

TRUCK ROUTE ACCESS EVALUATION

Campbell-Hausfeld
Leitchfield-Grayson County
Site # 2637

Report No. KTC-99-47

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

By

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with

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Kentucky Transportation Center and the Department of Civil Engineering
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May 1999

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1.0 Introduction

The Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189) is being conducted by the Kentucky Transportation Center on behalf of the Kentucky Transportation Cabinet. There are two main objectives of the study: 1) evaluation of the 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 the Campbell-Hausfeld Company facility located in Grayson County in the Lincoln Trail Area Development District (ADD) and KYTC Highway District #4. The location of the site is shown in Figure 1. Work on other specific sites as well as the freight commodity flow task is ongoing and 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 on January 15, 1998 and for data collection on October 26, 1998. The facility is located on Embry Road west of KY 920. Other facilities in the area not contacted are Leggett and Platt, Vermont American, and Inoac. The surrounding area is generally rural. A phone survey was conducted with the facility manager early in the study process. The survey found that approximately 60 trucks per day normally access the facility while HIS data indicated 570 trucks travel along KY 920 at the site. The trucks are generally semitrailers with a maximum length of 53 feet. The freight handled at this facility is primarily air compressors and accessories. The only problem mentioned in the survey was a tight turning radius at the intersection of Embry Drive and KY 920. The phone survey information can be found in Appendix A.

2.0 Truck Routes in Use

As shown in Figure 1, trucks use one of two routes to reach the NHS. Both routes follow Embry Drive to KY 920 and then follow KY 920 to US 62. The eastern route (shown in green) is used primarily by trucks traveling to Cincinnati. The route follows US 62 east to KY 224 which connects with the Western Kentucky Parkway and is approximately 5.1 miles in length. The western route (shown in orange) is used by trucks traveling west to Owensboro, and is approximately 2.1 miles in length. This route follows US 62 west through downtown Leitchfield and KY 259 to Exit 107 at the Western Kentucky Parkway. KY 920 passes through residential and urban areas near US 62 in Leitchfield. The US 62 east route passes through urban and rural areas. All roads except Embry Drive are state maintained. A detail map of Leitchfield is shown in Figure 2. There are two traffic signals along the eastern route and six along the western route. A route designation summary is shown in Table 1.

Figure 1: Location of Truck Generating Site

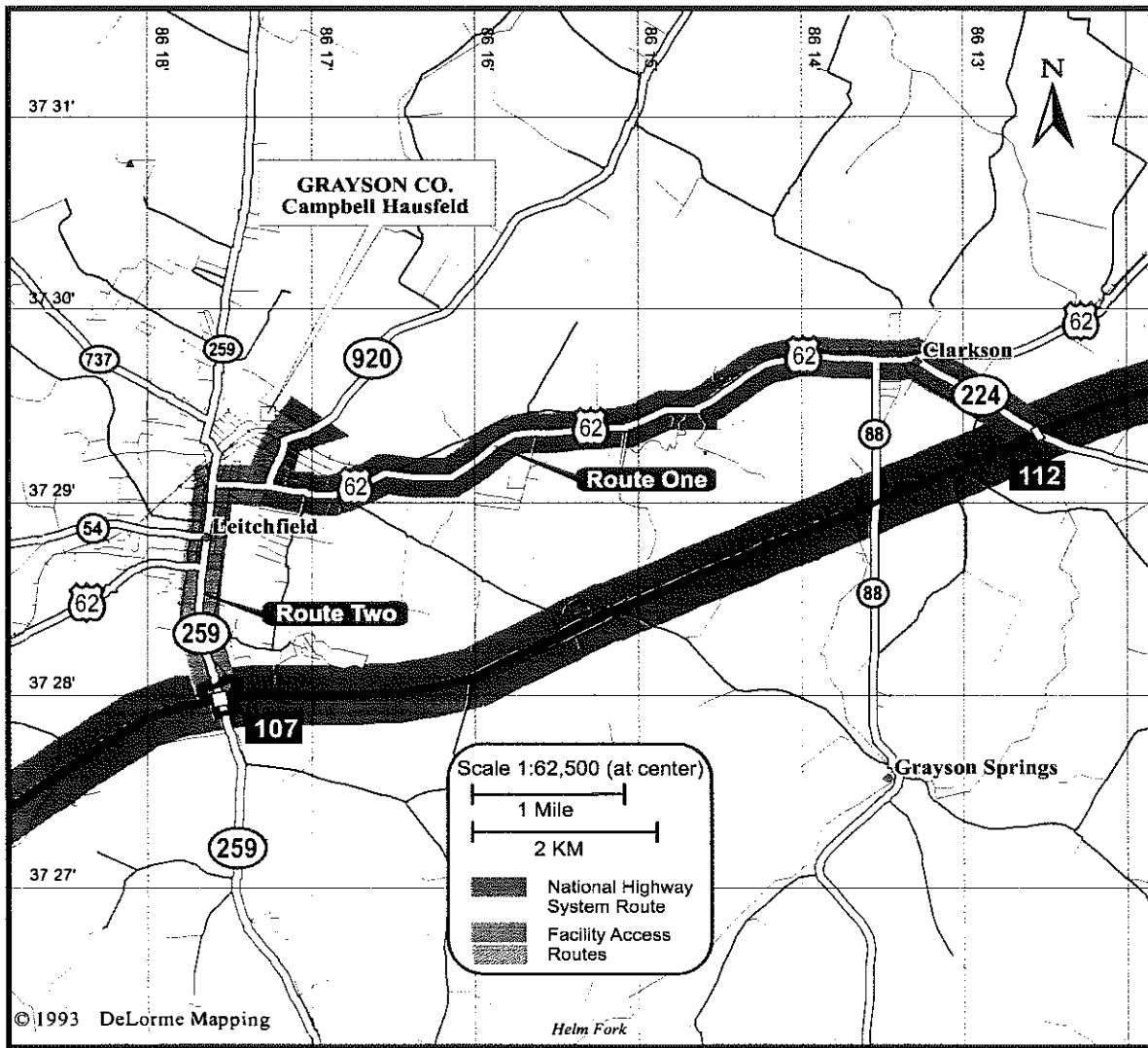


Figure 2: Detail Map of Routes in Leitchfield

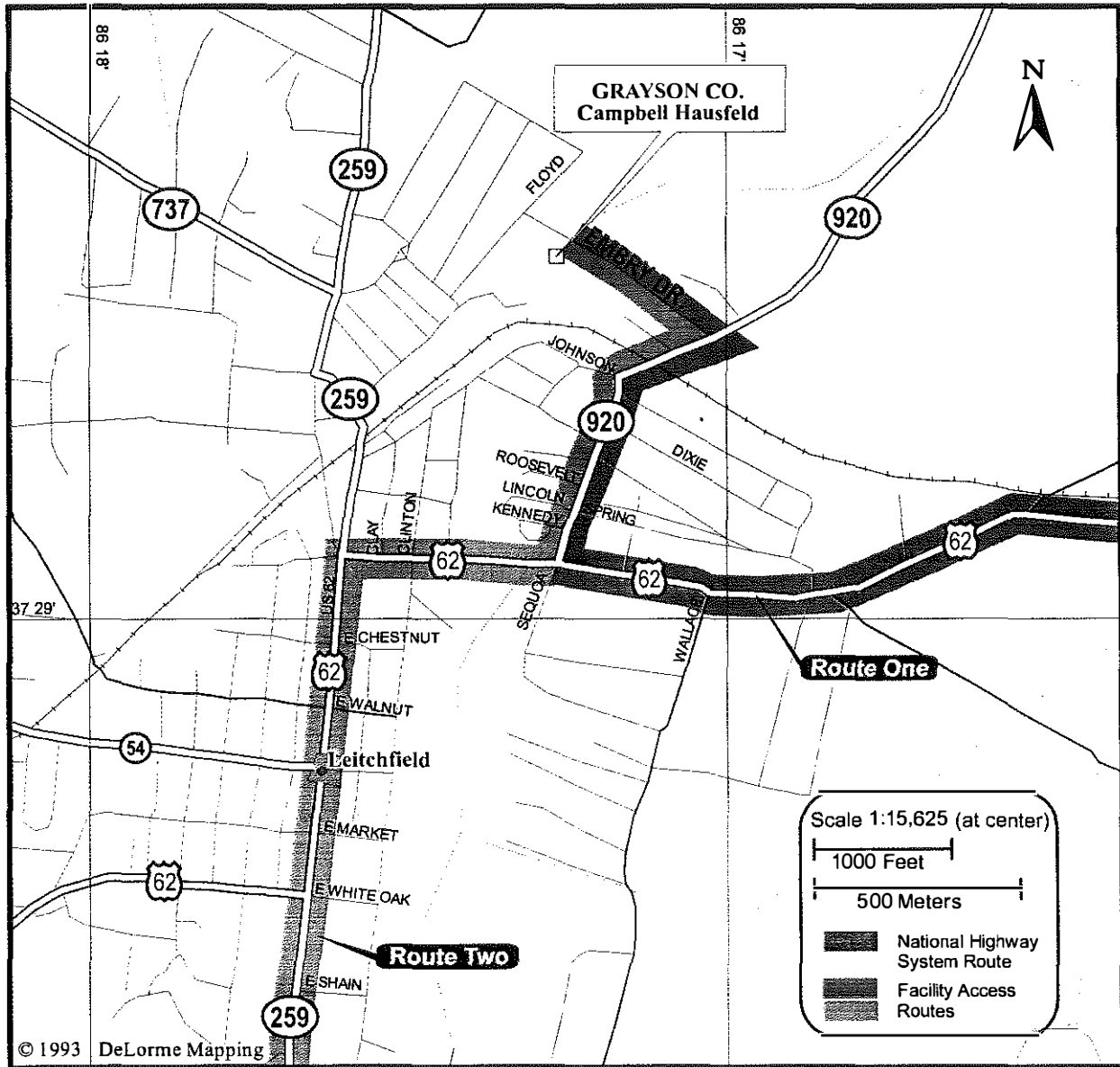


Table 1: Route Designation Summary

Route	Milepoint	Functional System	Weight Class	ADT
US 62	20.787-21.296	Rural Minor Arterial	AAA	20,200
	21.296-21.598	Rural Major Collector	AAA	17,300
KY 224	Length	Rural Major Collector	A	5,740
KY 259	Length	Rural Minor Arterial	AAA	11,300-18,200
KY 920	Length	Rural Minor Collector	AAA	3,970

The phone survey indicated that approximately 2/3 of the site traffic uses Route One, the eastern route, with Cincinnati being the primary destination. This route intersects the Western Kentucky Parkway at Exit 112 which is a partial interchange (exit-WB, enter-EB). Route Two, the western route, accesses the Western Kentucky Parkway at Exit 107. Site traffic using this route has a primary destination of Owensboro, according to the survey.

The eastern route has no sections which are designated as National Truck Network routes. Therefore, because of its length, if a 102 inch wide truck were to use this route it would be in violation of STAA rules by 0.1 mile.

3.0 Route Data Collection and Evaluation

The route features that are to be evaluated in this study are shown in Table 2 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.

Table 2: 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

3.1 Traffic Operations and Level of Service

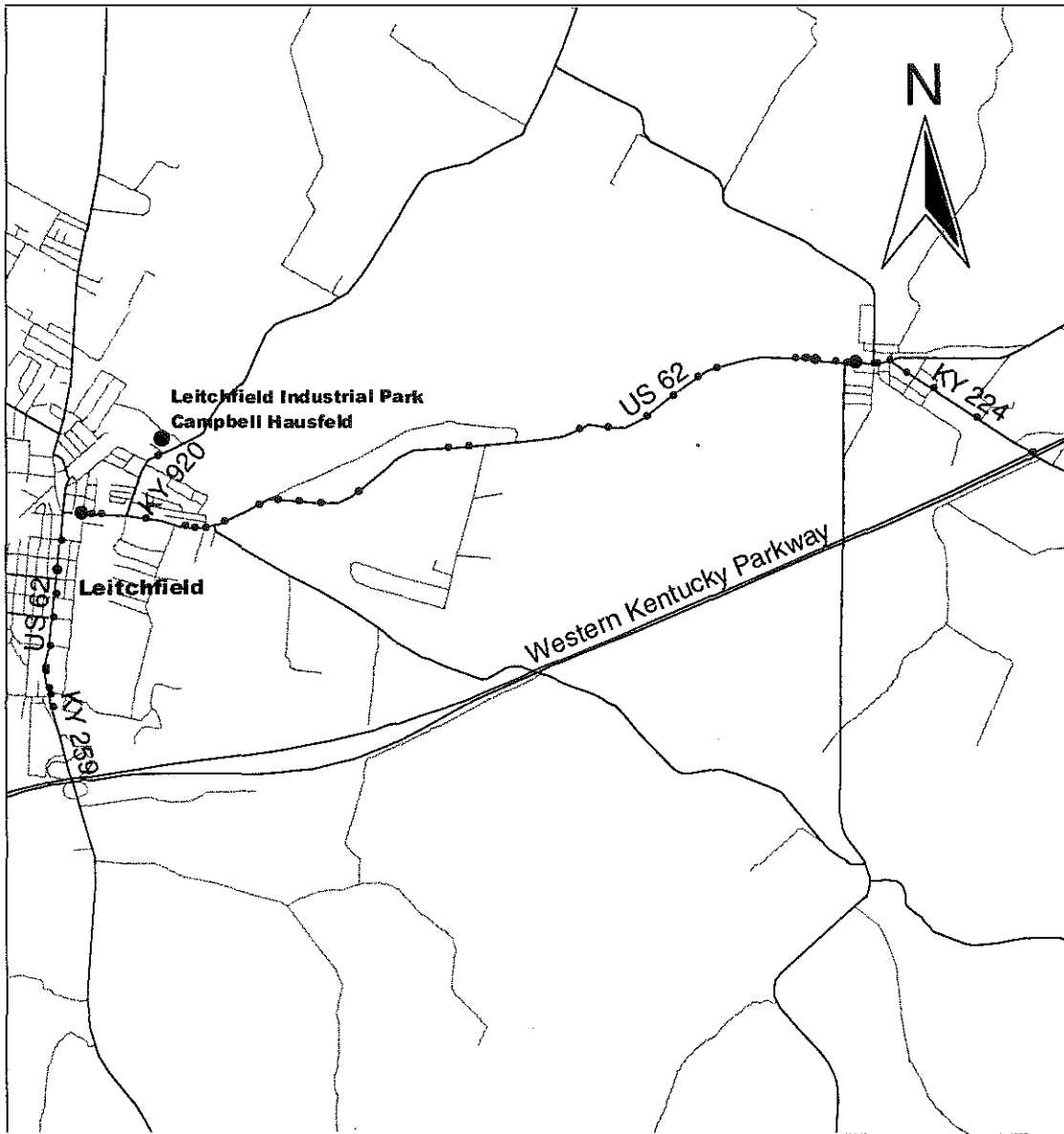
The survey of this site indicated that there were no operational problems or concerns for the access route to this site. Thus, no traffic evaluations were performed and the route is assumed to operate at an acceptable level of service.

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 (vehicle miles traveled). There were no sections along these routes where the accident rate was as high as the critical rate for that particular highway type.

Figure 3 shows the locations of accidents during the years 1995, 1996 and 1997. The figure shows that the accidents were scattered along both routes with a significant number occurring in Leitchfield and Clarkson.

Figure 3: Accident Locations (1995-1997)



LEGEND

- Facility
- Accidents: 1-3
- Accidents: 4-7
- Accidents: 8-13

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

A summary of the accidents along the truck routes is shown in Tables 3 and 4 for the same three year period. The 8.3% of accidents involving trucks on the eastern route is higher than the percent trucks along US 62 (5.6%), but lower than the percent trucks using KY 920 (11.2%) and KY 224 (8.4%). The 3.2% of accidents involving trucks on the western route is lower than the percent trucks along that route (US 62 - 6.5%, KY 259 - 6.5%, KY 920 - 11.2%). The percent trucks was obtained from 1998 KYTC Vehicle Classification Counts and HIS data.

Table 3: Accident Types along the Eastern Route to WKP at Exit 112

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	83	8	8.3
Fatal Accidents	0	0	0.0
Injury	43	2	4.4
Intersection	33	3	8.3

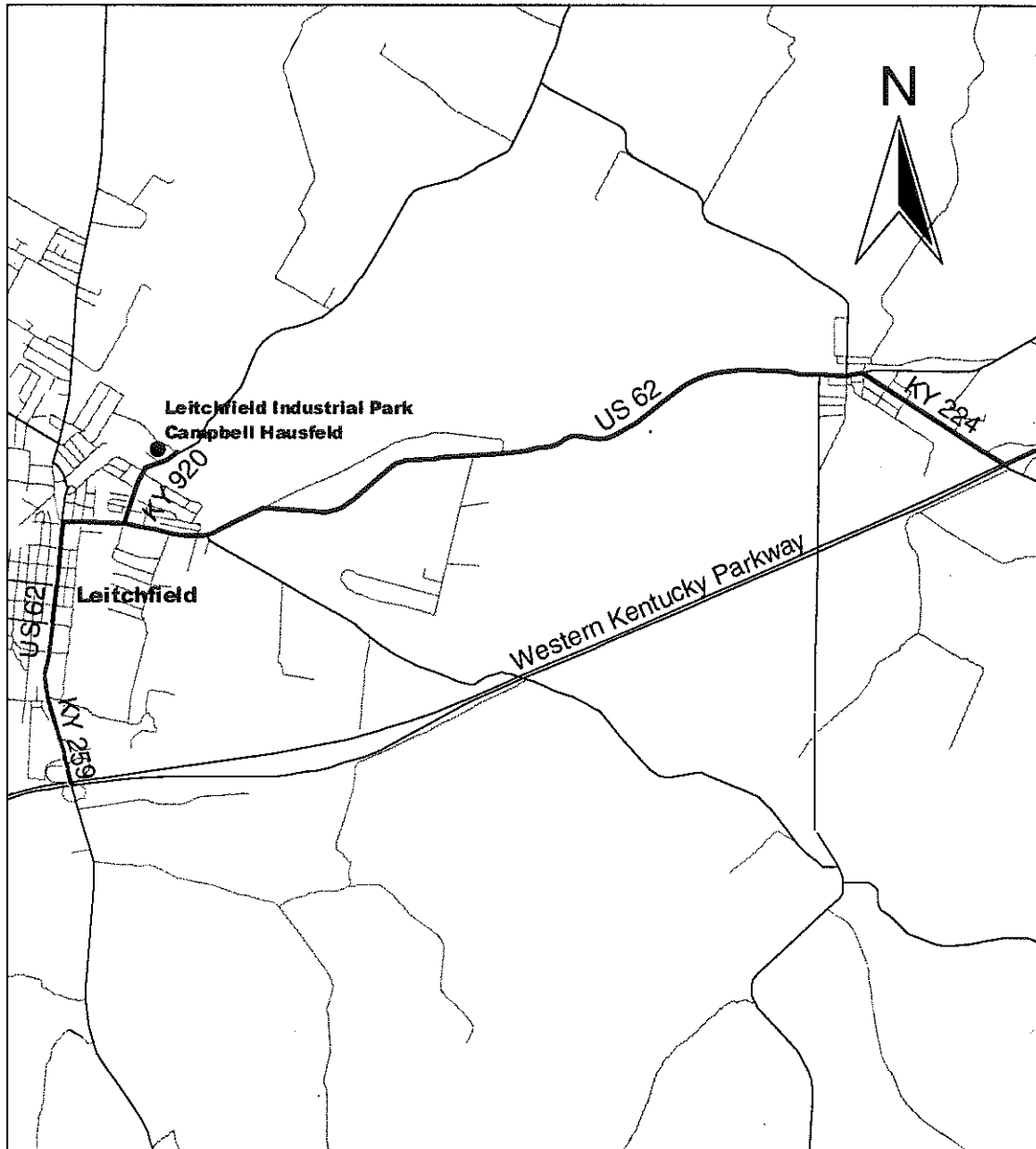
Table 4: Accident Types along the Western Route to WKP at Exit 107

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	30	1	3.2
Fatal Accidents	0	0	0.0
Injury	25	0	0.0
Intersection	10	0	0.0

3.3 Cross Section Features

Figures 4 and 5 illustrate the sections of the routes having different widths of lanes and shoulders. Along the eastern route, US 62 has “adequate” 11-foot lanes near KY 920 in Leitchfield and “less than adequate” 10-foot lanes in the rural areas. The “less than adequate” lane widths along KY 224 range from 9-10 feet. Along the western route, US 62 has “less than adequate” 10-foot lanes from KY 920 to the junction of KY 259. KY 259 has four “preferred” 12-foot lanes. There are no shoulders on Embry Drive or KY 920, while US 62 in Leitchfield is curbed. All other roadways have “less than adequate” two-foot shoulders. Ditches and side slopes cause clear zone problems along most of the routes. The pavement was generally good on most of US 62, KY 224 and KY 259, while it was in fair condition on KY 920 and Embry Drive.

Figure 4: Lane Widths



LEGEND

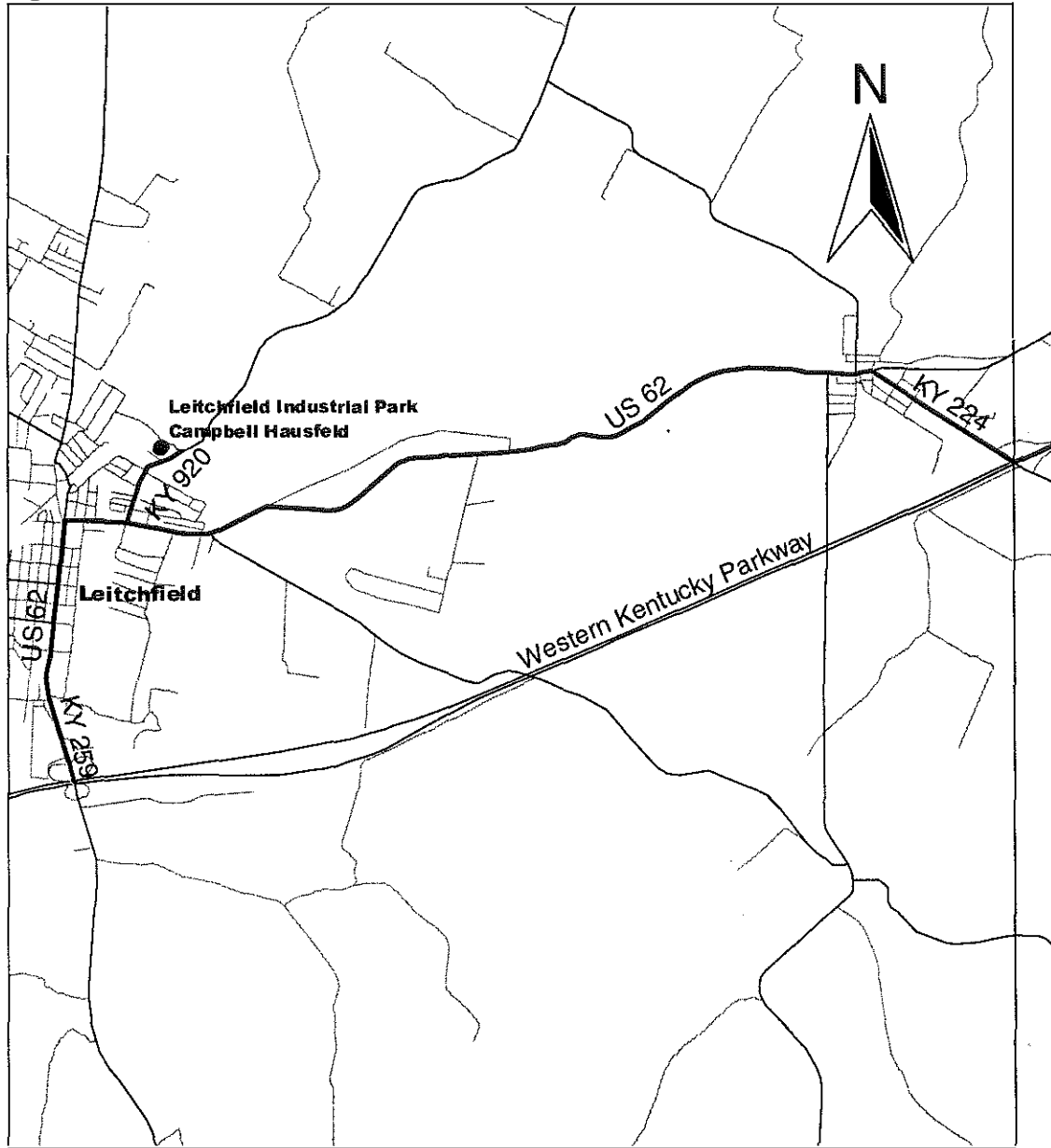
- Facility
- Lane Width - 9 Feet
- Lane Width - 10 Feet
- Lane Width - 11 Feet
- Lane Width - 12 Feet

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

Figure 5: Shoulder Widths



LEGEND

- Facility
- Shoulder Width - 0 Feet
- == Shoulder Width - 2 Feet
- === Shoulder Width - 3 Feet
- ==== Shoulder Width - 4 Feet

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

3.4 Curvature Features

Grades are considered problematic if they cause trucks to slow down excessively. There were no sections of roadway along these routes where this presents a problem.

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

The turning radii at the intersection of KY 920 and Embry Drive was observed to be “less than adequate” as shown in Figures 6, 7, and 8. Several vehicles were observed encroaching into the opposing lane while making a right turn from Embry Drive onto KY 920. When making left turns into the industrial park from KY 920, vehicles also drove off the pavement either on KY 920 or Embry Drive. The approximate layout of this intersection is shown in Figure 9. The near 45° angle at which Embry Drive joins KY 920, along with the pavement width, increases the required turning radius. The original pavement intersected KY 920 without any widening. The turn from KY 920 onto Embry Drive, which is approximately 45°, was rated “less than adequate” because trucks drive off the pavement to make the turns, as shown in Figures 6, 7 and 8.

Figure 6: KY 920 at Embry Drive



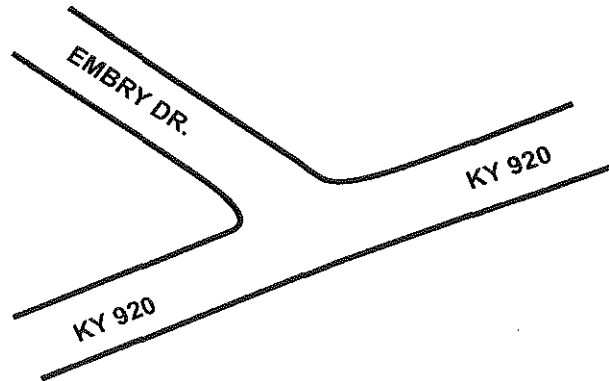
Figure 7: KY 920 at Embry Drive



Figure 8: Embry Drive at KY 920



Figure 9: Intersection Layout of KY 920 and Embry Drive



3.5 Railroad Crossings

There is one at-grade railroad crossing on the routes to this site. The crossing is on KY 920 near the intersection with Embry Drive as shown in Figure 2. The crossing has warning signs, flashing lights, gates and is relatively smooth giving it a “preferred” rating.

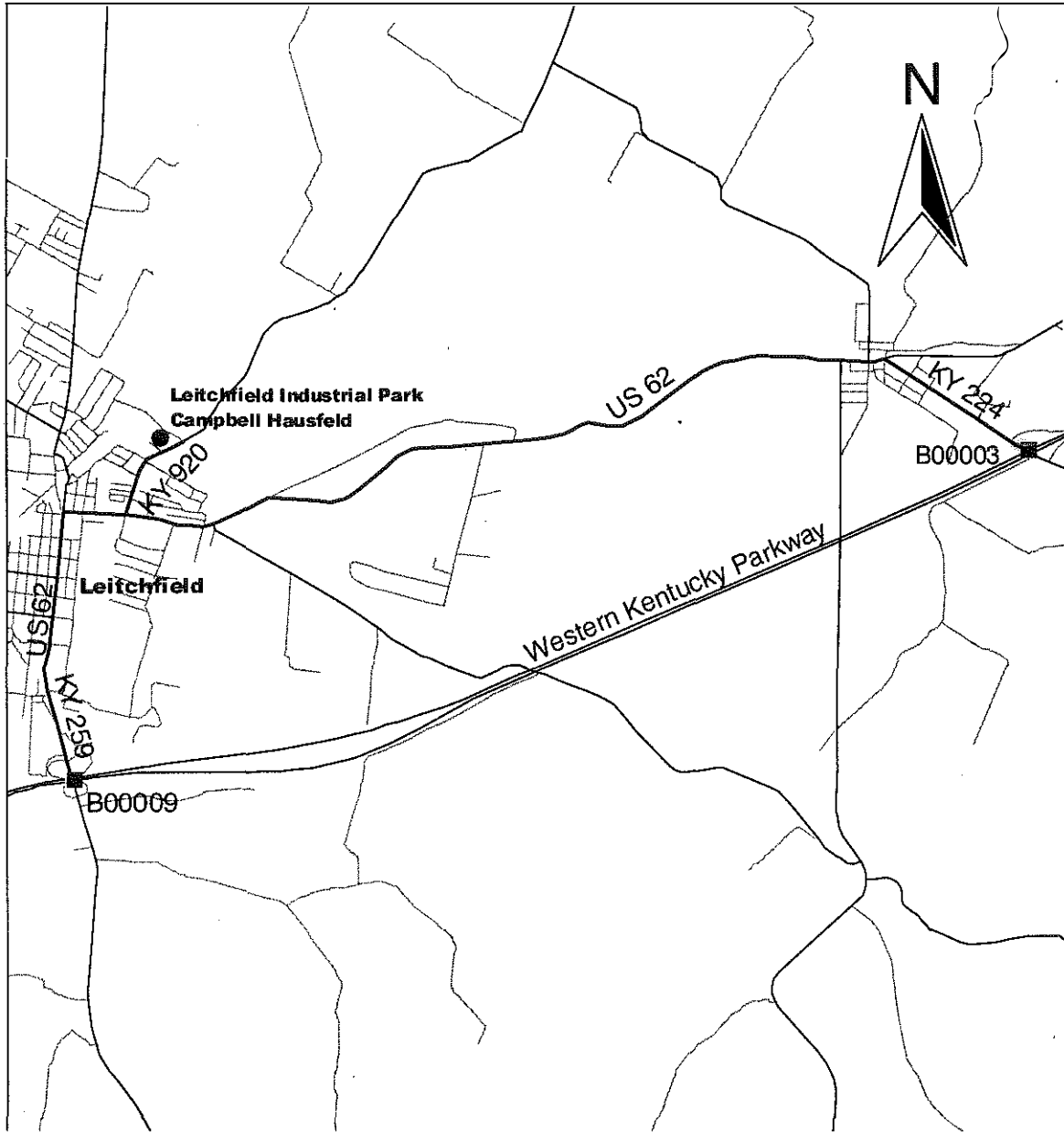
3.6 Bridges

Figure 10 shows the location of the two bridges on these routes. The bridges are located at the points where the access routes intersect with Western Kentucky Parkway. 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 factors) of the structure. The bridge along the eastern route on KY 224 over the Western Kentucky Parkway has a sufficiency rating of 75.2 giving it an “adequate” rating. The bridge on KY 259 over the Western Kentucky Parkway has a sufficiency rating of 66.8 which is also “adequate” for this study. A sufficiency rating of 80 or higher (out of a possible 100) is considered “preferred,” and a rating of at least 50 is “adequate.”

3.7 Sight Distance

No sight distance problems were noted on these routes.

Figure 10: Bridge Locations



LEGEND

- Facility
- B00000 Bridges - Bridge Number

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles



600 0 600 1200 1800 Meters



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 have been normalized for the number of miles, number of points and number of trucks using the route section. In the case of these Grayson County routes, two 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 HIS data.

Tables 5 and 6 contain the total problem truck miles and total problem points for lane width, shoulders and turning radii which apply to these routes. The rating of these routes relative to others evaluated will be reported in the final report.

4.2 Maintenance Improvement Locations

No additional routine maintenance is indicated along the routes.

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 Tables 7. The eastern route received an overall rating of 7, indicating that minor improvements could improve this route. The western route was given a rating of 8, because minor improvements could also improve access.

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

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.598 - 22.013	1	0.4	660		264
	US 62	22.013 - 25.463	2	3.5	660		4,620
	KY 224	Length	2	0.8	480		768
Total							5,996
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	Length	2	3.9	660		5,148
	KY 224	Length	2	0.8	480		768
Total							6,260
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 224	MP 0.804	1		480	480	

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

Table 6: Summary of Problem Truck Miles and Points for Western Route

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.296 - 21.598	2	0.3	1,265		759
Total							1,103
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	20.973 - 21.296	1	0.3	1,265		380
	US 62	21.296 - 21.598	2	0.3	1,265		759
	KY 259	Length	2	0.8	845		1,352
Total							2,835
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 259	MP 12.116	1		845	845	

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

Table 7: 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

4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck route:

- Narrow lanes and shoulders;
- Low truck weight class (“A”) on KY 224;
- Poor turning radius from KY 920 onto Embry Drive; and
- Two bridges with “adequate” rating.

The recommended improvement is the reconstruction of the intersection of KY 920 and Embry Drive to eliminate turning radius problem. Other roadways with lane and shoulder width problems could be addressed by rebuilding those sections of highways.

Appendix

Appendix A: Phone Survey Conducted with Facility

PHONE SURVEY RESULTS

<u>Facility ID</u>	<u>Facility Name</u>	<u>Location / City</u>	<u>County</u>	<u>ADD</u>
2637	CAMPBELL HAUSFELD	LEITCHFIELD	GRAYSON	LINCOLN TRAIL
<u>Contact Name</u>	<u>Title</u>	<u>Phone</u>	<u>Fax</u>	
TAMMY BLANTON		502-259-7755	502-259-6100	
CARL SMITH		502-259-7753		

1. Is the location of your facility on the map correct?
2. Our information shows about 60 trucks per day access your facility. Is that correct?
If not, fill in correct volume.
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? 53' SEMITRAILER
6. What is the largest truck operating at your facility?
7. What type of freight or commodity is shipped, and is incoming and outgoing freight different?
(one may be an empty truck) IN - DOMESTIC/ INTERNATIONAL AIR TOOLS
OUT- COMPRESSORS/ ACCESSORIES, WINCHES
8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) EARLY A.M. LOADING OUT 6 A.M. HEAVY - 10 A.M. 3P.M. - 8P.M.
HEAVY
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
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 - CINCINNATI - OUT VERY FEW LOCAL ROUTES, LTL CARRIERS OWENSBORO 1/3 OF TRUCKS
11. Do you have any other problems or concerns along the route you would like us to consider?
TIGHT TURNING RADIUS AT INTERSECTION OF EMBRY RD. AND KY 920, PARTICULARLY FOR TRUCKS W/ 53-foot TRAILERS
12. Would you like a copy of the final report (roadway/route evaluation ???)

NOTES/COMMENTS:

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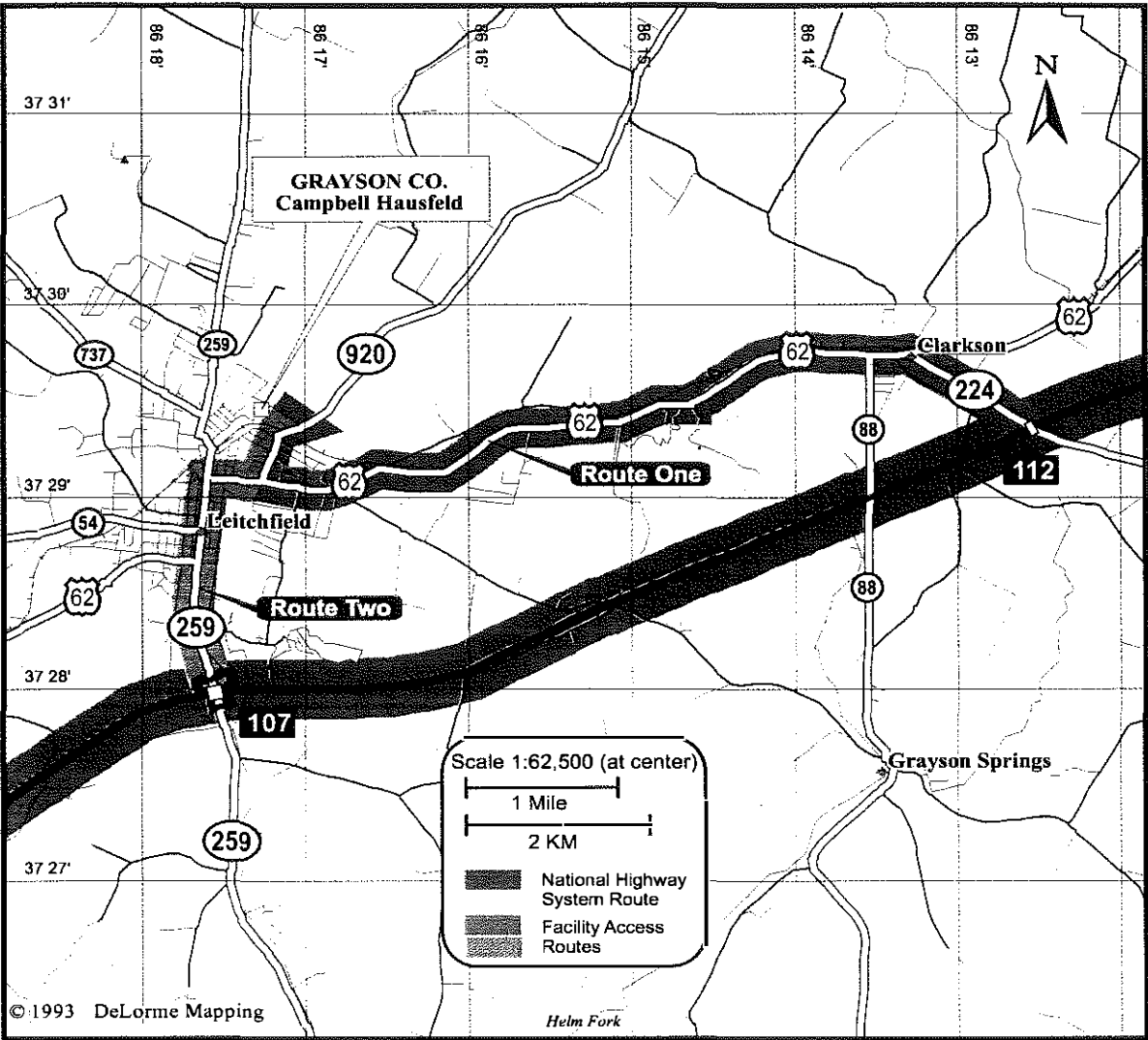


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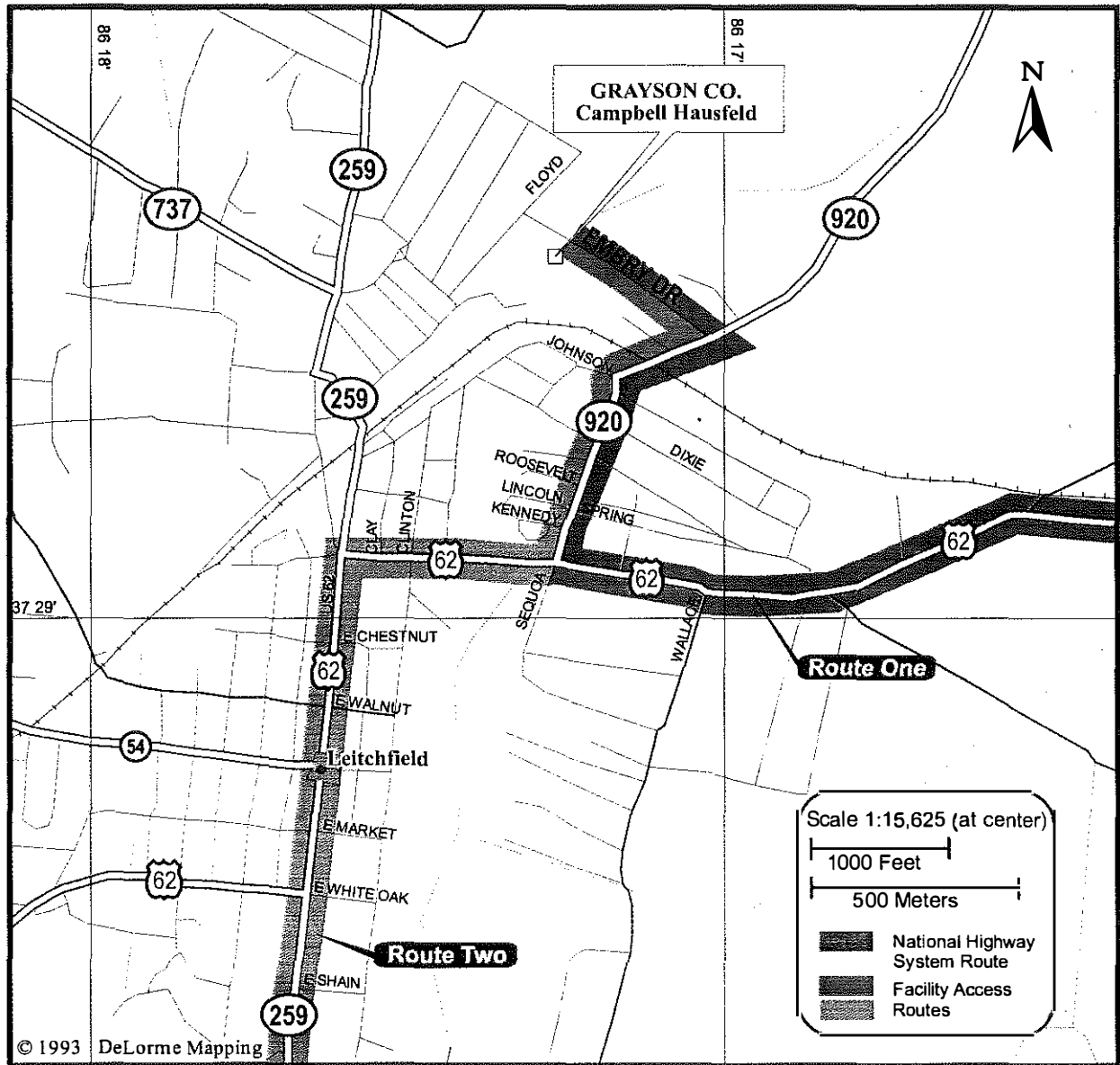


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Intersection LOS	Traffic counts	Only where problems are indicated by facility managers	Point
Route LOS	Traffic counts and travel time studies	Only where problems are indicated by managers	Continuous
RR Crossings	Field Observation	Evaluate all level crossings	Point
Bridges	KYTC Sufficiency Rating	Evaluate all bridges	Point

3.1 Traffic Operations and Level of Service

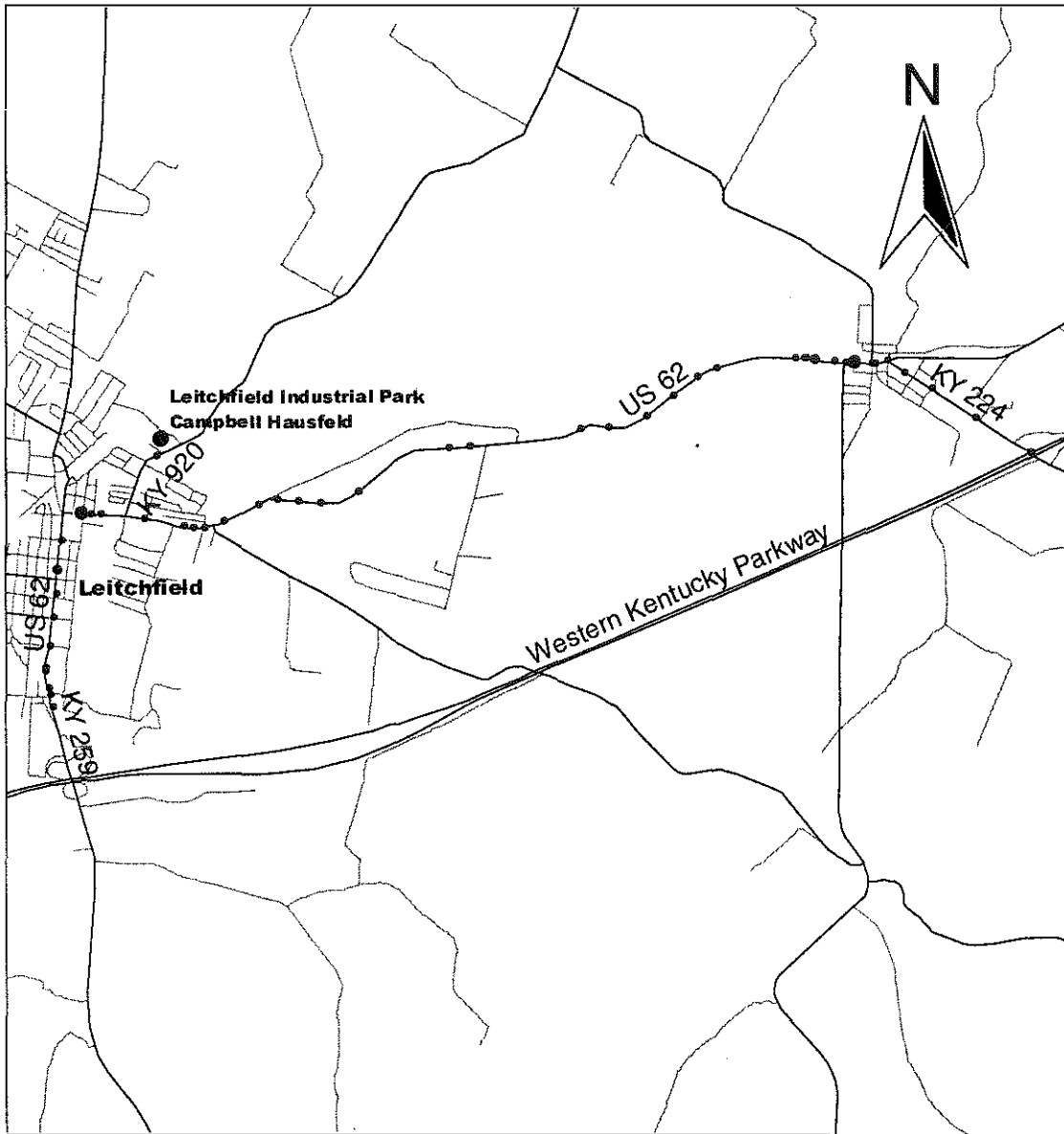
The survey of this site indicated that there were no operational problems or concerns for the access route to this site. Thus, no traffic evaluations were performed and the route is assumed to operate at an acceptable level of service.

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 (vehicle miles traveled). There were no sections along these routes where the accident rate was as high as the critical rate for that particular highway type.

Figure 3 shows the locations of accidents during the years 1995, 1996 and 1997. The figure shows that the accidents were scattered along both routes with a significant number occurring in Leitchfield and Clarkson.

Figure 3: Accident Locations (1995-1997)



LEGEND

- Facility
- Accidents: 1-3
- Accidents: 4-7
- Accidents: 8-13

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

A summary of the accidents along the truck routes is shown in Tables 3 and 4 for the same three year period. The 8.3% of accidents involving trucks on the eastern route is higher than the percent trucks along US 62 (5.6%), but lower than the percent trucks using KY 920 (11.2%) and KY 224 (8.4%). The 3.2% of accidents involving trucks on the western route is lower than the percent trucks along that route (US 62 - 6.5%, KY 259 - 6.5%, KY 920 - 11.2%). The percent trucks was obtained from 1998 KYTC Vehicle Classification Counts and HIS data.

Table 3: Accident Types along the Eastern Route to WKP at Exit 112

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	83	8	8.3
Fatal Accidents	0	0	0.0
Injury	43	2	4.4
Intersection	33	3	8.3

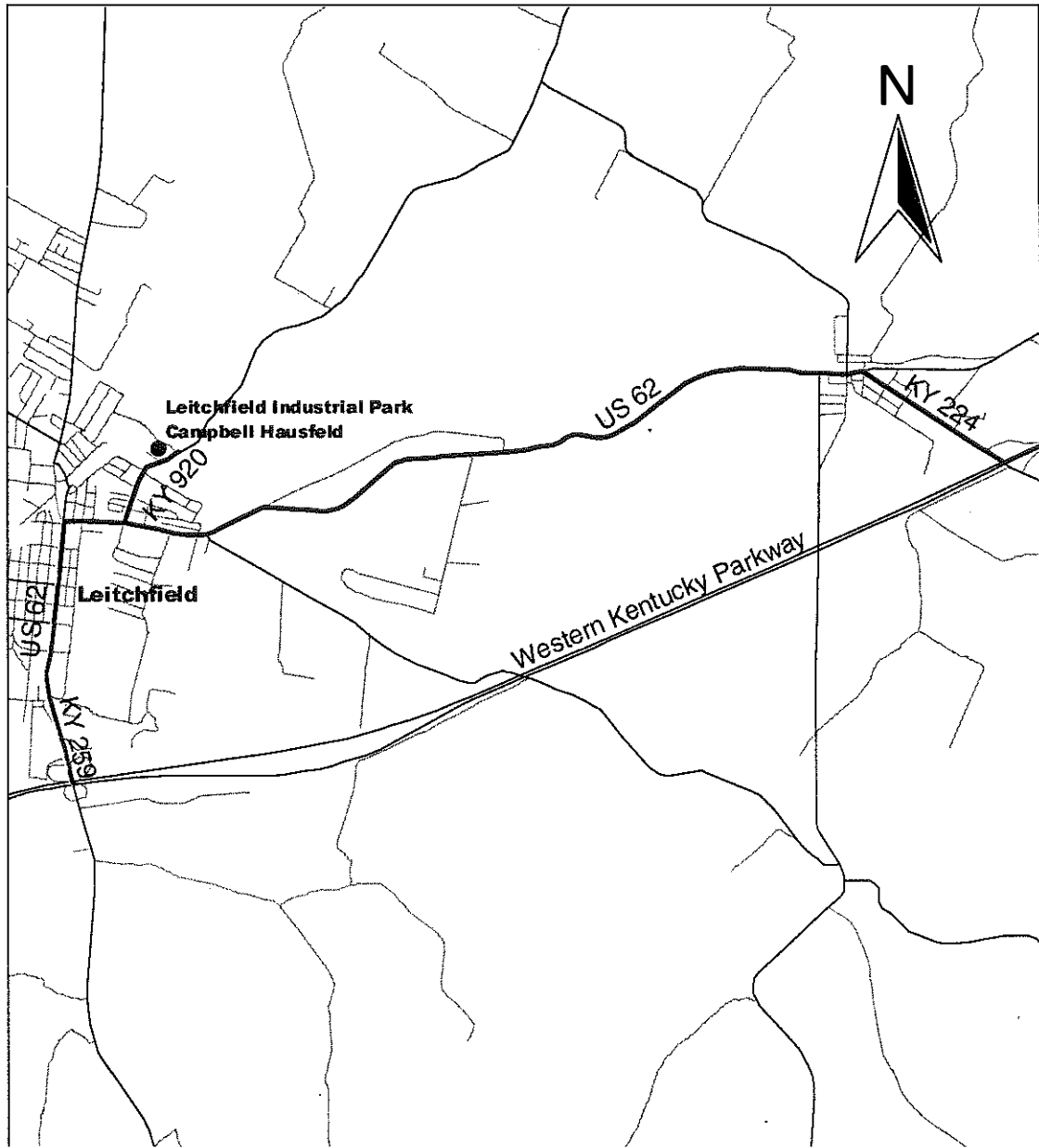
Table 4: Accident Types along the Western Route to WKP at Exit 107

	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
Total	30	1	3.2
Fatal Accidents	0	0	0.0
Injury	25	0	0.0
Intersection	10	0	0.0

3.3 Cross Section Features

Figures 4 and 5 illustrate the sections of the routes having different widths of lanes and shoulders. Along the eastern route, US 62 has “adequate” 11-foot lanes near KY 920 in Leitchfield and “less than adequate” 10-foot lanes in the rural areas. The “less than adequate” lane widths along KY 224 range from 9-10 feet. Along the western route, US 62 has “less than adequate” 10-foot lanes from KY 920 to the junction of KY 259. KY 259 has four “preferred” 12-foot lanes. There are no shoulders on Embry Drive or KY 920, while US 62 in Leitchfield is curbed. All other roadways have “less than adequate” two-foot shoulders. Ditches and side slopes cause clear zone problems along most of the routes. The pavement was generally good on most of US 62, KY 224 and KY 259, while it was in fair condition on KY 920 and Embry Drive.

Figure 4: Lane Widths



LEGEND

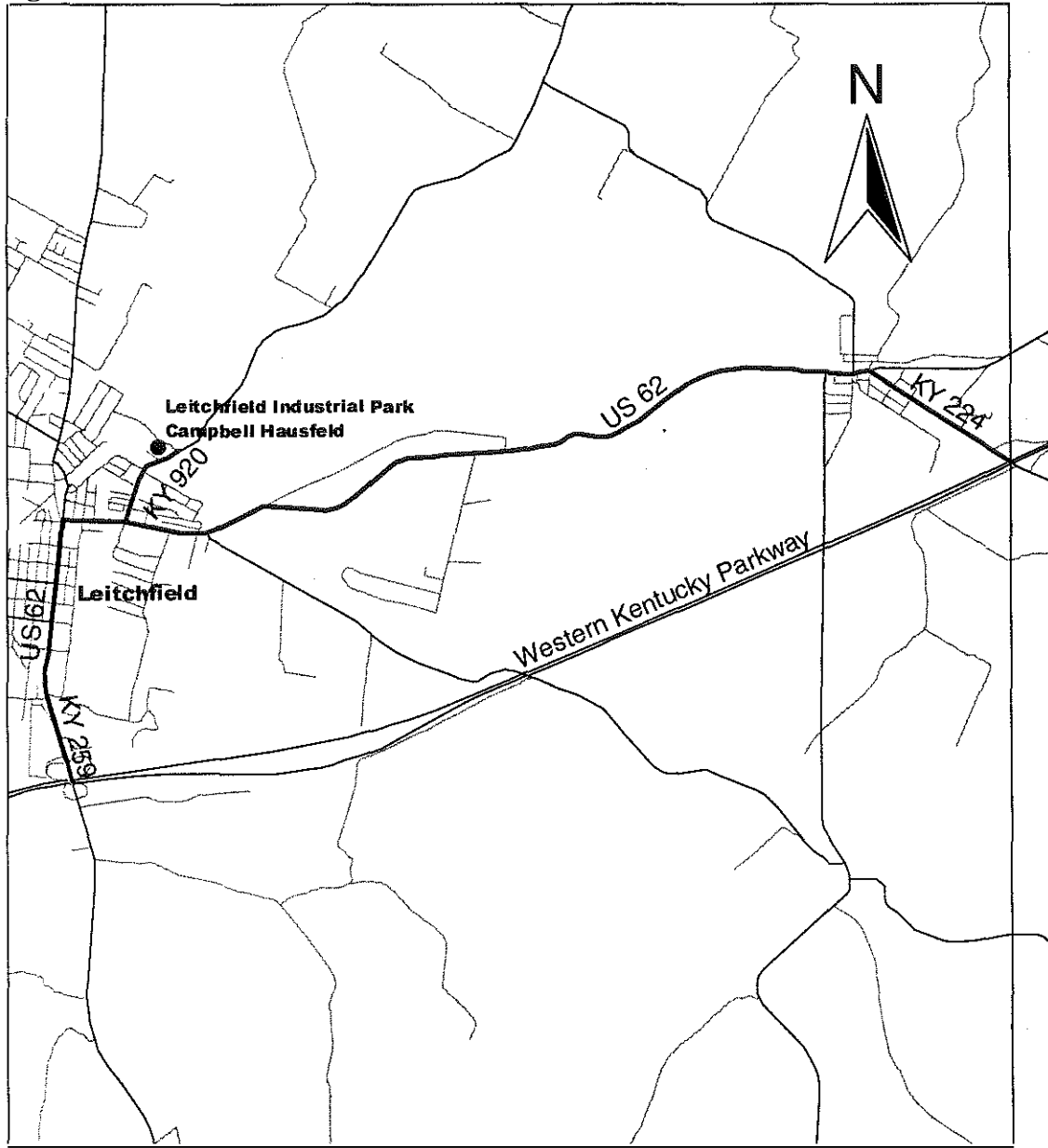
- Facility
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- Lane Width - 10 Feet
- Lane Width - 11 Feet
- Lane Width - 12 Feet

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

Figure 5: Shoulder Widths



LEGEND

- Facility
- Shoulder Width - 0 Feet
- Shoulder Width - 2 Feet
- Shoulder Width - 3 Feet
- Shoulder Width - 4 Feet

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

3.4 Curvature Features

Grades are considered problematic if they cause trucks to slow down excessively. There were no sections of roadway along these routes where this presents a problem.

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

The turning radii at the intersection of KY 920 and Embry Drive was observed to be “less than adequate” as shown in Figures 6, 7, and 8. Several vehicles were observed encroaching into the opposing lane while making a right turn from Embry Drive onto KY 920. When making left turns into the industrial park from KY 920, vehicles also drove off the pavement either on KY 920 or Embry Drive. The approximate layout of this intersection is shown in Figure 9. The near 45° angle at which Embry Drive joins KY 920, along with the pavement width, increases the required turning radius. The original pavement intersected KY 920 without any widening. The turn from KY 920 onto Embry Drive, which is approximately 45°, was rated “less than adequate” because trucks drive off the pavement to make the turns, as shown in Figures 6, 7 and 8.

Figure 6: KY 920 at Embry Drive

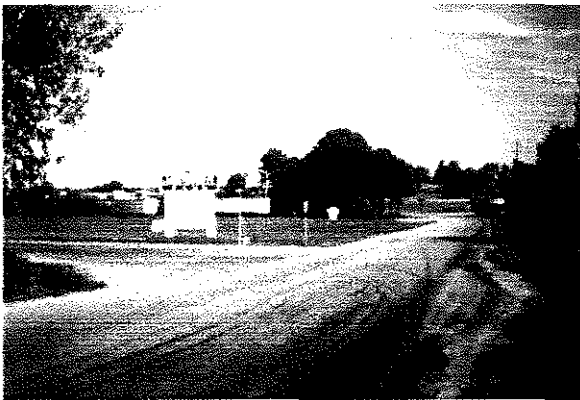


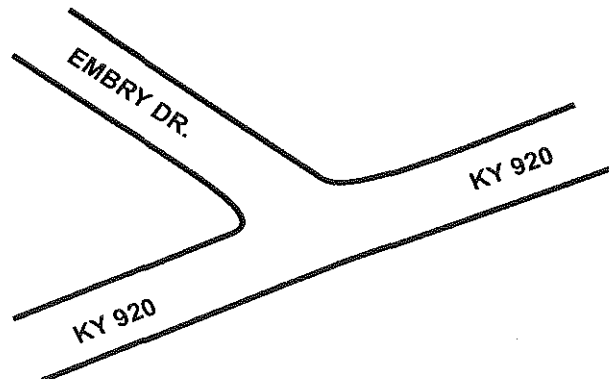
Figure 7: KY 920 at Embry Drive



Figure 8: Embry Drive at KY 920



Figure 9: Intersection Layout of KY 920 and Embry Drive



3.5 Railroad Crossings

There is one at-grade railroad crossing on the routes to this site. The crossing is on KY 920 near the intersection with Embry Drive as shown in Figure 2. The crossing has warning signs, flashing lights, gates and is relatively smooth giving it a “preferred” rating.

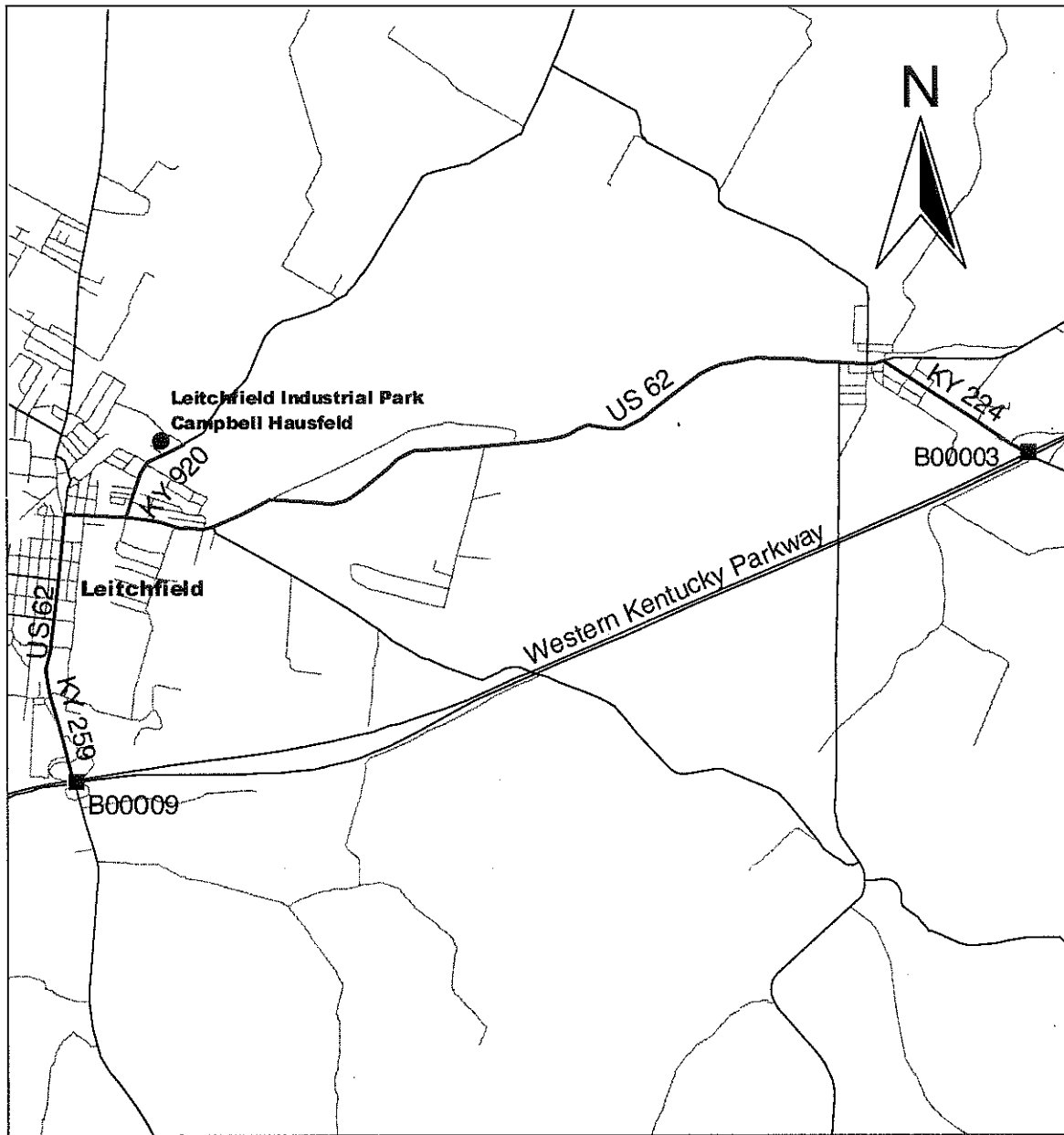
3.6 Bridges

Figure 10 shows the location of the two bridges on these routes. The bridges are located at the points where the access routes intersect with Western Kentucky Parkway. 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 factors) of the structure. The bridge along the eastern route on KY 224 over the Western Kentucky Parkway has a sufficiency rating of 75.2 giving it an “adequate” rating. The bridge on KY 259 over the Western Kentucky Parkway has a sufficiency rating of 66.8 which is also “adequate” for this study. A sufficiency rating of 80 or higher (out of a possible 100) is considered “preferred,” and a rating of at least 50 is “adequate.”

3.7 Sight Distance

No sight distance problems were noted on these routes.

Figure 10: Bridge Locations



LEGEND

- Facility
- B00000 Bridges - Bridge Number

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

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 have been normalized for the number of miles, number of points and number of trucks using the route section. In the case of these Grayson County routes, two 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 HIS data.

Tables 5 and 6 contain the total problem truck miles and total problem points for lane width, shoulders and turning radii which apply to these routes. The rating of these routes relative to others evaluated will be reported in the final report.

4.2 Maintenance Improvement Locations

No additional routine maintenance is indicated along the routes.

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 Tables 7. The eastern route received an overall rating of 7, indicating that minor improvements could improve this route. The western route was given a rating of 8, because minor improvements could also improve access.

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

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.598 - 22.013	1	0.4	660		264
	US 62	22.013 - 25.463	2	3.5	660		4,620
	KY 224	Length	2	0.8	480		768
Total							5,996
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	Length	2	3.9	660		5,148
	KY 224	Length	2	0.8	480		768
Total							6,260
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 224	MP 0.804	1		480	480	

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

Table 6: Summary of Problem Truck Miles and Points for Western Route

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.296 - 21.598	2	0.3	1,265		759
Total							1,103
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	20.973 - 21.296	1	0.3	1,265		380
	US 62	21.296 - 21.598	2	0.3	1,265		759
	KY 259	Length	2	0.8	845		1,352
Total							2,835
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 259	MP 12.116	1		845	845	

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

Table 7: 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

4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck route:

- Narrow lanes and shoulders;
- Low truck weight class (“A”) on KY 224;
- Poor turning radius from KY 920 onto Embry Drive; and
- Two bridges with “adequate” rating.

The recommended improvement is the reconstruction of the intersection of KY 920 and Embry Drive to eliminate turning radius problem. Other roadways with lane and shoulder width problems could be addressed by rebuilding those sections of highways.

Appendix

Appendix A: Phone Survey Conducted with Facility

PHONE SURVEY RESULTS

<u>Facility ID</u>	<u>Facility Name</u>	<u>Location / City</u>	<u>County</u>	<u>ADD</u>
2637	CAMPBELL HAUSFELD	LEITCHFIELD	GRAYSON	LINCOLN TRAIL
<u>Contact Name</u>	<u>Title</u>	<u>Phone</u>	<u>Fax</u>	
TAMMY BLANTON		502-259-7755	502-259-6100	
CARL SMITH		502-259-7753		

1. Is the location of your facility on the map correct?
2. Our information shows about 60 trucks per day access your facility. Is that correct?
If not, fill in correct volume.
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? 53' SEMITRAILER
6. What is the largest truck operating at your facility?
7. What type of freight or commodity is shipped, and is incoming and outgoing freight different?
(one may be an empty truck) IN - DOMESTIC/ INTERNATIONAL AIR TOOLS
OUT- COMPRESSORS/ ACCESSORIES, WINCHES
8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) EARLY A.M. LOADING OUT 6 A.M. HEAVY - 10 A.M. 3P.M. - 8P.M.
HEAVY
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
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 - CINCINNATI - OUT VERY FEW LOCAL ROUTES, LTL CARRIERS OWENSBORO 1/3 OF TRUCKS
11. Do you have any other problems or concerns along the route you would like us to consider?
TIGHT TURNING RADIUS AT INTERSECTION OF EMBRY RD. AND KY 920, PARTICULARLY FOR TRUCKS W/ 53-foot TRAILERS
12. Would you like a copy of the final report (roadway/route evaluation ???)

NOTES/COMMENTS:

TRUCK ROUTE ACCESS EVALUATION

Campbell-Hausfeld
Leitchfield-Grayson County
Site # 2637

Report No. KTC-99-47

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

By

David H. Cain

with

Ken Agent
Brian Aldridge
Lisa Aultman-Hall
Nick Stamatiadis
Joel Weber



Kentucky Transportation Center and the Department of Civil Engineering
University of Kentucky

May 1999

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1.0 Introduction

The Freight Movement and Intermodal Access in Kentucky Study (SPR 98-189) is being conducted by the Kentucky Transportation Center on behalf of the Kentucky Transportation Cabinet. There are two main objectives of the study: 1) evaluation of the 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 the Campbell-Hausfeld Company facility located in Grayson County in the Lincoln Trail Area Development District (ADD) and KYTC Highway District #4. The location of the site is shown in Figure 1. Work on other specific sites as well as the freight commodity flow task is ongoing and 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 on January 15, 1998 and for data collection on October 26, 1998. The facility is located on Embry Road west of KY 920. Other facilities in the area not contacted are Leggett and Platt, Vermont American, and Inoac. The surrounding area is generally rural. A phone survey was conducted with the facility manager early in the study process. The survey found that approximately 60 trucks per day normally access the facility while HIS data indicated 570 trucks travel along KY 920 at the site. The trucks are generally semitrailers with a maximum length of 53 feet. The freight handled at this facility is primarily air compressors and accessories. The only problem mentioned in the survey was a tight turning radius at the intersection of Embry Drive and KY 920. The phone survey information can be found in Appendix A.

2.0 Truck Routes in Use

As shown in Figure 1, trucks use one of two routes to reach the NHS. Both routes follow Embry Drive to KY 920 and then follow KY 920 to US 62. The eastern route (shown in green) is used primarily by trucks traveling to Cincinnati. The route follows US 62 east to KY 224 which connects with the Western Kentucky Parkway and is approximately 5.1 miles in length. The western route (shown in orange) is used by trucks traveling west to Owensboro, and is approximately 2.1 miles in length. This route follows US 62 west through downtown Leitchfield and KY 259 to Exit 107 at the Western Kentucky Parkway. KY 920 passes through residential and urban areas near US 62 in Leitchfield. The US 62 east route passes through urban and rural areas. All roads except Embry Drive are state maintained. A detail map of Leitchfield is shown in Figure 2. There are two traffic signals along the eastern route and six along the western route. A route designation summary is shown in Table 1.

Figure 1: Location of Truck Generating Site

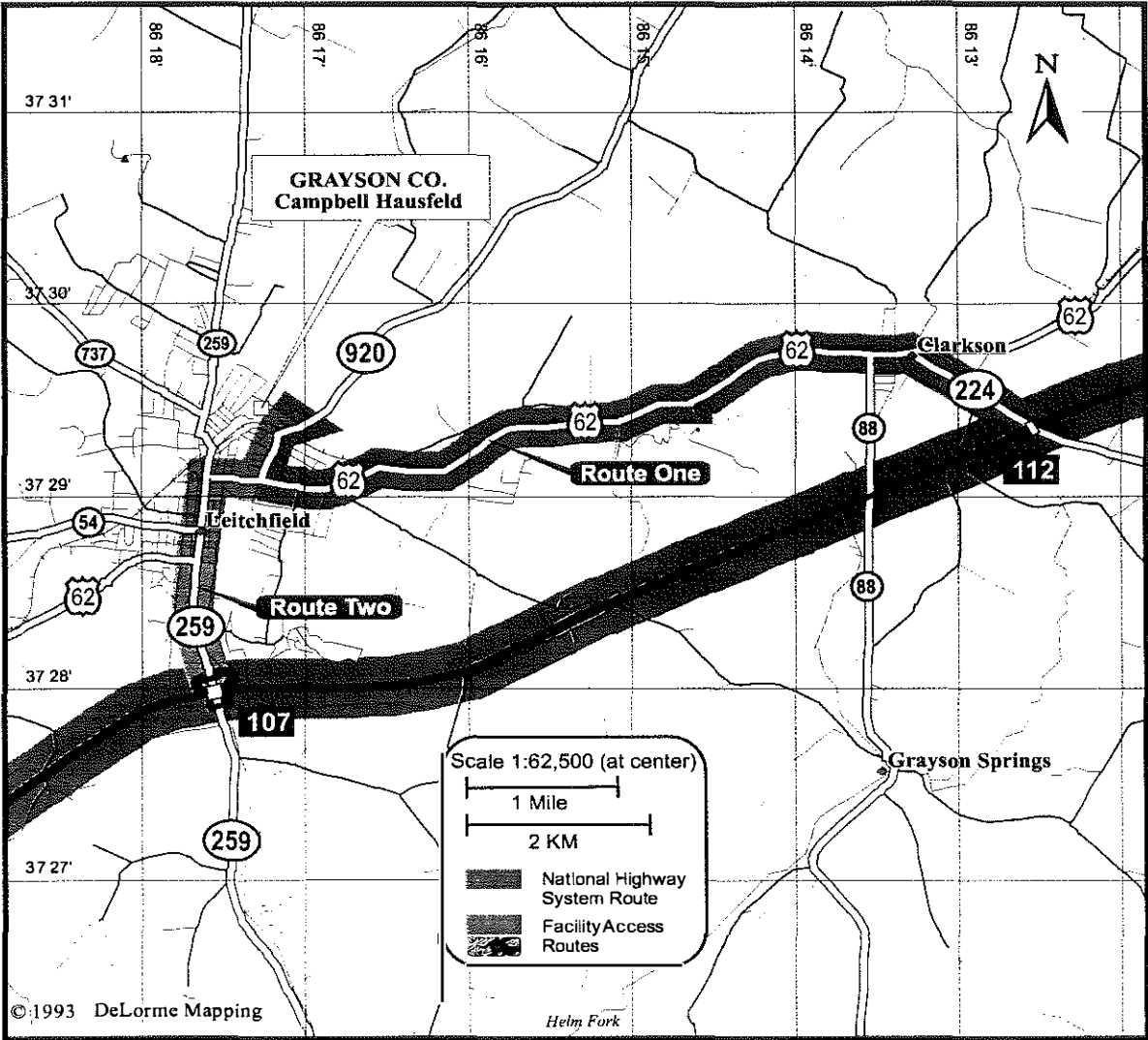


Figure 2: Detail Map of Routes in Leitchfield

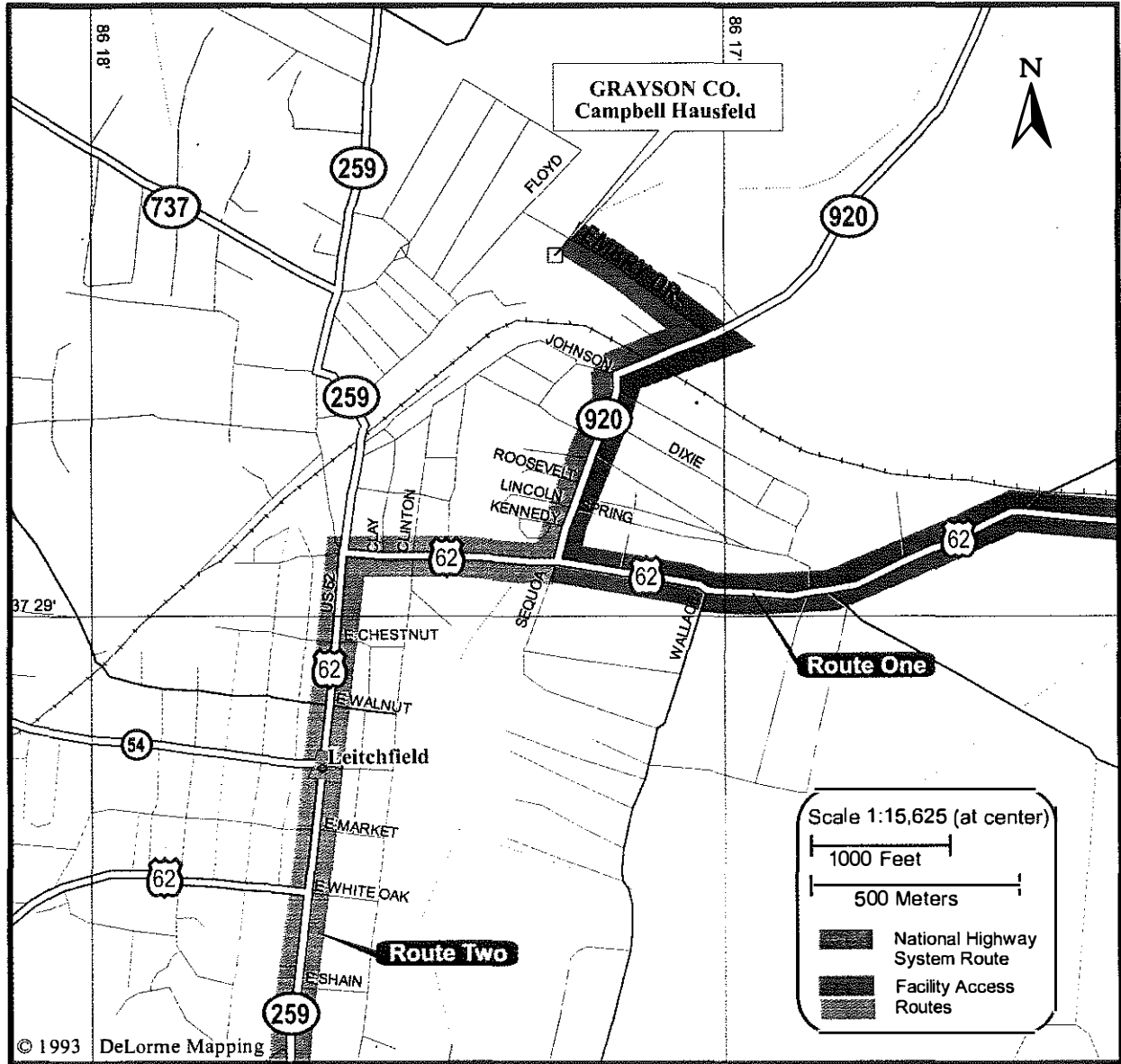


Table 1: Route Designation Summary

Route	Milepoint	Functional System	Weight Class	ADT
US 62	20.787-21.296	Rural Minor Arterial	AAA	20,200
	21.296-21.598	Rural Major Collector	AAA	17,300
KY 224	Length	Rural Major Collector	A	5,740
KY 259	Length	Rural Minor Arterial	AAA	11,300-18,200
KY 920	Length	Rural Minor Collector	AAA	3,970

The phone survey indicated that approximately $\frac{2}{3}$ of the site traffic uses Route One, the eastern route, with Cincinnati being the primary destination. This route intersects the Western Kentucky Parkway at Exit 112 which is a partial interchange (exit-WB, enter-EB). Route Two, the western route, accesses the Western Kentucky Parkway at Exit 107. Site traffic using this route has a primary destination of Owensboro, according to the survey.

The eastern route has no sections which are designated as National Truck Network routes. Therefore, because of its length, if a 102 inch wide truck were to use this route it would be in violation of STAA rules by 0.1 mile.

3.0 Route Data Collection and Evaluation

The route features that are to be evaluated in this study are shown in Table 2 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.

Table 2: 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
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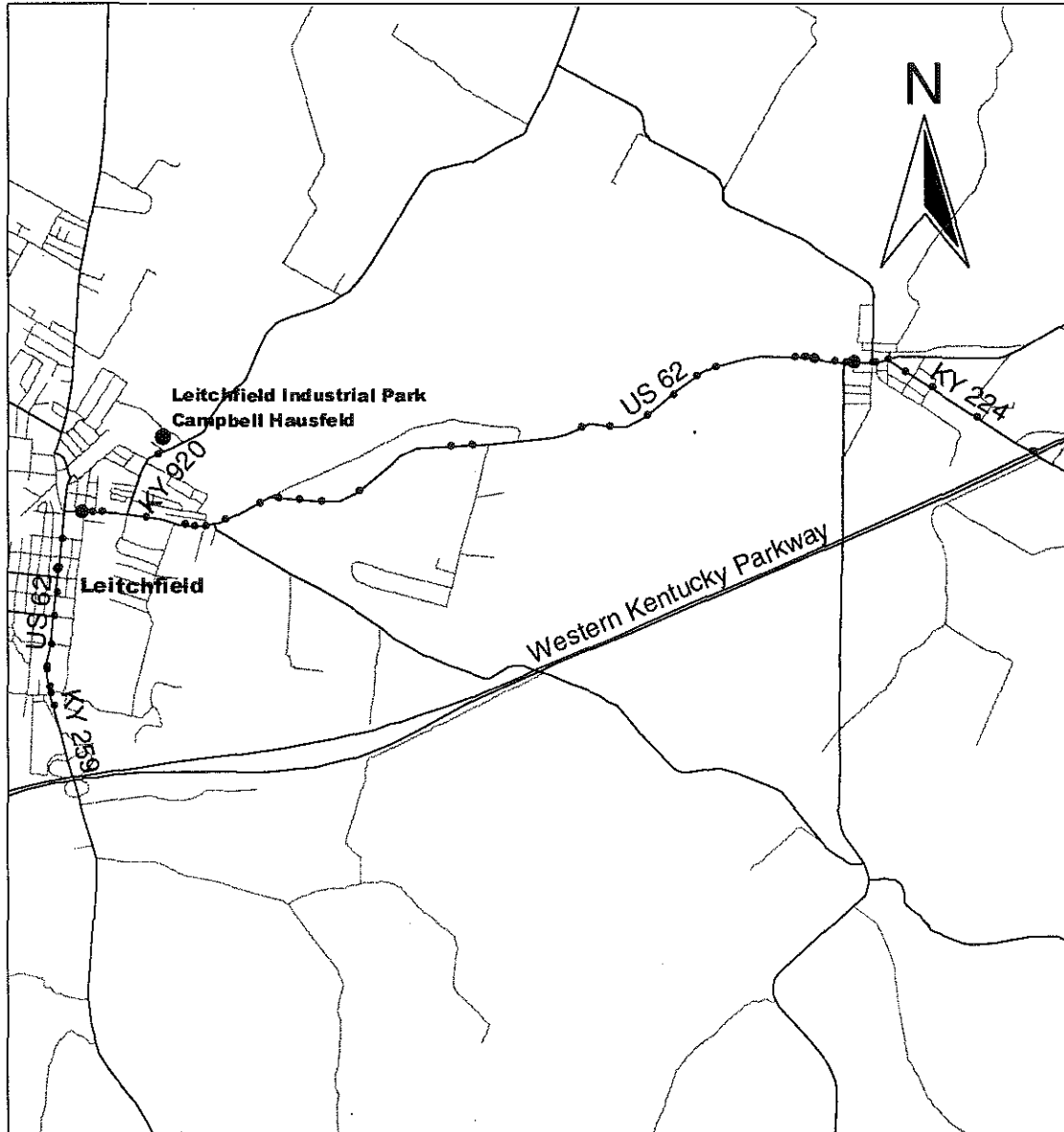
The survey of this site indicated that there were no operational problems or concerns for the access route to this site. Thus, no traffic evaluations were performed and the route is assumed to operate at an acceptable level of service.

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 (vehicle miles traveled). There were no sections along these routes where the accident rate was as high as the critical rate for that particular highway type.

Figure 3 shows the locations of accidents during the years 1995, 1996 and 1997. The figure shows that the accidents were scattered along both routes with a significant number occurring in Leitchfield and Clarkson.

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LEGEND

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0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

A summary of the accidents along the truck routes is shown in Tables 3 and 4 for the same three year period. The 8.3% of accidents involving trucks on the eastern route is higher than the percent trucks along US 62 (5.6%), but lower than the percent trucks using KY 920 (11.2%) and KY 224 (8.4%). The 3.2% of accidents involving trucks on the western route is lower than the percent trucks along that route (US 62 - 6.5%, KY 259 - 6.5%, KY 920 - 11.2%). The percent trucks was obtained from 1998 KYTC Vehicle Classification Counts and HIS data.

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	<i>Non-Truck Accidents</i>	<i>Truck Accidents</i>	<i>Percent Trucks</i>
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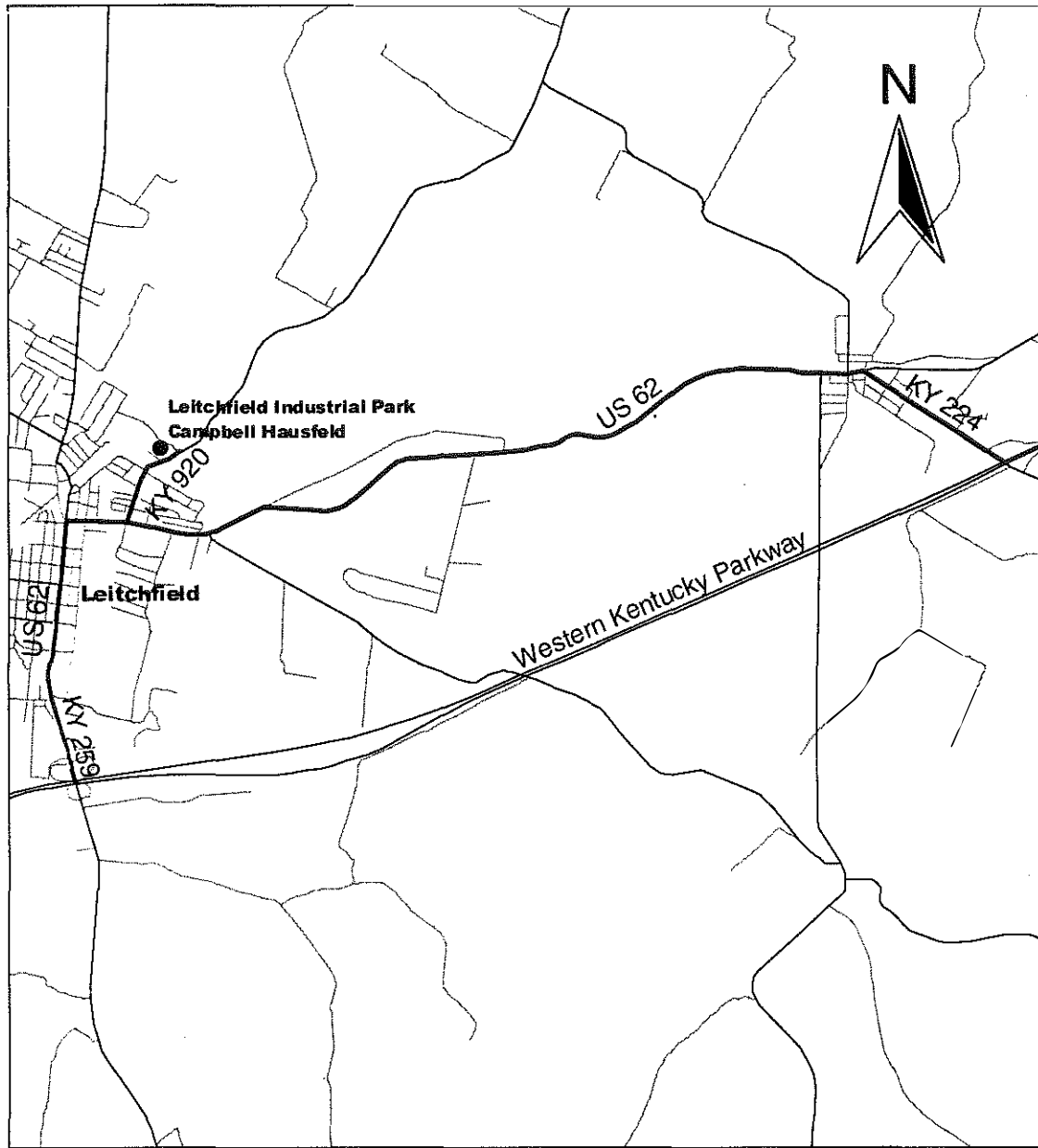
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Injury	25	0	0.0
Intersection	10	0	0.0

3.3 Cross Section Features

Figures 4 and 5 illustrate the sections of the routes having different widths of lanes and shoulders. Along the eastern route, US 62 has “adequate” 11-foot lanes near KY 920 in Leitchfield and “less than adequate” 10-foot lanes in the rural areas. The “less than adequate” lane widths along KY 224 range from 9-10 feet. Along the western route, US 62 has “less than adequate” 10-foot lanes from KY 920 to the junction of KY 259. KY 259 has four “preferred” 12-foot lanes. There are no shoulders on Embry Drive or KY 920, while US 62 in Leitchfield is curbed. All other roadways have “less than adequate” two-foot shoulders. Ditches and side slopes cause clear zone problems along most of the routes. The pavement was generally good on most of US 62, KY 224 and KY 259, while it was in fair condition on KY 920 and Embry Drive.

Figure 4: Lane Widths



LEGEND

- Facility
- Lane Width - 9 Feet
- Lane Width - 10 Feet
- Lane Width - 11 Feet
- Lane Width - 12 Feet

Scale - 1:46000

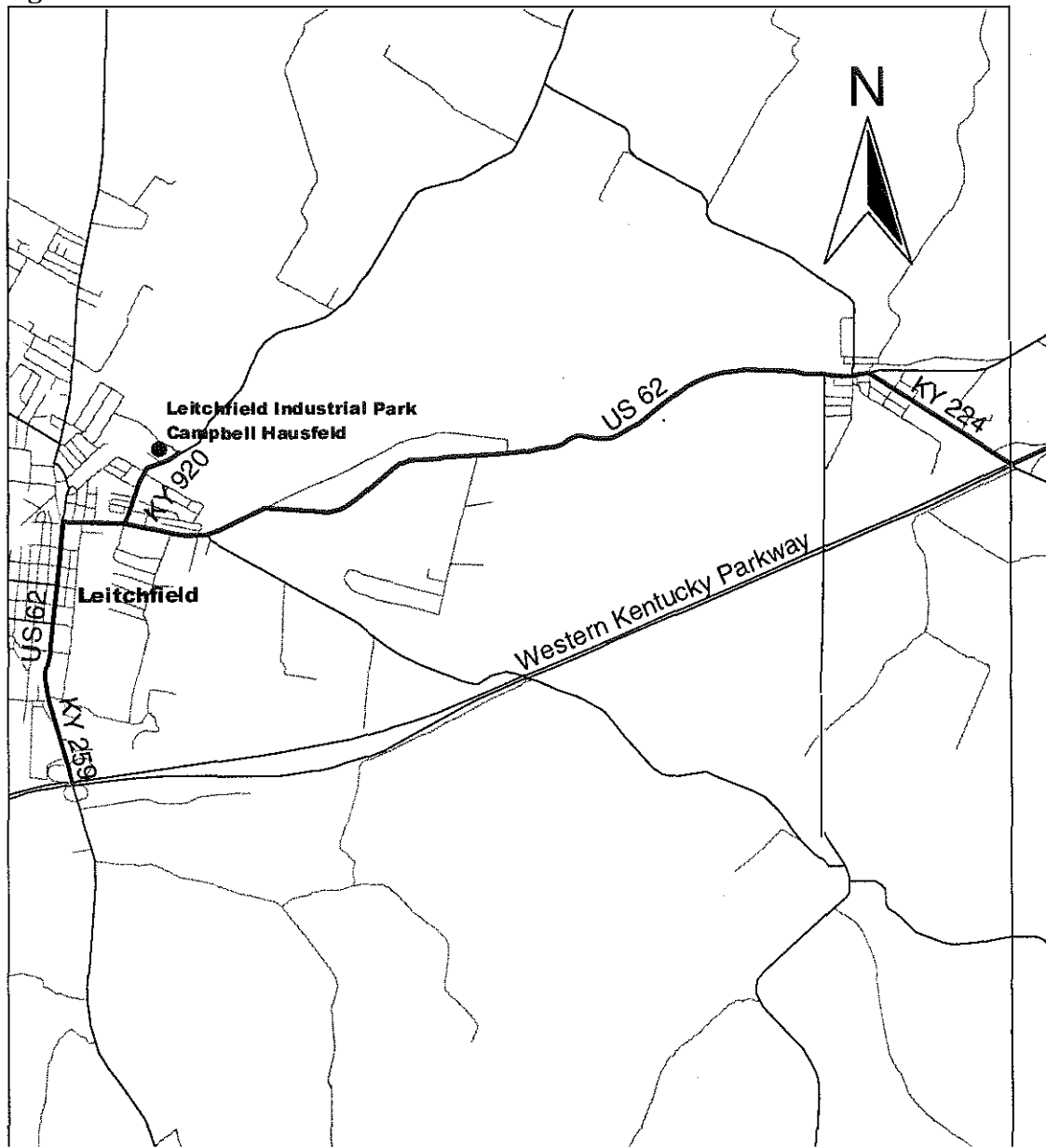
0.4 0 0.4 0.8 1.2 Miles



600 0 600 1200 1800 Meters



Figure 5: Shoulder Widths



LEGEND

- Facility
- Shoulder Width - 0 Feet
- Shoulder Width - 2 Feet
- Shoulder Width - 3 Feet
- Shoulder Width - 4 Feet

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

3.4 Curvature Features

Grades are considered problematic if they cause trucks to slow down excessively. There were no sections of roadway along these routes where this presents a problem.

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

The turning radii at the intersection of KY 920 and Embry Drive was observed to be “less than adequate” as shown in Figures 6, 7, and 8. Several vehicles were observed encroaching into the opposing lane while making a right turn from Embry Drive onto KY 920. When making left turns into the industrial park from KY 920, vehicles also drove off the pavement either on KY 920 or Embry Drive. The approximate layout of this intersection is shown in Figure 9. The near 45° angle at which Embry Drive joins KY 920, along with the pavement width, increases the required turning radius. The original pavement intersected KY 920 without any widening. The turn from KY 920 onto Embry Drive, which is approximately 45°, was rated “less than adequate” because trucks drive off the pavement to make the turns, as shown in Figures 6, 7 and 8.

Figure 6: KY 920 at Embry Drive



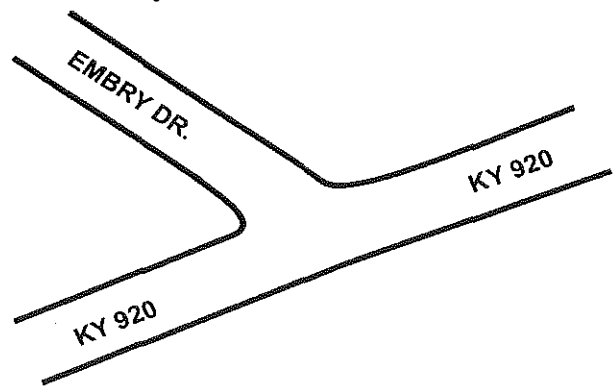
Figure 7: KY 920 at Embry Drive



Figure 8: Embry Drive at KY 920



Figure 9: Intersection Layout of KY 920 and Embry Drive



3.5 Railroad Crossings

There is one at-grade railroad crossing on the routes to this site. The crossing is on KY 920 near the intersection with Embry Drive as shown in Figure 2. The crossing has warning signs, flashing lights, gates and is relatively smooth giving it a “preferred” rating.

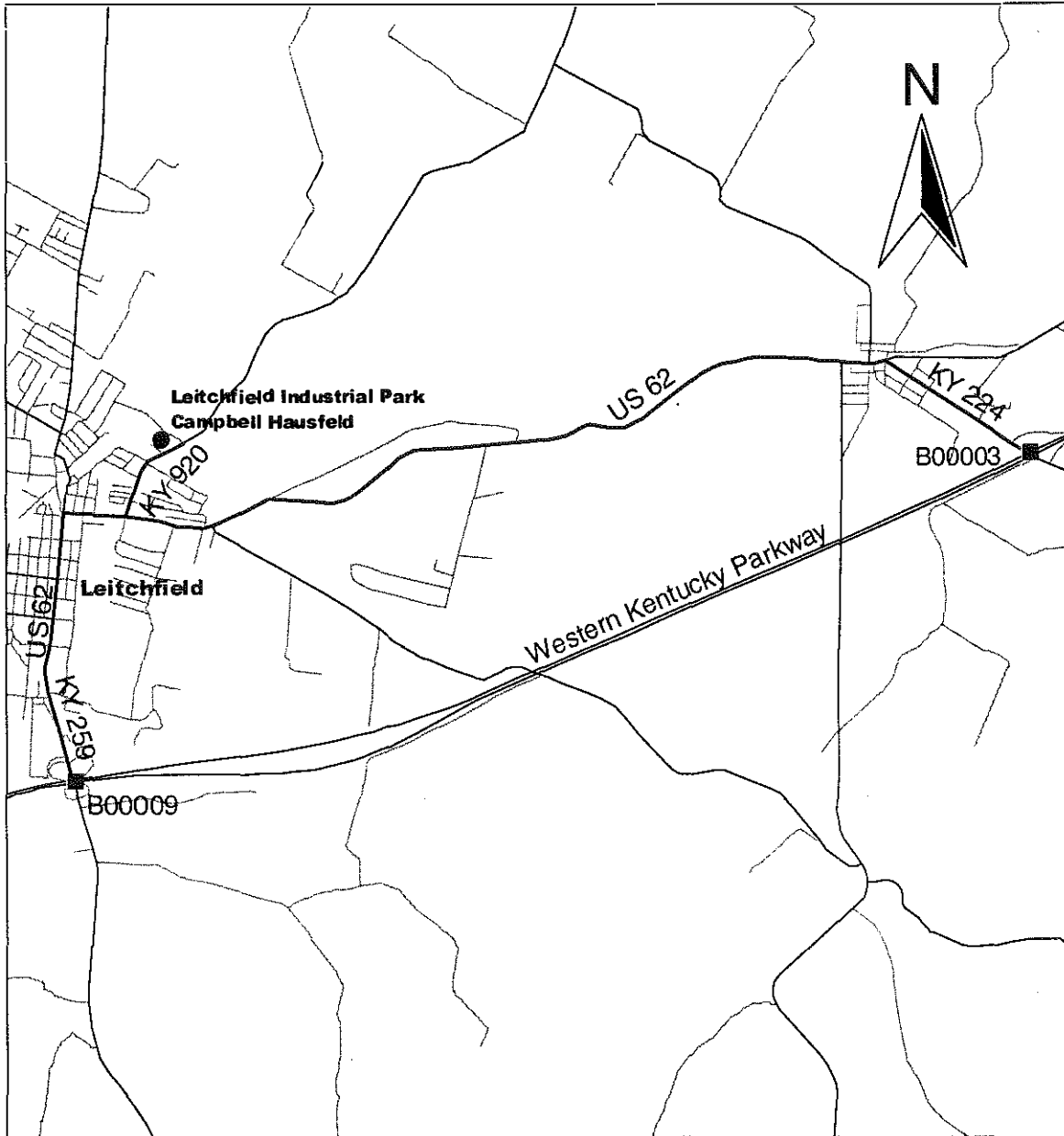
3.6 Bridges

Figure 10 shows the location of the two bridges on these routes. The bridges are located at the points where the access routes intersect with Western Kentucky Parkway. 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 factors) of the structure. The bridge along the eastern route on KY 224 over the Western Kentucky Parkway has a sufficiency rating of 75.2 giving it an “adequate” rating. The bridge on KY 259 over the Western Kentucky Parkway has a sufficiency rating of 66.8 which is also “adequate” for this study. A sufficiency rating of 80 or higher (out of a possible 100) is considered “preferred,” and a rating of at least 50 is “adequate.”

3.7 Sight Distance

No sight distance problems were noted on these routes.

Figure 10: Bridge Locations



LEGEND

- Facility
- B00000 Bridges - Bridge Number

Scale - 1:46000

0.4 0 0.4 0.8 1.2 Miles

600 0 600 1200 1800 Meters

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 have been normalized for the number of miles, number of points and number of trucks using the route section. In the case of these Grayson County routes, two 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 HIS data.

Tables 5 and 6 contain the total problem truck miles and total problem points for lane width, shoulders and turning radii which apply to these routes. The rating of these routes relative to others evaluated will be reported in the final report.

4.2 Maintenance Improvement Locations

No additional routine maintenance is indicated along the routes.

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 Tables 7. The eastern route received an overall rating of 7, indicating that minor improvements could improve this route. The western route was given a rating of 8, because minor improvements could also improve access.

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

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.598 - 22.013	1	0.4	660		264
	US 62	22.013 - 25.463	2	3.5	660		4,620
	KY 224	Length	2	0.8	480		768
Total							5,996
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	Length	2	3.9	660		5,148
	KY 224	Length	2	0.8	480		768
Total							6,260
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 224	MP 0.804	1		480	480	

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

Table 6: Summary of Problem Truck Miles and Points for Western Route

Feature	Road	Location	Points*	Length (miles)	Trucks (/day)	Truck-points	Truck-miles
Lane Width	KY 920	Length	2	0.4	430		344
	US 62	21.296 - 21.598	2	0.3	1,265		759
Total							1,103
Shoulders	KY 920	Length	2	0.4	430		344
	US 62	20.973 - 21.296	1	0.3	1,265		380
	US 62	21.296 - 21.598	2	0.3	1,265		759
	KY 259	Length	2	0.8	845		1,352
Total							2,835
Turning Radius	KY 920	Embry Drive	2		430	860	
Bridge	KY 259	MP 12.116	1		845	845	

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

Table 7: 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

4.4 Conclusions and Recommendations

In conclusion, the following problems were identified along the truck route:

- Narrow lanes and shoulders;
- Low truck weight class (“A”) on KY 224;
- Poor turning radius from KY 920 onto Embry Drive; and
- Two bridges with “adequate” rating.

The recommended improvement is the reconstruction of the intersection of KY 920 and Embry Drive to eliminate turning radius problem. Other roadways with lane and shoulder width problems could be addressed by rebuilding those sections of highways.

Appendix

Appendix A: Phone Survey Conducted with Facility

PHONE SURVEY RESULTS

<u>Facility ID</u>	<u>Facility Name</u>	<u>Location / City</u>	<u>County</u>	<u>ADD</u>
2637	CAMPBELL HAUSFELD	LEITCHFIELD	GRAYSON	LINCOLN TRAIL
<u>Contact Name</u>	<u>Title</u>	<u>Phone</u>	<u>Fax</u>	
TAMMY BLANTON		502-259-7755	502-259-6100	
CARL SMITH		502-259-7753		

1. Is the location of your facility on the map correct?
2. Our information shows about 60 trucks per day access your facility. Is that correct?
If not, fill in correct volume.
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? 53' SEMITRAILER
6. What is the largest truck operating at your facility?
7. What type of freight or commodity is shipped, and is incoming and outgoing freight different?
(one may be an empty truck) IN - DOMESTIC/ INTERNATIONAL AIR TOOLS
OUT- COMPRESSORS/ ACCESSORIES, WINCHES
8. Does the truck traffic peak at specific times of the day? (e.g., out in the morning and return in the afternoon) EARLY A.M. LOADING OUT 6 A.M. HEAVY - 10 A.M. 3P.M. - 8P.M.
HEAVY
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
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 - CINCINNATI - OUT VERY FEW LOCAL ROUTES, LTL CARRIERS OWENSBORO 1/3 OF TRUCKS
11. Do you have any other problems or concerns along the route you would like us to consider?
TIGHT TURNING RADIUS AT INTERSECTION OF EMBRY RD. AND KY 920, PARTICULARLY FOR TRUCKS W/ 53-foot TRAILERS
12. Would you like a copy of the final report (roadway/route evaluation ???)

NOTES/COMMENTS:

