

Research Report  
KTC-89-17

EARTHQUAKE HAZARD MITIGATION OF  
TRANSPORTATION FACILITIES  
FOR HOPKINS COUNTY

by

Bobby W. Meade  
Research Investigator

David L. Allen  
Chief Research Engineer

and

Vincent P. Drnevich  
Professor of Civil Engineering

Kentucky Transportation Center  
College of Engineering  
University of Kentucky  
Lexington, Kentucky

in cooperation with  
Transportation Cabinet  
Commonwealth of Kentucky

and

Federal Highway Administration  
U.S. Department of Transportation

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the University of Kentucky, the Kentucky Transportation Cabinet, nor the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. The inclusion of manufacturer names and tradenames are for identification purposes and are not to be considered as endorsements.

June 1989

Technical Report Documentation Page

1. Report No. KTC-89-1723		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle  Earthquake Hazard Mitigation of Transportation Facilities for Hopkins County			5. Report Date June 1989		
			6. Performing Organization Code		
7. Author(s) B. W. Meade, David L. Allen, Vince P. Drnevich			8. Performing Organization Report No.6 KTC-89-17		
9. Performing Organization Name and Address  Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0043			10. Work Unit No. (TR AIS)		
			11. Contract or Grant No. KYHPR-87-116		
12. Sponsoring Agency Name and Address Kentucky Transportation Cabinet State Office Building Frankfort, KY 40622			13. Type of Report and Period Covered		
			14. Sponsoring Agency Code		
15. Supplementary Notes Publication of this report was sponsored by the Kentucky Transportation Cabinet with the U.S. Department of Transportation, Federal Highway Administration					
16. Abstract Concern has grown in recent years over the seismic activity of the New Madrid seismic zone in Western Kentucky. Hopkins County, Kentucky is located in this region. To permit emergency medical, supply, and equipment traffic into this area after an earthquake has occurred, the Kentucky Transportation Cabinet is interested in the possibility of keeping selected routes passable. This report lists the routes that have been investigated and recommended as being the routes in Hopkins County that should be maintained in a passable condition. The recommended routes, US 41, US 41A, US 62, KY 109, and KY 1751 have been visually surveyed and all seismically significant features cataloged. These features are logged by their location on strip maps contained in Appendix A and a detailed listing of all the potentially critical features is given in Appendix B.					
17. Key Words Earthquake Earthquake Mitigation Alluvium Seismic Analyses Modified Mercalli Scale			18. Distribution Statement		
19. Security Classif. (of this report)  Unclassified		20. Security Classif. (of this page)  Unclassified		21. No. of Pages  45	22. Price

## INTRODUCTION

An awareness of earthquakes and their possible effects upon the nation's infrastructure is critically important to the public, and in particular, to public officials. The nation's highway system is one of the most important components of the infrastructure. After the occurrence of an earthquake, the highway system is the primary mode of transporting emergency supplies and services into an affected area. Thus, it is important to catalog the important components of the highway system and attempt to anticipate the possible damage to these components from an earthquake.

Western Kentucky in general and Hopkins County in particular are in a high risk earthquake zone. In 1811-1812, three of the most severe earthquakes in American history shook the country. The location of these quakes was not on the infamous San Andreas fault nor anywhere along the well-known fault laden Pacific coast but was near a small town on the Mississippi River where the states of Kentucky and Missouri share a border (Figure 1). It is this river town, New Madrid, Missouri, that is the namesake of a region now regarded by seismologists and disaster response planners as the most hazardous earthquake zone east of the Rocky Mountains -- the New Madrid seismic zone.

In addition to these three great earthquakes, there are several other well documented factors demonstrating the susceptibility of the New Madrid region to the recurrence of major earthquakes. Through a decade of extensive research, an ancient crustal rift has been found to underlie the relatively shallow sediments comprising the region's surface. This

type of geologic structure is prone to seismic activity. The New Madrid rift has been identified as being of sufficient size to generate major earthquakes. Further evidence of the area's seismicity is the record of over 2,000 earthquakes detected in the zone since 1974. Though most have been of a magnitude below the threshold of human perception, their existence clearly indicates the high level of seismic activity occurring in the zone.

Seismologists have calculated the probabilities of recurrence of sizeable earthquakes in the New Madrid rift zone. The probability of a magnitude 6.3 earthquake (Richter scale) within 50 years is from 86 to 97 percent. The probability (1) of that same earthquake occurring within the next 15 years is from 40 to 63 percent. For comparison, the 1971 San Fernando earthquake (magnitude 6.6) killed 58 people and caused \$480 million worth of damage. The 1988 Armenian earthquake of similar magnitude killed approximately 25,000 to 30,000 people.

The probability of a magnitude 7.6 earthquake occurring within 50 years is from 19 to 29 percent. The probability for this size earthquake occurring within 15 years drops to a range of 5.4 to 8.7 percent. On February 4, 1975, the Haicheng earthquake in China had a magnitude of 7.3 and destroyed or damaged about 90 percent of the structures in a city of 90,000 people.

When comparing historical earthquakes of similar magnitude, one must take into consideration that death totals and damage estimates will vary greatly due to the geology, population density, types of building, and quality of construction.

For a given earthquake, effects at a given location are described by the Modified Mercalli Intensity (MMI) scale (2) which ranges from I (no damage and felt only by instruments) to XII (total destruction). Details of the MMI scale are given in Table 1. Values of MMI associated with the 1811-1812 earthquakes are shown in Figure 1. The potential for damage and destruction from earthquakes in the region is significant.

In 1982, the Governor's Task Force on Earthquake Hazards and Safety was created to evaluate Kentucky's earthquake risk and to make recommendations for responding to those risks. This task force recommended increased public awareness and education programs, improved emergency response planning and training, improved building codes and seismic restraint designs, evaluation of other mitigation measures, and participation in national and regional earthquake forums and funding programs.

In 1984, Governor Collins created the Governor's Earthquake Hazards and Safety Technical Advisory Panel (GEHSTAP) to analyze scientific and engineering data regarding seismic risks in Kentucky and to make specific recommendations on mitigation, public awareness, response planning, and policy development for public health and safety. The States are dependent on their highway systems for the movement of goods and services. Due to the possible adverse effects a major earthquake could have on this system, the Earthquake Stability and Transportation Subcommittee (ESTS) of GEHSTAP was formed.

ESTS has encouraged the Kentucky Transportation Cabinet to secure

funding for generating and implementing an earthquake hazard mitigation plan in an attempt to safeguard the highway system against catastrophic earthquake failure. As a result, the Cabinet commissioned the Kentucky Transportation Center at the University of Kentucky to analyze and assess the possible effects of an earthquake on highway facilities. The study area includes the 26 westernmost counties in Kentucky that are adjacent to the New Madrid seismic zone (Figure 1). To date, one of the results of that study has been the recommendation that over 1,000 miles of highways in the study area be utilized as emergency or "priority" routes. These would be the primary routes used for transporting emergency supplies and personnel after an earthquake. Also, it is anticipated that these would be the first routes repaired after an earthquake.

The initial task in identifying these priority routes was to decide where they should begin; that is, in the event of a major earthquake, the point at which the transport of goods and services would originate. Ideally, the city chosen should possess the following attributes:

1. Sufficient size to contain all necessary personnel, supplies, and facilities to respond quickly to a major emergency;
2. Proximity to the high hazard area to speed the relief effort but not so close as to suffer the same high risk potential;
3. Easy access from other major cities in the State; and
4. Sufficient routes to provide relatively direct access to all 26

high-risk counties.

The city best fitting these criteria is Bowling Green. Located at the eastern edge of the earthquake zone in Warren County, Bowling Green meets both the size criterion (population 40,450) and the accessibility criterion (Louisville and Nashville via I 65 and Lexington via the Bluegrass Parkway). Bowling Green provides access to the 26-county area via US 68/KY 80; this road was chosen as the main east-west artery because it crosses Lake Barkley and Kentucky Lake upstream from the dams impounding those bodies of water.

As a first step towards establishing an overall policy for earthquake hazard mitigation in the highway system, these priority routes have been visually surveyed and all natural and man-made features along these routes that are considered seismically significant were cataloged. With this information, a realistic and cost-effective plan for "hardening" these routes against earthquakes can be established. Such efforts are currently under way.

#### **PRIORITY ROUTES IN HOPKINS COUNTY**

Hopkins County is located approximately 100 miles northeast of the center of the New Madrid Seismic Zone. Figure 1 indicates that Hopkins County is in the IX band of the MMI scale. This indicates considerable damage could occur in Hopkins County in the event of a major earthquake.

US 41, US 41A, US 62, KY 109, and KY 1751 have been designated as the priority routes in Hopkins County. There are two basic routes in the county with KY 109 and US 62

comprising the western route and US 41, US 41A, and KY 1751 comprising the eastern route.

The western route begins with US 62 at the Caldwell County - Hopkins County line and travels east 1.65 miles to the KY 109 junction. The route then continues north with KY 109 18.30 miles to the Webster County line.

The eastern route begins with US 41 at the Christian County - Hopkins County line and continues 1.67 miles to the US 41A junction. The route follows US 41A 16.10 miles to a junction with KY 1751 in Madisonville. KY 1751 continues 1.70 miles to a junction where US 41 resumes as the priority route and continues 8.40 miles to the Webster County line.

A number of features along these priority routes could potentially hamper rescue and relief efforts. These features included bridges, soil fills, cut slopes, gas pipelines, power lines, water towers, geologic faults, large trees, mines, water impoundments, and swamps. These features are logged by their location on strip maps contained in Appendix A and a detailed listing of all potentially critical features is given in Appendix B.

#### **BRIDGES**

Bridges are the most significant and important features on the priority route. With few exceptions, existing highway bridges in the study area have not been designed to resist motions and forces that may be generated by earthquakes. Bridges located within the seismic zone could possibly be damaged, thus reducing

their load-carrying ability. In some cases, damage could be sufficiently great to cause complete collapse. Several types of damage could occur:

1. A bridge could fail at the bearing which supports the main spans, causing the spans to fall from the bearings and possibly from the piers or abutments.
2. Failure could occur in the columns, piers, or footings which would reduce the load-carrying capacity of the bridge, if the bridge was still in place.
3. An abutment could tilt allowing the entire span to fall.
4. Soil movement or slumping could affect the bridge approach fills, damaging the abutments or piers, or making the bridge inaccessible.

There are two bridges on US 62, six on KY 109, ten on US 41A, one on KY 1751 and one on US 41. The bridges are located at:

**US 62**

1. Drainage ditch, and
2. Gany Creek.

**KY 109**

1. Western Kentucky Parkway,
2. Illinois Central Gulf Railroad,
3. Illinois Central Gulf Railroad,
4. Lick Creek,
5. Clear Creek, and

6. Weirs Creek.

**US 41A**

1. Louisville and Nashville Railroad,
2. Crab Orchard Creek,
3. Pleasant Run Creek,
4. Western Kentucky Parkway,
5. Louisville and Nashville Railroad,
6. Louisville and Nashville Railroad,
7. Hunting Branch,
8. Illinois Central Gulf Railroad,
9. Louisville and Nashville Railroad, and
10. Louisville and Nashville Railroad.

**KY 1751**

1. Louisville and Nashville Railroad.

**US 41**

1. Otter Creek.

Current research is studying the effects that an earthquake could have on these bridges and their approach fills.

**FILLS**

Highway fills are particularly important because of their tendency to fail from seismically induced motions. Fills fail in one of two major modes. The first is a generalized

circular or wedge-shaped failure resulting in one or both traffic lanes moving down and out. If both lanes failed, this would certainly render the route impassable and immediate repairs would be necessary. The second mode of failure is a general slumping or settling of the embankment. The roadway would probably remain passable if settlement or slumping were not severe but reduced speed limits would be required for safety.

Large fills on the priority routes Hopkins County are located as follows:

**US 62**

1. Approach fills for the drainage ditch bridge, and
2. Approach fills for the Cany Creek bridge.

**KY 109**

1. Approach fills for the Western Kentucky Parkway bridge,
2. Approach fills for the Illinois Central Gulf Railroad bridge,
3. Approach fills for the Illinois Central Gulf bridge,
4. Approach fills for the Lick Creek bridge,
5. Approach fills for the Clear Creek bridge, and
6. Approach fills for the Weirs Creek bridge.

**US 41A**

1. Approach fills for the Louisville and Nashville Railroad.

2. Approach fills for the Crab Orchard Creek bridge,
3. Approach fills for the Pleasant Run Creek bridge,
4. Approach fills for the Western Kentucky Parkway bridges,
5. Approach fills for the Louisville and Nashville Railroad bridge,
6. Approach fills for the Louisville and Nashville bridge,
7. 0.30 mile north of KY 112 junction,
8. Approach fills for the Hunting Branch bridge,
9. Approach fills for the Illinois Central Gulf Railroad bridge,
10. Approach fills for the Louisville and Nashville Railroad bridge, and
11. Approach fills for the Louisville and Nashville Railroad bridge.

**KY 1751**

1. Approach fills for the Louisville and Nashville Railroad bridge.

**US 41**

1. Approach fills for the Otter Creek bridge.

**CUT SLOPE**

Two cut slopes were cataloged during surveys of the priority routes in Hopkins County. Should a cut slope fail, both lanes of the roadway could be closed. Cut slopes that have a history of failure and those that have

steep slopes should be considered as problem areas. The cut slopes are located at:

**KY 109**

- 1. 0.19 mile south of the Weirs Creek bridge on KY 109.

**US 41**

- 1. 2.20 miles south of the Hopkins County - Webster County line.

**GAS PIPELINES**

Gas pipelines under or near a priority route could fail in the event of an earthquake. If a pipeline failed, an explosion might destroy a section of the priority route. Repair could be delayed by further gas leaks, fire, and/or additional explosions.

It appears that most of the pipelines in Hopkins County were constructed with little or no seismic considerations. Gas pipelines near priority routes are located at:

**KY 109**

- 1. 0.50 mile south of the Hopkins County - Webster County line.

**US 41**

- 1. 2.20 miles south of the Hopkins County - Webster County line.

**POWER LINES**

High voltage power lines also were cataloged during the route surveys. The height of the lines above the roadway were estimated visually. Power company officials speculated that a number of breaks along each power line would occur during a major earthquake. In most cases, fallen lines

would not be transmitting power because power would be automatically cut off within a few seconds in the event of a break.

In addition to the potential problem of live power lines, power line support towers could fall across and block a priority route. Power lines cross the priority routes at the following locations:

**KY 109**

- 1. 1.09 mile north of the Western Kentucky Parkway bridge,
- 2. 0.66 mile south of the Lick Creek bridge, and
- 3. 0.70 mile south of the Hopkins County - Webster County line.

**US 41A**

- 1. 0.58 mile north of the Pleasant Run bridge, and
- 2. 1.35 mile south of the Hunting Branch bridge.

**US 41**

- 1. 1.67 mile north of the Otter Creek bridge, and
- 2. 0.45 mile north of the KY 3233 junction.

**GEOLOGIC FAULTS**

There are numerous geologic faults (breaks in the bedrock where movement has occurred in the past) in the study area. The faults are seismically significant since a large earthquake could trigger additional movement along one or more old slip planes. There are no precautionary measures that can be taken to reduce



hazards from faults except that construction of bridges and other facilities over or near such faults requires special consideration. The faults are included for informational purposes only. Faults which cross under priority routes in Hopkins County are listed below:

#### **KY 109**

1. In the city of Dawson Springs,
2. 0.17 mile north of the US 62 (east) junction,
3. 0.28 mile south and 0.23, 0.40, and 0.85 mile north of the Illinois Central Gulf Railroad bridge,
4. 0.59, 0.38, and 0.34 mile south and 0.23 mile north of the KY 70 junction,
5. 0.64 and 0.23 mile south of the Clear Creek bridge, and
6. 0.53 and 0.15 mile south of the Weirs Creek bridge.

#### **US 41A**

1. 0.08 and 2.22 miles north of the Crab Orchard Creek bridge, and
2. 0.07, 0.20, 0.27, 0.37, 0.47, and 1.00 mile north of Pleasant Run Creek.

#### **KY 1751**

1. At the US 41A junction, and
2. 0.42 mile south and 0.22 mile north of the Louisville and Nashville Railroad bridge.

#### **US 41**

1. 0.33 mile south of the Otter Creek bridge, and
2. 2.37, 1.69, and 1.65 miles south of the Hopkins County - Webster County line.

#### **WATER IMPOUNDMENTS**

Small impoundments such as large farm ponds could be a problem area. Ponds which have large earthen dams that lie above the road surface could collapse during an earthquake and wash out a section of a priority route. Ponds which lie below the road surface and are adjacent to the toe of the fill could cause failures in the fill during an earthquake due to the high moisture content. Impoundments are located at:

#### **KY 109**

1. 1.12 miles north of the Lick Creek bridge.

#### **US 41A**

1. 0.20 mile south of the KY 813 junction.

#### **SWAMPS**

KY 109 is constructed over swamps south of the Clear Creek bridge and south of the Weirs Creek bridge. Priority routes that are constructed over or adjacent to swamps will probably be damaged due to failures within the soil structure during an earthquake. The high water tables penetrate the underlying road bed and weaken the soil structure. During an earthquake, the structure will be further weakened and large vertical displacements in the road surface are likely to occur.

**OIL WELL**

An oil well is located 0.75 mile south of the Western Kentucky Parkway bridge on US 41A. This facility could suffer damage during an earthquake which would result in an oil spillage and/or fire. The priority route could be closed.

- Orchard Creek bridge,
- 2. 0.60 and 1.35 miles north of the Western Kentucky Parkway bridges, and
- 3. 2.85, 2.04, 1.26, and 0.88 miles south and 0.06 mile north of the Hunting Branch bridge.

**US 41**

**MINES**

There are several types of mining operations, both current and abandoned, along the priority routes in Hopkins County. These operations include strip mines, deep mines, and quarries.

- 1. At the Christian County - Hopkins County line and 0.53, 0.89, 1.33, and 1.67 miles north of that county line, and
- 2. 1.03 south and 0.94 miles north of the Otter Creek bridge.

A large earthquake could collapse portions of quarry walls, breach strip mine water impoundments, or collapse underground shafts. Any of these actions could temporarily block or destroy a section of a priority route. Further inspection should be conducted to determine if these mines constitute a probable threat to the priority routes. Mines are located at:

**KY 109**

- 1. 1.49 miles south and 0.12, 0.80, and 1.31 miles north of the Lick Creek bridge,
- 2. 0.25, 0.19, and 0.06 mile south and 0.15 and 0.23 mile north of the KY 70 junction,
- 3. 0.61 and 0.48 mile south of the Clear Creek bridge, and
- 4. 0.19 mile south of the Hopkins County - Webster County line.

**US 41A**

- 1. 0.99 mile north of the Crab

**TREES**

The behavior of trees during an earthquake depends upon many factors including their condition, type, height, and size. Local soil conditions, geometry of the ground surface, and characteristics of the earthquake can also be important. Violent ground motions accompanied by surface rupture and perhaps permanent displacement of the soil surface produce sudden surface accelerations of the ground which can snap and uproot large trees (3).

Trees are so numerous that, if many of them fell, the priority routes could effectively be blocked for several hours or days before emergency crews could clear the debris. Groups of large trees are located near the road at the following sites:

**KY 109**

- 1. 0.29 mile north of the Western Kentucky Parkway bridge,

2. 1.84 and 0.54 miles south of the Lick Creek bridge,
3. 0.26 and 1.16 miles north of the Lick Creek bridge,
4. 0.20 mile north of the KY 70 junction,
5. 1.50 and 2.70 miles north of the city of Beulah,
6. 0.50 mile north of the KY 1034 junction, and
7. 0.40 mile south of the Hopkins County - Webster County line.

**US 41A**

1. 0.83 and 1.08 miles north of the Pleasant Run Creek bridge,
2. 0.30 and 1.50 miles north of the Western Kentucky Parkway bridges, and
3. 1.40 and 0.60 miles south of the KY 112 (southwest) junction.

**US 41**

1. 0.61 mile north of the Otter Creek bridge, and
2. 2.40 and 1.52 miles south of the Hopkins County - Webster County line.

**LARGE WATER IMPOUNDMENTS**

There are two impoundments (Nortonville Lake and Loch Mary Reservoir) on US 41A. Nortonville Lake is 0.38 mile south of the Pleasant Run Creek bridge and Loch Mary Reservoir is 0.04 mile north of the KY 112 junction. If these impoundments were to fail, the priority route would probably be

washed out.

**ALLUVIUM**

Soil maps for Hopkins County indicate that there are large amounts of alluvium present throughout the county. Alluvium is a loose, fine-grain soil which is deposited by flowing water such as creeks and rivers. Due to the nature of the alluvium, ground motions at the surface of the soil can be many times greater than those within the underlying bedrock and temporary liquefaction can occur (Figure 2). An alluvium map for Hopkins County is shown in Figure 3.

**CONCLUSIONS**

In 1984, ESTS developed a fivefold plan of action for formulating and implementing a seismic mitigation policy for the western Kentucky seismic zone. To date, the Kentucky Transportation Center has established priority routes for all 26 counties in the western Kentucky seismic zone and developed seismic risk maps of all natural and man-made features that are susceptible to earthquake damage that could jeopardize the priority routes.

Current work is being conducted to analyze these features and make recommendations for hardening them against earthquake damage.

Future work involves training key personnel in the Transportation Cabinet in hazard mitigation and seismic safety; which includes bridge inspectors, district engineers, construction inspectors, designers, and maintenance personnel.

Following the education of key personnel, the mitigation plan proposed by the Kentucky

Transportation Center will be reviewed by the Kentucky Transportation Cabinet and a program will be established for implementation. The final step involves the use of relevant seismic codes for all new construction, repair, and maintenance.

#### REFERENCES

1. Johnson, Arch C., "A Brief Overview of the Geology, Seismicity and Seismic Hazard of the Central Mississippi Valley Area," Proceedings, A Regional Seminar on Earthquake Fundamentals for the Mississippi Valley, Earthquake Engineering Research Institute, Memphis, Tennessee, October 29, 1985.
2. Green, N. B., "Earthquake Resistant Building Design and Construction," Third Edition, Elsevier, 1987, Page No. 179-180.
3. Keller, Edward A., "Environmental Geology," Charles E. Merrill Publishing Company, A Bell and Howell Company, 1979, Page No. 157.

### **Additional Information**

The Commonwealth of Kentucky has prepared a State Emergency Operations Procedures (State EOP) manual that is produced by the Division of Disaster and Emergency Services (DES), Department of Military Affairs, Frankfort, 40601. Annexes H. on Transportation and DD on Earthquakes give additional information on disaster preparedness and response.

A copy of the State EOP and information on local hazard mitigation activities and response preparedness are available from the AREA 2 Office of DES which is located in Hopkinsville. The phone numbers at this office are (502) 564-8602 and (502) 885-7100.

Additional information about the study discussed in this report should be directed to David L. Allen, Project Director, at the Kentucky Transportation Center, (606) 257-4513. Requests to be placed on the mailing list for updated information should be submitted on your company or agency letterhead to the Kentucky Transportation Center at the University of Kentucky, Lexington Kentucky 40506-0043.



MMI SCALE REGIONAL INTENSITY  
BOUNDARY ZONES



NEW MADRID SEISMIC  
ZONE

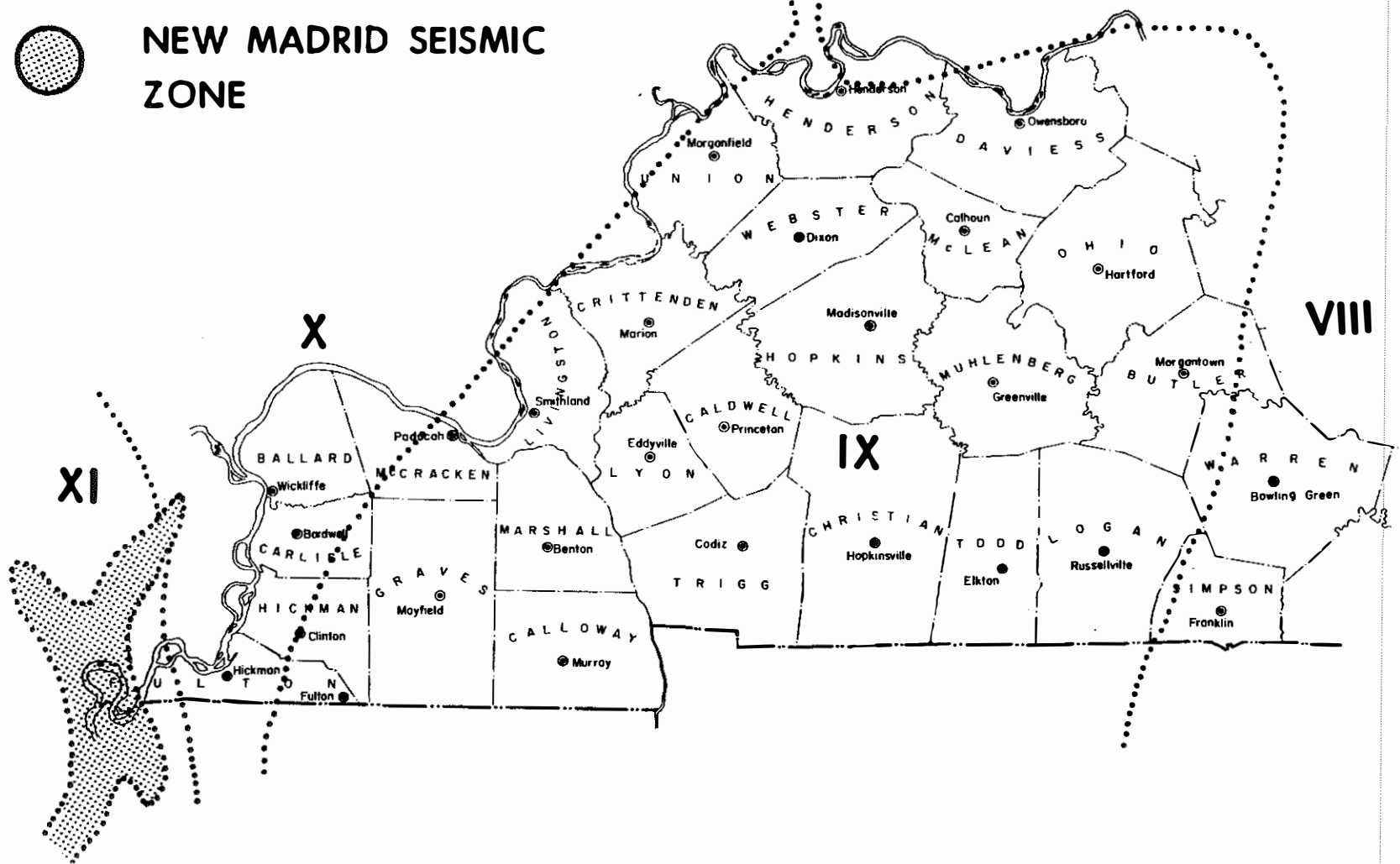


Figure 1: The twenty-six counties included in this study area.

Table 1: MODIFIED MERCALLI INTENSITY SCALE

Modified Mercalli Intensity Scale, 1956 Version

The following comments by Dr. Richter precede the published statement of the intensity scale:

...Each effect is named at the level of intensity at which it first appears frequently and characteristically. Each effect may be found less strongly, or in fewer instances, at the next lower grade of intensity; more strongly or more often at the next higher grade. A few effects are named at two successive levels to indicate a more gradual increase.

Masonry A, B, C, D. To avoid ambiguity of language, the quality of masonry, brick or otherwise, is specified by the following lettering.

Masonry A. Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.

Masonry B. Good workmanship and mortar, reinforced by not designed in detail to resist lateral forces.

Masonry C. Ordinary workmanship and mortar; no extreme weakness like failing to tie corners, but neither reinforced nor designed against horizontal forces.

Masonry D. Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

The following list represents the twelve grades of the scale.

- I. Not felt. Marginal and long-period effects of large earthquakes.
- II. Felt by persons at rest, on upper floors, or favorable placed.
- III. Felt indoors, Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
- IV. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV wooden walls and frame creak.
- V. Felt outdoors; direction estimated. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
- VI. Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken, Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken.
- VII. Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Same cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
- VI I. Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundation if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
- IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. Frame structures, if not bolted, shifted off foundations. Frames cracked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake fountains, sand crater.
- X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large land slides. Water thrown on banks of canals, river, lakes, etc. Sand and mud shifted horizontally on beaches and flat lands. Rails bent slightly.
- XI. Rails bent greatly. Underground pipelines completely out of service.
- XII. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown in the air.

# AMPLIFICATION OF SHAKING AND DAMAGE DUE TO SHAKING

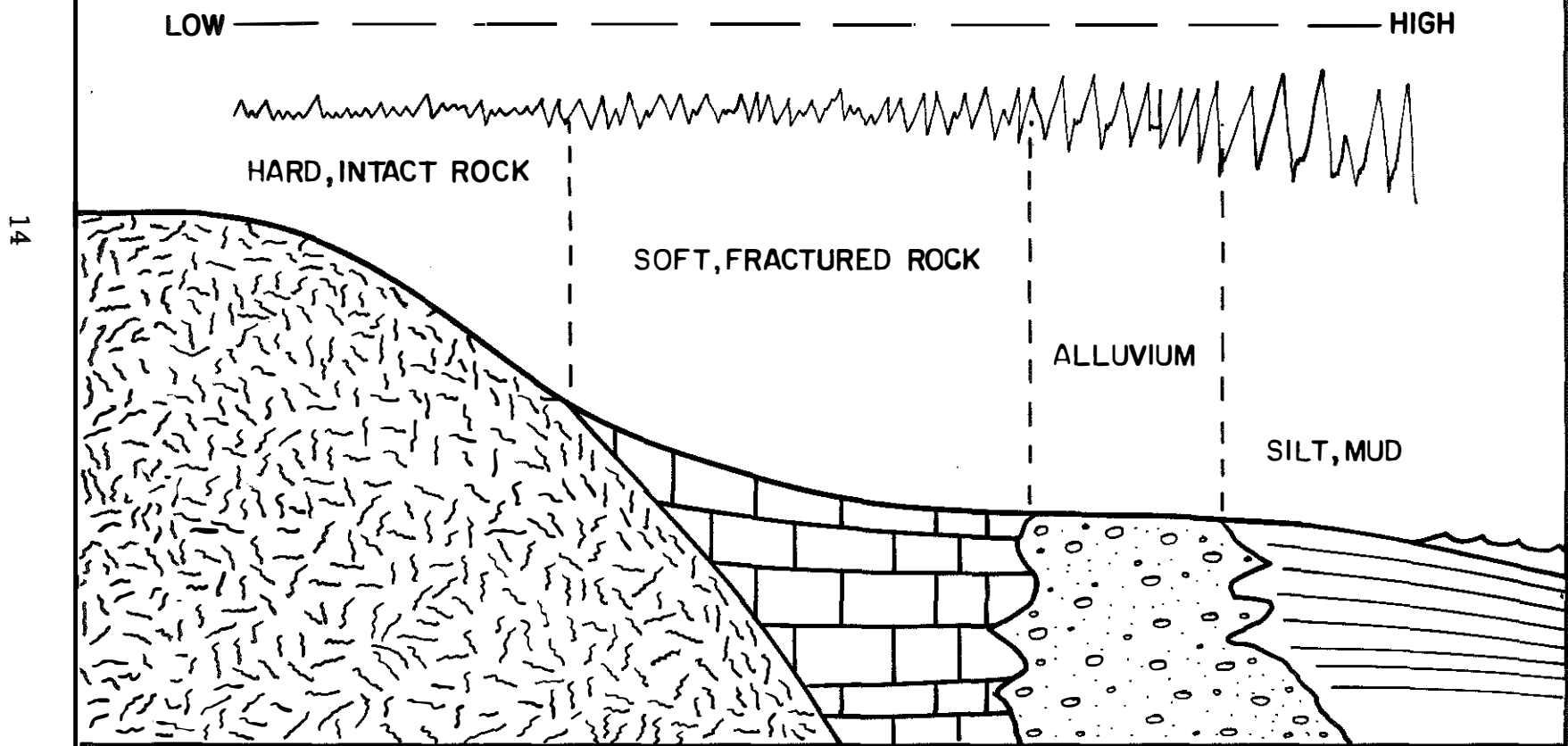
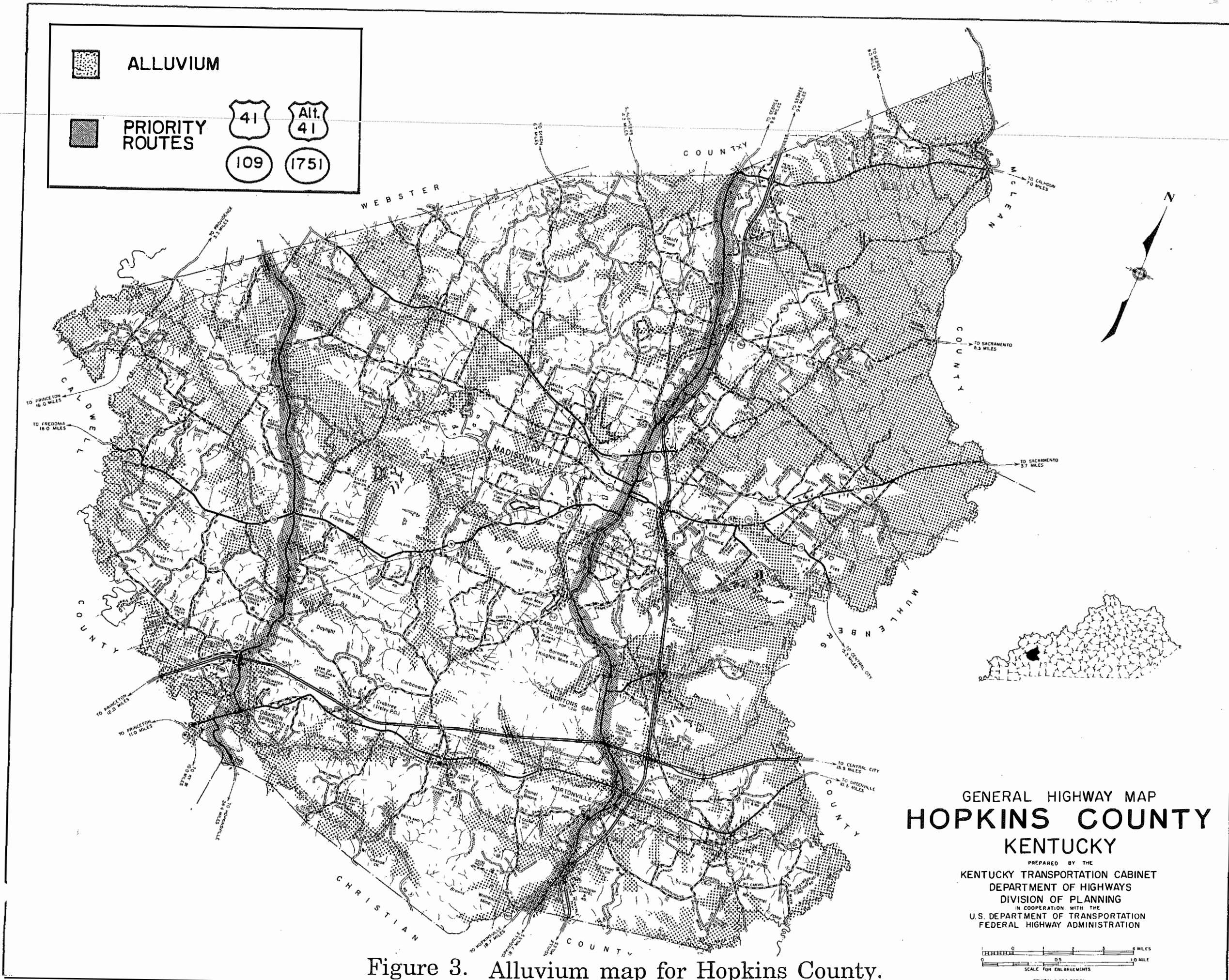


Figure 2 : Amplification of shaking in softer rock & soil during an earthquake.





GENERAL HIGHWAY MAP  
**HOPKINS COUNTY**  
 KENTUCKY

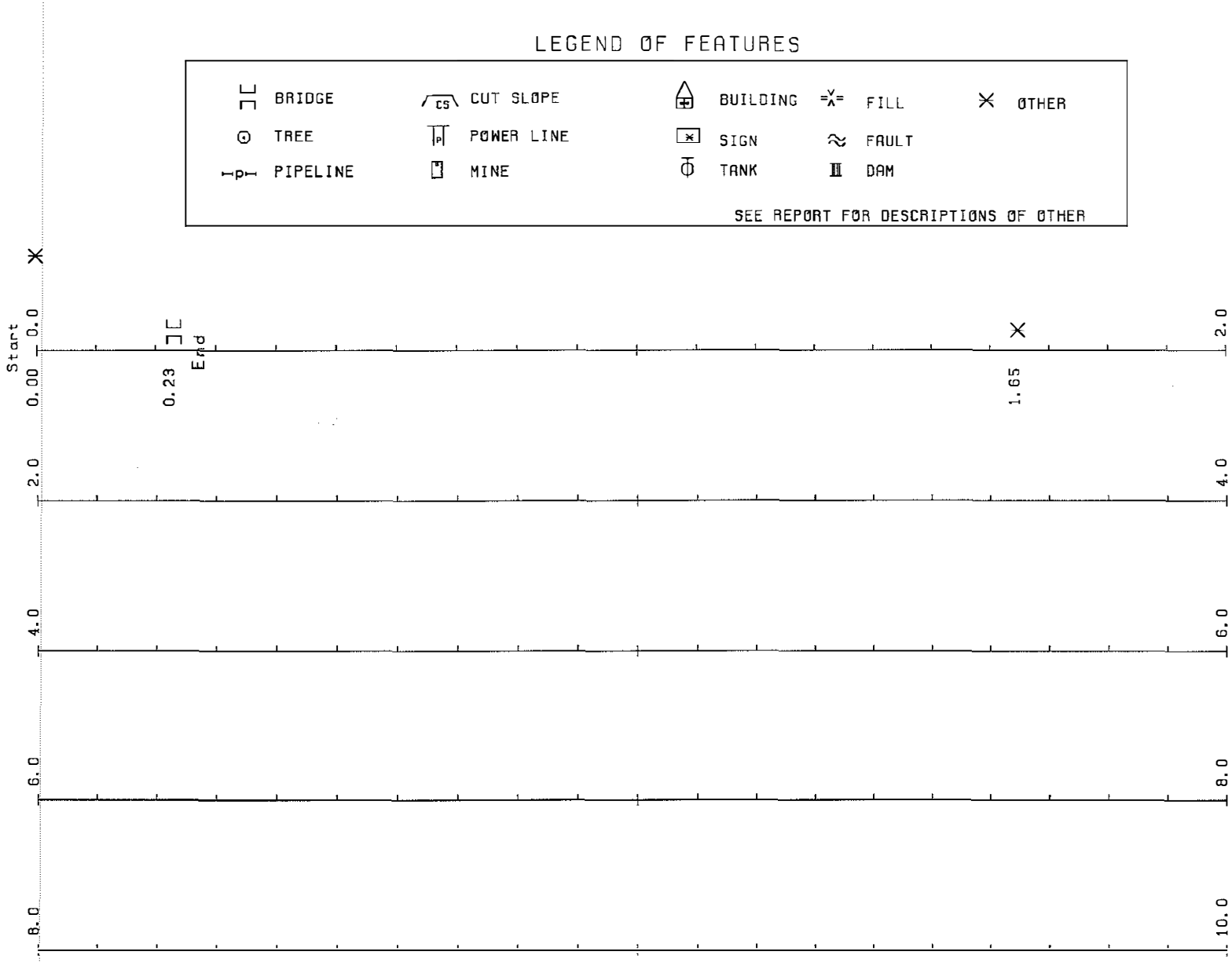
PREPARED BY THE  
 KENTUCKY TRANSPORTATION CABINET  
 DEPARTMENT OF HIGHWAYS  
 DIVISION OF PLANNING  
 IN COOPERATION WITH THE  
 U.S. DEPARTMENT OF TRANSPORTATION  
 FEDERAL HIGHWAY ADMINISTRATION



Figure 3. Alluvium map for Hopkins County.

---

APPENDIX A  
STRIP MAP FOR HOPKINS COUNTY  
US 62, KY 109, US 41, KY 1751, and US 41A



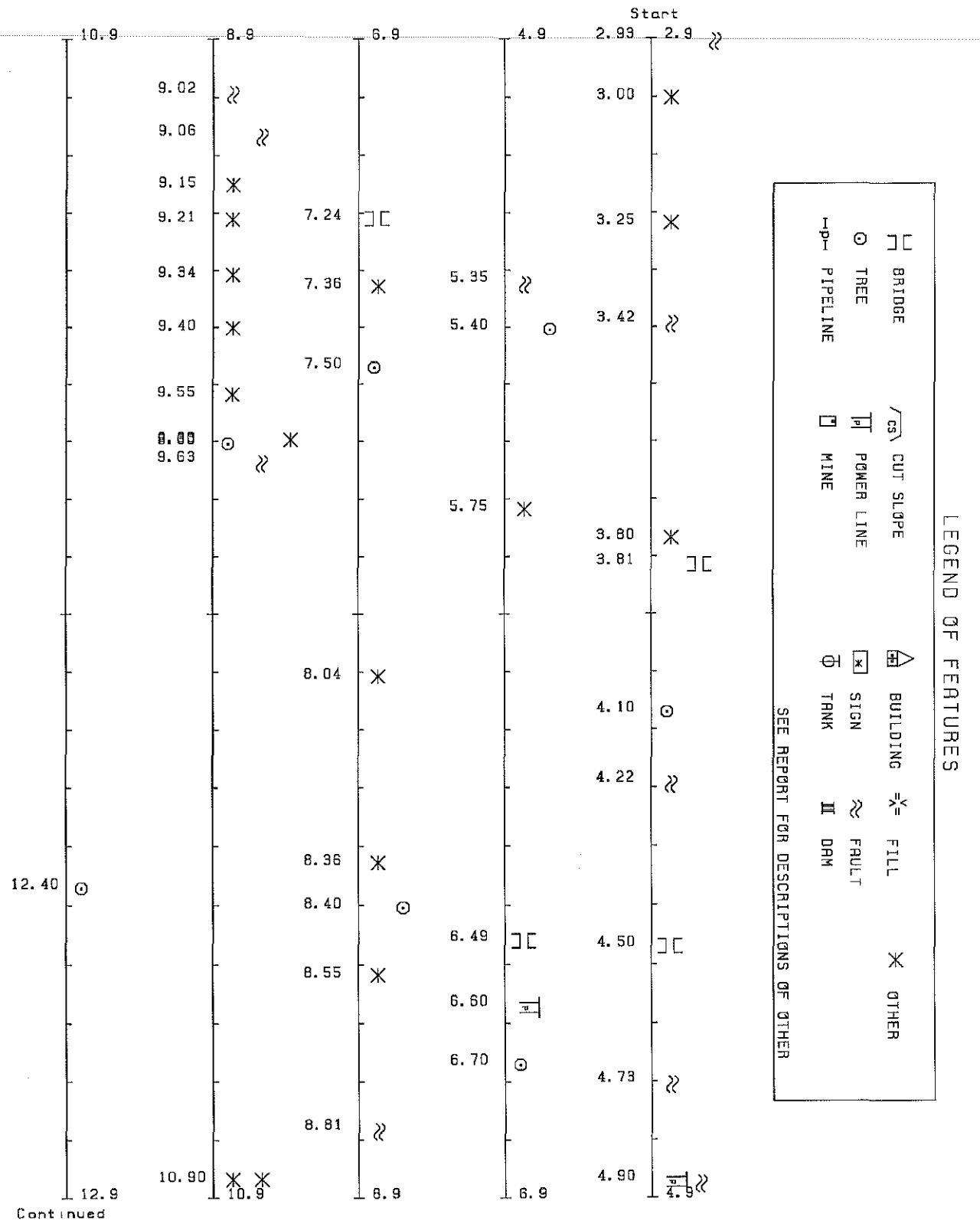
LEGEND OF FEATURES

BRIDGE	CUT SLOPE	BUILDING	FILL	OTHER
TREE	POWER LINE	SIGN	FAULT	
PIPELINE	MINE	TANK	DAM	

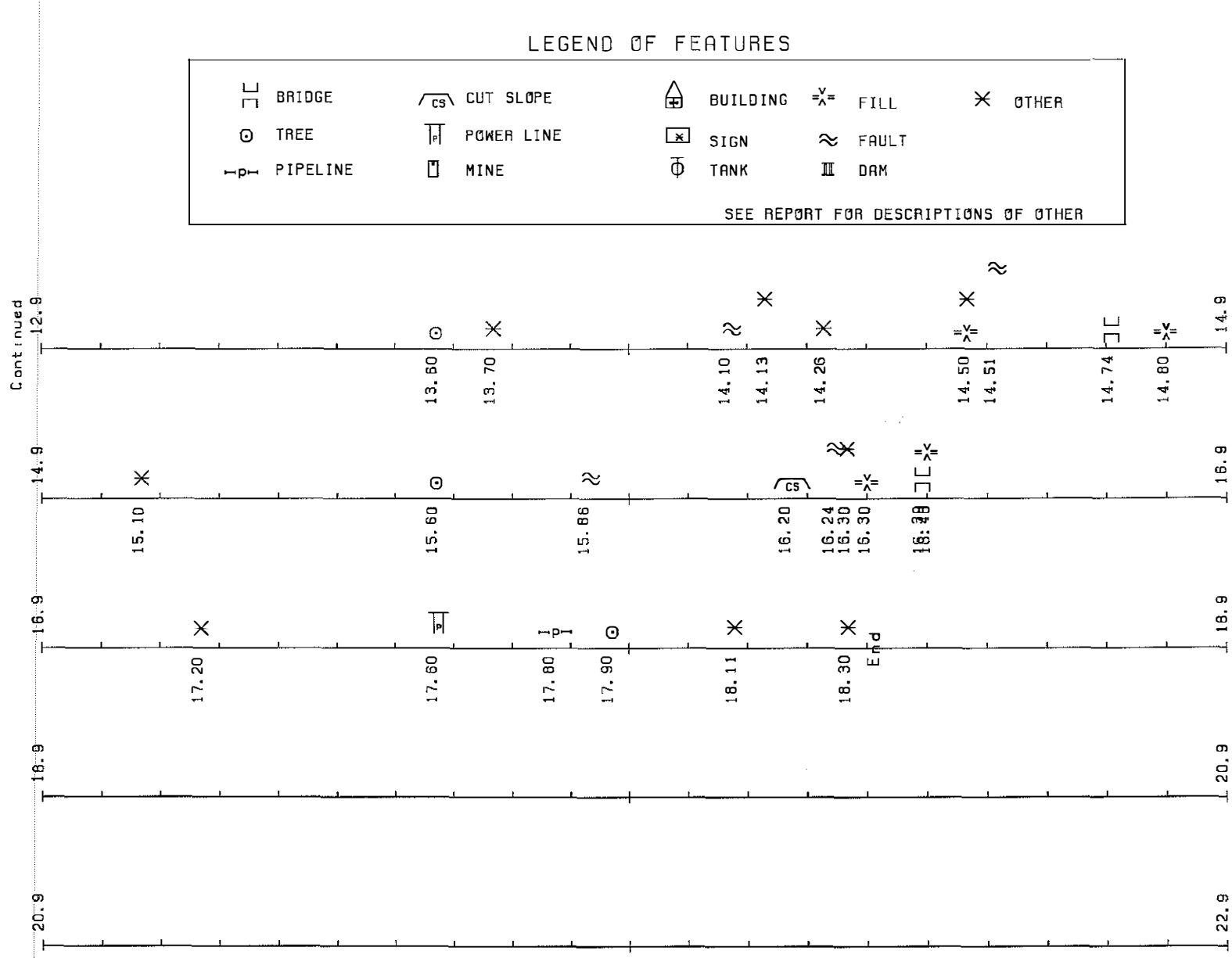
SEE REPORT FOR DESCRIPTIONS OF OTHER

# KY 109














# HOPKINS



KY109 HOPKINS



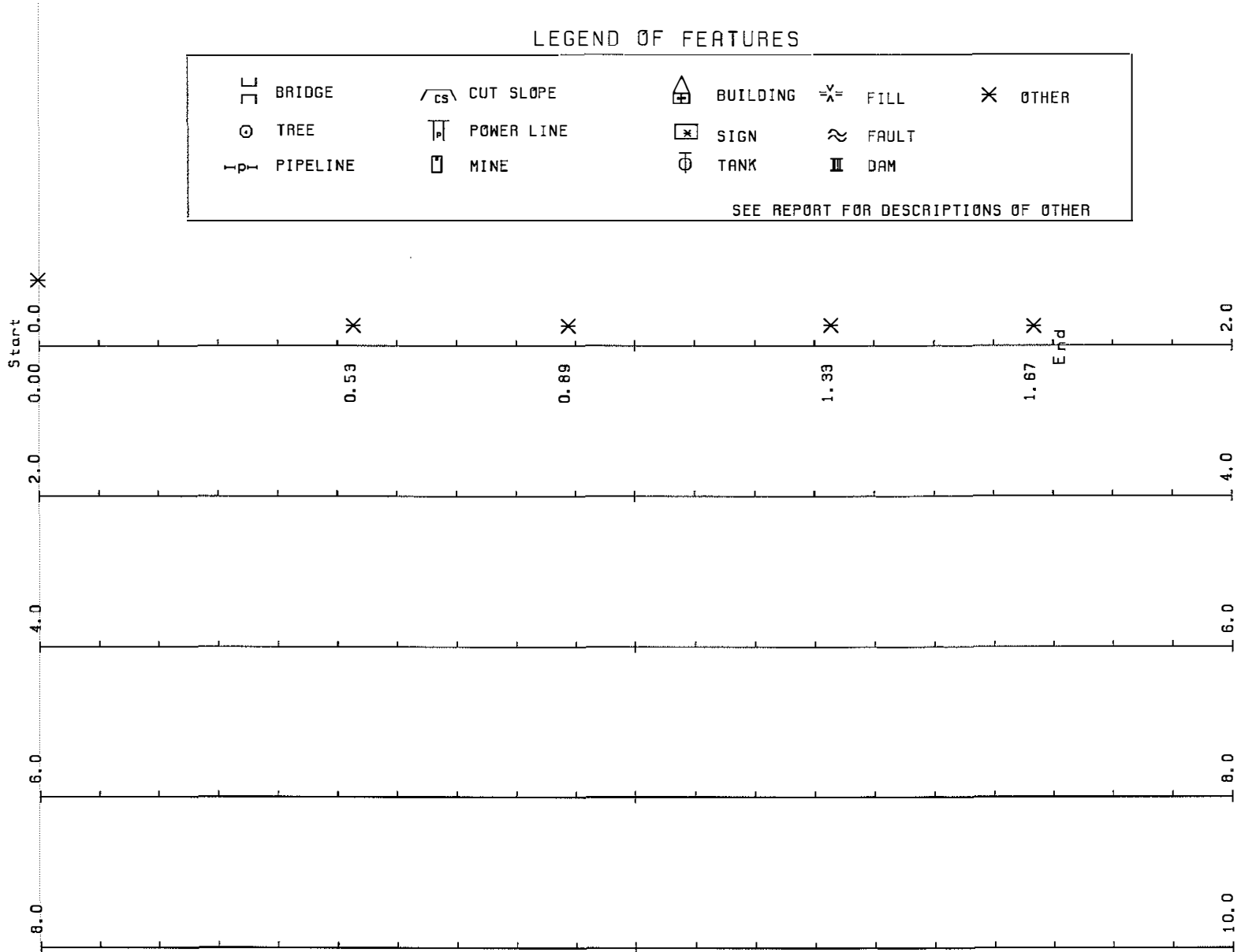
LEGEND OF FEATURES

 BRIDGE	 CUT SLOPE	 BUILDING	 FILL	 OTHER
 TREE	 POWER LINE	 SIGN	 FAULT	
 PIPELINE	 MINE	 TANK	 DAM	

SEE REPORT FOR DESCRIPTIONS OF OTHER

US41

HOPKINS



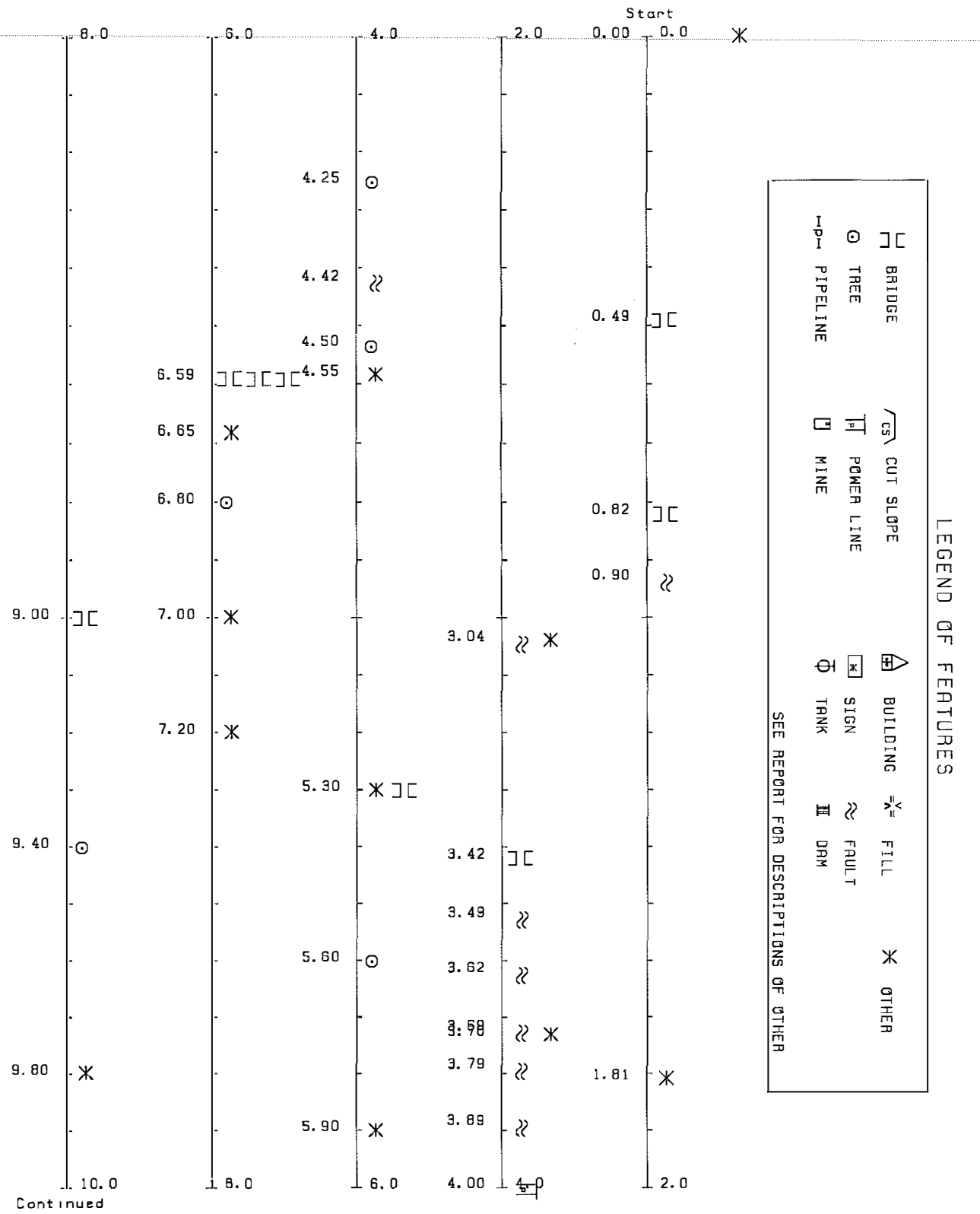
LEGEND OF FEATURES

BRIDGE	CUT SLOPE	BUILDING	FILL	OTHER
TREE	POWER LINE	SIGN	FAULT	
PIPELINE	MINE	TANK	DAM	

SEE REPORT FOR DESCRIPTIONS OF OTHER

# US41A

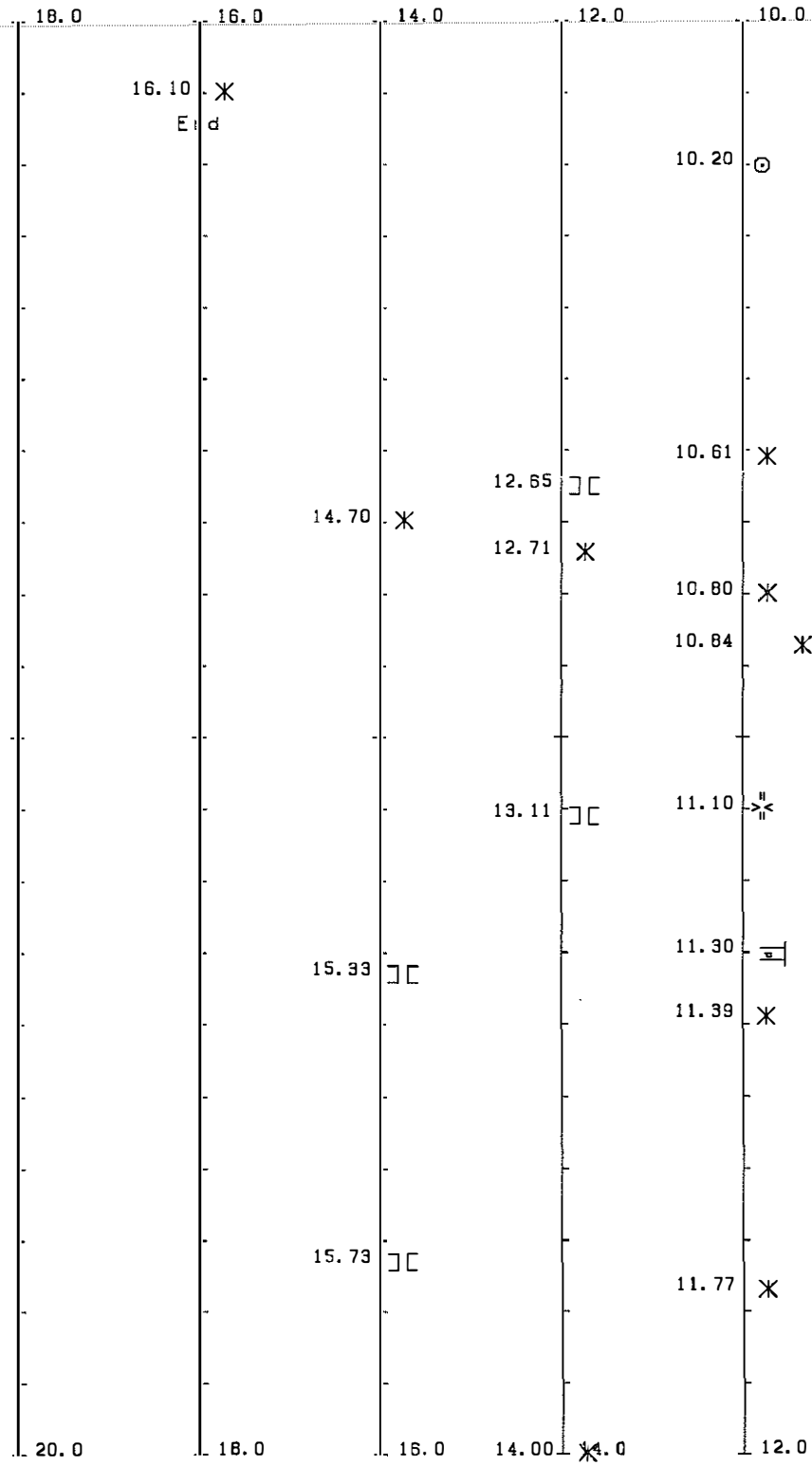
# HOPKINS



US41A

HOPKINS

Continued  
10.0



LEGEND OF FEATURES

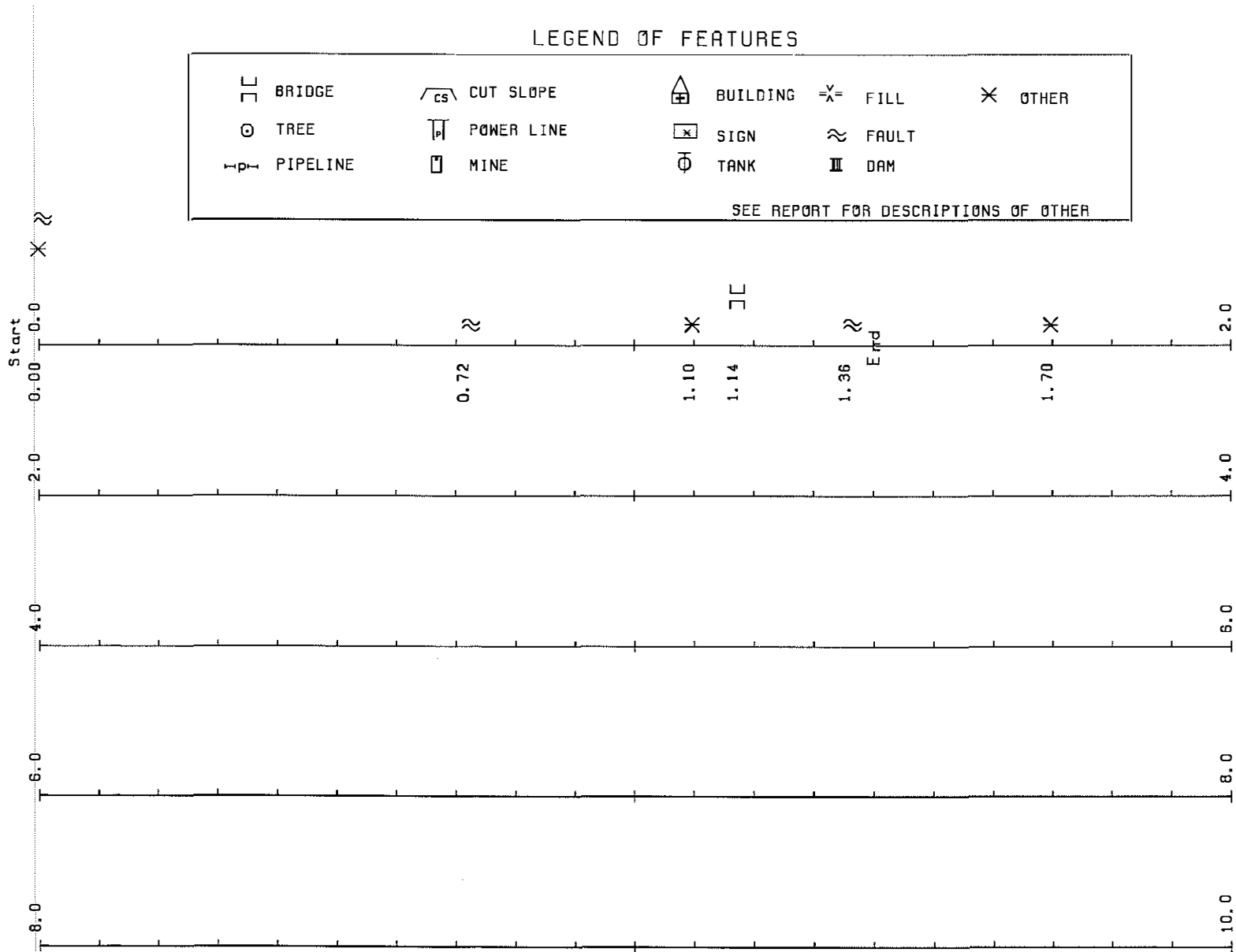
⌋	BRIDGE	△	BUILDING	≠	FILL	*	OTHER
⊙	TREE	⌋	SIGN	≈	FAULT		
— —	PIPELINE	⌋	TANK		DAM		
		∧	CUT SLOPE				
		⌋	POWER LINE				
		□	MINE				

SEE REPORT FOR DESCRIPTIONS OF OTHER



KY1751

HOPKINS



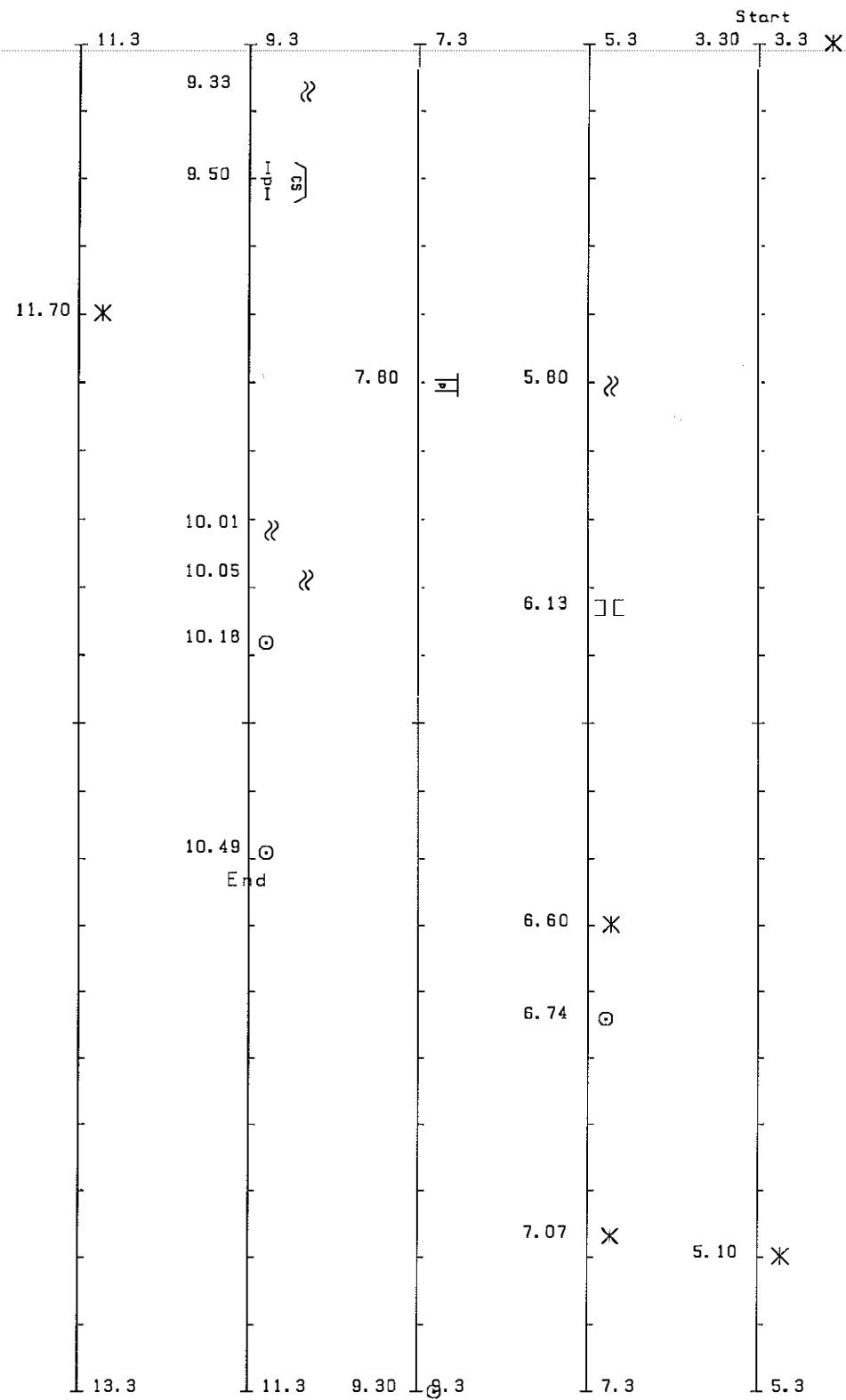
LEGEND OF FEATURES

	BRIDGE		CUT SLOPE		BUILDING		FILL		OTHER
	TREE		POWER LINE		SIGN		FAULT		
	PIPELINE		MINE		TANK		DAM		

SEE REPORT FOR DESCRIPTIONS OF OTHER

# US41

# HOPKINS



LEGEND OF FEATURES

∩	BRIDGE	∩	CUT SLOPE	△	BUILDING	*	FILL	*	OTHER
⊙	TREE	∩	POWER LINE	⊙	SIGN	≈	FAULT		
∩	PIPELINE	∩	MINE	⊙	TRUNK	∩	DAM		

SEE REPORT FOR DESCRIPTIONS OF OTHER

---

APPENDIX B  
SEISMICALLY SIGNIFICANT FEATURES

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 62

Milepoint	Feature	Data
0.00	Other	Junction KY 672 - US 62 Road Surface Type - Flexible
0.23	Bridge	Number of Spans 3 Type Unknown Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 152 feet Width 25 feet Pier Type - Solid SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown
1.65	Other	Junction KY 109 Heading North-South Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
2.93	Fault	Crabtree Fault Road Surface Type - Flexible
3.00	Other	City of Dawson Springs Road Surface Type - Flexible
3.25	Other	Junction US 62 Heading East Road Surface Type - Flexible
3.42	Fault	Fault Road Surface Type - Flexible
3.80	Other	Junction Western KY Parkway Heading NE-SW Road Surface Type - Flexible
3.81	Bridge	Number of Spans 4 Overpass Concrete T-Beam End 1 Rocker Pier 1 Rocker Pier 2 Rocker Pier 3 Rocker End 2 Rocker Deck Type - Concrete Length 239 feet Width 30 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Sliding Plate End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
4.10	Trees	Number of Trees 200 Height 50 feet Diameter 25 in. Ending Milepoint 4.50 Distance From Road 20 feet Road Surface Type - Flexible
4.22	Fault	Union Grove Fault Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
4.50	Bridge	Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 104 feet Width 24 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
4.73	Fault	Fault Road Surface Type - Flexible
4.90	Power Line	Electrical Power Line 6 Lines Height 35 feet Steel Support Structure Unknown Volts Road Surface Type - Flexible
4.90	Fault	Fault Road Surface Type - Flexible
5.35	Fault	Bishop Fault Road Surface Type - Flexible
5.40	Trees	Number of Trees 100 Height 30 feet Diameter 30 in. Ending Milepoint 5.5 Distance From Road 15 feet Road Surface Type - Flexible
5.75	Other	Strip Mines - (5.75 to 7.84) Milepoint Road Surface Type - Flexible
6.49	Bridge	Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 104 feet Width 24 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
6.60	Power Line	Electrical Power Line 3 Lines Height 30 feet Wood Support Structure Unknown Volts Road Surface Type - Flexible
6.70	Trees	Number of Trees 50 Height 50 feet Diameter 20 in. Ending Milepoint 6.73 Distance From Road 15 feet Road Surface Type - Flexible
7.24	Bridge	Number of Spans 5 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed End 2 Fixed Deck Type - Concrete Length 165 feet Width 24 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
7.36	Other	Shaft (Inclined) Road Surface Type - Flexible
7.50	Trees	Number of Trees 200 Height 30 feet Diameter 30 in. Ending Milepoint 8.20 Distance From Road 10 feet Road Surface Type - Flexible
8.04	Other	Strip Mine (8.04 to 8.43) Milepoint Road Surface Type - Flexible
8.36	Other	Retention Pond Road Surface Type - Flexible
8.40	Trees	Number of Trees 30 Height 45 feet Diameter 18 in. Ending Milepoint 8.60 Distance From Road 15 feet Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
8.55	Other	Abandoned Inclined Shaft Road Surface Type - Flexible
8.81	Fault	Fault Road Surface Type - Flexible
9.02	Fault	Fault Road Surface Type - Flexible
9.06	Fault	Fault Road Surface Type - Flexible
9.15	Other	Inclined Shaft Road Surface Type - Flexible
9.21	Other	Strip Mine Road Surface Type - Flexible
9.34	Other	Inclined Shaft Road Surface Type - Flexible
9.40	Other	Junction KY 70 Heading East-West Road Surface Type - Flexible
9.55	Other	Abandoned Vertical Shaft Road Surface Type - Flexible
9.60	Trees	Number of Trees 200 Height 35 feet Diameter 8 in. Ending Milepoint 10.20 Distance From Road 15 feet Road Surface Type - Flexible
9.63	Fault	Fault Road Surface Type - Flexible
9.63	Other	Strip Mine (0.0-10.25) Milepoint Road Surface Type - Flexible



Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
10.90	Other	Junction KY 502 Heading West Road Surface Type - Flexible
10.90	Other	City of Beulah Road Surface Type - Flexible
12.40	Trees	Number of Trees 200 Height 30 feet Diameter 36 in. Ending Milepoint 12.80 Distance From Road 10 feet Road Surface Type - Flexible
13.60	Trees	Number of Trees 50 Height 40 feet Diameter 36 in. Ending Milepoint 13.66 Distance From Road 10 feet Road Surface Type - Flexible
13.70	Other	Junction KY 291 Heading West Road Surface Type - Flexible
14.10	Fault	Stony Point Church Fault Road Surface Type - Flexible
14.13	Other	Strip Mine Road Surface Type - Flexible
14.26	Other	Abandoned Inclined Shaft Road Surface Type - Flexible
14.50	Fill	Material Type - Soil Height 10 feet Side slope 2:1 Length 1,050 feet Crest 1000 feet Type Fill - Other Road Surface Type - Flexible
14.50	Other	Swampy Land Along Sides of Road Road Surface Type - Flexible
14.51	Fault	Rose Creek Fault Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
14.74	Bridge	Number of Spans 11 Over Stream Concrete T-Beam Bridge Bearing Type Unknown Deck Type - Concrete Length 363 feet Width 24 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
14.80	Fill	Material Type - Soil Height 10 feet Side slope 2:1 Length 500 feet Crest 1000 feet Type Fill - Other Road Surface Type - Flexible
15.10	Other	Junction KY 1034 Heading East Road Surface Type - Flexible
15.60	Trees	Number of Trees 200 Height 30 feet Diameter 30 in. Ending Milepoint 16.26 Distance From Road 10 feet Road Surface Type - Flexible
15.86	Fault	Stony Point Mines Fault Road Surface Type - Flexible
16.20	Cut Slope	Cut Slope Type - Rock Height 28 feet Length 300 feet Backslope 1:1 Road Surface Type - Flexible
16.24	Fault	Shady Grove Fault Road Surface Type - Flexible
16.30	Fill	Material Type - Soil Height 8 feet Side slope 1.1 Length 500 feet Crest 25 feet Type Fill - Other Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 109

Milepoint	Feature	Data
16.30	Other	Swampy Land - 1,000 feet Road Surface Type - Flexible
16.39	Bridge	Number of Spans 5 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed Pier 4 Fixed End 2 Fixed Deck Type - Concrete Length 165 feet Width 24 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
16.40	Fill	Material Type - Soil Height 10 feet Side slope 2:1 Length 500 feet Crest 111 feet Type Fill - Other Road Surface Type - Flexible
17.20	Other	Junction KY 814 Heading North Road Surface Type - Flexible
17.60	Power Line	Electrical Power Line 6 Lines Height 35 feet Wood Support Structure Unknown Volts Road Surface Type - Flexible
17.80	Pipeline	Pipeline Type - Gas Road Surface Type - Flexible
17.90	Trees	Number of Trees 150 Height 40 feet Diameter 30 in. Ending Milepoint 18.38 Distance From Road 10 feet Road Surface Type - Flexible
18.11	Other	Abandoned Inclined Shafts Road Surface Type - Flexible
18.30	Other	Hopkins Co - Webster Co Boundary Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41

Milepoint	Feature	Data
0.00	Other	Strip Mine Road Surface Type - Flexible
0.53	Other	Abandoned Shaft Road Surface Type - Flexible
0.89	Other	Abandoned Shaft Road Surface Type - Flexible
1.33	Other	Abandoned Shaft Road Surface Type - Flexible
1.67	Other	Abandoned Shaft Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

---

Milepoint	Feature	Data
0.00	Other	Hopkins Co - Christian Co Boundary Road Surface Type - Flexible
0.49	Bridge	Number of Spans 3 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 160 feet Width 25 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
0.82	Bridge	Number of Spans 3 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 106 feet Width 20 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
0.90	Fault	Martin Chapel Fault Road Surface Type - Flexible
1.81	Other	Abandoned Shaft Road Surface Type - Flexible
3.04	Fault	Fault Road Surface Type - Flexible
3.04	Other	Nortonville Lake Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
3.42	Bridge	Number of Spans 7 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed Pier 4 Fixed Pier 5 Fixed Pier 6 Fixed End 2 Fixed Deck Type - Concrete Length 336 feet Width 30 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
3.49	Fault	South Graham Fault Road Surface Type - Flexible
3.62	Fault	Fault Road Surface Type - Flexible
3.69	Fault	Fault Road Surface Type - Flexible
3.70	Other	Junction US 62 Heading East-West Road Surface Type - Flexible
3.79	Fault	Nortonville Fault Road Surface Type - Flexible
3.89	Fault	Nortonville Fault Road Surface Type - Flexible
4.00	Power Line	Electrical Power Line 3 Lines Height 30 feet Wood Support Structure Unknown Volts Road Surface Type - Flexible
4.25	Trees	Number of Trees 10 Height 40 feet Diameter 12 in. Ending Milepoint 4.30 Distance From Road 10 feet Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
4.42	Fault	St Charles Fault Road Surface Type - Flexible
4.50	Trees	Number of Trees 20 Height 40 feet Diameter 28 in. Ending Milepoint 4.60 Distance From Road 10 feet Road Surface Type - Flexible
4.55	Other	Oil Wells Road Surface Type - Flexible
5.30	Bridge	Number of Spans 6 Overpass Concrete T-Beam End 1 Rocker Pier 1 Rocker Pier 2 Rocker Pier 3 Rocker Pier 4 Rocker Pier 5 Rocker End 2 Rocker Deck Type - Concrete Length 448 feet Width 30 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
5.60	Trees	Number of Trees 300 Height 50 feet Diameter 36 in. Ending Milepoint 6.60 Distance From Road 20 feet Road Surface Type - Flexible
5.90	Other	Strip Mine Road Surface Type - Flexible
6.59	Bridge	Number of Spans 1 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 132 feet Width 29 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
6.59	Bridge	Number of Spans 1 Steel Girder I-Beam Bridge Type - Overpass End 1 Fixed End 2 Fixed Deck Type - Steel Length 125 feet Width 29 feet Pier Type - Unknown SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Open Abutment End 2 Substructure - Open Abutment Foundation Type - Unknown
6.59	Bridge	Number of Spans 4 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed End 2 Fixed Deck Type - Concrete Length 176 feet Width 29 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Open Abutment End 2 Substructure - Open Abutment Foundation Type - Unknown
6.65	Other	Abandoned Inclined Shaft Road Surface Type - Flexible
6.80	Trees	Number of Trees 300 Height 50 feet Diameter 36 in. Ending Milepoint 7.80 Distance From Road 20 feet Road Surface Type - Flexible
7.00	Other	Small Pond (100 x 50) feet Road Surface Type - Flexible
7.20	Other	Junction KY 813 Heading West Road Surface Type - Flexible



Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
9.00	Bridge	Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 287 feet Width 30 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Poured Compression End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
9.40	Trees	Number of Trees 50 Height 45 feet Diameter 36 in. Ending Milepoint 9.50 Distance From Road 10 feet Road Surface Type - Flexible
9.80	Other	Strip Mines Road Surface Type - Flexible
10.20	Trees	Number of Trees 100 Height 40 feet Diameter 36 in. Ending Milepoint 10.50 Distance From Road 10 feet Road Surface Type - Flexible
10.61	Other	Possible Underground Mine Road Surface Type - Flexible
10.80	Other	Junction KY 112 Heading Southwest Road Surface Type - Flexible
10.84	Other	Loch Mary Reservoir (Earlington) Road Surface Type - Flexible
11.10	Fill	Material Type - Soil Height 45 feet Side slope 2:1 Length 700 feet Crest 125 feet Type Fill - Other Road Surface Type - Rigid

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
11.30	Power Line	Electrical Power Line 12 Lines Height 30 feet Steel Support Structure Unknown Volts Road Surface Type - Rigid
11.39	Other	Strip Mines Road Surface Type - Flexible
11.77	Other	Underground Mines Road Surface Type - Flexible
12.65	Bridge	Number of Spans 1 Type Unknown Concrete T-Beam End 1 Fixed End 2 Fixed Deck Type - Concrete Length 32 feet Width 72 feet Pier Type - Unknown SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown
12.71	Other	Victoria Mine Air Shaft Road Surface Type - Flexible
13.11	Bridge	Number of Spans 2 Steel Girder I-Beam Bridge Type - Underpass End 1 Fixed Pier 1 Fixed End 2 Fixed Deck Type - Concrete Length 116 feet Width 20 feet Pier Type - Unknown SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown
14.00	Other	Junction KY 70 Heading West Road Surface Type - Flexible
14.70	Other	Junction KY 70/85 Heading East Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41A

Milepoint	Feature	Data
15.33	Bridge	Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed Pier 4 Fixed Pier 5 Rocker End 2 Rocker Deck Type - Concrete Length 386 feet Width 29 feet Pier Type - Open SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown
15.73	Bridge	Number of Spans 1 Steel Girder I-Beam Bridge Type - Underpass End 1 Fixed End 2 Fixed Deck Type - Steel Length 50 feet Width 20 feet Pier Type - Unknown SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown
16.10	Other	End US 41A - Continue on Ky 1751 Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
KY 1751

Milepoint	Feature	Data
0.00	Other	Junction US 41A South Road Surface Type - Flexible
0.00	Fault	Fault Road Surface Type - Flexible
0.72	Fault	South Reinecke Fault Road Surface Type - Flexible
1.10	Other	Junction KY 1069 Heading Northwest Road Surface Type - Flexible
1.14	Bridge	Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 149 feet Width 24 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
1.36	Fault	North Reinecke Fault Road Surface Type - Flexible
1.70	Other	US 41 Junction Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41

Milepoint	Feature	Data
3.30	Other	Route Branches from KY 1751 to US 41 Road Surface Type - Flexible
5.10	Other	Junction KY 862 Heading East Road Surface Type - Flexible
5.80	Fault	Fault Road Surface Type - Flexible
6.13	Bridge	Number of Spans 4 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed Pier 3 Fixed End 2 Fixed Deck Type - Concrete Length 132 feet Width 24 feet Pier Type - Open SPC Rating - C Surface Type - Flexible Expansion Type - Other End 1 Substructure - Stub End 2 Substructure - Stub Foundation Type - Unknown
6.60	Other	Junction KY 260 Heading East Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41

Milepoint	Feature	Data
6.74	Trees	Number of Trees 25 Height 38 feet Diameter 28 in. Ending Milepoint 6.80 Distance From Road 10 feet Road Surface Type - Flexible
7.07	Other	Abandoned Mine Road Surface Type - Flexible
7.80	Power Line	Electrical Power Line 3 Lines Height 25 feet Wood Support Structure Unknown Volts Road Surface Type - Flexible
9.30	Trees	Number of Trees 1 Height 30 feet Diameter 28 in. Ending Milepoint 9.30 Distance From Road 10 feet Road Surface Type - Flexible
9.33	Fault	Fault Road Surface Type - Flexible
9.50	Pipeline	Pipeline Type - Natural Gas Road Surface Type - Flexible
9.50	Cut Slope	Cut Slope Type - Soil Height 20 feet Length 300 feet Backslope 1:1 Road Surface Type - Flexible
10.01	Fault	North Hanson Fault Road Surface Type - Flexible
10.05	Fault	North Hanson Fault Road Surface Type - Flexible
10.18	Trees	Number of Trees 10 Height 4 feet Diameter 30 in. Ending Milepoint 10.20 Distance From Road 20 feet Road Surface Type - Flexible

Report by Road and Milepoint  
for Hopkins County - Kentucky  
US 41

Milepoint	Feature	Data
10.49	Trees	Number of Trees 2 Height 36 feet Diameter 36 in. Ending Milepoint 10.50 Distance From Road 20 feet Road Surface Type - Flexible
11.70	Other	Hopkins Co - Webster Co Boundary Road Surface Type - Flexible