

# TRUCK ROUTE ACCESS EVALUATION

Safety Kleen  
Henry County  
Site #2145

Report No. KTC-99-7

“Freight Movement and Intermodal Access in Kentucky”  
SPR 98-189

Brian Aldridge

With:  
Ken Agent  
Lisa Aultman-Hall  
Dave Cain  
Nick Stamatiadis  
Joel Weber



Kentucky Transportation Center and Department of Civil Engineering  
University of Kentucky

February 1999

## **Table of Contents**

<b>1.0</b>	<b>Introduction</b>	<b>1</b>
<b>2.0</b>	<b>Truck Routes in Use</b>	<b>1</b>
<b>3.0</b>	<b>Route Data Collection and Evaluation</b>	<b>3</b>
<b>3.1</b>	<b>Traffic Operations and Level of Service</b>	<b>3</b>
<b>3.2</b>	<b>Accident History</b>	<b>3</b>
<b>3.3</b>	<b>Cross Section Features</b>	<b>6</b>
<b>3.4</b>	<b>Curvature Features</b>	<b>6</b>
<b>3.5</b>	<b>Railroad Crossings</b>	<b>14</b>
<b>3.6</b>	<b>Bridges</b>	<b>14</b>
<b>3.7</b>	<b>Sight Distance</b>	<b>14</b>
<b>4.0</b>	<b>Route Evaluation and Recommendations</b>	<b>14</b>
<b>4.1</b>	<b>Problem Truck Miles and Truck Points</b>	<b>14</b>
<b>4.2</b>	<b>Maintenance Improvement Locations</b>	<b>17</b>
<b>4.3</b>	<b>Overall Route Rating</b>	<b>17</b>
<b>4.4</b>	<b>Conclusions and Recommendations</b>	<b>18</b>
 <b>Appendices</b>		
	<b>Appendix A: Phone Surveys Conducted with Facilities</b>	<b>20</b>

## **List of Tables**

Table 1: Route Features and Method of Evaluation	4
Table 2: Accident Types along Henry County Truck Route	6
Table 3: Summary of Problem Truck Miles and Truck Points for Entire Route	17
Table 4: Interpretation of the Overall Route Rating	18

## **List of Figures**

Figure 1: Location of Truck Generating Site	2
Figure 2: Accident Locations (1995 – 1997)	5
Figure 3: Lane Widths	7
Figure 4: Shoulder Widths	8
Figure 5: Portion of KY 146 with No Shoulder	9
Figure 6: Northbound View of KY 153	9
Figure 7: Northbound KY 153 at I-71 Interchange	10
Figure 8: Section of KY 146 with No Clear Zone	10
Figure 9: Curve Safe Speeds	11
Figure 10: Westbound View of KY 146 from Facility Entrance	12
Figure 11: Offtracking Locations	13
Figure 12: Problematic Grade Location	15
Figure 13: Bridge Locations	16

## **1.0 Introduction**

The Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189), undertaken by the Kentucky Transportation Center (KTC) on behalf of the Kentucky Transportation Cabinet (KYTC), has two main objectives. These objectives include 1) the evaluation of access for trucks between intermodal or other truck generating sites and the National Highway System (NHS) and 2) furthering the understanding of freight commodity flows throughout the state. This report summarizes the access evaluation for one facility located in Henry County in the KIPDA Area Development District (ADD) and KYTC Highway District #5. The location of the site is shown in Figure 1. Work on other specific sites as well as the freight commodity flow task are on-going and are documented elsewhere.

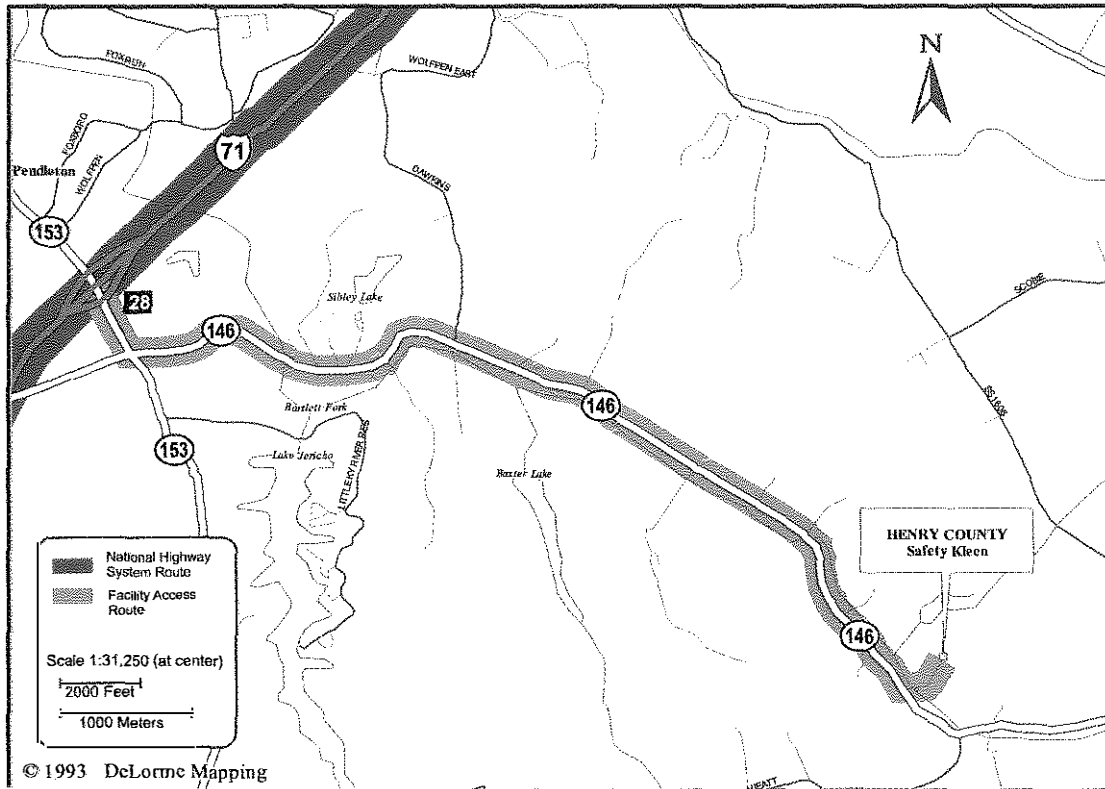
The sites to be evaluated were selected from two existing databases (a truck facility survey from 1994 and the intermodal facility inventory) based on ADD and KYTC Highway District planner recommendations, geographic location, distance to the NHS, and the number of trucks accessing the site. Consideration was also made for the freight type handled and transportation modes used.

The facility for study in this report is Safety Kleen in Smithfield, and the initial trip to the site revealed that there were no other significant sources of truck traffic in the vicinity. The site was visited for video recording on March 5, 1998 and the initial site visit for data collection was on July 3, 1998. Traffic counts were conducted by Presnell Associates for the KYTC Division of Planning between July 27 and July 29, 1998. Early into the study process, phone surveys were conducted so that facility managers could indicate the routes used by trucks and provide insight into potential access-limiting issues. The phone survey completed with this facility, which is found in Appendix A, indicated that approximately 60 trucks per day (120 one-way trips) are accessing the facility.

## **2.0 Truck Routes in Use**

There is one route used for access to the NHS (see Figure 1). Upon leaving the facility, trucks turn right onto westbound KY 146 and travel for approximately 4 miles to the intersection with KY 153. KY 146 lies on rolling terrain and is rural in character. Once at the intersection of KY 153 and KY 146, the route turns right and proceeds north on KY 153 for approximately 0.3 miles to the first entrance ramp onto I-71 northbound and 0.4 miles to the entrance ramp for I-71 southbound. KY 153 is predominately rural in character, but with several truck stops located in the vicinity of I-71, this area is best described as light commercial. Both KY 153 and KY 146 are in the AAA weight class indicating that each can carry 80,000 pound (gross weight) trucks. Total route length is approximately 4.3 miles. The only traffic signal control along this route is a caution light at the four-way, stop-controlled intersection of KY 146 and KY 153. The average daily traffic (ADT) on KY 146 ranges from 2,612 to 3,384 vehicles (from 1996 KYTC traffic counts). The ADT on KY 153 is 5,007 vehicles per day (from 1992 KYTC traffic counts).

Figure 1: Location of Truck Generating Site (Smithfield, KY)



### **3.0 Route Data Collection and Evaluation**

The route features that are to be evaluated in this study are shown in Table 1 along with a brief description of the evaluation method. While some of these features required only subjective evaluation by the engineer during site inspection, others required quantitative measurement in order 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 report for this project. In several cases measurements were only taken where subjective evaluation indicated a problem might exist.

#### **3.1 Traffic Operations and Level of Service**

The survey of this site indicated that there were no operational problems or concerns for this site. Thus, the route is assumed to operate at an acceptable level of service.

#### **3.2 Accidents**

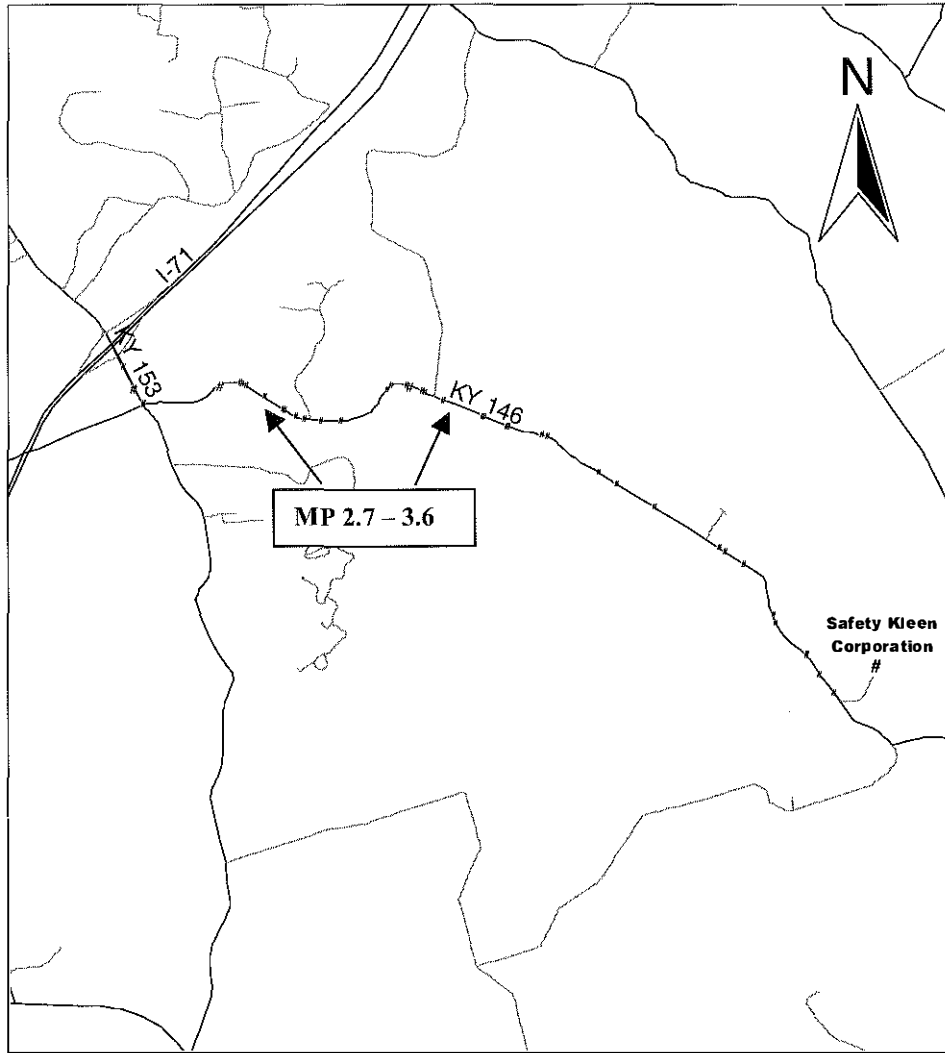
In 1997 the Kentucky Transportation Center studied all the state-maintained roads throughout Kentucky and determined average truck accident rates for different types of road sections. A critical accident rate was then calculated using the average accident rate for a specific highway type along with an assumed level of statistical significance and exposure (vehicle miles traveled). One section of this truck route had an accident rate higher than the critical rate for that highway type. KY 146 between the milepoints of 2.7 and 3.6 (shown in Figure 3) had a critical rate factor of 1.37, where the critical rate factor is the ratio of the actual accident rate to the critical accident rate. This value indicates that the number of accidents involving trucks is 1.37 times the critical rate and thus is a problem.

Figure 3 shows the locations of accidents during the years 1995, 1996, and 1997. A summary of the accidents along both truck routes (for all roads, not just state-maintained roads) is shown in Table 2 for the same three-year period. The percentage of trucks involved in accidents along this route (13.5%) is more than the percentage of trucks found on the KY 146 portion of the route from 1998 traffic counts. Traffic on KY 146 was composed of 8.8% trucks while KY 153 had 16.3% trucks. This suggests that there is a possible problem with truck accidents on KY 146 from a recent accident history point of view.

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

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

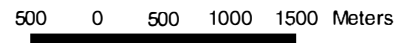
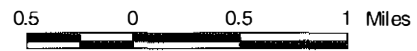
Figure 2: Accident Locations (1995-1997)



**LEGEND**

- # Facility
- \* Accidents: 1-2
- # Accidents: 3-4

**Scale - 1:40000**





**Table 2: Accident Types along Henry County Truck Route**

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	64	10	13.5
Fatal Accidents	1	0	0.0
Injury	21	5	19.2
Intersection	12	0	0.0

### **3.3 Cross Section Features**

Figures 3 and 4 illustrate the sections of the route with different lane widths and shoulder types, respectively. KY 153 and KY 146 both have 10-foot lanes which are considered “less than adequate”. Pavement along both roads is in good condition.

KY 146 has only a “less than adequate” 2- to 4-foot of turf shoulder along its length. The only exception to the turf shoulders is shown in Figure 5. This figure shows a short portion of KY 146 between milepoints 5.5 and 5.6 with no shoulder. All of the route portion of KY 153, except the area in the immediate vicinity of the intersection with KY 146, has 10-foot “preferred” paved shoulders, as shown in Figures 6 and 7.

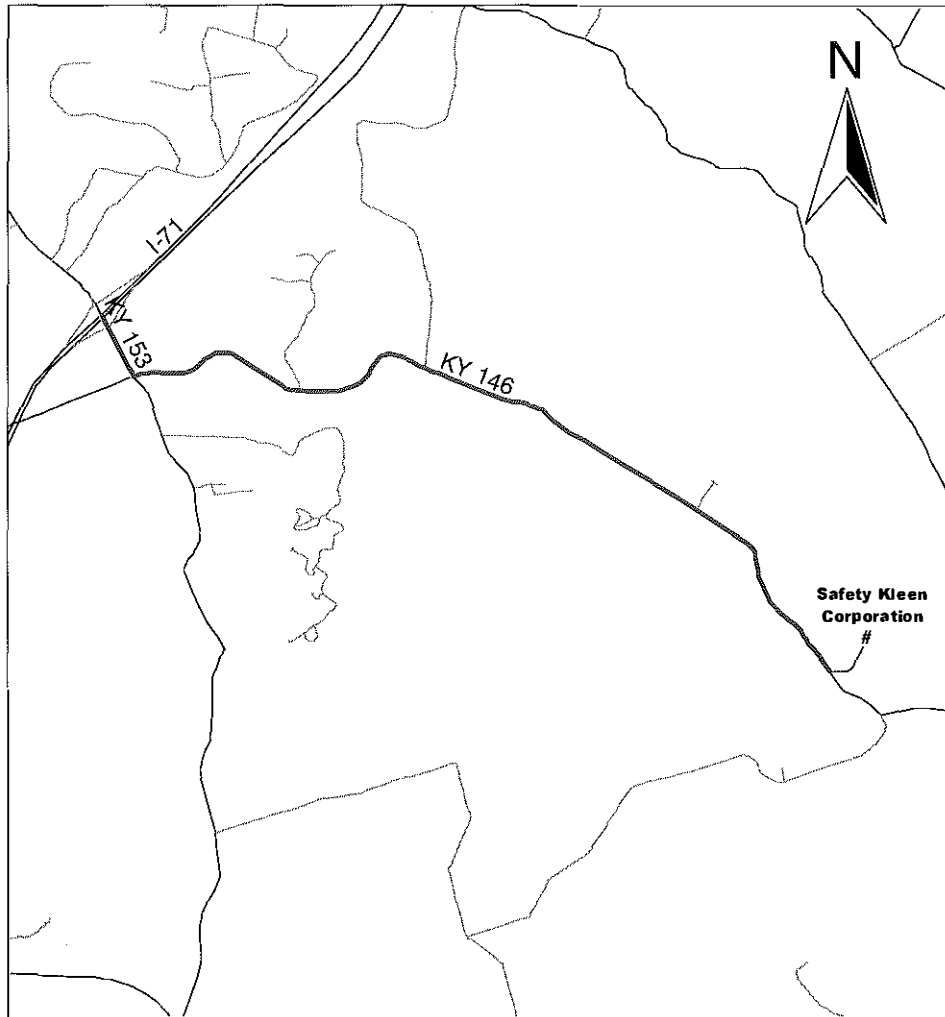
The only problem associated with clear zone is between milepoint 5.5 and 5.6 on KY 146. Figure 8 shows the section along the northern side of the road where there is no clear zone (or shoulder) available. With Bartlett Creek just below the roadside, the inclusion of guardrail along this section might be considered.

### **3.4 Curvature Features**

The route was tested for curves with safe speed problems by the use of the ball-bank indicator. By maintaining the posted speed limits and/or advisory speeds through curves, the ball-bank indicator allows for the determination of whether or not the curve should be safely driven at indicated speeds. There are two curves along the route with less than “preferred” ball-bank readings, as shown in Figure 9. Both curves had 45 mile-per-hour advisory speeds. The first can be found at approximately milepoint 3.5 on KY 146. This curve had a ball-bank reading greater than 10° which is “less than adequate”. The second curve is located at approximately milepoint 6.0 on KY 146. Figure 10 shows the beginning of this section of curvature. This curve also had a ball-bank reading of greater than 10° which is “less than adequate”.

Offtracking is considered a problem where a truck cannot stay in its lane through a curve. With only 10-foot lanes on KY 146, some curves were investigated for offtracking. Figure 11 shows the four curves that were evaluated due to suspected offtracking. The first two, beginning at milepoints 2.95 and 3.2, are approximately 6 degrees and are

**Figure 3: Lane Widths**



**LEGEND**

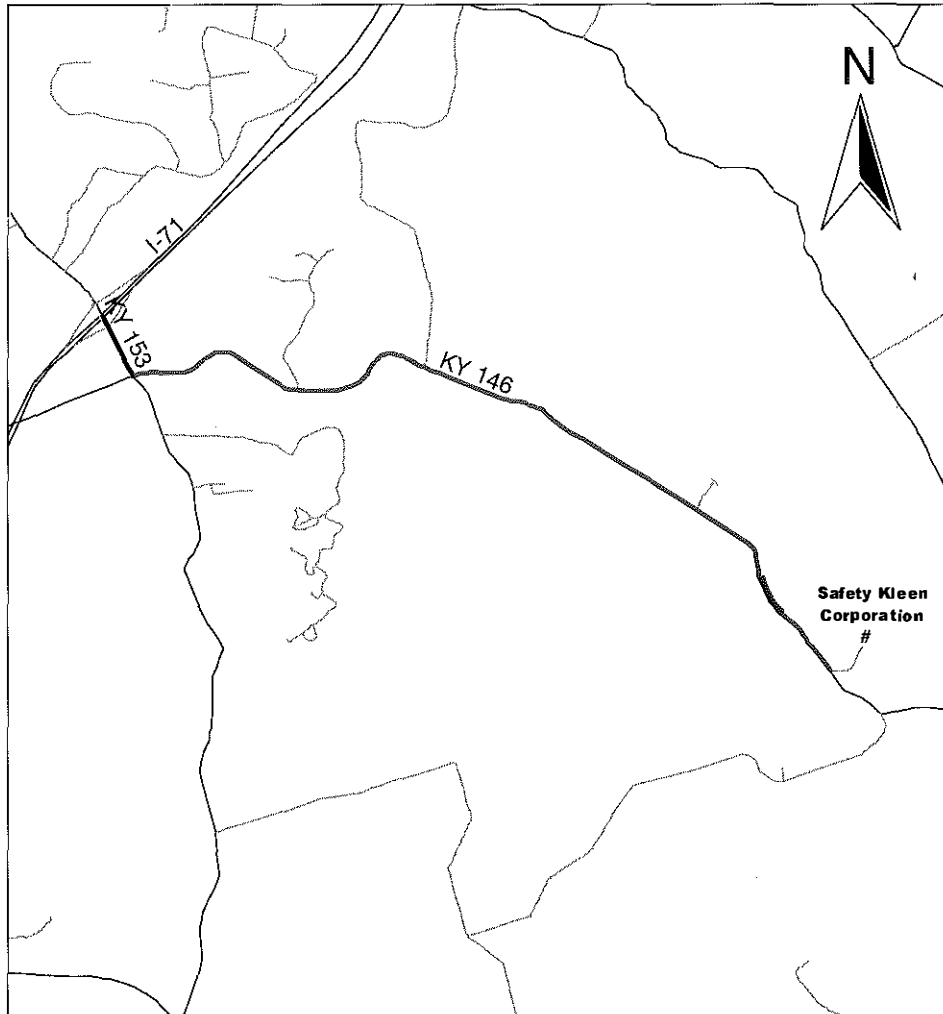
# Facility  
— Lane Width: 10 Feet

**Scale - 1:40000**

0.5 0 0.5 1 Miles

500 0 500 1000 1500 Meters

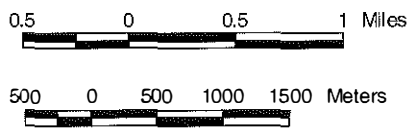
**Figure 4: Shoulder Widths**



**LEGEND**

- # Facility
- Shoulder Width: 10 Feet
- Shoulder Width: 2-4 Feet
- - - - - No Shoulder

**Scale - 1:40000**



**Figure 5: Portion of KY 146 with No Shoulder**



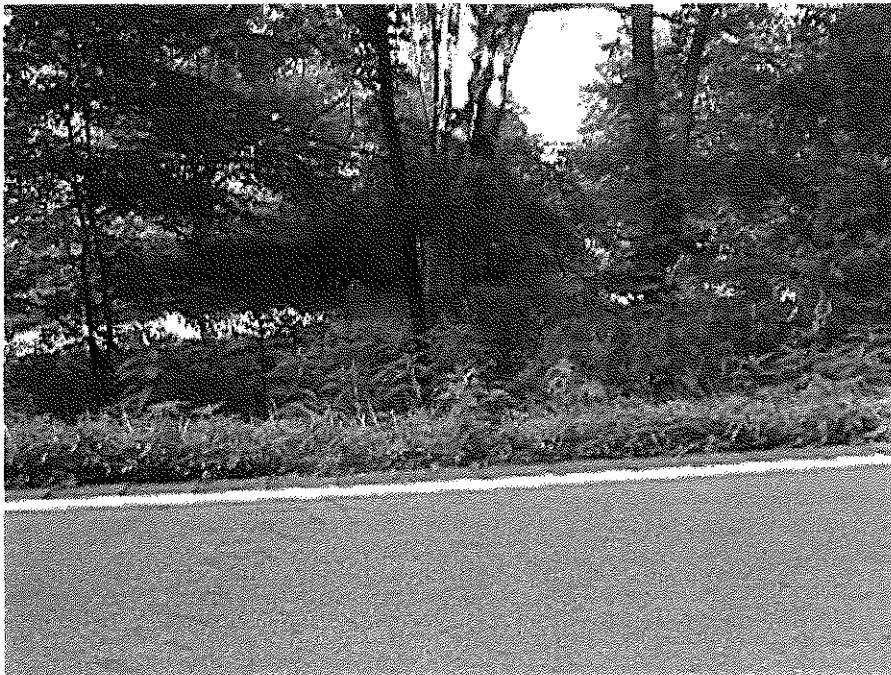
**Figure 6: Northbound View of KY 153**



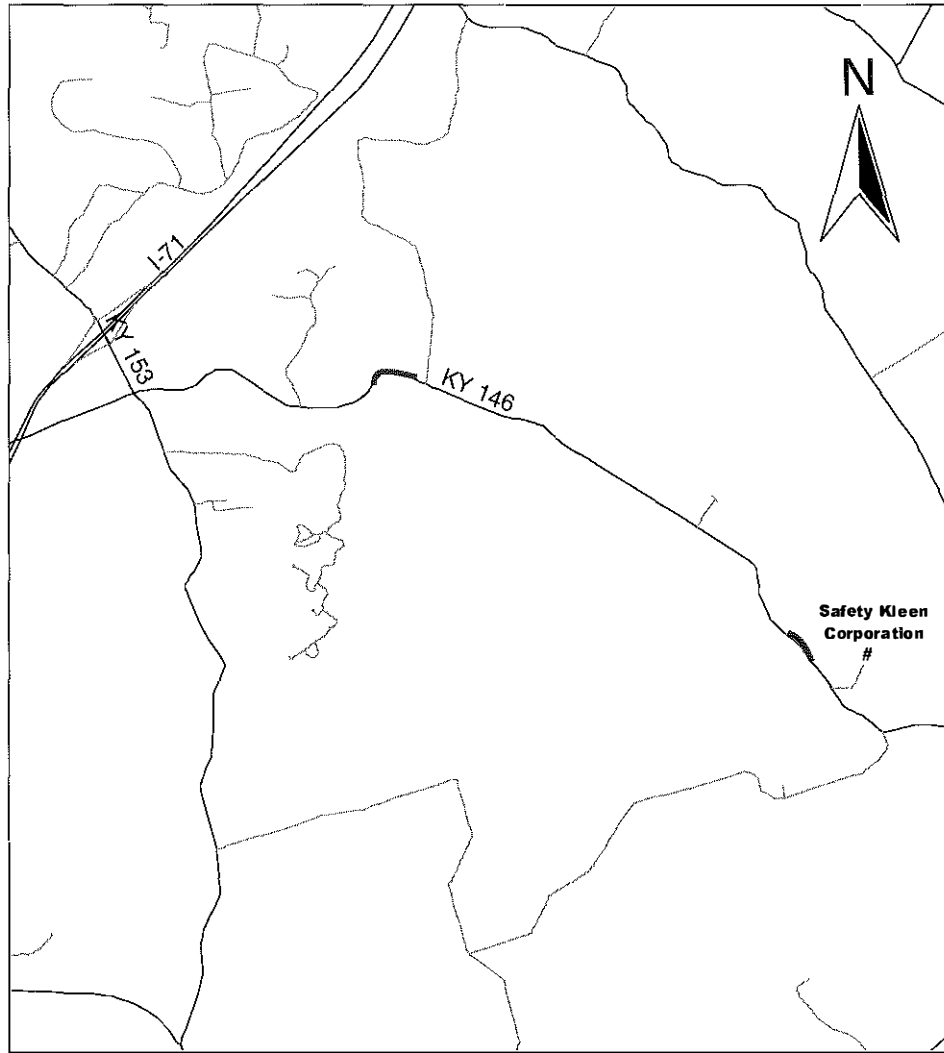
**Figure 7: Northbound KY 153 at I-71 Interchange**



**Figure 8: Section of KY 146 with No Clear Zone or Shoulder**



**Figure 9: Curve Safe Speeds**



**LEGEND**

# Facility

— Curve Speed: Less than Adequate

**Scale - 1:40000**

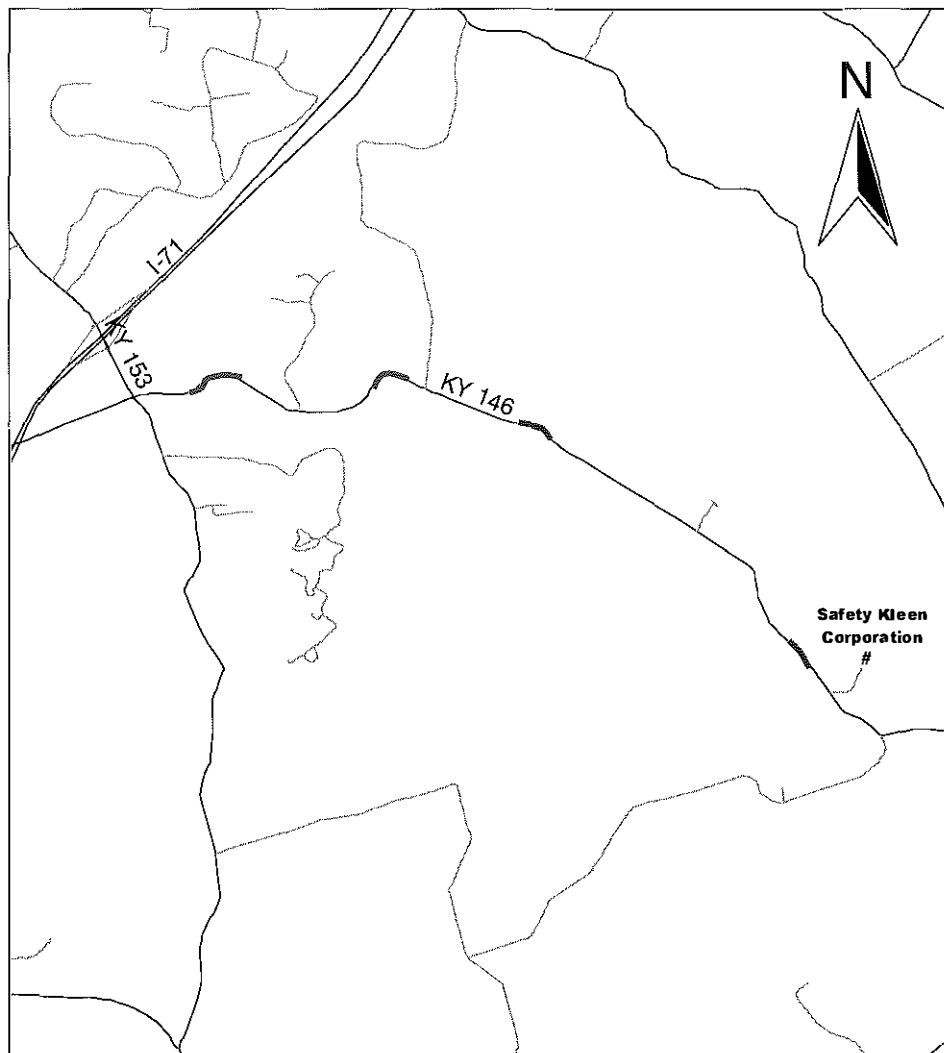
0.5 0 0.5 1 Miles

500 0 500 1000 1500 Meters

**Figure 10: Westbound View of KY 146 from Facility Entrance**



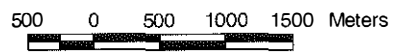
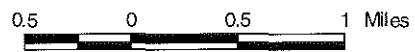
Figure 11: Offtracking Locations



**LEGEND**

- # Facility
- Offtracking: Adequate
- Offtracking: Less than Adequate

Scale - 1:40000





both considered “adequate” for the 48-foot semi-trailers and 10-foot lanes. Two other curves, beginning (approximately) at milepoints 4 and 5.35, are approximately 10 and 8 degrees (respectively) and are considered “less than adequate”.

Grades are considered problematic if they cause trucks to slow excessively. One grade on KY 146 near the intersection of KY 153 (from milepoints 2.5 to 2.7, shown in Figure 12) was investigated. The vertical curvature along this section is approximately 6%, which is “less than adequate” given the length of the grade.

### **3.5 Railroad Crossings**

There are no at-grade railroad crossings along this route.

### **3.6 Bridges**

There are four bridges along this route, as shown in Figure 13. The Kentucky Transportation Cabinet’s Division of Operations maintains a database of bridge sufficiency ratings that are based on the serviceability (as well as other features) of the structure. KY 153 has only one bridge, which crosses over I-71 at milepoint 5.81. It has a sufficiency rating of 90.8, which is considered “preferred”. KY 146 has three bridges at mileposts 2.88, 4.41 and 5.37. The sufficiency ratings for these bridges are 79.8, 79.7 and 89, respectively. The first two bridges are both “adequate” and the last one is “preferred”.

### **3.7 Sight Distance**

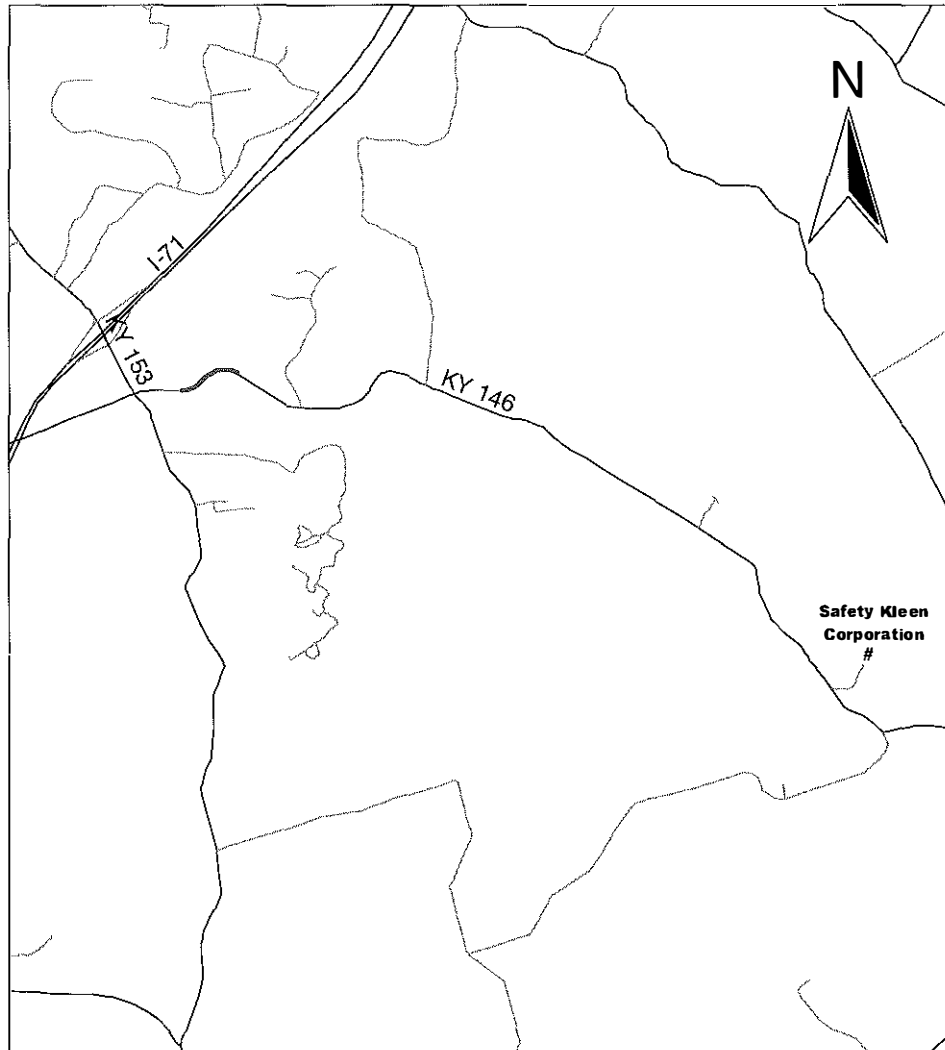
There are no problems associated with sight distance along this route.

## **4.0 Complete Route Evaluation and Recommendations**

### **4.1 Problem Truck Miles and Truck Points**

In order to compare different routes to consider the relative urgency of needed route improvements, the features rated “preferred”, “adequate”, and “less than adequate” along a route have been normalized for the number of miles, number of points, and number of trucks using the section. In the case of this Henry County truck route, six features (lane width, shoulders, curve safe speed, offtracking, grades, and bridges) that were evaluated quantitatively have points or sections that are considered less than “preferred”. A section or point that is considered “less than adequate” is weighted two times that of an “adequate” point or section. Less than “preferred” sections are weighed by length as well as the number of trucks passing that point.

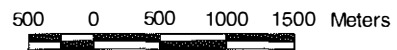
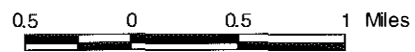
**Figure 12: Problematic Grade Location**



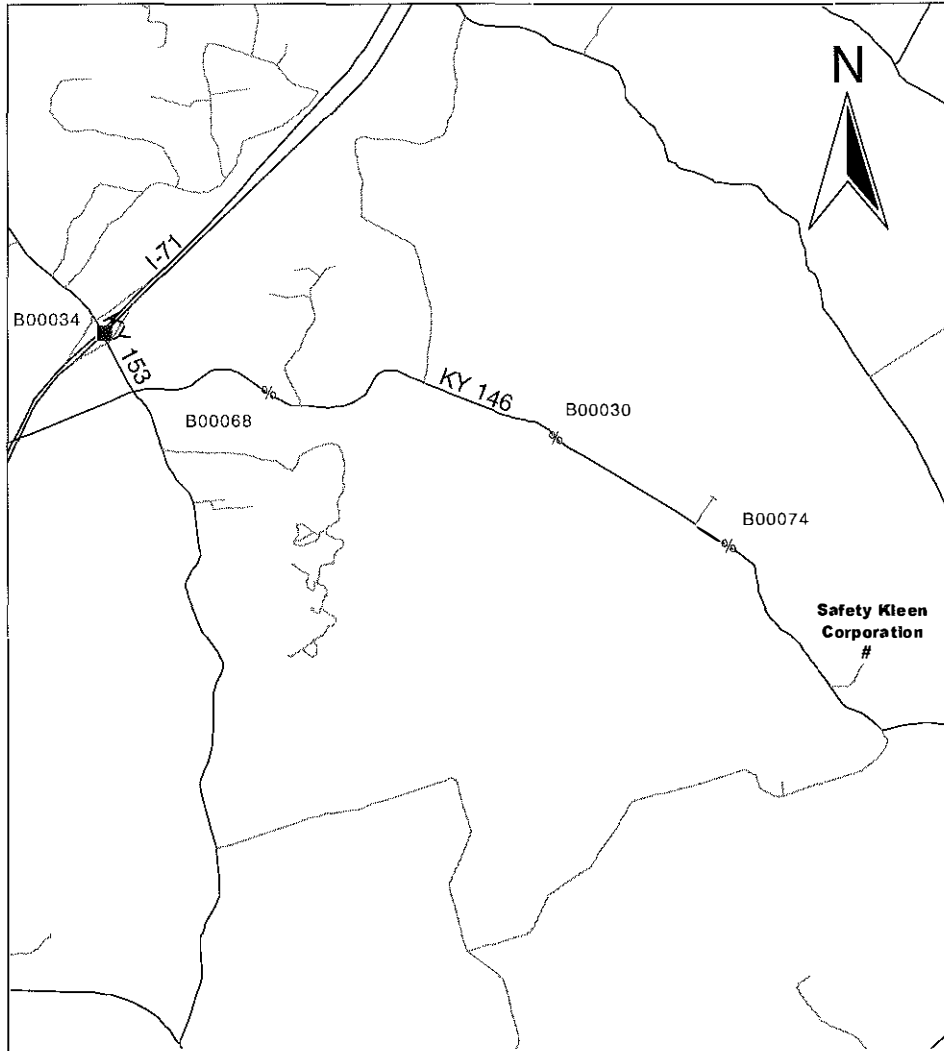
**LEGEND**

- # Facility
- Location of Grade

**Scale - 1:40000**



**Figure 13: Bridge Locations**



**LEGEND**

#	Facility
% B00000	Bridges - Bridge Number

**Scale - 1:40000**

0.5 0 0.5 1 Miles

500 0 500 1000 1500 Meters

Table 3 contains the total problem truck miles and total problem truck points for lane width, shoulders, grades, curve safe speeds, offtracking, and bridges along the entire 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**

<b>Feature</b>	<b>Road</b>	<b>Location</b>	<b>Points*</b>	<b>Length (miles)</b>	<b>Trucks (/day)</b>	<b>Truck-points</b>	<b>Truck-miles</b>
<b>Lane width</b>	KY 153	Length	2	0.3	495		297.0
	KY 146	Length	2	4	138		1104.0
<b>Total</b>							<b>1401.0</b>
<b>Shoulders</b>	KY 146	Length	2	4	138		1104.0
<b>Total</b>							<b>1104.0</b>
<b>Grade</b>	KY 146	MP 2.4 - 2.7	2	0.3	138		82.8
<b>Total</b>							<b>82.8</b>
<b>Curve safe speed</b>	KY 146	MP 3.5	2		138	276	
	KY 146	MP 5.3	2		138	276	
<b>Total</b>						<b>552</b>	
<b>Offtracking</b>	KY 146	MP 2.95	1		138	138	
	KY 146	MP 3.2	1		138	138	
	KY 146	MP 4	2		138	276	
	KY 146	MP 5.35	2		138	276	
<b>Total</b>						<b>828</b>	
<b>Bridge Ratings</b>	KY 146	B 00068	1		138	138	
	KY 146	B 00030	1		138	138	
<b>Total</b>						<b>276</b>	

\* Note: 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

There are no problems along the route pertaining to maintenance issues.

## 4.3 Overall Route Rating

In order to account for both the subjectively and objectively evaluated route features along truck routes throughout the state, a panel of Kentucky Transportation Center engineers who are responsible for studying the routes associated with this project devised a scale for quantitatively scoring the route from 1 to 10. The interpretation for this scale can be seen in Table 4. The route between I-71 and Safety Kleen was given an overall

rating of 5 indicating that minor improvements are required to improve the truck access along this route.

#### 4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck access route to Safety Kleen in Smithfield:

- Significant lengths of route with less than "preferred" lane widths and shoulders;
- Four curves with offtracking problems;
- Two curves with less than "preferred" ball-bank indicator readings;
- One less than "preferred" grade;
- Two less than "preferred" bridge sufficiency ratings;
- Accidents on KY 146; and
- Short lengths of highway with no clear zone.

The section of KY 146 with no shoulder or clear zone could be improved by installing guardrails, which has already been done on portions of the route in the vicinity. The remaining problems could only be remedied through reconstruction of the route, which is deemed unnecessary at the current time. If further development increases the truck volumes in the area, such reconstruction might be reconsidered.

**Table 4: Interpretation of the Overall Route Rating**

Overall Route Rating	Qualitative Interpretation of Rating
1	Trucks should not be using this route
2	Major construction is required to improve this route
3 to 5	Minor improvements are <u>required</u> on this route
6 to 8	Minor improvements could <u>improve</u> this route
9	Minor problems exist that do not seriously impede truck access
10	Trucks are served with reasonable access

## Appendices

**Appendix A: Phone Survey Conducted with Facility Manager**

**PHONE SURVEY RESULTS**

<u>Facility ID</u>	<u>Facility Name</u>	<u>Location / City</u>	<u>County</u>	<u>ADD</u>
2145	SAFETY KLEEN	SMITHFIELD	HENRY	KIPDA
<u>Contact Name</u>	<u>Title</u>	<u>Phone</u>	<u>Fax</u>	
DAVE HANSEN		502-845-2458	502-845-2417	

1. **Is the location of your facility on the map correct?**  
NO – ADJACENT TO BARTLETT CREEK ON KY 146
2. **Our information shows about 60 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?** 48' SEMITRAILER
6. **What is the largest truck operating at your facility?** 48' SEMITRAILER
7. **What type of freight or commodity is shipped, and is incoming and outgoing freight different? (one may be an empty truck)**  
IN – 55 GALLON DRUMS OF HAZARDOUS WASTE, BULK LOADS OF WASTE FUEL
8. **Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon)** CONSTANT (ONE TRUCK EVERY 2 HOURS?)
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)** WEST TO I-71
11. **Do you have any other problems or concerns along the route you would like us to consider?**  
ONE MILE EAST OF I-71 – SHOULDER PROBLEMS
12. **Would you like a copy of the final report (roadway/route evaluation ???)** NO

**NOTES/COMMENTS**