GUIDEBOOK
ASSOCIATION OF MISSOURI GEOLOGISTS
28TH ANNUAL FIELD TRIP
CAPE GIRARDEAU, MO
OCTOBER 3, 1981

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DEPARTMENT OF EARTH SCIENCES

SOUTHEAST MISSOURI STATE UNIVERSITY

CAPE GIRARDEAU, MISSOURI

Association of Missouri Geologists

Twenty-eighth Annual Meeting

Cape Girardeau, MO

October 2 & 3, 1981

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ROAD LOG

Louis Unfer, Jr.

Route from I-55

Mileage Difference	Cum.	
	0.0	Entrance to Holiday Inn. East on Hwy K.
0.15	0.15	Stoplight. Hwy K and Mt. Auburn Road.
0.15	0.3	Stoplight. Entrance to West Park Mall.
0.1	0.4	Second entrance to West Park Mall.
1.05	1.45	Stoplight. Hwy K and Kingshighway (Business 61) Turn right (S) on Kingshighway.
0.35	1.8	Stoplight. Kingshighway and Bloomfield Road.
1.25	3.05	Stoplight. Business 61 and Hwy 74. Mile 2.4 on the regular route.

Route from Sunny Hill Motel

Mileage Difference	Cum.	
	0.0	Leave Sunny Hill Motel. South on West End Blvd.
0.1	0.1	Stoplight. West End Blvd. and William St. (Hwy K)
0.2	0.3	Stoplight. West End Blvd. and Bloomfield Road.
1.1	1.4	Stoplight. West End Blvd. and Hwy 74. Turn right (E).
0.8	2.4	Stoplight. Hwy 74 and Business 61. Turn left (S). Divided Highway. Mile 3.05 on alternate route.
1.0	3.4	Turn left (SE) Cross northbound lane of traffic.
0.05	3.45	YIELD. Turn right south beyond yield sign.
0.15	3.6	Entrance to Southeast Missouri Stone Co.

Southeast Missouri Stone Co.

Lou Unfer & Fred Lasater

Plattin Formation

Hazelwood Member:
Limestone, relatively pure, gray to brown, lithographic to fine grained, thick-bedded. 36.3'

Establishment Member:
Shale, blue-green, laminated with interbeds of limestone, argillaceous, green-gray to buff. 3.8'

Brickeys Member:
Limestone, gray to purplish-brown, lithographic to fine-grained, with a few thin beds of green shale. 8.8'

Blomeyer Member:
Limestone, argillaceous, blue-gray to brown-gray. Weathers gray to buff and commonly thin-bedded. 8.0'

Pecatonica Formation

Oglesby Member:
Limestone, gray, fine-grained mottled with brown dolostone, cherty, thick-bedded. 11.0'

Medusa Member:
Limestone, dense, dark gray to buff, fine-grained, thick-bedded to massive, with some chert nodules (partly black). 14.8'

New Glarus Member:
Limestone, dense, fine-grained, dark gray to brown. 13.2'

Dane Member:
Limestone, dark gray to dark brown, fine-grained, thin to medium-bedded. Partly cherty, shale partings. 38.0'

Chana Member:
Limestone, dark gray to buff, fine-grained, thick-bedded, with shale partings in the lower part. 18.8'

Joachim Formation

Metz Member:
Limestone, argillaceous, silty, dark brown to gray, fine-grained, thin to medium-bedded. 19.4'

Matson Member:
Limestone, dark brown to gray, fine-grained, thick-bedded. 18.2'

Defiance Member:
Limestone, silty, dark gray to light gray, fine-grained, some mottling, thick-bedded. 43.7'

Boles Member:
Dolostone and limestone, dark gray to light gray, fine-grained, with shale partings, thin to medium-bedded. 26.7'

Augusta Member:
Dolostone and limestone, pure to silty, dark gray to light gray, fine-grained, thick-bedded, absorptive. 43.6'

Mileage Difference	Cum.	
0.0	3.6	Exit from Southeast Missouri Stone Co. quarry. Turn left. (S)
0.4	4.0	Stoplight. Turn left on Sprigg Street.
0.5	4.5	Plattin formation exposed on left side of road.
0.7	5.2	Natatorium on left side of road.
0.2	5.4	CAUTION: Plant area of Marquette Cement Manufacturing Co.
0.15	5.55	Entrance to quarry.
0.15	5.7	Turn right (E) to assembly area.

Marquette Cement Co. Quarry

Fred Aukeman and Bob Parkinson

Plattin Formation

Core Drill Hole No. 55-3

Depth From	(Feet) To	Description
0	104	Limestone, dove colored, cryptocrystalline to medium crystalline. Mottled or banded with darker limestone between 31' to 32', 47' to 48', 86' to 95', 100' to 102.
104	125	Limestone, alternating beds of dove colored and light gray cryptocrystalline stone.
125	135	Limestone, dark gray, cryptocrystalline.
135	160	Limestone, dove gray, banded, slightly crystalline, somewhat dolomitic.
160	165	Limestone, gray, mottled, slightly dolomitic.
165	177	Limestone, dove colored, mottled and banded with light gray limestone, slightly dolomitic.
177	220	Limestone, dove colored, crystalline. Banded with darker limestone between 202' to 203' and 216' to 220'.
220	223	Limestone, dark gray, cryptocrystalline, banded.
223	225	Limestone, light gray, cryptocrystalline.
225	228	Limestone, dark gray, cryptocrystalline, banded.
228	237	Limestone, dove colored.
237	238	Limestone, light buff.
238	241	Limestone, dove colored, lower part of unit banded, slightly dolomitic.
241	244	Limestone, dark gray, slightly dolomitic.
244	246	Limestone, light buff, slightly dolomitic.
246	257	Limestone, dove colored, banded zones, slightly dolomitic.
257	258	Limestone, light gray, banded, slightly dolomitic.
258	259	Limestone, dark gray, banded, slightly dolomitic.

Depth From	(Feet) To	Description
259	281	Limestone, alternating beds of light gray and dove colored stone, slightly crystalline, slightly dolomitic.
281	287	Limestone, dark gray, slightly dolomitic. Slightly broken at 281.
287	310	Limestone, alternating beds of light gray and dove colored stone, slightly crystalline, slightly dolomitic. Dark gray limestone between 306' and 307'.

Mileage Difference	Cum.	
0.15	5.85	Leave Marquette quarry. Turn right (S) on Sprigg Street.
1.6	7.45	Stop. Hwy 74.
0.05	7.5	Ramsey Branch
0.1	7.6	I-55 Overpass Former Valley of the Mississippi River to the left (S).
1.35	8.95	Arnold Quarry (abandoned) to the right (N) of Hwy 74. The Joachim formation is exposed in the quarry.
0.35	9.3	Ranney Creek
2.2	11.5	Geiser Quarry (abandoned) to the right (N) of Hwy 74. The Dutchtown formation if exposed in the quarry.
0.6	12.4	STOP. Junction Hwy 74 and Hwy 25. Turn left (S) on Hwy 25.
1.2	14.0	Bridge over Diversion Channel.
0.6	14.6	Junction Hwy 25 and Hwy 77. Turn right (W) on Hwy 25.
4.4	19.0	Delta City limits. CAUTION: 35 MPH.
0.3	19.3	CAUTION: Railroad crossing. Junction Hwy 25 and Hwy N east of RR tracks. Junction Hwy 25 and Hwy EE west of RR tracks. Continue ahead on Hwy 25.
0.6	19.9	Junction Hwy 25 and Hwy P. Quarry is at the east end of the ridge (north of Hwy 25). Turn left (S) on Hwy P.
0.6	20.5	CAUTION: Sharp bend.
3.0	23.5	Cross Railroad Tracks.
0.3	23.8	Randles.
0.3	24.1	Junction Hwy P and Hwy JJ. Continue ahead on Hwy P.
2.8	26.9	Perkins. Bird Hill (Paleozoic bedrock) to left (E).
1.2	28.1	Junction Hwy P and Hwy W. Continue ahead on Hwy P.
0.3	28.9	Cow Hill (Paleozoic bedrock) to the left (E).
0.1	29.0	Junction Hwy P and Hwy O. Continue ahead on Hwy P.
1.0	30.0	Drainage Ditch #33.
2.4	32.4	Junction Hwy P and Hwy 91. Continue ahead on Hwy 91.
0.7	33.1	Drainage Ditch #24.
0.6	33.7	Bell City city limits. CAUTION: 20 MPH.
0.1	33.8	Junction Hwy 91 and Hwy N. Turn left (S) on N.

Mileage Difference	Cum.	
4.3	38.1	STOP. Junction Hwy N and Hwy Y. Turn right (W) on Hwy Y.
0.5	38.6	Drainage Ditch #30.
2.4	41.0	CAUTION: Railroad Crossing.
0.1	41.1	Entrance to Lowe's Southern Clay, Inc. Plant and clay pit. Crowleys Ridge is beyond the plant.

Clay Pit

John W. Whitfield

Porters Creek Clay

Dark gray absorbent clay.

Faults in the clay have been covered and are not visible.

See page 22 "Lowe Industry Bloomfield Clay Plant."

Return to Hwy 91

Optional Trip to the Ardeola Hill section.

	0.0	Junction Hwy N and Hwy 91. Turn left (W) on Hwy 91.
0.5	0.5	Road bends right (N) and Crosses Railroad tracks. (Road to right goes to McNairy Sand Pit)
0.3	0.8	Junction Hwy 91 and Stoddard Co. Hwy 341. Turn left. (W) on Stoddard Co. Hwy 341, on Crowleys Ridge.
2.35	3.15	Junction Stoddard Co. Hwy 341 and Stoddard Co. Hwy 331. Turn left (S) on Stoddard Co. Hwy 331. Ardeola Hill Porters Creek clay at the top of the section.

Field Trip Leaders

Southeast Missouri Stone So. Quarry.

Lou Unfer, Dept. of Earth Sciences, Southeast Missouri State University.

Fred Lasater, Dept. of Highway and Transportation, District 10, Sikeston.

Marquette Cement Co. Quarry.

Fred Aukeman, Marquette Cement Manufacturing Co., Cape Girardeau.

Bob Parkinson, Dept. of Earth Sciences, Southeast Missouri State University.

Lowe Industry Clay Pit

John W. Whitfield, Missouri Geological and Land Survey, Rolla.

GEOLOGY OF THE CAPE GIRARDEAU AREA

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Southeast Missouri State University

Cape Girardeau is located near the boundary between the Ozark Highlands and the Mississippi Embayment Provinces.

Bedrock of the Ozark Highlands has a range in age from Middle Ordovician (Everton Formation at Dutchtown) to Devonian (Bailey Formation at Cape Girardeau). Exposed bedrock of the Embayment has a range in age from Cretaceous to Pliocene.

Paleozoic Rocks

Ordovician System

Champlainian Series

Everton Formation:

The Everton Formation is the basal unit of the Champlainian Series. It rests unconformably upon rocks of the Canadian Series. The Everton Formation is mainly a sandy dolostone, but it does contain beds of sandstone, chert, and limestone. The dolostone is light and dark gray. The sand grains are rounded and frosted. The sandstone of the Everton Formation is not easily distinguished from the St. Peter Sandstone.

St. Peter Formation:

The St. Peter Formation is a well sorted, quartzose sandstone having fine to medium sized, rounded, and frosted grains. Fresh surfaces are white and friable, but weathered surfaces are case hardened. Crossbedding and ripple marks are present in the formation. It is porous and permeable in most localities and is an aquifer. The thickness is variable--10 to 100 plus feet.

Dutchtown Formation:

The Dutchtown Formation is dominantly medium to thinly bedded limestone and dolostone. Its color is dark blue, gray, or black. It has a petroliferous odor when struck by a hammer. The Dutchtown Formation is thick at Cape Girardeau but thins rapidly northward, pinching out between Perryville and Brewer. It is exposed in the Geiser Quarry along Highway 74, between Dutchtown and Cape Girardeau.

Joachim Formation:

The Joachim Formation is predominantly an argillaceous dolostone that is yellowish-brown. Mudcracks are found on the surface of the dolostone in the abandoned Arnold Quarry west of Cape Girardeau along Highway 74.

Pecatonica Formation:

The Pecatonica Formation includes beds that were formerly called the Rock Levee Formation at the Southeast Missouri Stone Company Quarry along Highway 74 at the south end of Cape. It is predominantly limestone.

Plattin Formation:

The Plattin Formation is the unit quarried by the Marquette Cement Company at Cape Girardeau. It is a dark gray, finely to microcrystalline limestone. A green shale (Establishment Shale) occurs near the base of the formation. It is approximately 450 feet thick at Cape Girardeau.

Decorah Formation:

The Decorah Formation is made up mainly of green and brown shales with interbedded limestones. It is not well exposed at Cape Girardeau.

Kimmswick Formation:

The Kimmswick Formation is a white to light gray, coarsely crystalline limestone. It has a pitted weathered surface and crossbedding can be seen in the weathered outcrops near the foot of the Cape Bridge. "Receptaculites oweni" can be seen in the Main Street exposures.

Cincinnatian Series

Cape Formation:

The Cape Formation is a gray, coarsely crystalline, argillaceous, fossiliferous limestone. The Cape Formation was formerly called the Fernvale Formation.

Maquoketa Formation:

The Maquoketa Formation is a green and brown, thinly laminated shale with local nodules of limestone.

Thebes Formation:

The Thebes Formation is a gray to bluish gray, fine grained sandstone that weathers to yellowish-brown.

Girardeau Formation:

The Girardeau Formation is a dark to medium gray, microcrystalline limestone. Black and brown chert occurs in nodules. The Girardeau Formation is exposed at Cape Rock.

Ernie DuBoise has suggested that the Maquoketa, Thebes, and Girardeau Formations are facies.

Silurian System

Alexandrian Series

Sexton Creek Formation:

The Secton Creek Formation is an olive gray, finely to medium crystalline limestone interbedded with chert. The Secton Creek Formation is exposed at Cape Rock above the Girardeau Formation. They are not separated by a distinctive erosion surface.

Niagaran Series

Bainbridge Formation:

The Bainbridge Formation is typically a dark red, argillaceous limestone, but may be green, purple, or yellow. Locally it appears to be a calcareous shale.

Devonian System

Bailey Formation:

The Bailey Formation in the Cape Girardeau area, where exposed, is a tan limestone, interbedded with chert. The chert appears to be dominant, since it is resistant to chemical weathering.

Mesozoic Rocks

Cretaceous System

McNairy Formation:

The McNairy Formation has been subdivided into the lower Commerce Member and the upper Ardeola Member. The Commerce member consists of light gray, thinly bedded clay with interbedded orange, fine to medium grained sand. The upper part of the Commerce Member is light yellow to orange, medium to coarse grained, subangular sand. The Ardeola Member has a clayey sand at its base with fine, white, very clean, angular sand above it. Above this sand is a light gray to black sandy, lignitic clay. About one foot of low grade lignite occurs near Bell City. Next is a white, angular sand with interbedded clay. The sand has prominant crossbedding. The uppermost unit of the Ardeola Member is a brown, lignitic, micaceous, sandy clay with abundant leaf prints.

Owl Creek Formation:

The Owl Creek Formation is a sandy, micaceous, glauconitic, fossiliferous clay.

Cenozoic Rocks

Tertiary System

Paleocene Series

Midway Group

Clayton Formation:

The Clayton Formation is a fossiliferous, calcareous, glauconitic sand and clay.

Porters Creek Formation:

The Porters Creek Formation is a dark gray clay. It is mined in the Ardeola area.

Eocene Series

Wilcox Group

Ackerman Formation:

The Ackerman Formation is a light gray to brown, silty clay. It is slightly lignitic.

Holly Springs Formation:

The Holly Springs Formation is a white, fine-to coarse-grained sandstone with clay and gravel. It is crossbedded. On a weathered surface the color is orange to dark red. The clay is multicolored. Highly polished, black gravel occurs at the base of the formation.

Pliocene Series

"Lafayette" Formation:

The "Lafayette" Formation is gravel composed of polished, and rounded pebbles of chert with some quartz pebbles. Sand and clay also occur in the formation.

Structure

The Cape Girardeau area is on the eastern flank of the Ozark Dome, near its boundary with the Illinois Basin.

Brooks Dome is a small local structure to the northeast of Cape Girardeau. The Kimmswick Formation is exposed at the center of Brooks Dome. The Dome has been drilled for oil but none has been discovered.

Cape Girardeau is near the junction of three major fault zones that have produced seismic activity in the area. (1) The New Madrid Fault Zone extends to the southwest, along the Mississippi River and has produced the major activity. (2) The Ste. Genevieve Fault Zone extends to the northwest and has had occasional activity. (3) The Southern Illinois Zone extends to the northeast, through the St. Lawrence Valley. The November 1968 earthquake was located between Marion and Harrisburg, in this zone. Many minor faults are in the Cape area. The Jackson Fault extends from the Mississippi River through Jackson.

Economic Geology

Nonmetallic mineral resources are present in the Cape Girardeau area. Limestones of the area are quarried.

Southeast Missouri Stone Company is quarrying the limestones of the Pecatonica Formation. The main product of this Company is crushed stone.

Marquette Cement Company is quarrying the limestone of the Plattin Formation. This limestone is used in the manufacture of cement.

Clays of Southeast Missouri are also used.

Clay deposits at Jackson are used for the manufacture of pottery and for brick.

Clay deposits near Ardeoloa are used by Lowes, Inc. The Porters Creek clay is an absorbent clay and is often referred to as the "kitty-litter" clay.

Sand and gravel of Pliocene and Pleistocene age are locally used for road material.

ON THE ORIGIN OF THEBES GAP

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ABSTRACT

Thebes Gap, located five miles south of Cape Girardeau, Missouri, is a segment of the Mississippi River valley which has no floodplain. The courses of the Mississippi River, the Ohio River, and a north flowing stream which once existed at the present site of Thebes Gap have all experienced drastic changes in the recent geologic past. A recent major change involving all three streams was the diversion of flow of the Mississippi River across a seven mile segment of the Benton Hills. It is hypothesized that a combination of drainage basin piracy and climatically controlled river alluviation led to the creation of Thebes Gap.

INTRODUCTION

Thebes Gap is the term applied to that segment of the Mississippi River between Gale, Illinois and Commerce, Missouri. In this 6.7 mile segment, the river has no floodplain and essentially flows over bedrock. These factors, along with the increased gradient, the rapids, and the intense mass wasting of the valley walls, testify to the extreme geologic youth of this feature.

PREVIOUS INVESTIGATIONS

C. F. Marbut, in 1902, described the evolution of the northern part of the southeast Missouri lowlands. He attributed the drainage changes to stream piracy guided by differences in erosion resistance between the Mississippi north of the Benton Hills and the Ohio, which flows on less resistant strata.

D. R. Stewart (1942) did a great deal of general field work in an area which included the Benton Hills. He did some detailed work in the immediate vicinity of Commerce, includding a large number of shallow cores. This work includes evidence for relatively recent deformation in the Commerce area, the Benton Hills, and the Bloomfield hills.

N. H. Fisk, in 1944, published his monumental, classic work on the alluvial valley of the lower Mississippi River. He included a hypothesized chronology for the drainage evolution of the study region, relating the most dominate changes to glacioeustatic control of base level.

P. E. Potter, in 1955 in a pair of papers discussed the origin of the Lafayette gravels. He interpreted these high, enigmatic deposits as locally derived, preglacial alluvial fan deposits, spread by high velocity streams.

Geologists and geophysicists of the United States Geological Survey, the Missouri Geological Survey, and the Illinois Geological Survey, and other agencies, have conducted recent investigations which include the study area. None of these deal directly with the origin of Thebes Gap, and these research efforts only indirectly involve Thebes Gap. Most of the reports of these activities can be found through a relatively complete bibliography at the end of this report.

GEOMORPHIC FACTORS A VALID HYPOTHESIS MUST ADDRESS

A hypothesis, to be valid, must take into consideration several regional and local geomorphic phenomena which are almost certain to be closely related to the evolution of Thebes Gap. Some of these follow:

1. Evidence suggests the former existence of a north flowing stream system whose main channel occupied the position of the present Thebes Gap. Fisk (1944) pointed out that tributary streams flowing into the Mississippi River within Thebes Gap join the Mississippi with acute angles pointing northward, suggesting a drainage reversal has taken place in times too recent for the tributaries to have made adjustments. The projected elevations of the former junctions decrease northward, as would be expected if the trunk stream then flowed northward.

2. Evidence suggests that the former drainage basin of the ancestral north flowing stream system extended considerably further south of the present southern margin of the Benton Hills. Fisk (1944) attributed this to basin piracy of the ancestral Ohio River. The present drainage divide lies very close to the south edge of the Benton Hills.

3. Evidence suggests the existence of a former east-west trending channel which flowed through the present location of the Scott City railroad yard and the main street of Scott City. The geomorphic history of this feature awaits further research.

4. The drainage evolution of the Thebes Gap cannot be isolated from the evolution of the other Mississippi River former drainage courses. The evolution of changes involving the Ohio and Tennessee Rivers should also be taken into account.

GEOMORPHIC HISTORY OF THEBES GAP - A WORKING HYPOTHESIS

At the present state of research, the following generalized sequence of events is suggested:

Phase One. Pre-diversion. Possible late Wisconsin.

During latest Wisconsin-earliest Holocene time stream discharges were high due to galcial meltwater. The gradients of the major rivers were steep, due to low sea level. Major rivers were cutting deeply into their former deposits, and into bedrock, eroding deep valleys.

1. The Mississippi River was flowing west-southwest through the present site of the Cape Girardeau municipal airport through the Drum Lowland.

2. The Ohio River was flowing west-southwest through the Cache Valley, eroding away the southern portion of the Benton Hills, including the headwaters of the north flowing stream which occupied the present site of the Thebes Gap.

3. An ancient stream was flowing southwest through that part of the present Ohio River valley from near Metropolis past Cairo, then southward.

4. The Tennessee River was flowing northeast and then north past Paducah, where it joined the Ohio River near Golconda at the east end of Cache Valley.

Phase Two. Beginnings of Diversion. Early to Mid Holocene.

The climatic changes which controlled the glacial-interglacial stages were swinging once again toward increasing aridity. As meltwater discharges decreased, valley cutting decreased, gradients became less steep as sea level rose, and valley alluviation began, largely from fans built outward from tributary streams. Sediment availability became increasingly controlled by the decreasing vegetation cover, and less so by reworking glacial deposits.

1. Mississippi River drainage was increasingly diverted through the Bell City-Oran Gap.

2. The Ohio River was diverted south of Cache Valley into its present course past Paducah and Cairo.

3. High water overflow began through the beheaded basin at the south end of the present Thebes Gap. This backwater overflow gradually increased with succeeding floods.

4. An east-west channel formed, flowing past Illmo and Scott City. This channel could have evolved from an original tributary of the north flowing Thebes Creek. The direction of this flow appears to have been mostly toward the east-northeast, but could have been partially west-southwest in the western half.

Phase Three. Full Diversion. Late Holocene.

Glacial meltwater was no longer a factor in discharge. Sea level continued to rise. Gradients of major streams continued to decrease. Sediment availability was largely controlled by harsh mechanical weathering allowed by the more sparse vegetative cover. This sediment was introduced into the Mississippi intrenched valley largely as alluvial fan deposits. The river reworked and spread this material, building itself higher and higher, until backwater from floods began to overflow the beheaded divide of the ancestral south-flowing Thebes Creek basin.

1. The Mississippi River was diverted through Thebes Gap by overflowing the lowered divide during flood times. As this flow increased, the flow through the Bell City-Oran Gap decreased.

2. The Mississippi-Ohio junction changed from far south of Cairo to near Cairo.

3. Only relatively minor drainage changes have occurred since the Thebes Gap diversion.

OTHER FACTORS WHICH MAY HAVE CONTRIBUTED

Factors other than those described above may have contributed to the evolution of Thebes Gap. Some of these follow:

1. Rising sea level during late Wisconsin-early Holocene time as a result of glacial meltwater pouring into the world ocean. Fisk (1944) believed this to be the primary control of deposition as far upstream as the middle Mississippi Valley. Other workers feel this factor has influenced deposition only within a short distance of the coastline.

2. Regional epeirogenic uplift since Tertiary time. Several investigators, including Potter (1955), believe this to be the major control of stream regimens in the upper Mississippi-Ohio alluvial valley.

3. Regional and/or local deformation by folding and faulting. Several field studies have strongly suggested geologically recent folding and faulting in the area. Stewart (1942) and some more recent investigators have suggested the possibility of post-Lafayette or even post-loess faulting.

4. Varying efficiency of weathering processes due to climate oscillations. Total availability of sediment may be greater as a result of alternating Holocene arid-humid cycles than by more static arid or humid climates.

FURTHER RESEARCH

Many of the hypotheses outlined above need to be thoroughly tested by detailed field investigations. The origin of Thebes Gap is but one event in the larger, overall evolution of the geomorphology of this part of the world. Much work remains.

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Lowe Industry Bloomfield Clay Plant

John W. Whitfield

The Lowe Industry Bloomfield clay plant is in sec. 28, T. 27 N., R. 11 E., Stoddard County, Missouri, three miles northeast of the town of Aquilla (Figure 2). Physiographically, it is on the eastern edge of Crowleys Ridge where the Castor River flows onto the alluvial plain. In this area, there is approximately 200 feet of relief between the alluvial plain and higher elevations on the Ridge. Loess mantles the Ridge covering Tertiary gravels which are exposed only where streams have cut headward at higher elevations.

There have been mining operations at this site for the past three years; however, it was only during the past year that large quantities of clay were removed.

The Porters Creek Clay, a dark gray, highly absorbent clay, is mined for use in the production of "Kitty Litter" and pesticide carrier. The stratigraphy of the area is illustrated in Figure 1.

There is at least one significant normal fault in the quarry, trending N 65°W, down faulted to the northeast with approximately 16 feet of displacement. Fault movement occurred sometime after deposition of the Porters Creek Clay but antedated deposition of the overlying Pleistocene colluvial silt and gravel unit. As illustrated in Figure 2, the main fault comprises two closely spaced parallel faults dipping 65° northeast. It is noteworthy that the angle of dip diminishes toward the upper boundary of the Porters Creek. A minor antithetic fault, with 12 inches of displacement, dips into the main fault. There is no evidence of strike-slip movement along the fault. No displacement was observed in the overlying materials.

The investigation of Lowes Quarry has afforded an excellent opportunity to view Tertiary age faulting, but the question arises what affect does the fault have on the underlying Cretaceous and Paleozoic age rocks.

To answer this question, the Missouri Geology and Land Survey is having 3 investigation borings drilled at the quarry.

Two borings will be located on the downthrown side of the fault and the third will be on the opposite side of the fault.

One hole has been completed to a depth of 455 feet. The hole penetrated 266 feet of Cretaceous sand and clay (McNairy and Owl Creek) before encountering limestone. From 266 feet to 455 feet, bedrock consists of limestone, dolomite and sandy dolomite. In places, bedrock was severely brecciated but had rejoined with secondary calcite.

The stratigraphic sequence has not yet been identified but bedrock has been tentatively placed in Ordovician age Rock Levee-Joachim Formations.

Ron Ward, formerly a geologist with the Missouri Geology and Land Survey was the Principal Investigator on this project until he left for other employment. Ron did the surface geology, fault description, and proposed the drilling investigation.

cont.

Funding for this investigation has been furnished by the U.S. Nuclear Regulatory Commission.

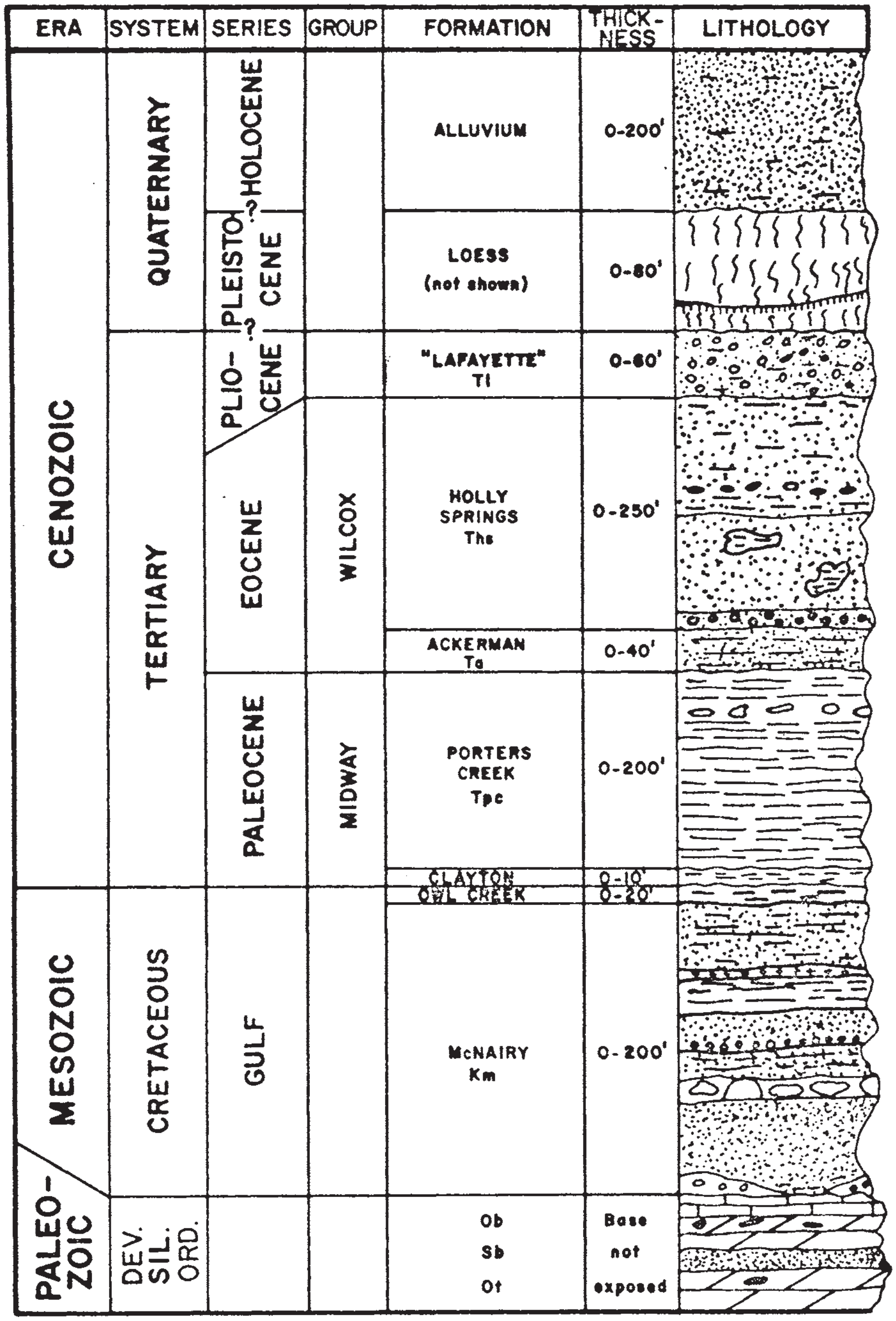


Figure 1

A detailed stratigraphic section of the units exposed in the prominent ridges of Missouri's Bootheel, with emphasis on the Gulf (Cretaceous), Paleocene, Eocene, and Pliocene (Tertiary) Series.

Cross Section of Fault - Lowe Industry - Bloomfield Clay Plant

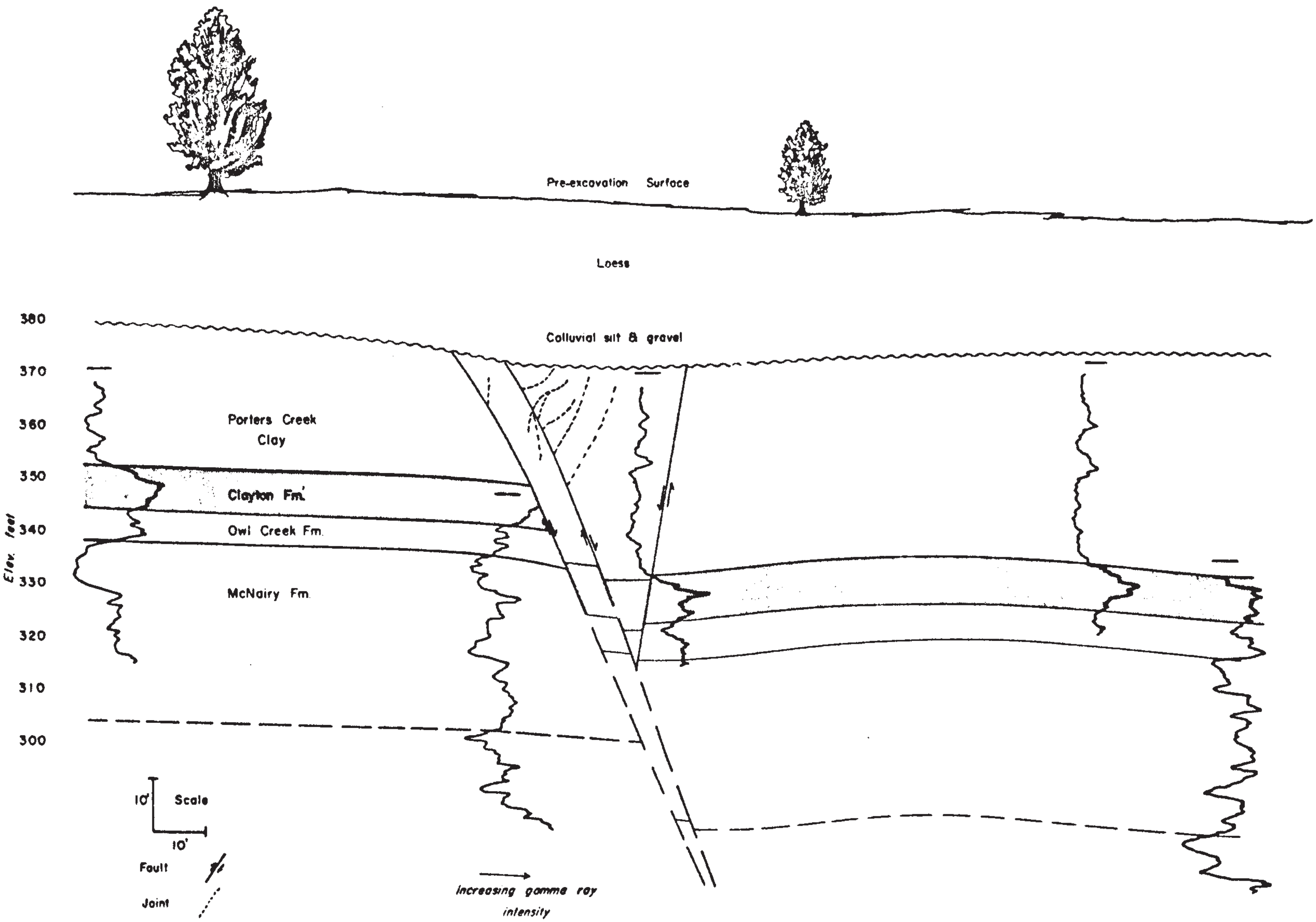
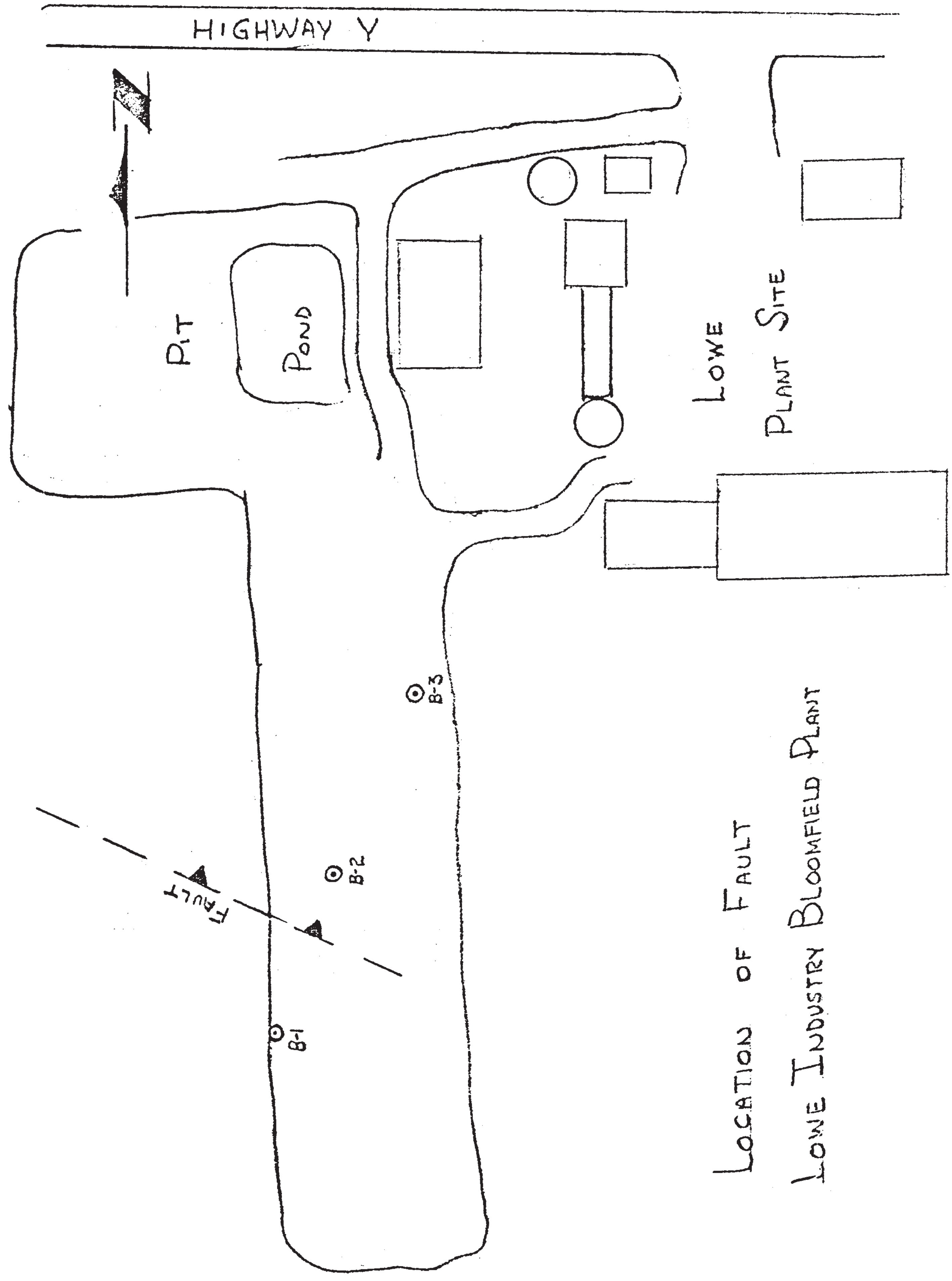


Figure 2

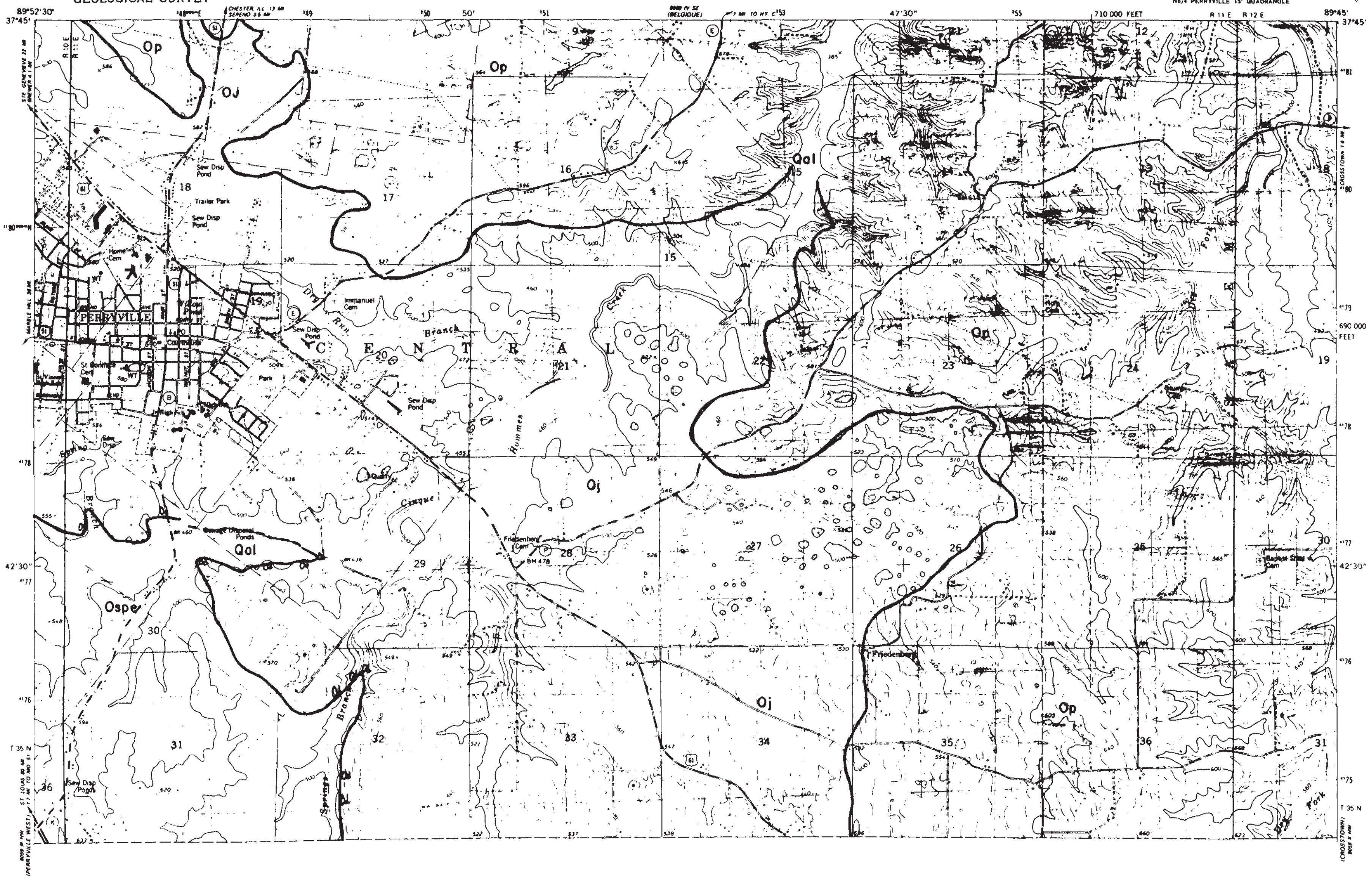


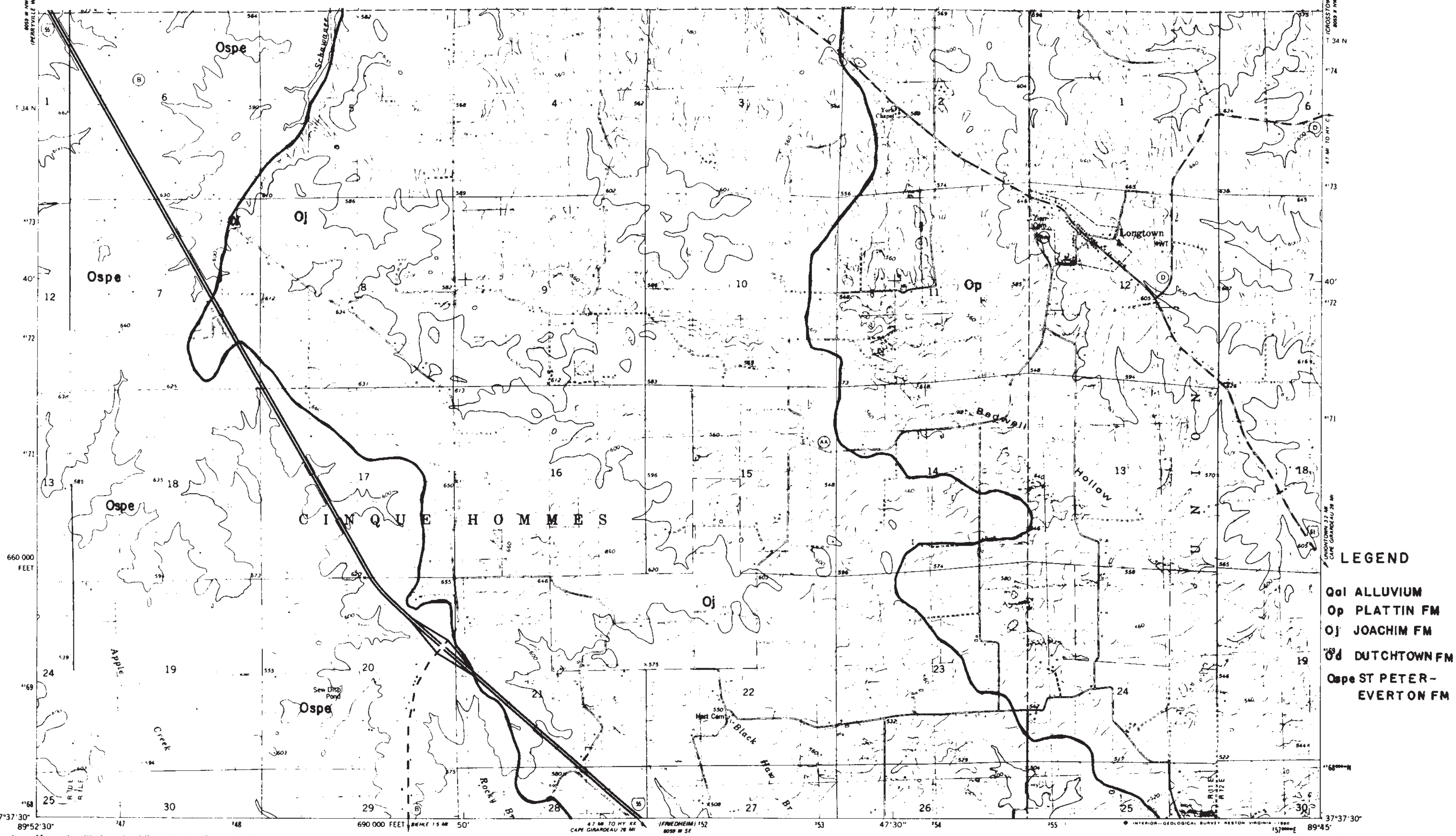
LOCATION OF FAULT
LOWE INDUSTRY BLOOMFIELD PLANT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOLOGIC MAP

PERRYVILLE EAST QUADRANGLE
MISSOURI–PERRY CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
NE/4 PERRYVILLE 15' QUADRANGLE





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Projection and 10,000-foot grid ticks: Missouri coordinate system, east zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid, zone 16
1927 North American Datum
To place on the predicted North American Datum 1983 move the projection lines 3 meters south and 8 meters east as shown by dashed corner ticks

Red tint indicates area in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Field Assts: Don Taylor, Clark Nievendorp, Renato Bizzio, Margaret Scott, Jim Palmer, Bill Wright
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MISSOURI DEPARTMENT OF NATURAL RESOURCES, ROLLA, MISSOURI 65401
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

PERRYVILLE EAST, MO.
NE/4 PERRYVILLE 15' QUADRANGLE
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1980
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LOUIS UNFER, JR 1980