TRUCK ROUTE ACCESS EVALUATION

Kenmor Stone and Ruth Brothers Quarry
Olive Hill
Site # 2620

Report No. KTC-98-27

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

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1.0 Introduction

This is a study undertaken on behalf of the Kentucky Transportation Cabinet (KYTC). There are two main objectives of the Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189): 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 Kenmor Stone and Ruth Brothers Quarry located in Carter county in the FIVCO Area Development District (ADD) and KYTC Highway District #9. The location of the sites 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 in this study 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.

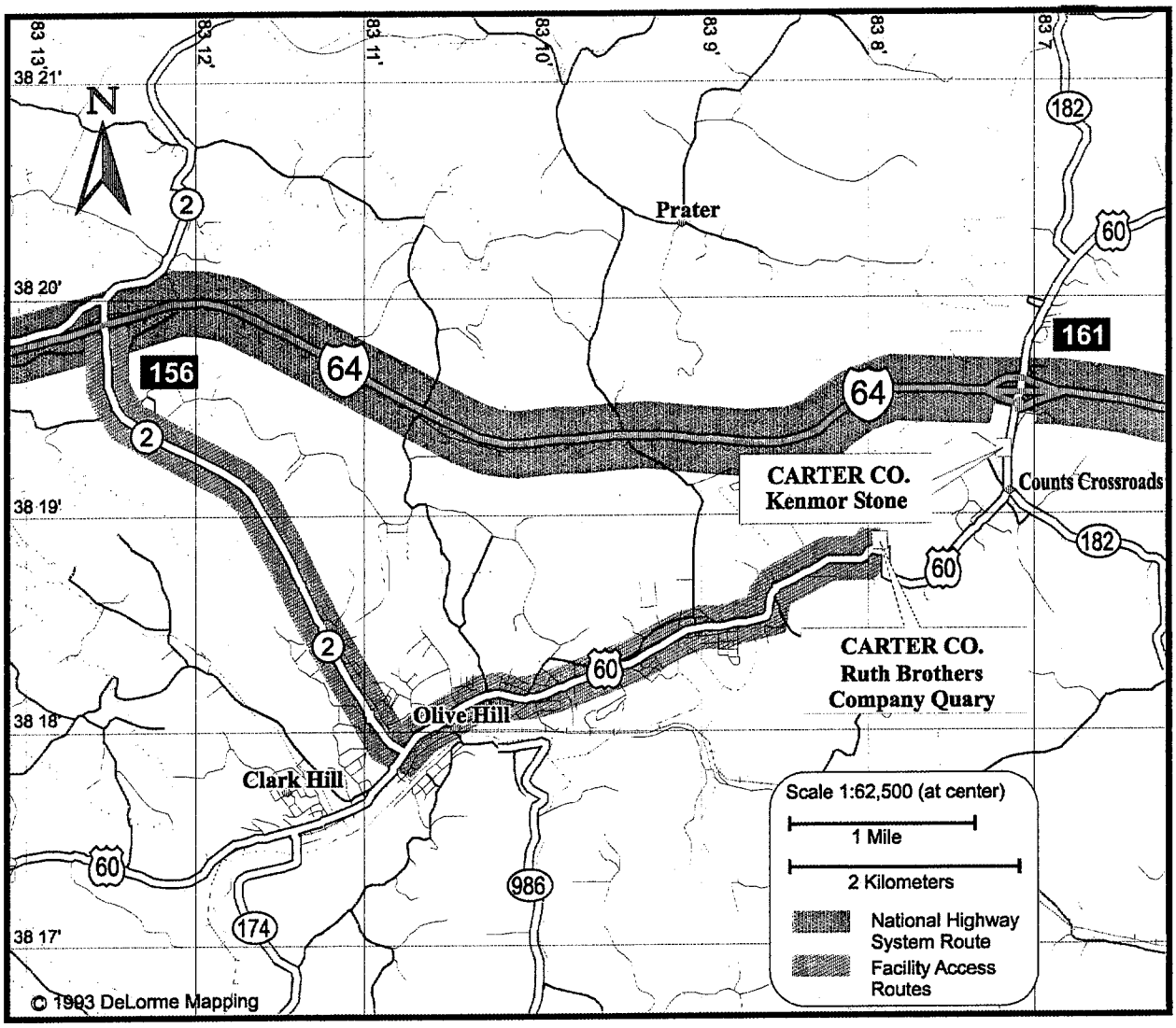
The site was visited for video recording and data collection as listed in Appendix A. The facilities are located along US 60 near I-64, which is part of the National Highway System. Kenmor Stone is approximately 0.4 miles west of I-64 exit 161, and Ruth Brothers Quarry is an additional 1.5 miles west. The surrounding area is generally rural.

A phone survey was conducted with facility managers early in the study process. The survey was conducted with Olive Hill Trucking which services both facilities. Approximately 50 - 100 trucks per day normally access the sites. The trucks are generally semi tractor trailers, and the freight handled is primarily limestone. Problems indicated along the route include sharp curves on US 60 and limited sight distance at the entrance to Ruth Brothers Quarry. It was also noted that the entrance ramp to I-64 eastbound at exit 161 has a steep grade and insufficient merging distance for slow moving trucks. The phone survey information can be found in Appendix B.

2.0 Truck Routes in Use

As shown in Figure 1, there are two routes used by trucks to reach the National Highway System. The eastern route (shown in yellow) is used by the trucks from Kenmor Stone and by most of the trucks accessing Ruth Brothers Quarry. The route follows US 60 east to exit 161 of Interstate 64, a distance of approximately 1.9 miles. The western route (shown in green) is used by trucks from the Ruth Brothers facility that travel west to exit 156 of I-64. The route takes US 60 west to KY 2 then north to I-64, a distance of 5.5 miles. US 60 is a winding two lane road with minimal shoulders. There are traffic signals where US 60 passes through Olive Hill and at the intersection with KY 2. KY 2 is a two lane rural highway with a full shoulder. Both roads are state maintained.

Figure 1: Location of Truck Generating Sites



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 require 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 as "preferred" type sections and points do not contribute to an increase in the problem truck points or miles that are summed for the route (see Section 4).

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 traffic level of service.

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).

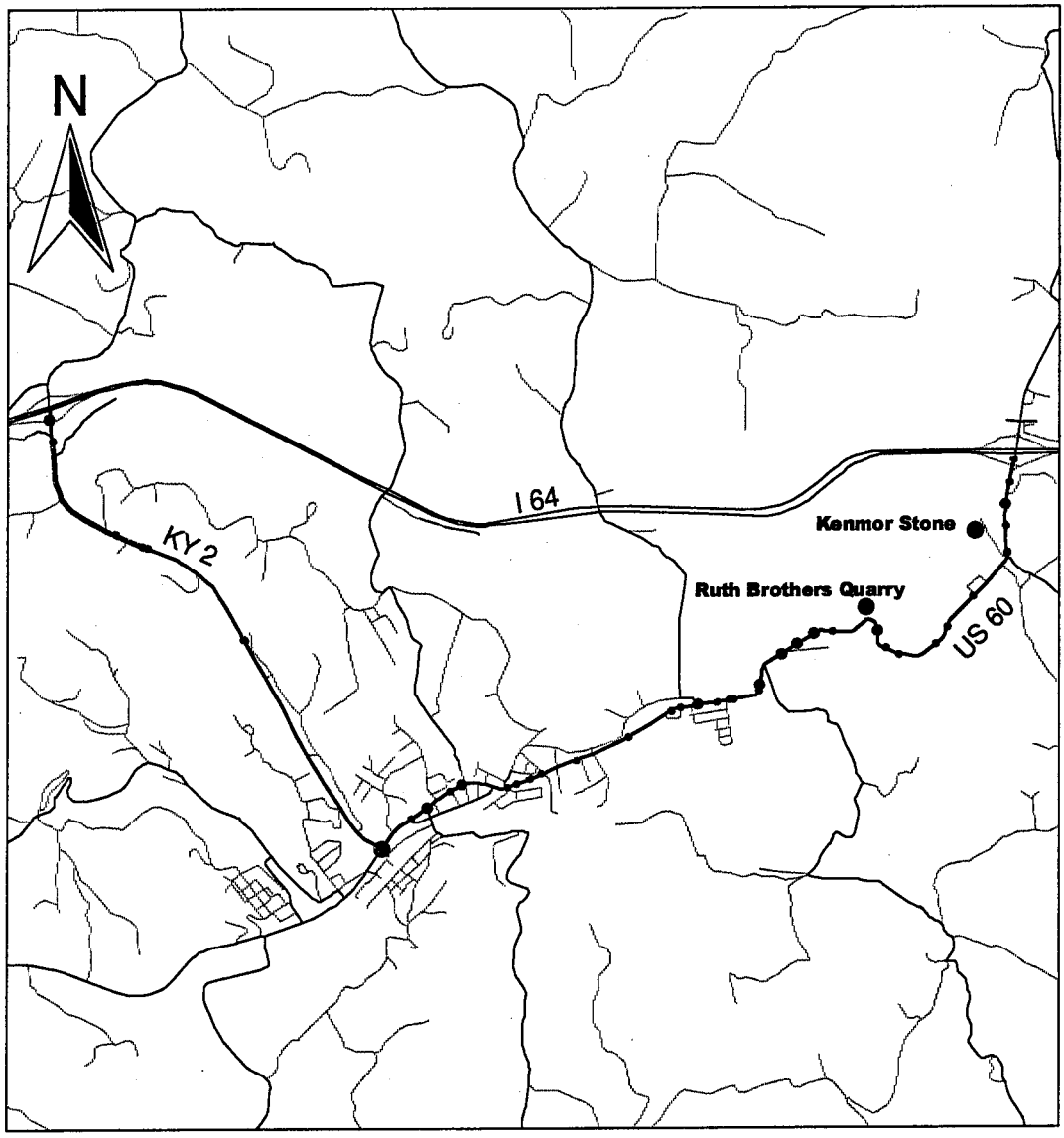
The section of KY 2 near I-64 (between milepoints 2.0 and 2.8) had a critical rate factor (the ratio of the actual accident rate to the critical accident rate) of 1.0 indicating that the truck accident rate is equal to the critical rate for that particular highway type. The section with a critical accident rate is shown in green in Figure 2.

Figure 2 also shows the locations of all accidents during the years 1994, 1995 and 1996. The figure shows that a majority of the accidents were on US 60, with a significant number occurring at intersections. This indicates that there are safety concerns along US 60. Most accidents on KY 2 were at the I-64 interchange or the intersection with US 60.

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 (1994-1996)



LEGEND

- Facility
- Accidents: 1
- Accidents: 2 - 3
- Accidents: 4 - 5
- Accidents: 6 - 7
- Critical Accident Rate
- Freight Access Route
- State Highway System
- Other Roads

Scale - 1:50000

0.5 0 0.5 1.0 1.5 2.0 Miles

1000 0 1000 2000 3000 Meters

A summary of the accidents along the truck routes is shown in Tables 2 and 3 for the same three year period. Truck accidents represent a significant portion of the overall accidents along both routes. The 5.6% of accidents involving trucks on the eastern route is higher than the percent trucks along US 60 (2.9%). The 13.0% of accidents involving trucks on the western route is higher than either the percent trucks along US 60 (2.9%) or KY 2 (10.9%). This suggests there are some safety concerns from an accident history point of view that could be addressed along these routes.

Table 2: Accident Types along Eastern Route

	Non-Truck Accidents	*Truck Accidents*	*Percent Trucks*
Fatal Accidents	0	0	0
Injury	10	0	0
Intersection	0	1	100
Total	17	1	5.6

Table 3: Accident Types along Western Route

	Non-Truck Accidents	*Truck Accidents*	*Percent Trucks*
Fatal Accidents	1	0	0
Injury	11	3	21.4
Intersection	12	3	20.0
Total	40	6	13.0

3.3 Cross Section Features

Figures 3 and 4 illustrate the sections of the routes having different widths of lanes and shoulders. A 2.3 mile section of US 60 which includes the Ruth Brothers entrance has "adequate" 11 foot lanes. All other sections of both routes have "preferred" 12 foot lane widths. The eastern route includes 0.4 miles of US 60 with "adequate" 10 foot gravel shoulders. The remaining 1.5 miles have "less than adequate" 3 foot shoulders. The western route includes 0.8 miles of "less than adequate" 3 foot shoulders and 0.9 miles with no shoulder on US 60. The remaining 0.9 miles of US 60 and all of KY 2 have "adequate" 10 foot gravel shoulders. Sections of US 60 on both routes had inadequate clear zone with the most common problems being trees and drainage ditches. There were no significant clear zone problems found on KY 2. The pavement on both routes was generally good.

3.4 Curvature Features

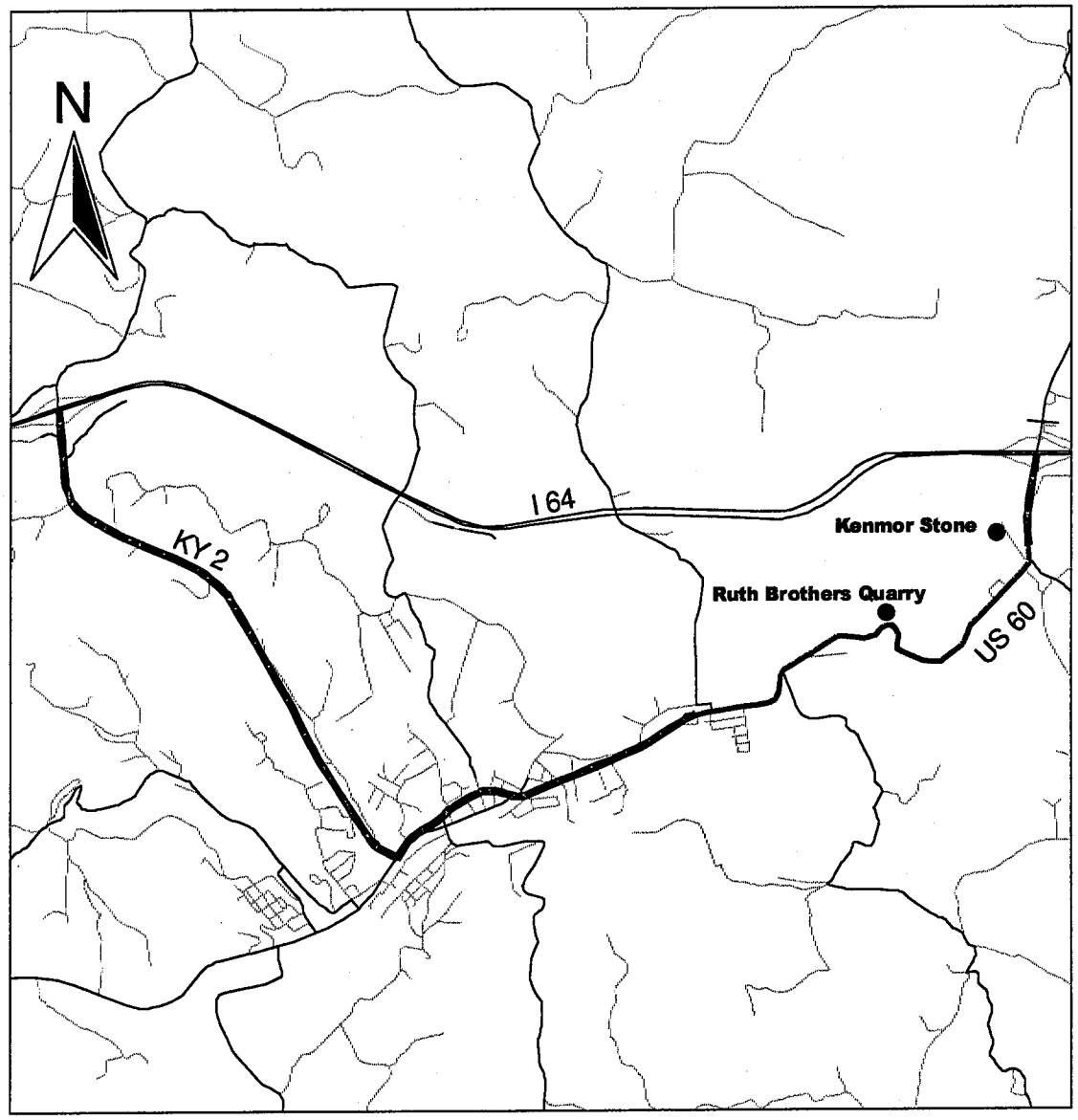
Grades are considered problematic if they cause trucks to slow down excessively. The locations of problematic grades (evaluated using AASHTO speed reduction tables) are shown in Figure 5. The eastern route includes three "less than adequate" grades. The western route also has three "less than adequate" grades on US 60 and one that was rated "adequate." The most significant grade on US 60 (near Olive Hill) is not considered a problem because a climbing lane is provided. There is also a rather long hill on KY 2, north of Olive Hill that is not a problem because a climbing lane is provided for most of the hill.

Offtracking is considered a problem where a truck cannot stay in its lane through a curve. Figure 6 shows the location of several curves on US 60 where offtracking could be a problem as calculated from lane width and degree of curvature. The eastern route has five curves that received a rating of "less than adequate" and one curve with an "adequate" rating. The western route includes three curves that received a "less than adequate" rating due to offtracking.

There are also some sections of US 60 where safe speed on a curve can be a problem as measured using a ball bank indicator. These curves are shown in Figure 7. The eastern route has two curves rated "adequate" and one rated "less than adequate." A fourth curve has an advisory speed sign in one direction for an "adequate" rating, but does not have a similar sign for the other direction which gives it a "less than adequate" rating. The western route includes one curve receiving an "adequate" rating and two curves with a "less than adequate" rating.

The turning radius from US 60 onto KY 2 was approximated in the field. This location is shown in Figure 8. The turn (55 foot radius) was rated "less than adequate" because trucks are not able to complete the turn without encroaching on opposing traffic or starting the turn in the westbound through lane rather than the turn lane.

Figure 3: Lane Widths



LEGEND

- Facility
- Lane Width: 11
- Lane Width: 12 Feet
- Freight Access Route
- State Highway System
- Other Roads

Scale - 1:50000

0.5 0 0.5 1 1.5 2 Miles

1000 0 1000 2000 3000 Meters

Figure 4: Shoulder Widths

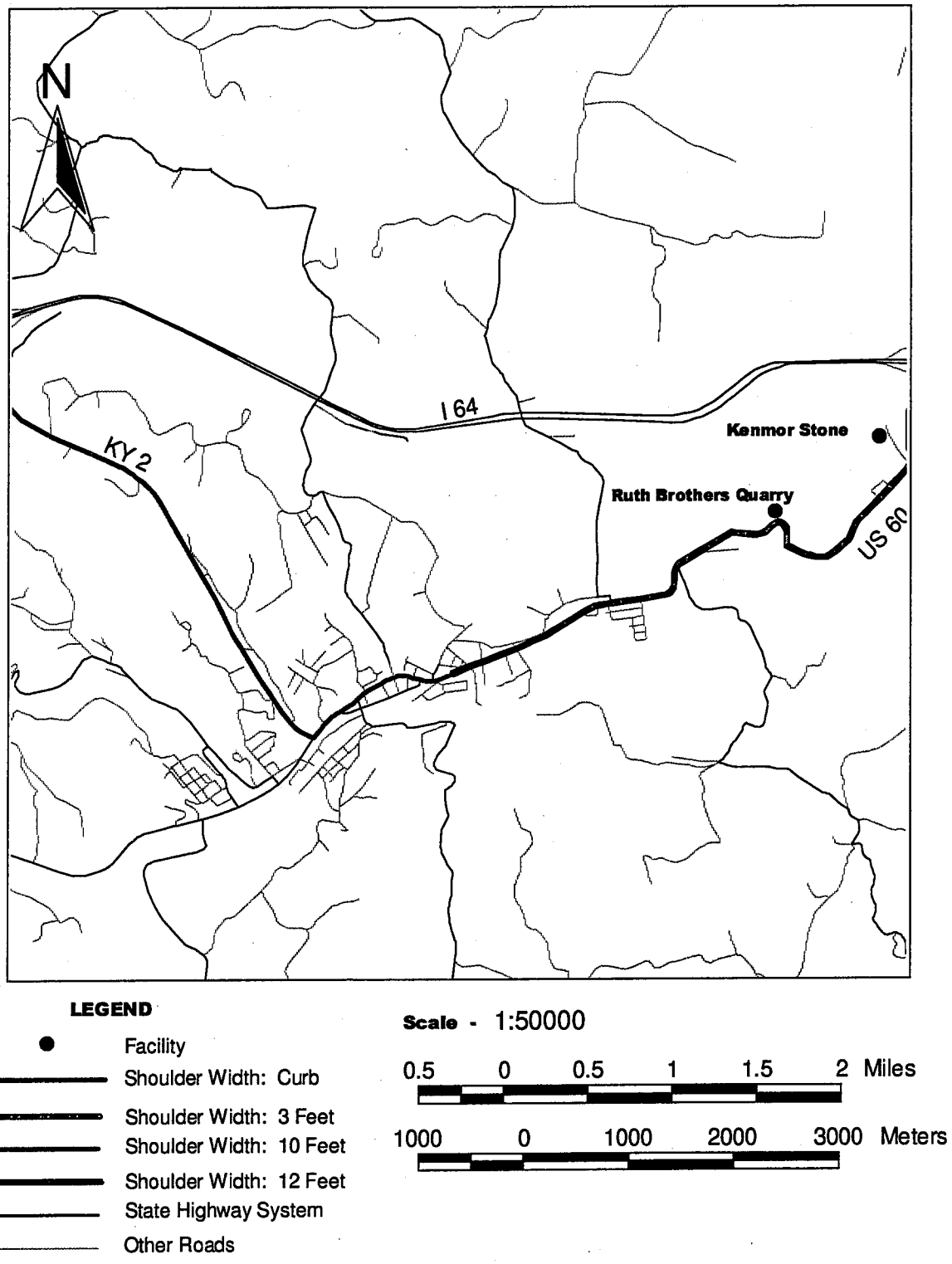


Figure 6: Curves Where Offtracking Could Occur

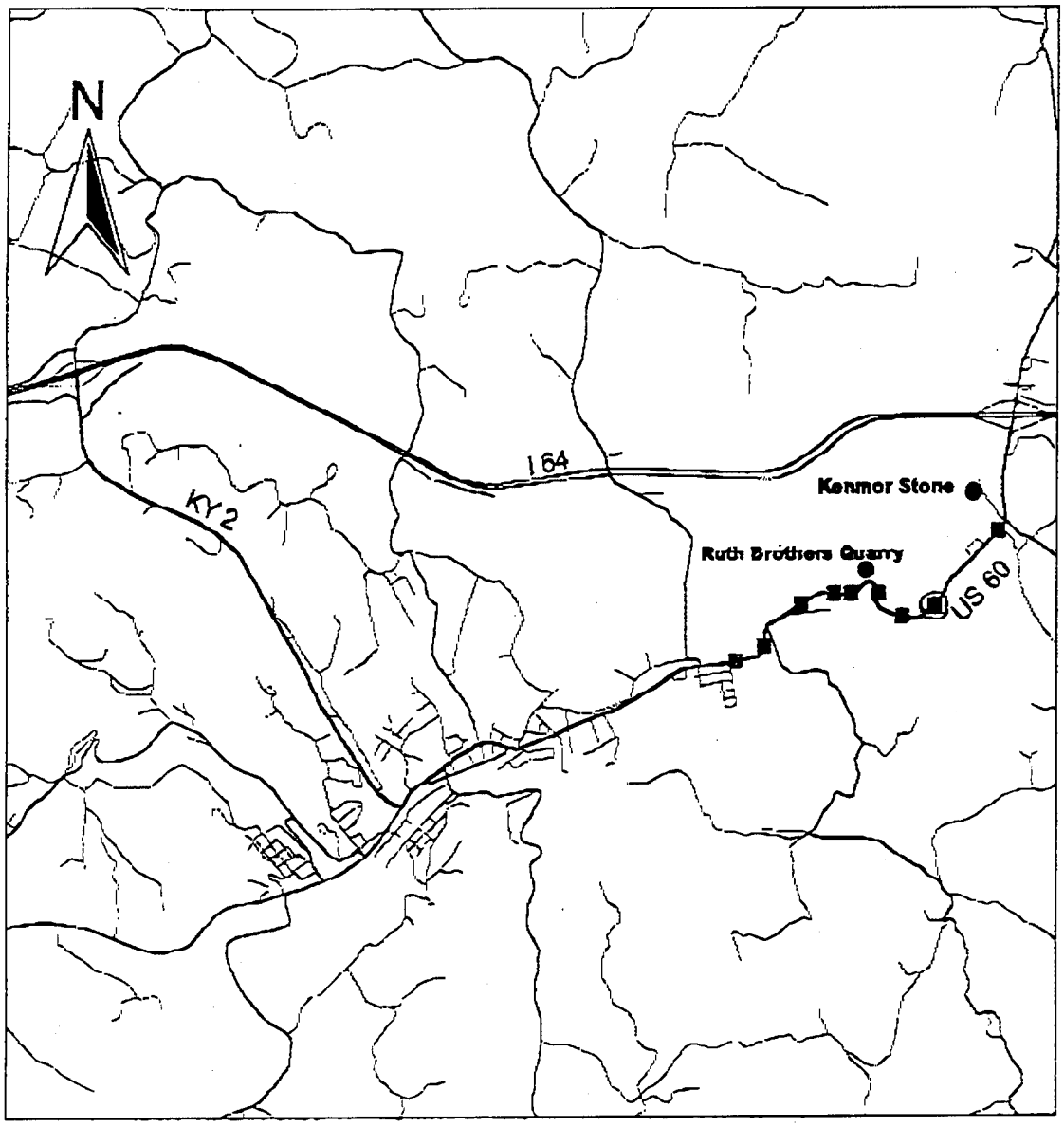
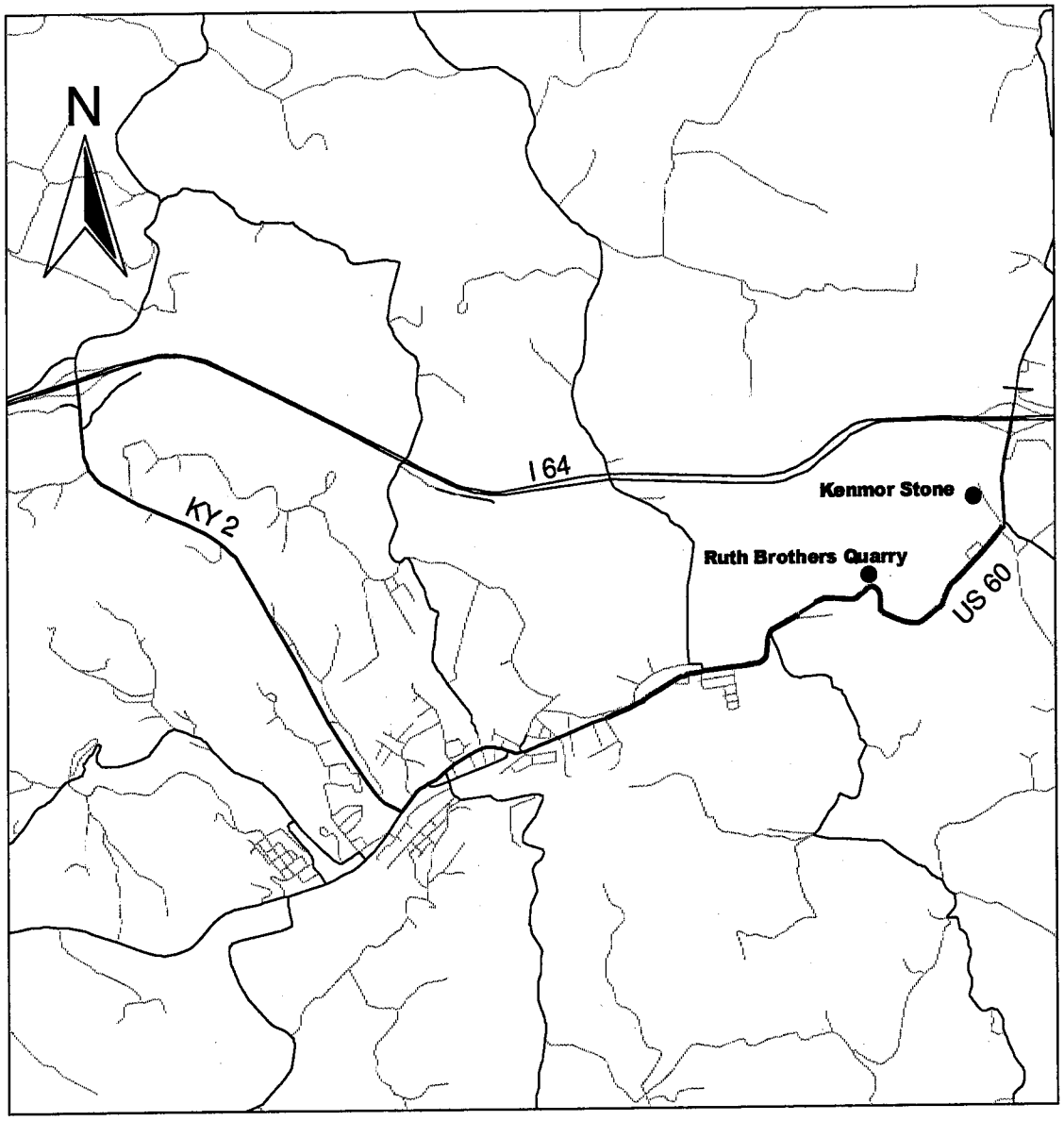


Figure 5: Problematic Grades



LEGEND

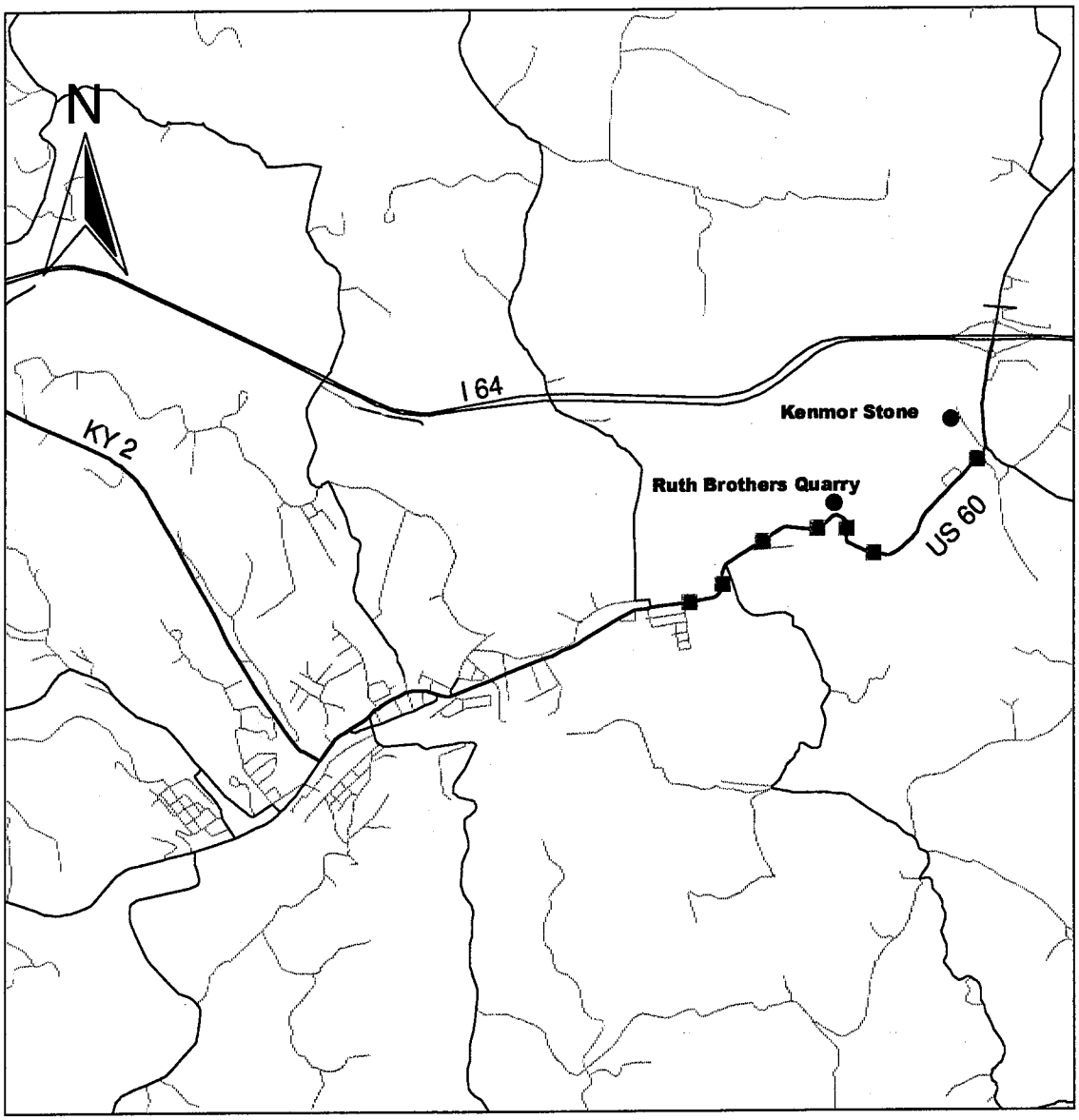
- Facility
- Grade - Less then Adequate
- Grade - Adequate
- Freight Access Route
- State Highway System
- Other Roads

Scale - 1:50000

0.5 0 0.5 1 1.5 2 Miles

1000 0 1000 2000 3000 Meters

Figure 7: Curves Where Safe Speed May be a Problem



LEGEND

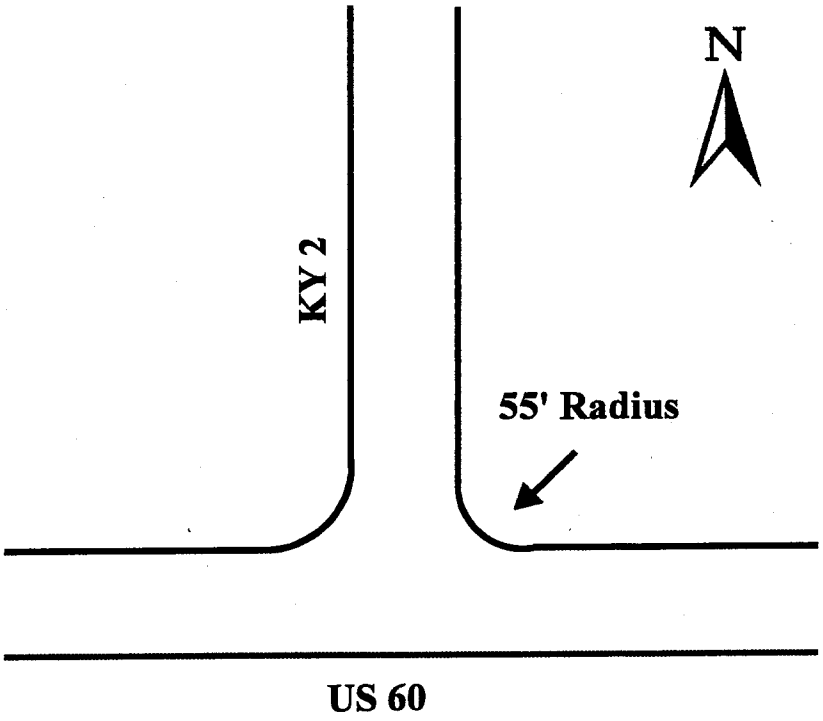
- Facility
- Ball Bank Indicator - Advisory
- Ball Bank Indicator - Failed
- Freight Access Route
- State Highway System
- Other Roads

Scale - 1:50000

0.5 0 0.5 1 1.5 2 Miles

1000 0 1000 2000 3000 Meters

Figure 8: Approximate Turning Radius at US 60 and KY 2



3.5 Railroad Crossings

There were no at-grade railroad crossings on these routes.

3.6 Bridges

The location of the bridge on US 60 near milepost 11 is shown on Figure 9. The bridge has a sufficiency rating (provided by the Division of Operations ate the KYTC) of 60.7 (out of a possible 100) which is considered "adequate." The bridge is relatively narrow and obstructs the clear zone. The only other bridge along these routes is on KY 2 at the interchange with I-64. This bridge has as sufficiency rating of 81.6 which is "preferred."

3.7 Sight Distance

The sight distance was measured at the entrance of the Ruth Brothers Quarry where a sharp curve (shown in the background of Figure 10) limits the sight distance for truck turning left to travel east on US 60. The 300 foot distance is considered "adequate" because there are warning signs on US 60 indicating a truck entrance.

Figure 9: Bridge Locations

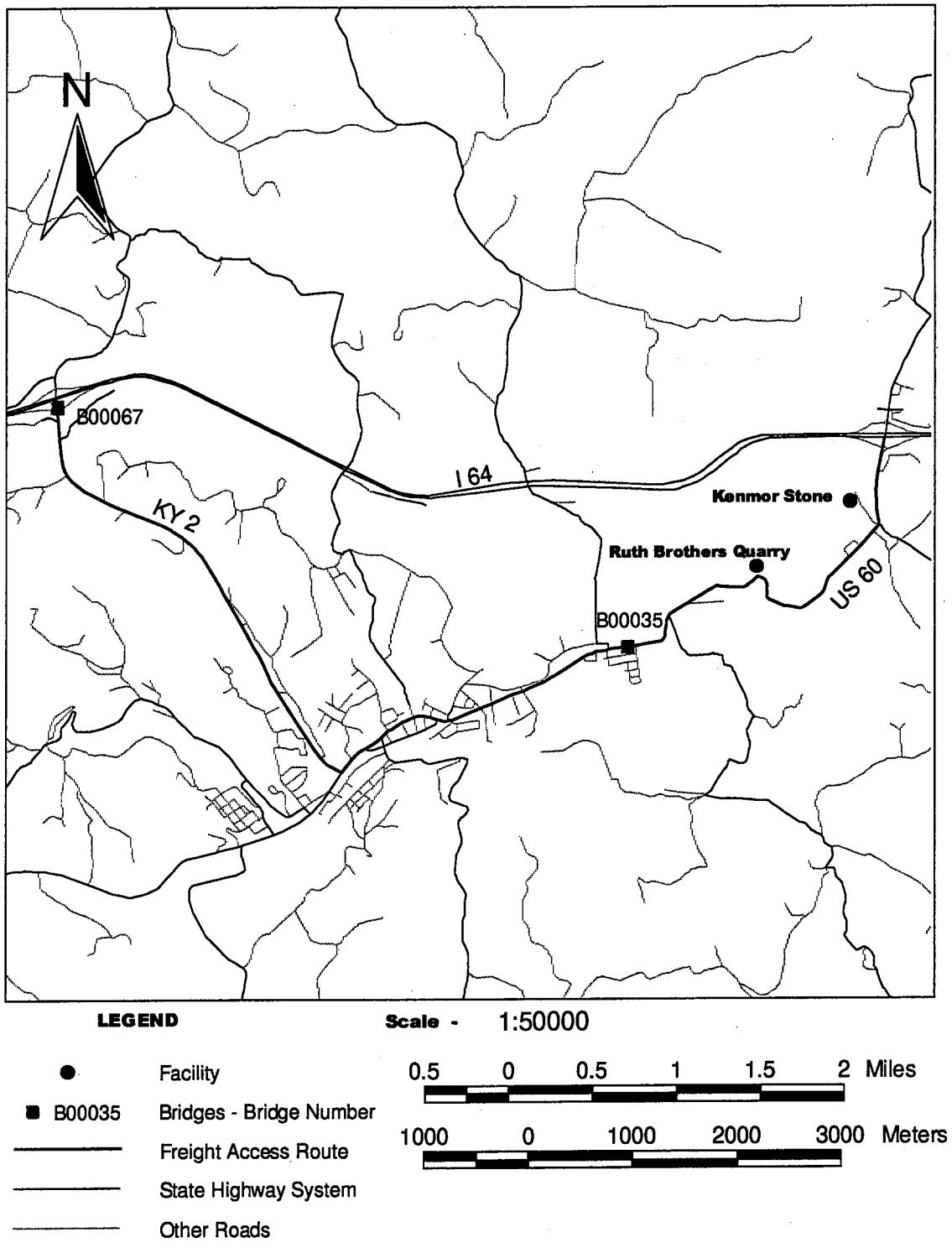


Figure 10: Sight Distance at Quarry Entrance

3.8 Other Route Features

Parking along US 60 through Olive Hill reduces the lane width available for truck traffic. The turning lanes at several intersections in Olive Hill also cause significant lane reduction.

4.0 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 these Olive Hill routes, seven features that were evaluated quantitatively have 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. Less than "preferred" sections are weighted by length as well as the number of trucks passing that point. The number of trucks was obtained from 1990 and 1998 KYTC Vehicle Classification Counts.

Tables 4 and 5 contain the total problem truck miles and total problem points for offtracking, curve speed, grade, lane width, shoulders, turning radii, sight distance and bridges which apply to the routes. The rating of these routes relative to others evaluated will be reported in the final report.

Table 4: Summary of Problem Truck Miles and Points for Eastern Route

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	US 60	Near Quarry	1	1.5	304		608.0
Shoulders	US 60	Near I-64	2	0.4	304		243.2
	US 60	Near Quarry	1	1.5	304		456.0
Total							**699.2**
Grade	US 60	MP 11.68 - 11.97	2	0.29	152		88.2
	US 60	MP 11.97 - 12.51	2	0.54	152		164.2
	US 60	MP 12.51 - 13.04	2	0.53	152		161.1
Total							**413.5**
Offtracking	US 60	MP 11.8	2		304	608	
	US 60	MP 11.9	2		304	608	
	US 60	MP 12.1	2		304	608	
	US 60	MP 12.3	2		304	608	
	US 60	MP 12.5	1		304	304	
	US 60	MP 13.0	2		304	608	
Total						**3,344**	
Curve Speed	US 60	MP 11.9	1		304	304	
	US 60	MP 12.1	1		304	304	
	US 60	MP 12.3 EB	1		152	152	
	US 60	MP 12.3 WB	2		152	304	
	US 60	MP 13.0	2		304	608	
Total						**1,672**	
Sight Distance	US 60	At Quarry	1		40	40	

*1 point for "adequate" features and 2 points for "less than adequate" features (0 points for "preferred" features not shown

Table 5: Summary of Problem Truck Miles and Points for Western Route

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	US 60	Near Quarry	1	0.8	304		243.2
Shoulders	US 60	East of town	1	0.9	304		273.6
	US 60	Other sections	2	1.7	304		1033.6
	KY 2	Length	1	2.9	348		1009.2
Total							**2,316.4**
Grade	US 60	MP 10.31 - 10.55	2	0.24	304		145.9
		MP 10.55 - 10.79	1	0.24	304		73.0
		MP 10.79 - 11.05	2	0.26	304		158.1
		MP 11.15 - 11.56	2	0.41	304		249.3
Total							**626.3**
Offtracking	US 60	MP 11.1	2		304	608	
	US 60	MP 11.3	2		304	608	
	US 60	MP 11.6	2		304	608	
Total						**1,824**	
Curve Speed	US 60	MP 11.1	2		304	608	
	US 60	MP 11.3	2		304	608	
	US 60	MP 11.6	1		304	304	
Total						**1,520**	
Turning Radii	US 60	KY 2	2		174	348	
Bridge Rating	US 60	MP 11	1		304	304	

*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

Some features noted during the site work could be changed to improve truck access without requiring major construction or expense. The on-street parking along a one-half mile section of US 60 in Olive Hill could be studied with consideration of increasing available lane width.

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 have rated the overall access on a scale of 1 through 10. The interpretation for these ratings is shown in Table 6. The eastern route received an overall rating of 2 indicating that major construction is requited to improve the route. The western route was given a rating of 3 indicating that minor improvements are required along the route.

Table 6: 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
3-5	Minor improvements are required on this route
6-8	Minor improvements could improve this route
9	Minor problems exist that do not seriously impede truck access
10	Trucks are served with reasonable access

Appendices

Appendix A: Field Site Visit Dates and Activities

May 6, 1998 - field data collection
May 14, 1998 - traffic counts and travel time survey
May 22, 1998 - additional field data collection

Appendix B: Phone Survey Conducted with Facility

Facility ID	*Facility Name*	*Location / City*	*County*	*ADD*
2620	Kenmor Stone Ruth Brothers Quarry	Olive Hill	Carter	FIVCO

Contact Name	*Title*	*Phone*	*Fax*
*Vernon Adkins, Olive Hill Trucking		606-286-4576	606-286-8284

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

2. **Our information shows about** 50 **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?**
   Seasonal, 100 trucks per day in summer

4. ***(If truck traffic is seasonal)*** **Is the** 50 **trucks/day for the peak season?** No

5. **What is the most common size truck operating at your facility?** Semitrailer 5-6 axle

6. **What is the largest truck operating at your facility?** Semitrailer 6 axle

7. **What type of freight or commodity is shipped, and is incoming and outgoing freight different?** ***(one may be an empty truck)***
   In: Sand/slag for asphalt plant in quarry
   Out: Limestone

8. **Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon)** Peak: 6:00 a.m. - 8:00 a.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)** East to I-64 exit 161
    West to I-64 exit 156

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

Curves on US 60

Limited sight distance (150') for trucks turning east on US at quarry entrance due to sharp curve.

Entrance ramp to eastbound I-64 at exit 161 has a steep grade and a normal merging distance that should be extended. 300-500 trucks use the ramp daily with merging speeds around 40 mph. Truckers are encouraged to use flashers when merging. This is a high accident area (rear-ends) due to speed differentials on I-64.

Mr. Adkins has concerns about possible improvements to US 60 between the quarry and I-64 exit 161. The Kentucky DOH has been surveying the area. He would oppose improvements to the existing alignment and suggests a straight line relocation from the vicinity of the quarry to the interchange. The fields have been mined extensively and a large area in the vicinity of US 60 and south remain intact. Improvements to the existing route would diminish these reserves, and a straight line would facilitate and encourage area development.

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

NOTES/COMMENTS

*Spoke with Mr. Adkins of Olive Hill Trucking. Both facilities referred questions about access to Olive Hill Trucking.