EARTHQUAKE HAZARD MITIGATION OF TRANSPORTATION FACILITIES FOR LOGAN 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.

May 1989
Earthquake Hazard Mitigation of Transportation Facilities for Logan County

Publication of this report was sponsored by the Kentucky Transportation Cabinet with the U.S. Department of Transportation, Federal Highway Administration.
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 Logan 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
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 LOGAN COUNTY

Logan County is located approximately 140 miles east of the center of the New Madrid Seismic Zone. Figure 1 indicates that Logan County is in the IX band of the MMI scale. This indicates considerable damage could occur in Logan County in the event of a major earthquake.

US 431, US 68/KY 80, and US 79 have been designated as the priority routes in Logan County. The US 431 route starts at the junction with US 68/KY 80 at Russellville and continues north 17.80 miles. US 68/KY 80 begins at the Todd County-Logan County line and travels east 26.50 miles to the Logan County-Warren County line. US 79 begins at the Todd County-Logan County line and continues north 11.20 miles to the city of Russellville.

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 four bridges located on US 431, five bridges on US 68/KY 80, and four bridges on US 79. The bridges are located at:

**US 431**
1. L & N Railroad,
2. Wolf Lick Creek,
3. Wolf Lick Swamp, and
4. Rawhide Creek.

**US 68/KY 80**
1. Whippoorwill Creek,
2. L & N Railroad,
3. East Fork - Town Branch,
4. Black Lick Creek, and
5. L & N Railroad.

**US 79**
1. Vicks Branch,
2. Whippoorwill Creek,
3. Dry Creek, and
4. L & N Railroad.

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 Logan County are located as follows:

**US 431**
1. Approach fills for the bridge over the L & N Railroad,
2. Approach fills for the Wolf Lick Creek bridge,
3. Fill between the Wolf Lick Creek and Wolf Lick Swamp bridges,
4. Approach fills for the Wolf Lick Swamp bridge, and
5. Approach fills for the Rawhide Creek bridge.

**US 68/KY 80**
1. Approach fills for Whippoorwill Creek bridge,
2. Approach fills L & N Railroad bridge,
3. Approach fills for East Fork of Town Branch bridge,

4. 1.50 miles east of Russellville,

5. 3.20 miles west of KY 722 (north) junction,

6. Approach fills for Black Lick Creek bridge, and


**US 79**

1. Approach fills for Vicks Branch bridge,

2. Approach fills for Whippoorwill Creek bridge,

3. 0.10 mile north of Whippoorwill Creek bridge,

4. 0.10 mile south of KY 1151 junction,

5. Approach fills for Dry Creek bridge, and


**CUT SLOPES**

Several cut slopes were cataloged during surveys of the priority routes in Logan County. Should any of these slopes 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 most critical cut slopes are located:

**US 431**

1. 0.90 mile south of Rawhide Creek bridge, and

2. 0.70 mile south of Muhlenberg County line.

**US 68/KY 80**

1. 0.40 mile east of Russellville,

2. 1.40 miles east of Russellville,

3. 2.90 miles east of Russellville.

4. 3.00 miles west of KY 722 junction, and

5. 2.60 miles west of KY 722 junction,

**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 Logan County were constructed with little or no seismic considerations. Gas pipelines near priority routes are located at:

**US 431**

1. 0.51 mile south of the L & N Railroad bridge.

**US 68/KY 80**

1. 0.90 mile west of KY 3233 junction,

2. 3.80 miles east of Russellville,
3. 2.20 miles west of Logan County - Warren County line, and

4. 1.70 miles west of Logan County - Warren 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:

**US 431**

1. 1.11 miles south of the L & N Railroad bridge, and

2. 1.20 miles south of the KY 106 (southwest) junction.

**US 68/KY 80**

1. 0.80 mile west of KY 3233 junction, and

2. 3.70 miles east of US 79 junction.

**US 79**

1. 1.15 miles south of the KY 3233 junction, and

2. 0.45 mile north of the KY 3233 junction.

**STRUCTURES**

A barn is located 15 feet from US 79 approximately 0.11 mile north of Whippoorwill Creek. The barn could collapse during a major earthquake and temporarily block the priority route. Within the city of Russellville other structures could present problems.

**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 Logan County are listed below:

**US 431**

1. 0.28 mile south of the L & N Railroad,

2. 2.24, 2.05, 1.95, 1.70, 1.63, and 0.91 miles south of the KY 106 (southwest) junction, and

3. 0.38 mile north of KY 106 (northeast) junction.

**SINKHOLES**

Logan County is located in a karst
topographic region. In this region there are numerous sinkholes, caverns, and underground streams. A major earthquake could cause additional and/or rapid subsidence along the priority routes. Sinkholes located under the priority routes in Logan County are located at;

**US 68/KY 80**

1. 3.34 and 1.86 miles west of the KY 722 (north) junction,
2. 0.71 and 0.58 mile west of the city of Auburn, and
3. 1.18 miles east of the L & N Railroad bridge.

**WATER IMPOUNDMENTS**

Small impoundments such as large farm ponds could also 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.

A small pond lies adjacent to US 68/KY 80 approximately 1.30 miles east of the Whippoorwill Creek bridge.

**MINES**

There are several quarries along the priority routes in Logan County. A large earthquake could collapse portions of the quarry walls and temporarily block or destroy a section of the priority route. Further inspection should be conducted to determine if there is a possible threat to the priority route. Quarries are located at:

**US 431**

1. 1.50 and 1.72 miles north of the L & N Railroad bridge, and
2. 1.37 miles north of the Rawhide Creek bridge.

**US 68/KY 80**

1. 0.29 mile east of the city of Russellville,
2. 1.81 miles west of the KY 103 (south) junction, and
3. 0.08 mile west of the Logan County - Warren County line.

**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:

**US 431**

1. 3.10 miles north of the city of Russellville,
2. 0.51 mile north of the L & N Railroad bridge,

3. 0.91 mile south and 0.21 mile north of the Wolf Lick Creek bridge, and

4. 0.61 mile south and 1.09 mile north of the Rawhide Creek bridge.

**US 68/KY 80**

1. At the Whippoorwill Creek bridge and 1.88 miles east of the bridge,

2. 2.71 and 0.80 miles west of the KY 722 (north) junction,

3. 0.20 and 0.11 mile west of the KY 103 (south) junction, and

4. 1.80 miles west of the Logan County - Warren County line.

**US 79**

1. 0.82, 1.50 and 1.82 miles east of the Todd County - Logan County line,

2. 0.50 mile west of the KY 1309 junction,

3. At the Whippoorwill Creek bridge and 0.11 mile east of the bridge, and

4. From the Dry Creek bridge to the Logan County - Warren County line.

**SWAMPS**

US 79 is constructed over a swamp approximately 0.83 mile south of the Dry 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.

**ALLUVIUM**

Soil maps for Logan County indicate that there is little 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 Logan 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


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.
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.


V. Felt outdoors; direction estimated. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open.


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.

VIII. 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. Cha 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 will-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.
Figure 3. Alluvium map for Logan County.
APPENDIX A
STRIP MAP FOR Logan COUNTY
US 431, US 68/KY 80, and US 79
APPENDIX B

SEISMICALLY SIGNIFICANT FEATURES
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 14.00     | Other   | Junction US 68 / KY 80  
Road Surface Type - Flexible |
| 14.00     | Other   | City of Russellville  
Road Surface Type - Flexible |
| 17.10     | Trees   | Number of Trees 75  
Height 50 feet  
Diameter 30 in.  
Ending Milepoint 17.50  
Distance From Road 15 feet  
Road Surface Type - Flexible |
| 17.50     | Other   | Junction KY 1040 Heading Northeast  
Road Surface Type - Flexible |
| 19.20     | Power Line | Electrical Power Line 5 Lines  
Height 45 feet  
Steel Support Structure Unknown Volts  
Road Surface Type - Flexible |
| 19.80     | Pipeline | Pipeline Type - Gas  
Road Surface Type - Flexible |
| 20.03     | Fault   | Fault  
Road Surface Type - Flexible |
| 20.31     | 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 135 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 |
| 20.80     | Trees   | Number of Trees 7  
Height 40 feet  
Diameter 24 in.  
Ending Milepoint 20.83  
Distance From Road 15 feet  
Road Surface Type - Flexible |
## Report by County and Milepoint for Logan County - Kentucky

### US 431

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.81</td>
<td>Other</td>
<td>Quarry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.03</td>
<td>Other</td>
<td>Quarry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.26</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.45</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.55</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.80</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>22.87</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>23.20</td>
<td>Trees</td>
<td>Number of Trees 2 Height 50 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diameter 30 in. Ending Milepoint 23.23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance From Road 50 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>23.30</td>
<td>Power Line</td>
<td>Electrical Power Line 3 Lines Height 3 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steel Support Structure Unknown Volts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>23.59</td>
<td>Fault</td>
<td>Fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>24.50</td>
<td>Other</td>
<td>Junction KY 106 Heading Southwest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>24.70</td>
<td>Other</td>
<td>Junction KY 107 Heading West</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
</tbody>
</table>

---

25
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 25.10     | Other   | Junction KY 106 Heading Northeast  
Road Surface Type - Flexible |
| 25.48     | Fault   | Fault  
Road Surface Type - Flexible |
| 26.50     | Trees   | Number of Trees 5  Height 45 feet  
Diameter 36 in.  Ending Milepoint 26.52  
Distance From Road 15 feet  
Road Surface Type - Flexible |
| 27.41     | 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 264 feet  
Width 23 feet  Pier Type - Solid  
SPC Rating - B  Surface Type - Flexible  
Expansion Type - Other  
End 1 Substructure - Full  
End 2 Substructure - Full  
Foundation Type - Unknown |
| 27.60     | Trees   | Number of Trees 50  Height 30 feet  
Diameter 24 in.  Ending Milepoint 27.80  
Distance From Road 15 feet  
Road Surface Type - Flexible |
| 27.73     | 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 140 feet  
Width 23 feet  Pier Type - Unknown  
SPC Rating - B  Surface Type - Flexible  
Expansion Type - Other  
End 1 Substructure - Stub  
End 2 Substructure - Stub  
Foundation Type - Unknown |
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 28.01     | Other   | Cut Slope  
Road Surface Type - Flexible |
| 28.30     | Trees   | Number of Trees 200  
Height 45 feet  
Diameter 30 in.  
Ending Milepoint 29.70  
Distance From Road 15 feet  
Road Surface Type - Flexible |
| 28.91     | Bridge  | Number of Spans 2  
Over Stream Concrete T-Beam  
End 1 Fixed  
Pier 1 Fixed  
End 2 Fixed  
Deck Type - Concrete  
Length 85 feet  
Width 23 feet  
Pier Type - Unknown  
SPC Rating - B  
Surface Type - Flexible  
Expansion Type - Other  
End 1 Substructure - Full  
End 2 Substructure - Full  
Foundation Type - Unknown |
| 30.28     | Other   | Abandoned Quarry  
Road Surface Type - Flexible |
| 31.00     | Trees   | Number of Trees 100  
Height 30 feet  
Diameter 30 in.  
Ending Milepoint 30.30  
Distance From Road 15 feet  
Road Surface Type - Flexible |
| 31.10     | Cut     | Cut Slope Type - Rock  
Height 25 feet  
Length 60 feet  
Backslope 1:1  
Road Surface Type - Flexible |
| 31.80     | Other   | Logan Co - Muhlenberg Co Boundary  
Road Surface Type - Flexible |
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>Other</td>
<td>Logan Co - Todd Co Boundary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>0.79</td>
<td>Trees</td>
<td>Number of Trees 5 Height 35 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diameter 24 in. Ending Milepoint .80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance From Road 25 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>2.70</td>
<td>Other</td>
<td>Junction KY 1151 Heading Southeast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>2.80</td>
<td>Bridge</td>
<td>Number of Spans 2 Over Stream Concrete T-Beam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End 1 Fixed Pier 1 Fixed End 2 Fixed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deck Type - Concrete Length 74 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Width 36 feet Pier Type - Solid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPC Rating - A Surface Type - Flexible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expansion Type - Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End 1 Substructure - Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End 2 Substructure - Full</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foundation Type - Unknown</td>
</tr>
<tr>
<td>2.80</td>
<td>Trees</td>
<td>Number of Trees 40 Height 40 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diameter 18 in. Ending Milepoint 3.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance From Road 15 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>4.10</td>
<td>Other</td>
<td>Pond</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>4.68</td>
<td>Trees</td>
<td>Number of Trees 30 Height 50 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diameter 30 in. Ending Milepoint 4.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distance From Road 15 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>7.60</td>
<td>Pipeline</td>
<td>Pipeline Type - Natural Gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
</tbody>
</table>
Report by County and Milepoint for Logan County - Kentucky
US 68/KY 80

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.70</td>
<td>Power</td>
<td>Electrical Power Line 6 Lines Height 45 feet Steel Support Structure Unknown Volts Road Surface Type - Flexible</td>
</tr>
<tr>
<td>8.50</td>
<td>Other</td>
<td>Junction KY 3233 Road Surface Type - Flexible</td>
</tr>
<tr>
<td>8.90</td>
<td>Other</td>
<td>Junction KY 178 Heading Northwest Road Surface Type - Flexible</td>
</tr>
<tr>
<td>9.60</td>
<td>Fill</td>
<td>Material Type - Soil Height 15 feet Side slope 3:2 Length 300 feet Crest 40 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
<tr>
<td>9.64</td>
<td>Bridge</td>
<td>Number of Spans 7 Underpass Concrete T-Beam End 1 Fixed End 2 Fixed Deck Type - Concrete Length 364 feet Width 24 feet Pier Type - Open SPC Rating - A Surface Type - Flexible Expansion Type - Poured Compression End 1 Substructure - Pile Bent End 2 Substructure - Pile Bent Foundation Type - Unknown</td>
</tr>
<tr>
<td>9.80</td>
<td>Other</td>
<td>Junction US 431 Heading North-South Road Surface Type - Flexible</td>
</tr>
<tr>
<td>10.33</td>
<td>Bridge</td>
<td>Number of Spans 1 Type Unknown Concrete Unknown Deck Type - Concrete Length 42 feet Width 29 feet Pier Type - Unknown SPC Rating - A Surface Type - Flexible Expansion Type - Unknown End 1 Substructure - Unknown End 2 Substructure - Unknown Foundation Type - Unknown</td>
</tr>
<tr>
<td>Milepoint</td>
<td>Feature</td>
<td>Data</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>10.50</td>
<td>Building</td>
<td>Urban Location Masonary Building</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Floors 3 Area/Floor 15000 sq.ft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible Community</td>
</tr>
<tr>
<td>11.00</td>
<td>Other</td>
<td>City of Russellville</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>11.10</td>
<td>Other</td>
<td>Junction KY 100 Heading Southeast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>11.10</td>
<td>Other</td>
<td>Junction US 79 Heading Northeast-Southwest</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>11.29</td>
<td>Other</td>
<td>Abandoned Quarry</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>11.40</td>
<td>Cut Slope</td>
<td>Cut Slope Type - Rock Height 18 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length 300 feet Backslope 1:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>12.40</td>
<td>Cut Slope</td>
<td>Cut Slope Type - Rock Height 15 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length 300 feet Backslope 1:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>12.50</td>
<td>Fill</td>
<td>Material Type - Soil Height 15 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Side slope 2:1 Length 300 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crest 40 feet Type Fill - Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>13.90</td>
<td>Cut Slope</td>
<td>Cut Slope Type - Rock Height 20 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length 800 feet Backslope 1:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>14.80</td>
<td>Pipeline</td>
<td>Pipeline Type - Natural Gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>14.80</td>
<td>Power Line</td>
<td>Electrical Power Line 6 Lines Height 40 feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steel Support Structure Unknown Volts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Road Surface Type - Flexible</td>
</tr>
<tr>
<td>Milepoint</td>
<td>Feature</td>
<td>Data</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>------</td>
</tr>
</tbody>
</table>
| 14.96     | Other   | Sinkhole  
           | Road Surface Type - Flexible |
| 15.10     | Fill    | Material Type - Soil  
           | Height 20 feet  
           | Side slope 3:2  
           | Length 300 feet  
           | Crest 40 feet  
           | Type Fill - Other  
           | Road Surface Type - Flexible |
| 15.30     | Cut     | Cut Slope Type - Rock  
           | Height 18 feet  
           | Length 400 feet  
           | Backslope 1  
           | Road Surface Type - Flexible |
| 15.59     | Trees   | Number of Trees 5  
           | Height 45 feet  
           | Diameter 25 in.  
           | Ending Milepoint 16.00  
           | Distance From Road 10 feet  
           | Road Surface Type - Flexible |
| 15.70     | Cut     | Cut Slope Type - Rock  
           | Height 10 feet  
           | Length 400 feet  
           | Backslope 1  
           | Road Surface Type - Flexible |
| 16.44     | Other   | Sinkholes  
           | Road Surface Type - Flexible |
| 17.50     | Trees   | Number of Trees 1  
           | Height 65 feet  
           | Diameter 36 in.  
           | Ending Milepoint 17.50  
           | Distance From Road 15 feet  
           | Road Surface Type - Flexible |
| 18.19     | Other   | Abandoned Quarry  
           | Road Surface Type - Flexible |
| 18.30     | Other   | Junction KY 722 Heading North  
           | Road Surface Type - Flexible |
| 18.40     | Other   | Junction KY 980 Heading South  
           | Road Surface Type - Flexible |
### Report by County and Milepoint for Logan County - Kentucky

#### US 68/KY 80

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.80</td>
<td>Trees</td>
<td>Number of Trees 75 Height 65 feet Diameter 24 in. Ending Milepoint 20.20 Distance From Road 10 feet Road Surface Type - Flexible</td>
</tr>
<tr>
<td>19.89</td>
<td>Trees</td>
<td>Number of Trees 4 Height 50 feet Diameter 28 in. Ending Milepoint 19.90 Distance From Road 15 feet Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.00</td>
<td>Other</td>
<td>Junction KY 103 Heading South Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.09</td>
<td>Other</td>
<td>Sinkhole Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.22</td>
<td>Other</td>
<td>Sinkhole Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.60</td>
<td>Other</td>
<td>Junction KY 1039 Heading North Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.80</td>
<td>Other</td>
<td>City of Auburn Road Surface Type - Flexible</td>
</tr>
<tr>
<td>20.94</td>
<td>Bridge</td>
<td>Number of Spans 2 Over Stream Concrete T-Beam End 1 Fixed Pier 1 Fixed End 2 Fixed Deck Type - Concrete Length 44 feet Width 44 feet Pier Type - Unknown SPC Rating - B Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown</td>
</tr>
<tr>
<td>21.50</td>
<td>Other</td>
<td>Junction KY 1039 Heading South Road Surface Type - Flexible</td>
</tr>
<tr>
<td>Milepoint</td>
<td>Feature</td>
<td>Data</td>
</tr>
<tr>
<td>-----------</td>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>21.70</td>
<td>Fill</td>
<td>Material Type - Soil Height 40 feet&lt;br&gt;Side slope 2:1 Length 1,000 feet&lt;br&gt;Crest 40 feet Type Fill - Other&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>21.91</td>
<td>Bridge</td>
<td>Number of Spans 3 Type Unknown Concrete T-Beam&lt;br&gt;End 1 Fixed Pier 1 Fixed Pier 2 Fixed&lt;br&gt;End 2 Fixed&lt;br&gt;Deck Type - Concrete Length 247 feet&lt;br&gt;Width 30 feet Pier Type - Unknown&lt;br&gt;SPC Rating - A Surface Type - Flexible&lt;br&gt;Expansion Type - Other&lt;br&gt;End 1 Substructure - Full&lt;br&gt;End 2 Substructure - Full&lt;br&gt;Foundation Type - Unknown</td>
</tr>
<tr>
<td>21.95</td>
<td>Fill</td>
<td>Material Type - Soil Height 60 feet&lt;br&gt;Side slope 2:1 Length 1,000 feet&lt;br&gt;Crest 40 feet Type Fill - Other&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>23.09</td>
<td>Other</td>
<td>Sinkhole&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>23.10</td>
<td>Trees</td>
<td>Number of Trees 2 Height 65 feet&lt;br&gt;Diameter 38 in. Ending Milepoint 23.10&lt;br&gt;Distance From Road 10 feet&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>24.00</td>
<td>Other</td>
<td>Junction KY 73 Heading South&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>24.30</td>
<td>Pipeline</td>
<td>Pipeline Type - Gas&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
<tr>
<td>24.70</td>
<td>Trees</td>
<td>Number of Trees 4 Height 55 feet&lt;br&gt;Diameter 32 in. Ending Milepoint 24.70&lt;br&gt;Distance From Road 10 feet&lt;br&gt;Road Surface Type - Flexible</td>
</tr>
</tbody>
</table>
### Report by County and Milepoint for Logan County - Kentucky

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 24.80     | Pipeline | Pipeline Type - Natural Gas  
|           |         | Road Surface Type - Flexible |
| 24.80     | Other   | Junction KY 1466 Heading North  
|           |         | Road Surface Type - Flexible |
| 25.46     | Trees   | Number of Trees 11 Height 60 feet  
|           |         | Diameter 36 in.  
|           |         | Distance From Road 18 feet  
|           |         | Ending Milepoint 25.50  
| 26.42     | Other   | Quarry  
|           |         | Road Surface Type - Flexible |
| 26.50     | Other   | Logan Co - Warren Co Boundary  
<p>|           |         | Road Surface Type - Flexible |</p>
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.82</td>
<td>Trees</td>
<td>Number of Trees 10 Height 40 feet Diameter 18 in. Ending Milepoint 0.85 Distance From Road 15 feet Road Surface Type - Flexible</td>
</tr>
<tr>
<td>1.50</td>
<td>Trees</td>
<td>Number of Trees 6 Height 45 feet Diameter 30 in. Ending Milepoint 1.55 Distance From Road 20 feet Road Surface Type - Flexible</td>
</tr>
<tr>
<td>1.82</td>
<td>Trees</td>
<td>Number of Trees 6 Height 40 feet Diameter 20 in. Ending Milepoint 1.85 Distance From Road 12 feet Road Surface Type - Flexible</td>
</tr>
<tr>
<td>1.95</td>
<td>Other</td>
<td>Junction KY 775 Heading Southeast Road Surface Type - Flexible</td>
</tr>
<tr>
<td>2.90</td>
<td>Fill</td>
<td>Material Type - Soil Height 8 feet Side slope 3:2 Length 200 feet Crest 30 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
<tr>
<td>2.91</td>
<td>Bridge</td>
<td>Number of Spans 3 Overpass Concrete T-Beam End 1 Fixed Pier 1 Fixed Pier 2 Fixed End 2 Fixed Deck Type - Concrete Length 90 feet Width 28 feet Pier Type - Solid SPC Rating - A Surface Type - Flexible Expansion Type - Other End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown</td>
</tr>
<tr>
<td>3.00</td>
<td>Fill</td>
<td>Material Type - Soil Height 8 feet Side slope 3:2 Length 200 feet Crest 35 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
</tbody>
</table>
### Report by Road and Milepoint for Logan County - Kentucky

#### US 79

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.05</strong></td>
<td><strong>Trees</strong></td>
</tr>
<tr>
<td><strong>3.55</strong></td>
<td><strong>Other</strong></td>
</tr>
<tr>
<td><strong>4.64</strong></td>
<td><strong>Bridge</strong></td>
</tr>
<tr>
<td><strong>4.65</strong></td>
<td><strong>Fill</strong></td>
</tr>
<tr>
<td><strong>4.75</strong></td>
<td><strong>Trees</strong></td>
</tr>
<tr>
<td><strong>4.75</strong></td>
<td><strong>Other</strong></td>
</tr>
</tbody>
</table>

#### Feature Data:

- **Trees**
  - Number of Trees: 1
  - Height: 30 feet
  - Diameter: 20 in.
  - Ending Milepoint: 3.05
  - Distance From Road: 10 feet
  - Road Surface Type: Flexible

- **Other**
  - Junction: KY 1309 Heading North & South
  - Road Surface Type: Flexible

- **Bridge**
  - Number of Spans: 3
  - Overpass: Concrete T-Beam
  - End 1: Fixed Pier 1
  - End 2: Fixed Pier 2
  - Deck Type: Concrete
  - Length: 104 feet
  - Width: 30 feet
  - Pier Type: Solid
  - SPC Rating: A
  - Surface Type: Flexible
  - Expansion Type: Other
  - End 1 Substructure: Full
  - End 2 Substructure: Full
  - Foundation Type: Unknown

- **Fill**
  - Material Type: Soil
  - Height: 18 feet
  - Side slope: 1:1
  - Length: 150 feet
  - Crest: 35 feet
  - Type Fill: Other
  - Road Surface Type: Flexible

- **Trees**
  - Number of Trees: 2
  - Height: 40 feet
  - Diameter: 24 in.
  - Ending Milepoint: 4.65
  - Distance From Road: 15 feet
  - Road Surface Type: Flexible

- **Trees**
  - Number of Trees: 4
  - Height: 35 feet
  - Diameter: 20 in.
  - Ending Milepoint: 4.75
  - Distance From Road: 20 feet
  - Road Surface Type: Flexible

- **Other**
  - Barn Within: 15 feet of Road
  - Road Surface Type: Flexible
### Report by County and Milepoint for Logan County - Kentucky

#### US 79

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75</td>
<td>Fill</td>
<td>Material Type - Soil Height 18 feet Side slope 1:1 Length 75 feet Crest 30 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.10</td>
<td>Fill</td>
<td>Material Type - Soil Height 12 feet Side slope 3:2 Length 400 feet Crest 40 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.10</td>
<td>Other</td>
<td>Swamp Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.20</td>
<td>Other</td>
<td>Junction KY 1151 Heading South Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.25</td>
<td>Other</td>
<td>Junction KY 1151 Heading North Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.89</td>
<td>Fill</td>
<td>Material Type - Soil Height 12 feet Side slope 3:2 Length 250 feet Crest 35 feet Type Fill - Other Road Surface Type - Flexible</td>
</tr>
<tr>
<td>5.93</td>
<td>Bridge</td>
<td>Number of Spans 2 Overpass Concrete Box Beam End 1 Fixed Pier 1 Fixed End 2 Fixed Deck Type - Concrete Length 80 feet Width 30 feet Pier Type - Unknown SPC Rating - A Surface Type - Flexible Expansion Type - Poured Compression End 1 Substructure - Full End 2 Substructure - Full Foundation Type - Unknown</td>
</tr>
<tr>
<td>5.95</td>
<td>Trees</td>
<td>Number of Trees 6 Height 40 feet Diameter 20 in. Ending Milepoint 5.95 Distance From Road 15 feet Road Surface Type - Flexible</td>
</tr>
</tbody>
</table>
### Feature Data

<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 6.30 | Trees | Number of Trees 3  Height 45 feet  
Diameter 24 in.  Ending Milepoint 6.30  
Distance From Road 20 feet  
Road Surface Type - Flexible |
| 7.30 | Other | Junction KY 1041 Heading South  
Road Surface Type - Flexible |
| 7.94 | Trees | Number of Trees 20  Height 35 feet  
Diameter 24 in.  Ending Milepoint 8.00  
Distance From Road 10 feet  
Road Surface Type - Flexible |
| 9.14 | Trees | Number of Trees 30  Height 40 feet  
Diameter 15 in.  Ending Milepoint 9.20  
Distance From Road 20 feet  
Road Surface Type - Flexible |
| 9.38 | Trees | Number of Trees 20  Height 30 feet  
Diameter 12 in.  Ending Milepoint 9.40  
Distance From Road 10 feet  
Road Surface Type - Flexible |
| 9.43 | Bridge | Number of Spans 1  Underpass Concrete T-Beam  
End 1 Fixed  End 2 Fixed  
Deck Type - Concrete  Length 30 feet  
Width 10 feet  Pier Type - Unknown  
SPC Rating - A  Surface Type - Flexible  
Expansion Type - Other  
End 1 Substructure - Full  End 2 Substructure - Full  
Foundation Type - Unknown |
| 9.50 | Trees | Number of Trees 10  Height 40 feet  
Diameter 24 in.  Ending Milepoint 9.50  
Distance From Road 10 feet  
Road Surface Type - Flexible |
<table>
<thead>
<tr>
<th>Milepoint</th>
<th>Feature</th>
<th>Data</th>
</tr>
</thead>
</table>
| 9.60      | Power Line | Electrical Power Line  6 Lines  Height 50 feet  
Steel Support Structure Unknown Volts  
Road Surface Type - Flexible |
| 9.80      | Trees     | Number of Trees 6  Height 40 feet  
Diameter 20 in.  Ending Milepoint 9.80  
Road Surface Type - Flexible |
| 10.75     | Other     | Junction KY 3233 Heading South  
Road Surface Type - Flexible |
| 11.05     | Trees     | Number of Trees 2  Height 50 feet  
Diameter 24 in.  Ending Milepoint 11.05  
Distance From Road 10 feet  
Road Surface Type - Flexible |
| 11.20     | Power Line | Electrical Power Line  3 Lines  Height 30 feet  
Wood Support Structure Unknown Volts  
Road Surface Type - Flexible |