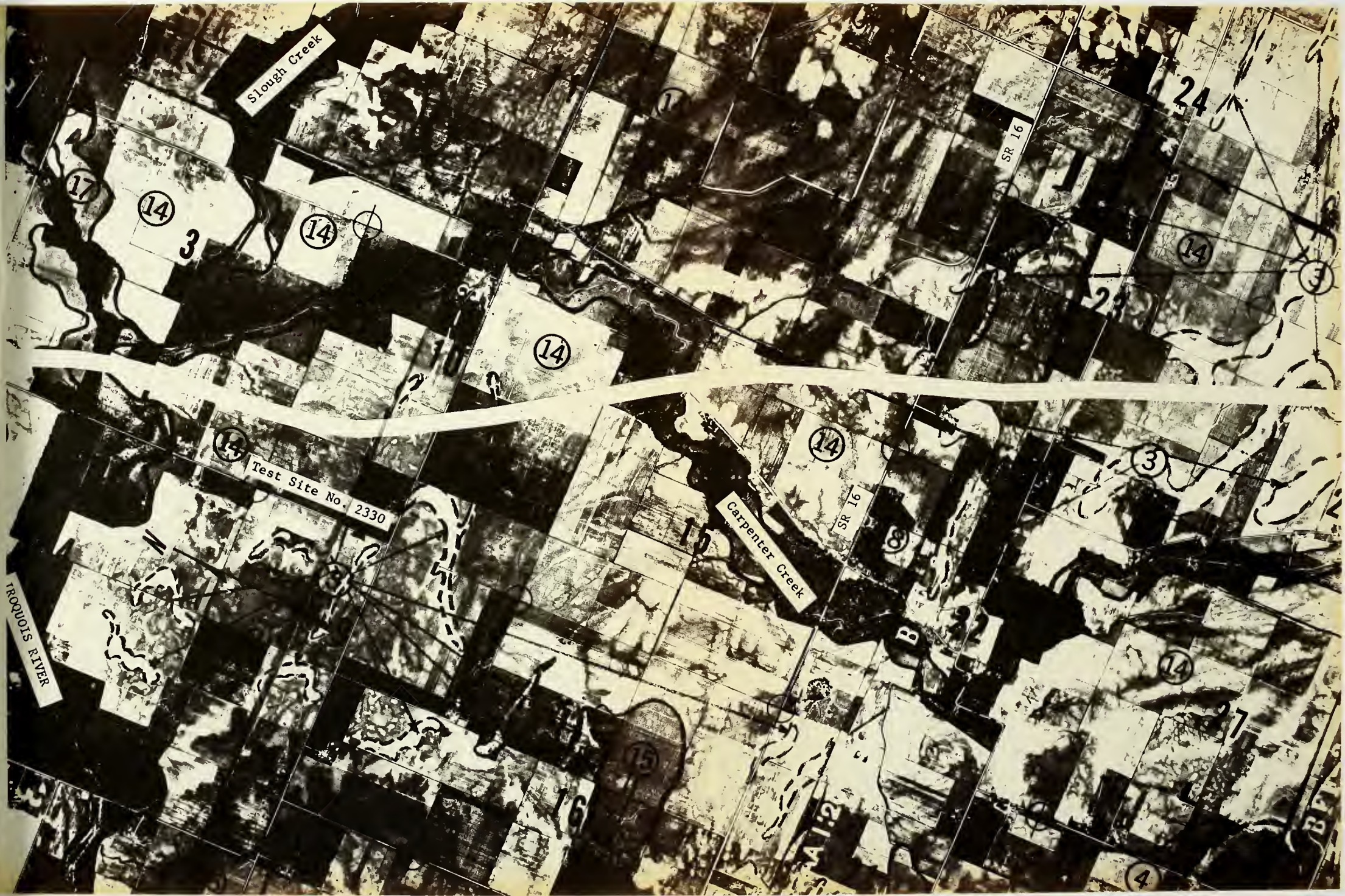

Dehaan D.
Forest City
Brent D.
JASPER COUNTY
NEWTON COUNTY
LAKE COUNTY
Otis D.
Swamp
KANKAKEE RIVER DITCH
NEWTON COUNTY
New York Central RR.
19
25
36
1
12
35


SR 10
Boyle D.
JASPER COUNTY
Pembroke
Chicago Indianapolis Louisville RR.
Knight Ditch
SR 10


FAIR OAKS
NEWTON COUNTY
JASPER COUNTY
Kent Ditch
Chicago Attica and Southern RR.

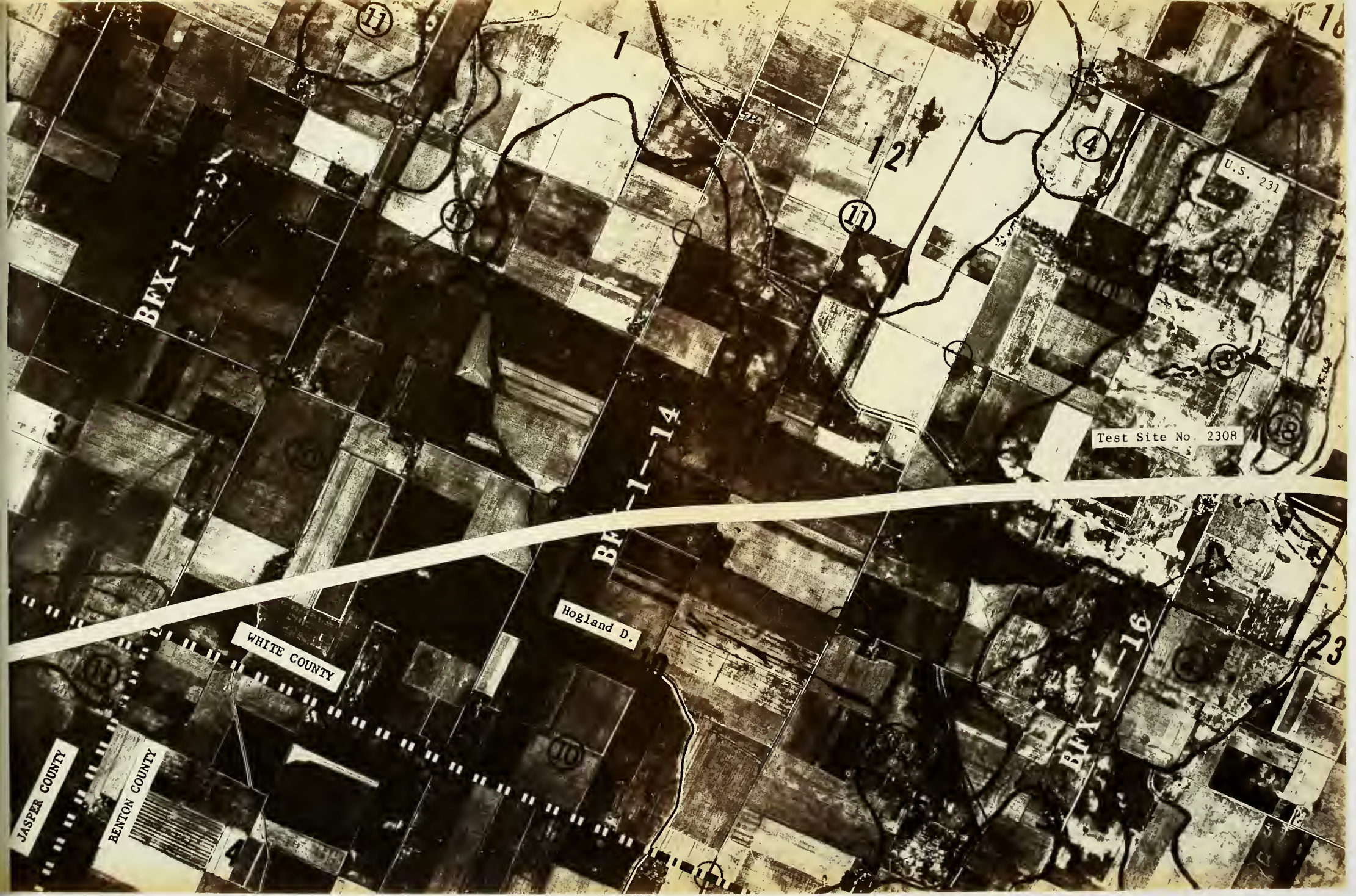

Swain D.
North Newton
SR 14
SR 14
JASPER COUNTY
NEWTON COUNTY
Kent Ditch
Curtis Creek


Test Site No. 2331
SR 114
BFF-3-32
BFF-2-16
Curtis Creek
IROQUOIS RIVER
N


Slough Creek
SR 16
Test Site No. 2330
Carpenter Creek
SR 16
TROQUOIS RIVER


Bice D.
U.S. 231
SR 53
Carpenter Creek

JASPER COUNTY
WHITE COUNTY
BENTON COUNTY
SR 53
U.S. 24
U.S. 231
Pennsylvania RR.
17
18
19
20
29
30
8
10
11


BFX-1-13
BFX-1-14
BFX-1-16
U.S. 231
Test Site No. 2308
Hogland D.
WHITE COUNTY
BENTON COUNTY
JASPER COUNTY


Test Site No. 2309
18
19
20
29
33
32
U.S. 231
SR 53
Quarry
30
24
25
31
U.S. 231
SR 53
36
Pond
1
10-24-38

Myers D.
SR 18
Raymond D.
Gravel-pit
Raymond D.
SR 18

BFV-7-3
BFV-7-4
TIPPECANOE COUNTY
WHITE COUNTY
N

Gravel-pit
Walters D.
Burnetts Creek
SR 43
Pond
Burnetts Creek
Burnetts Creek