

TRUCK ROUTE ACCESS EVALUATION

Medusa Aggregates
Warren County
Site #2628

Report Number KTC-98-36

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

Brian Aldridge

With:

Ken Agent
Lisa Aultman-Hall
David Cain
Nick Stamatiadis
Joel Weber



Kentucky Transportation Center and Department of Civil Engineering
University of Kentucky

January 1999

Table of Contents

| | | |
|------------|---|----|
| 1.0 | Introduction | 1 |
| 2.0 | Truck Routes in Use | 1 |
| 3.0 | Route Data Collection and Evaluation | 3 |
| 3.1 | Traffic Operations and Level of Service | 3 |
| 3.2 | Accident History | 5 |
| 3.3 | Cross Section Features | 5 |
| 3.4 | Curvature Features | 9 |
| 3.5 | Railroad Crossings | 10 |
| 3.6 | Bridges | 10 |
| 3.7 | Sight Distance | 10 |
| 4.0 | Route Evaluation and Recommendations | 10 |
| 4.1 | Problem Truck Miles and Truck Points | 10 |
| 4.2 | Maintenance Improvement Locations | 10 |
| 4.3 | Overall Route Rating | 12 |
| 4.4 | Conclusions and Recommendations | 12 |

Appendices

| | | |
|--|--|----|
| | Appendix A: Phone Survey Conducted with Facility Manager | 15 |
|--|--|----|

List of Tables

| | |
|---|----|
| Table 1: Route Features and Method of Evaluation | 4 |
| Table 2: Accident Types Warren County Truck Route | 5 |
| Table 3: Summary of Problem Truck Miles and Truck Points for Entire Route | 12 |
| Table 4: Interpretation of the Overall Route Rating | 13 |

List of Figures

| | |
|--|----|
| Figure 1: Location of Truck Generating Site | 2 |
| Figure 2: Aerial photograph of the Warren County site (1995 picture) | 3 |
| Figure 3: Accident Locations (1994 – 1996) | 6 |
| Figure 4: Lane Widths | 7 |
| Figure 5: Shoulder Widths | 8 |
| Figure 6: Turning radius at McGinnis Quarry Road and US 31W | 9 |
| Figure 7: Bridge Locations | 11 |

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 the evaluation of 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 facility located in Warren County in the Barren River Area Development District (ADD) and KYTC Highway District #3. The location of the site is shown in Figure 1 while Figure 2 illustrates an aerial view of the area. 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 Kentucky Transportation Cabinet (KYTC) 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 particular site was visited for data collection on May 13, 1998 and video recording on January 8, 1998. The truck generating facility at this site is Medusa Aggregates, and the initial trip to the site revealed that there were no other significant sources of truck traffic in the vicinity. The phone survey completed on the facility found that approximately 50 trucks per day (100 one-way trips) are accessing the site. Truck sizes range from four-axle single unit dump trucks to five-axle semi trailers. The complete phone survey is in Appendix A.

2.0 Truck Routes in Use

There is one route used for access to the National Highway System from this site as shown in Figure 1. Trucks leave the facility and follow McGinnis Quarry Road, a rural, unmarked county road that ends at the intersection of US 31W, approximately 0.43 miles southeast of the Medusa Aggregates entrance. There, trucks turn right and travel southwest on US 31W for approximately 4.1 miles and then turn left onto the on-ramp for KY 446. US 31W, which is in the 80,000 weight class, is a two-lane, two-way road until it combines with US 68 / KY 80 at which point it becomes a four-lane, urban principal arterial. KY 446 is a four-lane, divided arterial and is also in the 80,000 pound weight class. It ends at the entrance ramps for Interstate 65. The only traffic signal control along the route occurs at KY 446 and Corvette Drive. The average daily traffic (ADT) on US 31W ranges from 7,372 to 22,476 vehicles (from 1995 KYTC traffic counts). The ADT on KY 446 is 13,191 vehicles per day (from 1998 KYTC traffic counts) and the ADT on McGinnis Quarry Road is 2,225 vehicles per day (from a 1998 classification count conducted for the KYTC Division of Planning).

Figure 1: Location of Truck Generating Site

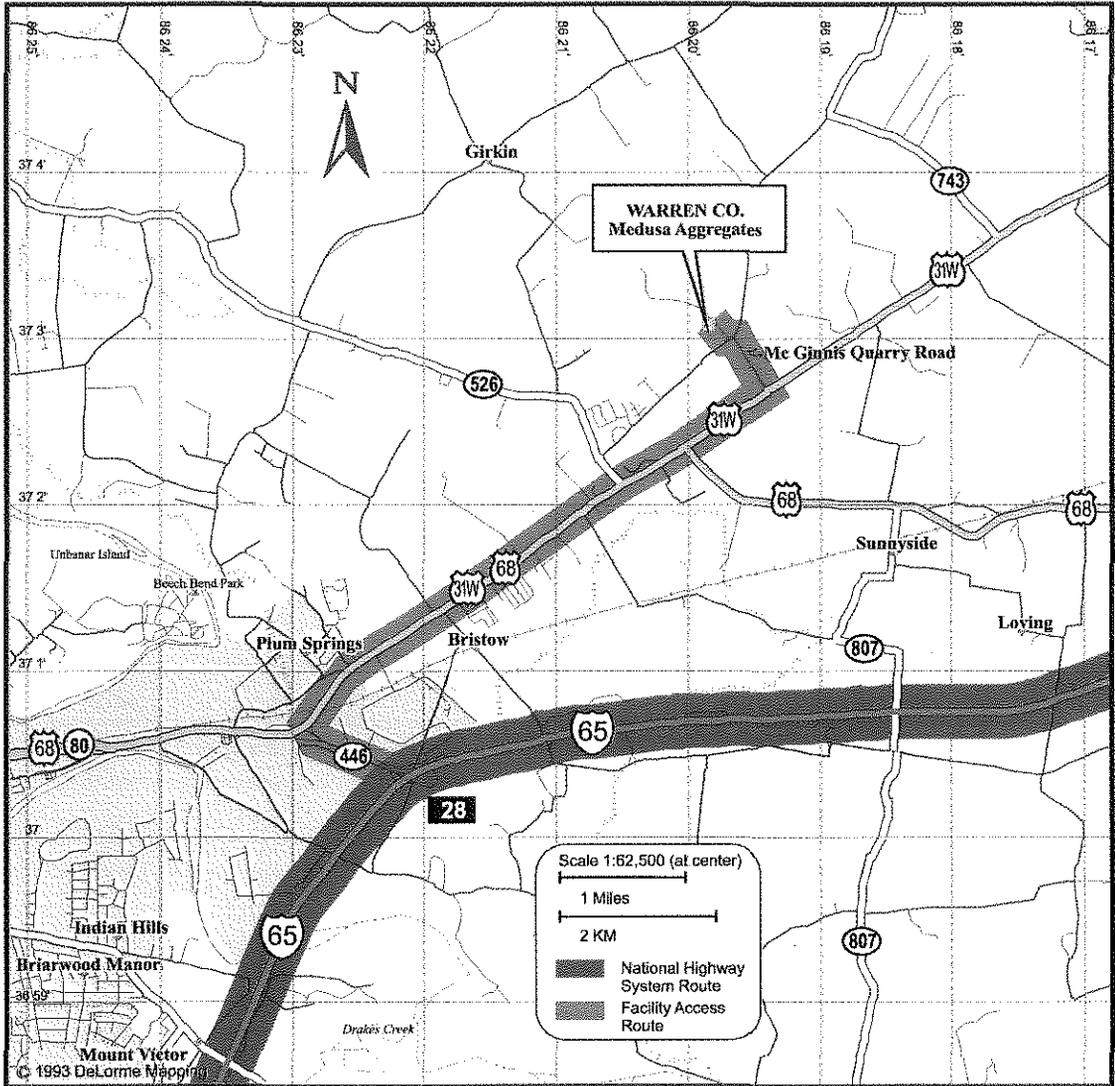
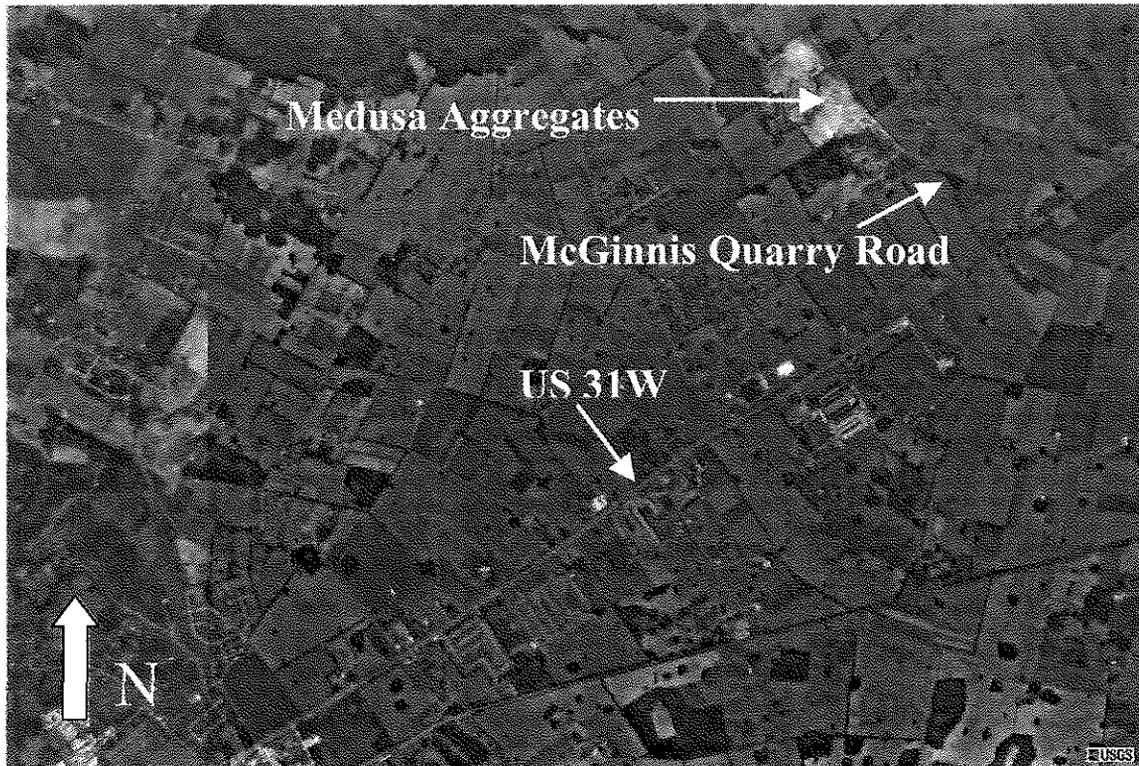


Figure 2: Aerial Photograph of the Warren County Site (1993 picture)*



* Note: Site and roadways appear unchanged since photograph.

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 phone 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.

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 |

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 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 the particular highway type. US 31W between milepoints 17.764 and 18.522 (shown on Figure 3) had a critical rate factor of 1.27, 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 along this portion of the route is 1.27 times the critical rate and thus is a problem.

Figure 3 shows the locations of accidents during the years 1994, 1995, and 1996. 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 is less than the percentage of trucks found on the routes from 1998 traffic counts conducted on McGinnis Quarry Road (13.8%), US 31W (11.4%), and KY 446 (11.7%) for the KYTC Division of Planning. This suggests that there is no problem with truck accidents for the entire route from a recent accident history point of view.

Table 2: Accident Types along Warren County Truck Route

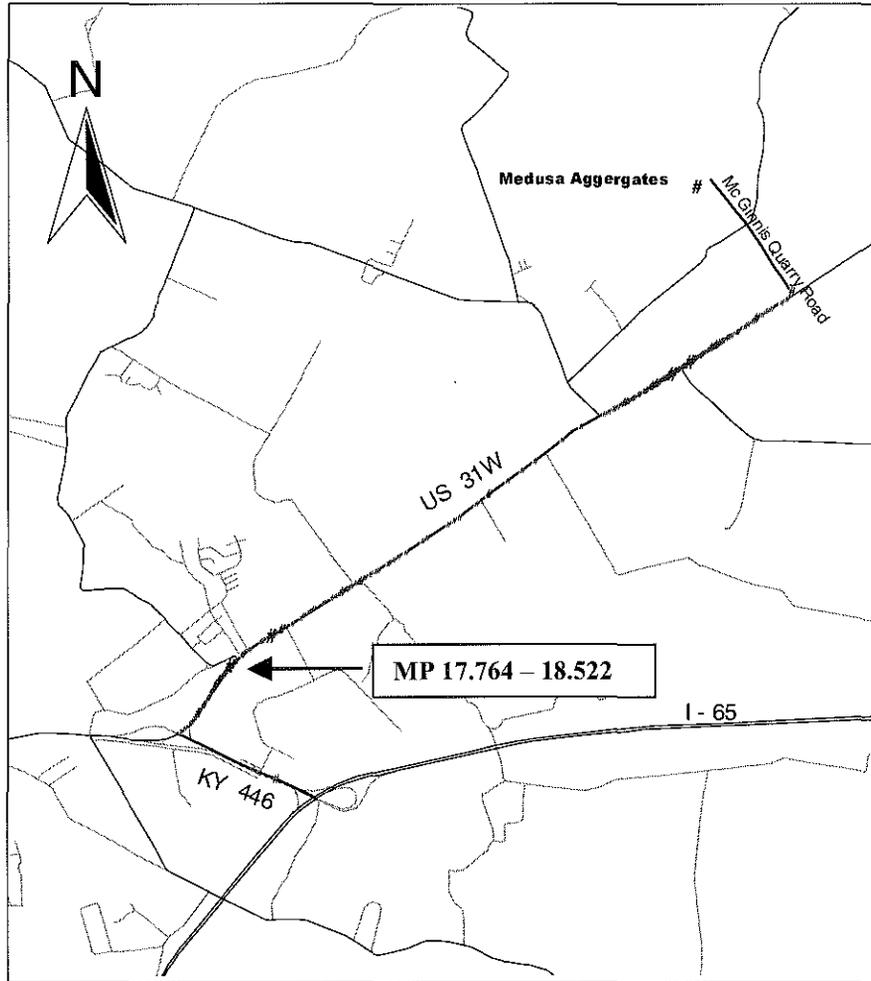
| | <i>Non-Truck Accidents</i> | <i>Truck Accidents</i> | <i>Percent Trucks</i> |
|-----------------|----------------------------|------------------------|-----------------------|
| Total | 116 | 12 | 9.4 |
| Fatal Accidents | 0 | 0 | 0.0 |
| Injury | 58 | 7 | 10.8 |
| Intersection | 45 | 5 | 10.0 |

3.3 Cross Section Features

Figures 4 and 5 illustrate the sections of the route with different lane widths and shoulder types, respectively. KY 446 and US 31W both have “preferred” 12-foot lanes. US 31W is separated by a 32-foot, depressed median from the intersection of US 68 / KY 80. KY 446 has a 24-foot, depressed median along its entire length. McGinnis Quarry Road has only 10-foot lanes which are considered “less than adequate” for trucks.

The initial section of KY 446 is curbed, which is considered to be “less than adequate” since trucks must remain in the travel lanes during emergencies or breakdowns. The following half mile of KY 446 has 10-foot, stabilized shoulders which are “adequate” and the remainder of the road has 10-foot, paved shoulders which are considered “preferred”

Figure 3: Accident Locations (1994-1996)



LEGEND

- # Facility
- * Accidents: 1 - 2
- # Accidents: 3 - 8
- # Accidents: 9 - 10
- # Accidents: 11 - 13

Scale - 1:45000

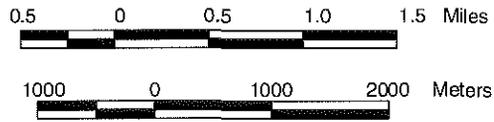
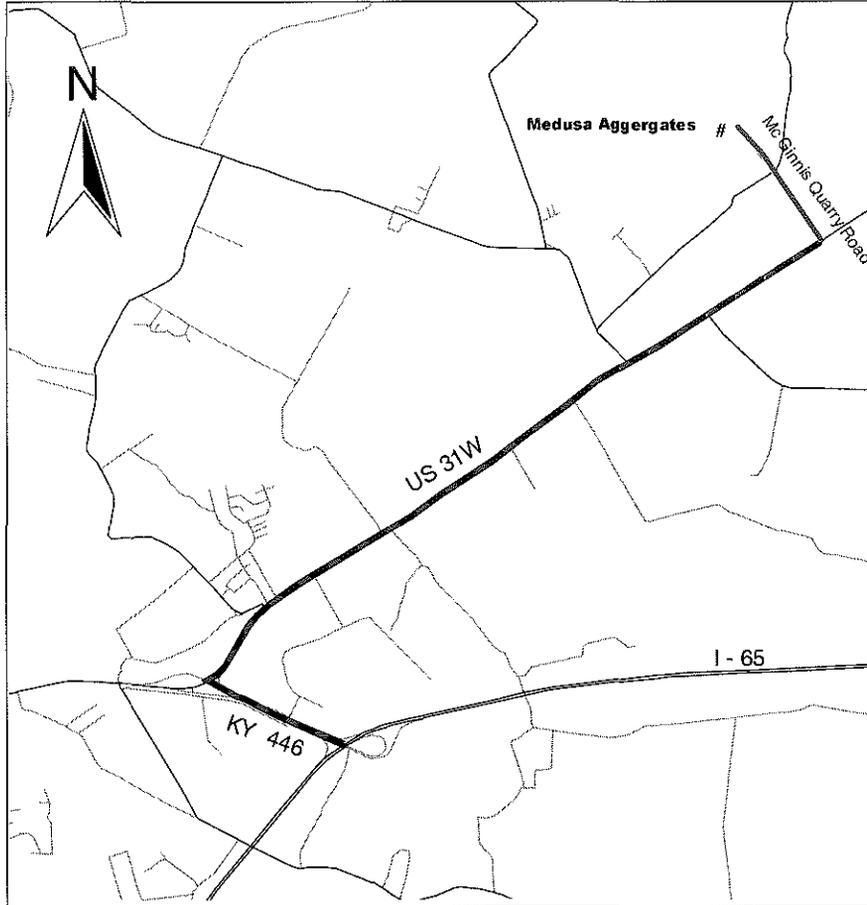


Figure 4: Lane Widths



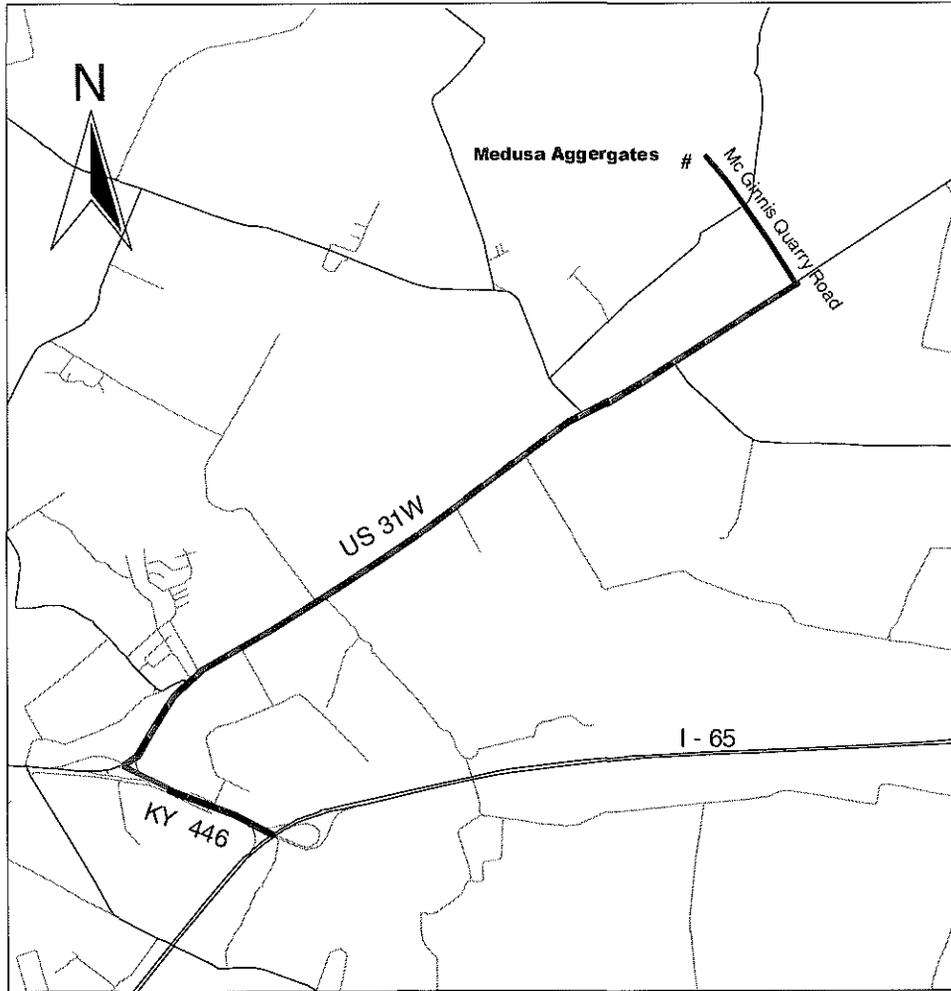
LEGEND

| | |
|---|---------------------|
| # | Facility |
|  | Lane Width: 10 Feet |
|  | Lane Width: 12 Feet |

Scale - 1:45000



Figure 5: Shoulder Widths



LEGEND

- | # | Facility |
|---|--------------------------|
|  | Shoulder Width - 1 Foot |
|  | Shoulder Width - 2 Feet |
|  | Shoulder Width: 4 Feet |
|  | Shoulder Width - 10 Feet |

Scale - 1:45000



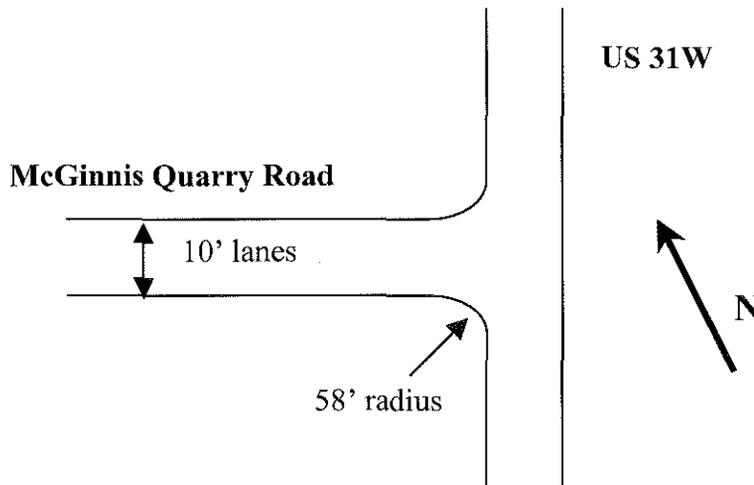
for truck access. US 31W has only a 2-foot stabilized shoulder and McGinnis Quarry has from 2-to 4-feet of turf shoulder, both of which are “less than adequate”. There are no problems with clear zone along the route’s length.

3.4 Curvature Features

Offtracking is considered a problem where a truck cannot stay in its lane through a curve. There are no problems associated with offtracking along this route.

One turning radius (as illustrated in Figure 6) was suspected of being problematic and therefore was measured in the field. The intersection of McGinnis Quarry Road and US 31W was monitored for turning trucks, and most trucks were capable of negotiating the turn while remaining in their own lane. However, only single unit trucks were witnessed making the turn. The phone survey completed on the facility indicates that some semi-trailers are using the route, and these trucks will encounter more difficulty negotiating the 58-foot right turning radius to travel south towards I-65. The 10-foot lanes on McGinnis Quarry Road do not allow for trucks to make a clear turn without entering the opposite lane of traffic. Therefore a rating of “less than adequate” is given to this turning radius.

Figure 6: Turning radius at McGinnis Quarry Road and US 31W



3.5 Railroad Crossings

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

3.6 Bridges

There are two bridges along this route (Figure 7). 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 characteristics) of the structure. The bridge on KY 446 near milepoint 0.6 received a rating of 77 out of a possible 100 points which is considered "adequate". The second bridge, located on US 31W at milepoint 17.76, received a rating of 75.7 which is also considered "adequate".

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

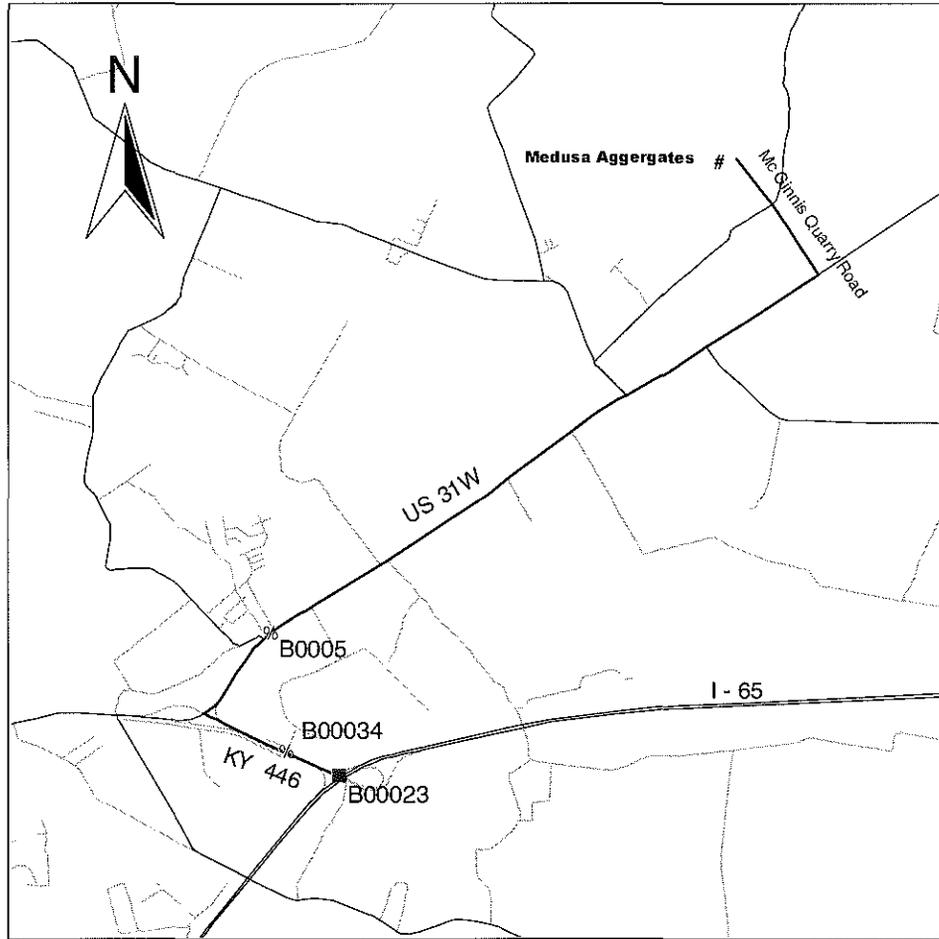
In order to compare different routes to consider the relative urgency of needed route improvements, the features rated "preferred", "adequate", and "less than adequate" along a route have been normalized for the number of miles, number of points, and number of trucks using the section. In the case of this Warren County truck route, four features (lane width, shoulders, turning radii, and bridges) 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 on the section.

Table 3 contains the total problem truck miles and total problem truck points for lane width, shoulders, turning radii, and bridges along this route. Truck counts were obtained from vehicle classification counts conducted for the KYTC Division of Planning in 1996 (US 31W) and 1998 (McGinnis Quarry Road and KY 446). The rating of this route relative to others evaluated will be reported in the final report.

4.2 Maintenance Improvement Locations

Lane markings along McGinnis Quarry Road should be considered due to the relatively large number of vehicles that it carries on a daily basis. The 10-foot lanes should have (at a minimum) a centerline. Edge markings on 10-foot lanes are not required, but are preferred.

Figure 7: Bridge Locations



LEGEND

| | |
|----------|-------------------------|
| # | Facility |
| % B00000 | Bridges - Bridge Number |

Scale - 1:45000

0.5 0 0.5 1 1.5 Miles

1000 0 1000 2000 Meters

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

| Feature | Road | Segment/point | Points* | Length (miles) | Trucks (/day) | Truck-points | Truck-miles |
|----------------|-----------------|----------------|---------|----------------|---------------|--------------|----------------|
| Lane width | McGinnis Quarry | Length | 2 | 0.43 | 308 | | 264.9 |
| Total | | | | | | | 264.9 |
| Shoulders | McGinnis Quarry | Length | 2 | 0.66 | 308 | | 406.6 |
| | US 31W | Length | 2 | 4.1 | 2283 | | 18720.6 |
| | KY 446 | MP 0 - 0.29 | 2 | 0.29 | 1582 | | 917.6 |
| | KY 446 | MP 0.29 - 0.79 | 1 | 0.5 | 1582 | | 791.0 |
| Total | | | | | | | 20835.7 |
| Turning Radius | McGinnis Quarry | US 31W | 2 | | | 308 | 616 |
| Total | | | | | | | 616 |
| Bridge Ratings | US 31W | B 00005 | 1 | | 2283 | 2283 | |
| | KY 446 | B 00034 | 1 | | 1582 | 1582 | |
| Total | | | | | | | 3865 |

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

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. Based on the findings from the various site visits and information obtained from the HIS database, this route merits a score of 7 indicating that minor improvements could improve the route.

4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck access route to Medusa Aggregates:

- Minor lengths of highway with less than "preferred" lane widths and shoulders;
- One problematic intersection (McGinnis Quarry Road with US 31W) with turning radius problems for right turning trucks;
- Two bridges with less than "preferred" sufficiency ratings; and
- Minor truck accident problems.

Minor improvements (such as lane widening) to the intersection of US 31W and McGinnis Quarry Road could alleviate the turning radius problem. The remaining access-limiting issues could only be corrected with major construction. Should future growth in the area create higher volumes of truck traffic on the route, such construction might become feasible.

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 required on this route |
| 6 to 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: 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> |
|---------------------|----------------------|------------------------|---------------|--------------|
| 2628 | MEDUSA AGGREGATES | BOWLING GREEN | WARREN | BARREN RIVER |
| <u>Contact Name</u> | <u>Title</u> | <u>Phone</u> | <u>Fax</u> | |
| BOB FORBES | OPERATION MGR. | 502-842-5618 | 502-842-9450 | |

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?
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? 4-AXLE SINGLE UNIT
6. What is the largest truck operating at your facility? 5 AXLE SEMITRAILER
7. What type of freight or commodity is shipped, and is incoming and outgoing freight different? *(one may be an empty truck)*
STONE AND AGRICULTURAL LIME
8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) < MID-MORNING OUT
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)
LOCAL, SO. ON LOUISVILLE RD (US 31W) TO I-65 AT EXIT 28, 2/3 SOUTHBOUND
11. Do you have any other problems or concerns along the route you would like us to consider?
NONE
12. Would you like a copy of the final report (roadway/route evaluation ???) YES

NOTES/COMMENTS: NARROW BRIDGE ON KY 1435, 0.3 MILES EAST OF KY 626