Kentucky Transportation Center
College of Engineering

Truck Route Access Evaluation

Hopkinsville Industrial Park
Off US 41 South of Hopkinsville
Site #41
TRUCK ROUTE ACCESS EVALUATION

Hopkinsville Industrial Park
Off US 41 South of Hopkinsville
Site # 41

Report No. KTC-98-26

"Freight Movement and Intermodal Access in Kentucky"
Project No. SPR 98-189

by

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September 1998
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1.0 Introduction

The Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189) is being conducted on behalf of the Kentucky Transportation Cabinet (KYTC). There are two major objectives of the study: evaluation of the access for trucks between intermodal or other truck generating sites and the National Highway System (NHS); and furthering the understanding of freight commodity flows throughout the state. This report summarizes the access evaluation for one cluster of facilities located in Christian County in the Pennyrile Area Development District (ADD) and KYTC Highway District # 2. The location of the site is shown in Figure 1. Work on other specific sites and the freight commodity flow task are on-going and are reported elsewhere.

The sites to be evaluated were selected from two existing databases (a truck facility survey from 1994 and the intermodal facility inventory) based on ADD and KYTC Highway District planner recommendations, geographic location, distance to the national highway system, and the number of trucks accessing the site. Consideration was also made for the freight type handled and transportation modes used. This industrial park is located along US 41 (Pembroke Road) at Hopkinsville. Another company (Phelps Dodge Magnet Wire) was located adjacent to the industrial park along US 41 and was included in the analysis.

The site was visited several times for data collection and video recording as listed in Appendix A. The following facilities are located in the industrial park: Brazeway, BRHVD, Continental Grain, Copar, Dana, Douglas Autotech, Flynn Enterprises, Freudenberg Norwovens, Hopkinsville Coating, IG Autotrim, International Paper, Meritor, MHI Machine Tool, Original Exhaust, Perdue Furniture, Plymouth Tube, and White Hydraulics. These facilities are located on Bill Bryan Boulevard and Commerce Drive off of US 41 while Phelps Dodge Magnet Wire is located on US 41. Approximate locations are also shown in Figure 1. The surrounding area is at the edge of an urban area.

A phone survey of a sample of facility managers was conducted early in the study process. The phone survey did not include all the sites in the cluster so a traffic count was used to obtain the truck volume. A 1991 KYTC volume count indicates that almost 800 trucks per day (12 percent of total volume) travel along US 41 and a 1998 volume count showed 580 trucks per day on Bill Bryan Boulevard (25 percent of total volume). The site trucks are generally semi tractor trailers with a maximum length of 53 feet. The phone survey information can be found in Appendix B.

2.0 Trucks Routes in Use

There is currently only one primary route for trucks to reach the National Highway System. The trucks accessing the industrial areas on US 41 are traveling to and from the Pennyrile Parkway, a distance of about 1.7 miles from the main entrance to the industrial park at Bill Bryan Boulevard (Figure 1). The trucks travel north on US 41 to the Pennyrile Parkway. US 41 is a four lane divided (20-foot mountable median) highway with 12-foot lanes and a 10-foot gravel shoulder between the industrial park and the Pennyrile Parkway (Figure 2). US 41 changes to a two lane
Figure 1: Location of Truck Generating Sites

- BILL BRYAN BLVD.
  - Brazeway, Inc.
  - Continental Grain
  - COPAR, Inc.
  - Dana Corp.
  - Flynn Enterprise
  - Freudenberg Nonwovens
  - Hopkinsville Coatings
  - IG Auto Trim
  - Meritor
  - MHI Machine Tool, USA
  - Mid Continent Spring
  - Perdue Wood Works
  - Plymouth Tube company
  - White Hydraulics

- COMMERCE DR.
  - BRHVO
  - Douglas Autotec
  - International Paper
  - Original Exhaust

- Phelps Dodge Magnet Wire

Scale 1:31,250 (at center)

2000 Feet

1000 Meters

- National Highway
- System Route
- Facility Access
- Routes

© 1993 DeLorme Mapping
Figure 2: US 41

Figure 3: Bill Bryan Boulevard
road just south of the industrial park. Trucks in the industrial park travel on a two lane roadway within the park to access US 41. A portion of this road is divided. Bill Bryan Boulevard is about one mile in length with about one third of the road divided (Figure 3). Commerce Drive is about 0.8 mile in length and is a two lane road. The general character of the area is urban. Right of way at the driveways from the industrial park to US 41 is controlled by a stop sign on the driveways. Right of way at the Pennyrile Parkway is controlled by stop signs on the exit ramps.

Phone surveys were conducted with industries in the pre-existing intermodal or truck databases or the major industries observed during the sites visits. While the overall response from industries was very good, in some cases facility managers could not be contacted or did not want to assist with the survey. In order to stay within the resources available for the project not all smaller facilities with lower truck volumes could be contacted. A problem noted from the phone surveys conducted with facility managers was that there had been several accidents at the intersection between the main industrial park access (Bill Bryan Boulevard) and US 41 (Pembroke Road) which was related to the lack of a traffic signal. It was also noted that additional use would be made of US 41 southbound if had four lanes rather than two.

3.0 Route Data Collection and Evaluation

The route features that were evaluated in this study are shown in Table 1 along with a brief description of the evaluation method. While some of these features require only subjective evaluation during site inspection, others required quantitative measurement to label the particular point or section as “preferred”, “adequate”, or “less than adequate” for truck access. The guidelines for labeling a point or section into one of these three descriptive categories are provided in both the interim and final reports for this project. In several cases measurements were only taken where subjective evaluation indicated a problem might exist since “preferred” type sections and points do not contribute to an increase in the problem truck points or miles that are summed for the route.

3.1 Traffic Operations and Level of Service

Potential problem areas identified in the surveys were with the entrance ramps to the Pennyrile Parkway from US 41 and a possible need for a traffic signal at the intersection of US 41 and the entrance to the industrial park at Bill Bryan Boulevard.

Traffic counts conducted at the intersection of US 41 and Bill Bryan Boulevard (Appendix C) indicate that there is no need for a traffic signal due to low volumes along US 41. A 15-minute count was taken during a time indicated as a peak time according to the surveys. The volume was then converted into hourly volumes. Moreover, the analysis of this unsignalized intersection using the Highway Capacity Manual indicates that the intersection operates at Level of Service A.
Traffic counts were not conducted at the parkway ramps due to the low volumes observed for a 15-minute period. Therefore, no problems were observed at these intersections as well.

Observations were made as an observer traveled along US 41 in both directions while maintaining the speed of the traffic. It was apparent that no significant delays or operational problems experienced along US 41 since the arterial operates at acceptable LOS. Given this analysis, the access route appears to operate at an adequate traffic and operational level.

**Table 1: Route Features and Method of Evaluation**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Methodology</th>
<th>Team Consensus based on Committee Meeting and Draft Report Feedback</th>
<th>Feature Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offtracking</td>
<td>Lane Width with formula based on wheel and axle spacing</td>
<td>Evaluate where observation of trucks indicates possible offtracking - use HIS data and collect in field</td>
<td>Point</td>
</tr>
<tr>
<td>Max. Safe Speed on a Curve</td>
<td>Ball Bank Indicator Reading</td>
<td>Evaluate complete route due to ease of data collection</td>
<td>Point</td>
</tr>
<tr>
<td>Grade</td>
<td>Speed Reduction Tables with Percent Grade and Direct Observation</td>
<td>Evaluate where observation of trucks indicates speed reduction occurs using HIS data and collect in field as needed</td>
<td>Continuous</td>
</tr>
<tr>
<td>Lane Width</td>
<td>HIS data and field measurement</td>
<td>Review complete route due to ease of data collection</td>
<td>Continuous</td>
</tr>
<tr>
<td>Clear Zone</td>
<td>Observation</td>
<td>Subjective evaluation</td>
<td>Subjective</td>
</tr>
<tr>
<td>Shoulders</td>
<td>HIS data and field measurement</td>
<td>Evaluate where HIS data is available and estimate based on observation elsewhere</td>
<td>Continuous</td>
</tr>
<tr>
<td>Pavement Condition</td>
<td>Observation</td>
<td>Subjective evaluation</td>
<td>Subjective</td>
</tr>
<tr>
<td>Truck Stopping Sight Distance</td>
<td>Field measurements</td>
<td>Measure only when observation indicates possible problem</td>
<td>Point</td>
</tr>
<tr>
<td>Turning Radii</td>
<td>Field measurements and observations of trucks</td>
<td>Measure only when observation indicates possible problem</td>
<td>Point</td>
</tr>
<tr>
<td>Accident History</td>
<td>Accident data files and KTC High Truck Accident Report</td>
<td>Do for entire route</td>
<td>Subjective</td>
</tr>
<tr>
<td>Intersection LOS</td>
<td>Traffic counts</td>
<td>Only where problems are indicated by facility managers</td>
<td>Point</td>
</tr>
<tr>
<td>Route LOS</td>
<td>Traffic counts and travel time studies</td>
<td>Only where problems are indicated by managers</td>
<td>Continuous</td>
</tr>
<tr>
<td>RR Crossings</td>
<td>Field Observation</td>
<td>Evaluate all level crossings</td>
<td>Point</td>
</tr>
<tr>
<td>Bridges</td>
<td>KYTC Sufficiency Rating</td>
<td>Evaluate all bridges</td>
<td>Point</td>
</tr>
</tbody>
</table>
3.2 Accident History

In 1997 the Kentucky Transportation Center studied all state-maintained roads throughout Kentucky and determined average truck accident rates for different types of road sections. A critical accident rate was then calculated using the average accident rate for a specific highway type along with an assumed level of statistical significance and exposure (vehicles miles traveled). Critical rate factors were calculated for one-mile sections having critical numbers of accidents. No sections were identified along US 41 with either a critical number or rate.

Figure 4 shows the locations of accidents during the years 1994, 1995 and 1996. The largest number of accidents occurred around the Pennyrile Parkway interchange. A summary of the accidents on US 41 between the Pennyrile Parkway interchange and Bill Bryan Road is shown in Table 2 for the same three year period. Only two of the 30 accidents involved a truck (6.7 percent), and this percentage was less than the 12 percent of heavy trucks on this route. The accident history does not show a problem related to truck traffic.

Table 2: Accident Types along Christian County Truck Route

<table>
<thead>
<tr>
<th></th>
<th>Non-Truck Accidents</th>
<th>Truck Accidents</th>
<th>Percent Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatal Accidents</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Injury</td>
<td>9</td>
<td>1</td>
<td>11.1</td>
</tr>
<tr>
<td>Intersection</td>
<td>12</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>2</td>
<td>6.7</td>
</tr>
</tbody>
</table>

3.3 Cross Section Features

Figures 5 and 6 illustrate the lane and shoulder widths along the route. The 12-foot lane widths provided on US 41 are considered “preferred” and the roadway widths on the road in the industrial park gave a lane width of over 12 feet (also “preferred”). The 10-foot gravel shoulders on US 41 are considered “adequate” while no shoulders were provided on the industrial park road (considered “less than adequate”).

No significant clear zone problems were found. The pavement was in fair condition on US 41 and in good condition along the rest of the route.

3.4 Curvature Features

Grades are considered problematic if they cause trucks to slow down excessively. No such grades were found on this route. There were no segments where safe speed on curves or off tracking would be a problem along this route for trucks. The turning radius at the major intersections were observed. No radius problems were noted.
Figure 4: Accident Locations (1994-1996)
Figure 5: Lane Widths
Figure 6: Shoulder Widths

LEGEND

- Facility
- No Shoulder
- Shoulder Width: 10 Feet
- State Highway System
- Other Roads

Scale - 1:25000

0.25 0 0.25 0.5 Miles

500 0 500 1000 Meters

Phelps Dodge Magnet Wire
Plymouth Tube
I G Autotrim
BRHV9
Original Exhaust
Perdue Furniture
Dana
Freudenberg Norwofens
International Paper
White Hydraulics
Copar

Brazeway
Flynn Enterprises
Douglas Autotech
Meritor
Continental Grain
MHI Machine Tool
Hopkinsville Coating
3.5 Railroad Crossings

There were no at-grade railroad crossings on this route.

3.6 Bridges

There were no bridges on this route. The interchange involved an overpass.

3.7 Sight Distance

No sight distance problems were observed at any entrance or side street.

3.8 Other Route Features

No specific problems were noted.

4.0 Composite Route Evaluation and Recommendations

4.1 Problem Truck Miles and Truck Points

In order to compare different routes to consider relative urgency of needed route improvements the features rated “preferred”, “adequate” and “less than adequate” along a route were normalized for the number of miles, number of points and number of trucks using the route section. In the case of this Christian County route, only one of the features that were evaluated quantitatively had sections or points that are considered only “adequate” or “less than adequate.” A section or point that is considered “less than adequate” is weighted two times that of an “adequate” point or section. Sections which are not rated as “preferred” are weighted by length as well as the number of trucks on that section.

Table 3 contains the total problem truck miles for the shoulders along this route. The rating of this route relative to others evaluated will be reported in the final report.

Table 3: Summary of Problem Truck Miles and Points for Entire Route

<table>
<thead>
<tr>
<th>Feature</th>
<th>Road</th>
<th>Location</th>
<th>Points</th>
<th>Length (miles)</th>
<th>Trucks (/day)</th>
<th>Truck-points</th>
<th>Truck-miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulders</td>
<td>US 41</td>
<td>Parkway-Park</td>
<td>1</td>
<td>1.7</td>
<td>765</td>
<td></td>
<td>1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bill Bryan</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 41-Casky</td>
<td>2</td>
<td>1.8</td>
<td>580</td>
<td></td>
<td>1,044</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commerce</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,344</td>
</tr>
</tbody>
</table>

*1 point for “adequate” features and 2 points for “less than adequate” features (0 points for “preferred” features not shown)
4.2 Maintenance Improvement Locations

No features noted during the site inspections were found which were causing a substantial problem and should be addressed during routine maintenance.

4.3 Overall Route Rating

In order to account for both the subjectively and objectively evaluated route features along truck routes throughout the state, UK engineers who studied the route and its features either during a site visit or by viewing a video of trucks using the routes rated the overall access on a scale of 1 through 10. The interpretation for these ratings is shown in Table 4. The route in Christian County from the Hopkinsville Industrial Park to the Pennyrile Parkway was given an overall rating of 10 indicating that trucks are served with reasonable access. Access between the NHS (Pennyrile Parkway) and industrial park was provided by a four lane roadway with full width shoulders. The only points given on the route related to the shoulders, primary in the industrial park, which did not impede truck access.

Table 4: Interpretation of the Overall Route Rating

<table>
<thead>
<tr>
<th>Overall Route Rating</th>
<th>Qualitative Interpretation of Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Trucks should not be using this route</td>
</tr>
<tr>
<td>2</td>
<td>Major construction is required to improve this route</td>
</tr>
<tr>
<td>3-5</td>
<td>Minor improvements are <strong>required</strong> on this route</td>
</tr>
<tr>
<td>6-8</td>
<td>Minor improvements could <strong>improve</strong> this route</td>
</tr>
<tr>
<td>9</td>
<td>Minor problems exist that do not seriously impede truck access</td>
</tr>
<tr>
<td>10</td>
<td>Trucks are served with reasonable access</td>
</tr>
</tbody>
</table>
Appendices
Appendix A: Field Site Visit Dates and Activities

January 14, 1998 - site layout, facility identification, photographs and video
May 19, 1998 - traffic counts and geometric measurements
May 26, 1998 - final data collection
Appendix B: Phone Surveys Conducted with Facilities
PHONE SURVEY RESULTS

<table>
<thead>
<tr>
<th>Facility ID</th>
<th>Facility Name</th>
<th>Location / City</th>
<th>County</th>
<th>ADD</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Phelps Dodge</td>
<td>Hopkinsville</td>
<td>Christian</td>
<td>Pennyville</td>
</tr>
<tr>
<td></td>
<td>Magnet Wire</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact Name</th>
<th>Title</th>
<th>Phone</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bob Moran</td>
<td>Shipping</td>
<td>502-886-3961</td>
<td>502-887-5254</td>
</tr>
</tbody>
</table>

1. Is the location of your facility on the map correct? Yes

2. Our information shows about ___35___ trucks per day access your facility. Is that correct? If not, fill in correct volume. Yes

3. Is the truck traffic to and from your facility seasonal or mostly constant? Constant

4. (If truck traffic is seasonal) Is the ___ trucks/day for the peak season?

5. What is the most common size truck operating at your facility? 45' Semitrailer 5-axle

6. What is the largest truck operating at your facility? 53' Semitrailer

7. What type of freight or commodity is shipped, and is incoming and outgoing freight different? (one may be an empty truck) In - Raw materials Out - Insulated copper wire

8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) Receive - A.M. Shipping - P.M.

9. What traffic congestion and delay problems along the routes are you aware of, or feel need improvement? Location (route segment, intersection, etc.) Time and Day of Week
   None

10. Where do trucks at your facility go to and come from? (This may be an interstate, cities, general direction-N, S, E, W) Pennyville TO US 68 EB US 41 TO US 41A N&S

11. Do you have any other problems or concerns along the route you would like us to consider? Yes

12. Would you like a copy of the final report (roadway/route evaluation ???) Yes

NOTES/COMMENTS:
PHONE SURVEY RESULTS

<table>
<thead>
<tr>
<th>Facility ID</th>
<th>Facility Name</th>
<th>Location / City</th>
<th>County</th>
<th>ADD</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>White Hydraulics</td>
<td>Hopkinsville</td>
<td>Christian</td>
<td>Pennyrile</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact Name</th>
<th>Title</th>
<th>Phone</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doyle Shelton</td>
<td></td>
<td>502-885-1110</td>
<td>502-887-0393</td>
</tr>
</tbody>
</table>

1. Is the location of your facility on the map correct? Yes

2. Our information shows about ___ trucks per day access your facility. Is that correct? 
   If not, fill in correct volume. Yes

3. Is the truck traffic to and from your facility seasonal or mostly constant? Constant

4. (If truck traffic is seasonal) Is the ___ trucks/day for the peak season?

5. What is the most common size truck operating at your facility? 45' Semitrailer

6. What is the largest truck operating at your facility? 50' Semitrailer

7. What type of freight or commodity is shipped, and is incoming and outgoing freight different? 
   (one may be an empty truck) In - Iron castings, steel plates, steel bars 
   Out - Hydraulic motors

8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return 
   in the afternoon) 3:00 p.m. - 6:00 p.m. (Both)

9. What traffic congestion and delay problems along the routes are you aware of, or feel need 
   improvement? 
   Location (route segment, intersection, etc.) Time and Day of Week
   Bill Bryan/ Pembroke (US 41A) - No signal
   Shift work congestion on US 41A exits off Pennyrile to US 41

10. Where do trucks at your facility go to and come from? (This may be an Interstate, cities, 
    general direction-N,S,E,W) In - N. Ohio, N. Indiana, Detroit
    Out - Central U.S.

11. Do you have any other problems or concerns along the route you would like us to consider? 
    Several accidents at intersection of Bill Bryan/ Pembroke (US 41) no signal. Two multiple 
    vehicle accidents in last two days, would use US 41 SB to US 79 to I-24 if it were four lane.

12. Would you like a copy of the final report (roadway/route evaluation ???) Yes

NOTES/COMMENTS:
Appendix C: Traffic Counts

A 15-minute count was taken at the intersection of US 41 and Bill Bryan Boulevard on May 19, 1998 during a time indicated as a peak time according to the surveys. The volume was then converted to the following hourly volumes.

<table>
<thead>
<tr>
<th>Direction</th>
<th>Route</th>
<th>Direction</th>
<th>Volume (Truck Volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB</td>
<td>US 41</td>
<td>Straight</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RT</td>
<td>48 (4)</td>
</tr>
<tr>
<td>NB</td>
<td>US 41</td>
<td>Straight</td>
<td>136 (8)</td>
</tr>
<tr>
<td>EB</td>
<td>Bill Bryan</td>
<td>LT</td>
<td>144 (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RT</td>
<td>4 (4)</td>
</tr>
</tbody>
</table>