APPENDIX B – TRAFFIC FORECAST REPORT

Executive Summary

Traffic Forecast Report and Bike/Ped Accommodation Assessment for Barren County Scoping Study - Major Widening on KY-90 Item No. 03-8819.00

Prepared for:

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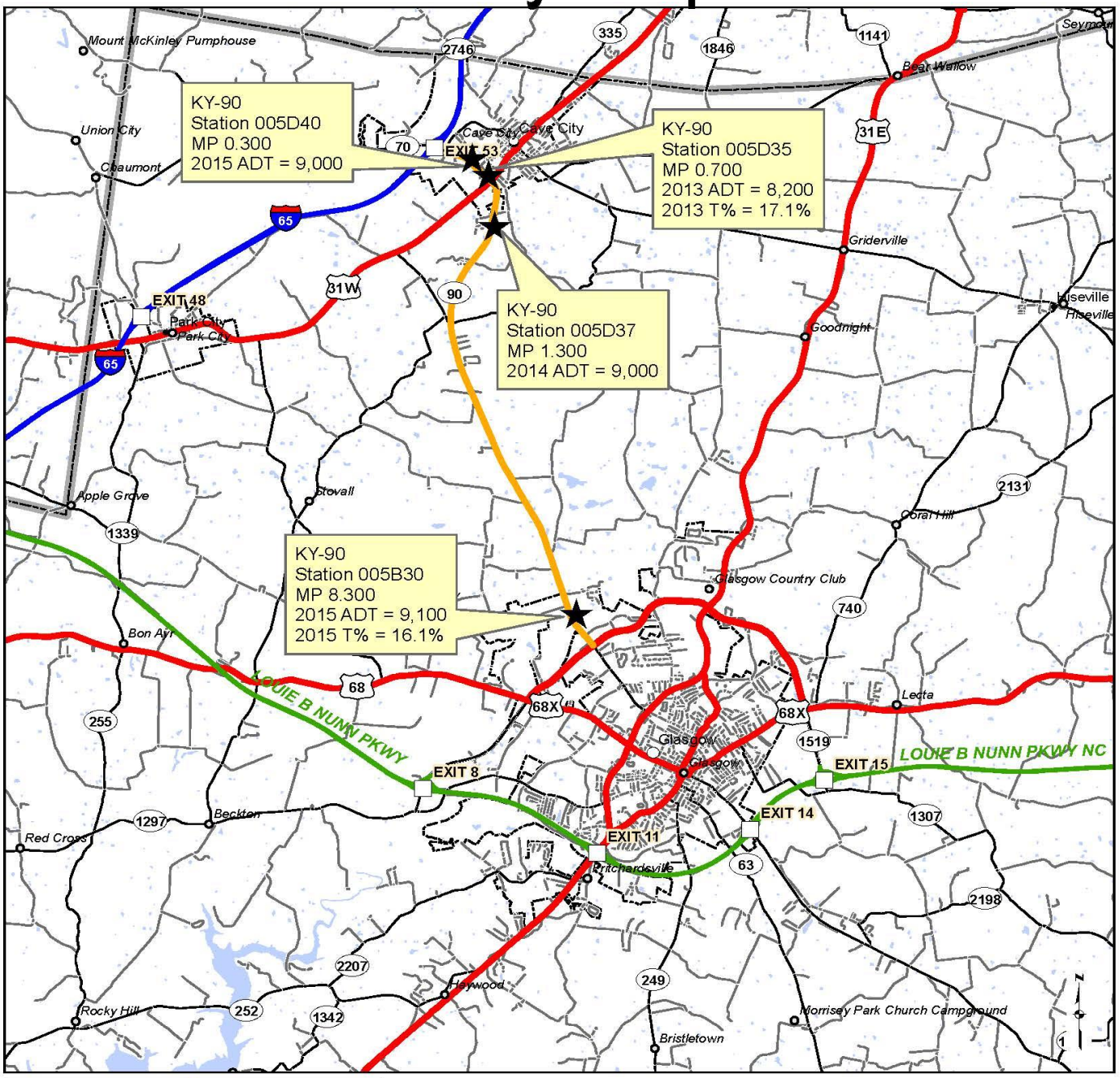
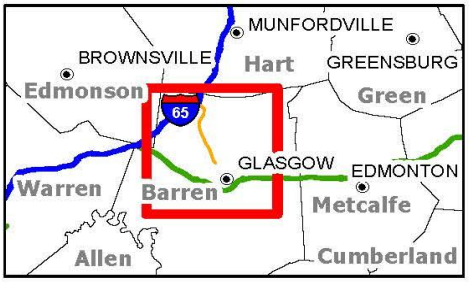
Commonly Used Abbreviations and their Descriptions

ADT	Average Daily Traffic	Without any adjustment
ATR	Automatic Traffic Recorder	A permanent & continuous recording station
BCI	Bicyclists Comfort Index	Ratings of bicyclists' comfort level
D-Factor	Directional Factor	Percentage of dominant flow to total
DHV	Design Hour Volume	30^{th} highest hour of a year
ESAL	Equivalent Single Axle Load	A measure of traffic's impact on roadway
FC	Functional Class	Refers to a road's importance
GR	Growth Rate	A value normally compounded annually
K-Factor	K-30^{th} hour Factor	DHV divided by ADT (DHV/ADT)
KYSTM	Kentucky Statewide Model	A computerized representation of KY roads
MP	Mile Point	Miles increase easterly and northerly
PHF	Peak Hour Factor	Considers a 15 minute spike in an hourly count
RUCA	Road User Cost Analysis	The total cost to daily users and overall Project
T%	Truck Percentage	The number of trucks divided by total volume

Vicinity Map





Barren County
Major Widening on KY-90
Item #03-8819.00

Kentucky UNBRIDLED SPIRIT

Legend

Scoping Study-Widening

Traffic Count Station

0 2 4 Miles

Traffic Forecast Executive Summary
Barren County: Major Widening
Item No. 03-8819.00

FORECAST SUMMARY

This project calls for a scoping study for major widening from Sanders Street in Cave City to US-68 (Glasgow Outer Loop) in Glasgow. The purpose of this report is to analyze current and future traffic utilizing KY-90 between MP 0.160 to MP 8.574.

FORECAST TYPE

The following types of forecasts were developed:

- 2015 and 2040 Average Daily and Design Hourly Truck Percent Forecasts
- 2015 and 2040 ADT and DHV values
- 20-year ESALs
- Bicycle and Pedestrian Accommodation Assessment

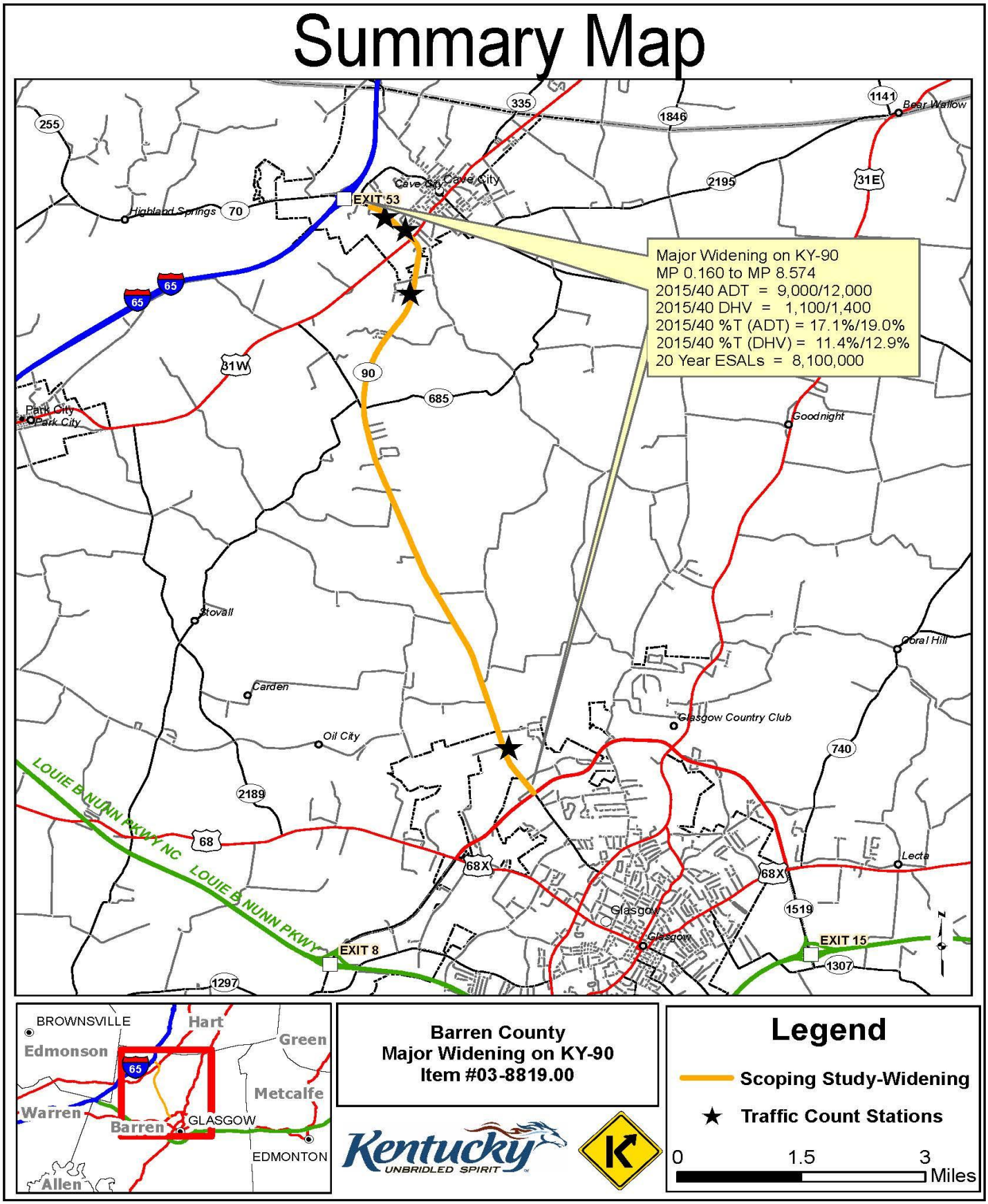
DESIGN-YEAR/GROWTH FACTORS

The Kentucky State Data Center forecasts that Barren County's population will increase 0.70% annually over the next 20 years. Exponential growth analyses performed on historical data at traffic stations 005D40(MP 0.300), 005D35(MP 0.700), 005D37(MP 1.300), and 005B30(MP 8.300) on KY-90, suggests traffic volumes have been increasing. Therefore, a growth rate of 1.10% was used for the purpose of this forecast.

TRUCK PERCENTAGE

The truck percentage was estimated based on a 24-hour classification count at Station 005D35 at MP 0.700. Therefore, a truck percentage of 17.1% and a growth rate of 0.50% were used for the purpose of this forecast.

Summary Map


Major Widening on KY-90
MP 0.160 to MP 8.574
2015/40 ADT = 9,000/12,000
2015/40 DHV = 1,100/1,400
2015/40 %T (ADT) = 17.1%/19.0%
2015/40 %T (DHV) = 11.4%/12.9%
20 Year ESALs = 8,100,000
EXIT 53
EXIT 8
EXIT 15
Cave City
Highland Springs
Park City
Bear Wallow
Goodnight
Stovall
Carden
Oil City
Coral Hill
Glasgow Country Club
Lecta
Glasgow
LOUIE B NUNN PKWY NC
LOUIE B NUNN PKWY
255
335
1846
1141
2195
31E
70
65
31W
90
685
740
2189
68
68X
1519
1307
1297
BROWNSVILLE
Hart
Edmonson
Green
Metcalfe
Warren
Barren
GLASGOW
EDMONTON
Allen
Barren County
Major Widening on KY-90
Item #03-8819.00
Legend
Scoping Study-Widening
Traffic Count Stations
0
1.5
3
Miles

FORECAST OF EQUIVALENT SINGLE AXLE LOAD ACCUMULATIONS-4 LANE (20-year)

Full Route Unique Identifier
005-KY-0090 -000

ROUTE ID:

County	Barren
Road Name	Happy Valley Rd.
Functional Class	6 - Rural Minor Arterial
Project Description	KY-90 Scoping Study - Major Widening
Scenario	Build
Segment Description	Same

Date	10/05/15
Forecaster	Justin Harrod

County No.	005
MARS No.	9074201P
Item No.	03-8819.00
T.F. No.	15.039
Beg. MP	0.160
End MP	8.574
No. of Lanes	2
1 or 2 way	2

REFERENCES:

Previous Forecasts	None
Traffic Volume	005D40
Milepoint	0.300
Truck Percent	005D35
Milepoint	0.700
ESAL Information	2013 Aggregated ESALS
Growth Rate	1.10%

K-Factor Source	FC Avg.
K- Factor Value	11.7%
PHF	0.85
2015 DHV	1100
2040 DHV	1400
2015 %T (DHV)	11.4%
2040 %T (DHV)	12.9%

TRAFFIC PARAMETERS:

		Present Year	Growth Rate	Construction Year	Median Year	Design Year
		2015		**2020**	**2030**	**2040**
Volume	(AADT)	9000	1.10%	9500	11000	12000
Percent Trucks	(%T)	17.10%	0.50%	18.00%	18.00%	19.00%
Number of Trucks		1500	1.6%	1700	2000	2300
Percent Trucks Hauling Coal	(%CT)	0.00%	0.00%	0.00%	0.00%	0.00%
Non-Coal Trucks:						
Axles/Truck	(A/T)	3.200	0.00%	3.200	3.200	3.200
ESALs/Axle	(ESAL/A)	0.291	1.00%	0.306	0.338	0.373
Coal Trucks:						
Axles/Truck	(A/CT)	0.000	0.00%	0.000	0.000	0.000
ESALs/Axle	(ESAL/CA)	0.000	0.00%	0.000	0.000	0.000

ESAL CALCULATIONS:

10 Design ESALs in Critical Lane	3,500,000
20 Design ESALs in Critical Lane	**8,100,000**
40 Design ESALs in Critical Lane	21,000,000

General Comments:

eLink to Detailed Traffic Forecast Files in ProjectWise

Bicycle and Pedestrian Review for Project #03-8819.00

Project Overview:

- This is a corridor study for KY-90 (Happy Valley Road) in Barren County between Sanders Street in Cave City and extends to the intersection with US-68 including the city limits of Glasgow.

Local Governments/Regional Bicycle and Pedestrian Plan:

- The *Glasgow Alternative Transportation Endeavor (GATE) Master Plan*

http://www.glasgow-ky.com/planning/Greenway/Greenway.htm

1. Project Descriptions - Chapter 5, pages 7 & 9

http://Www.Glasgow-Ky.Com/Planning/Greenway/Chapter%205%20_Greenway%20System.Pdf

2. Mapping - Greenway crossing KY-90 (Figure 3)

http://www.glasgow-ky.com/planning/Greenway/Chapter%205%20-%20Maps.pdf

3. Implementation Plans - Chapter 6, pages 2 & 3

http://www.glasgow-ky.com/planning/Greenway/Chapter%206%20_Implementation.pdf

- Cave City is also coordinating with Edmonson, Warren, and Hart Counties to develop a regional non-motorized transportation plan that includes the *GATE Master Plan. This is in the early stages of development (no formal plan as of October 2015).*

https://cavecitykentucky.wordpress.com/2015/07/10/cave-region-group-wants-to-create-trail-towns/

Existing conditions:

❖ KY-90

a. ADT range is 8400-9100
b. Posted speed limit is 45 MPH (MP 0.160- MP 1.364)
c. Posted speed limit is 55 MPH (MP 1.364-8.574)
d. Paved shoulder space is 6’ or greater
e. The Bicyclists Comfort Index (BCI*) average for this corridor is a C. Some portions between MP 3.100-7.000 have a BCI of D.
f. Current bicycle activity within the project corridor (low to moderate) (Figure 1)

Logical termini with in project limits:

❖ Cave City Area

1. Brian Doyle Park
2. Restaurants
3. Mammoth Cave Wildlife Museum
4. Grocery Stores
5. Residential Areas (low income housing)
6. Employment Centers
7. Shopping Centers

❖ Glasgow Area

1. Beaver Trail Park
2. Poynters Lake
3. Restaurants
4. American Legions Park

The KYTC Bicycle and Pedestrian program team recommendations are:

Entire Project Area (MP 0.160-8.560) - All treatments-*Good, Better, and Best Scenarios*

- ✓ Agreements should be created such that the local government is responsible for the incidental maintenance (cleaning/removal of debris, replacing markings, signage, and repair) of these pedestrian and/or bicycle facilities in their areas.
- ✓ Provide a 10 foot gap space every 40-60 feet within the rumble strip/stripes (Figure 5) on any constructed shoulder over 4 feet in width to better accommodate pedestrian and bicycle travel for the entire project area.
- ✓ Special consideration should be taken at MP 8.200-8.560 since it is in flood hazard area.

Best:

Cave City Area (MP 0.160-3.174)

- Construct a shared-use facility, 10 foot wide or wider, in the cardinal direction (eastern side) of the roadway for the northern portion of the project area. This would provide a connection and completion of a current loop route identified by the Strava© Bicycle Travel Heat Source Map (Figure 2) as well as provides accommodations for pedestrians.
    - ✓ This would provide a BCI* rating A (from a D) for the MP 0.160-3.174.

Glasgow Area (MP 7.000-8.560)

- A constructed a shared-use facility, 10 foot or wider, to accommodate pedestrian and bicycle travel from the intersection of KY-90 & Poynter Road to the intersection of KY-90 & US-68. The *GATE Master Plan* has bicycle routes and a planned greenway system route (multi-use path) that crosses KY-90 near the city limit area (Figure 3). This facility type would encourage and accommodate the level B & C bicycle rider.
    - ✓ This would provide a BCI* rating A (from a D) for the MP 7.000-8.560.

Good:

Cave City Area (MP 0.160-3.174) – If Curb and Gutter Cross Section is used:

- In the area of MP 0.160-1.369, construct a sidewalk, 5 feet or wider, on both sides of the roadway within the urban project area.
- In the area of MP 0.160-3.174, construct a separated bicycle facility, 8 feet or wider, with a two-foot buffer space (minimum) in the cardinal direction (eastern side) of the roadway for the northern portion of the project area (Figure 4A Urban, Figure 4B Rural). This would provide a connection to and complete a current loop route identified by the Strava© Bicycle Travel Heat Source Map (Figure 2).
    - ✓ This would provide a BCI* rating A (from a D) for the MP 0.160-3.174

Glasgow Area (MP 7.000-8.560)

- In the area of MP 8.420-8.574, construct a sidewalk, 5 feet or wider, on both sides of the roadway for the urban areas.
- Constructed a separated bicycling facility, 8 feet or wider, to accommodate bicycle travel from the intersection of KY-90 & Poynter Road to the intersection of KY-90 & US-68. The *GATE Master Plan* has bicycle routes and a planned greenway system route (multi-use path) that crosses MP 7.000- 8.560 on KY-90 near the city limit area (Figure 3). This facility type would encourage and accommodate the level B bicycle rider.
    - ✓ This would provide a BCI*rating A (from a D) for the MP 7.000-8.560.

Entire Project (MP 0.160-8.560) If Rural Cross Section is used:

- Construct a paved shoulder, 6 feet or wider, for the entire project area.
- Place a second white stripe within the shoulder, 2-3 feet to the right on the travel lane (Figure 4B). Then use bicycle route signs -MUTCD # D11-1 (Figure 5). The second white stripe is a buffer and provides guidance for the bicyclists to stay as far right as practicable. This is not a dedicated bicycle facility; the bicycle rider or "sharrow" pavement marking should not be used.

http://transportation.ky.gov/Highway-Design/Highway%20Design%20Manual/Additional%20Design%20Topics.pdf

- ✓ The Bicyclists Comfort Index (BCI*) would go from D to B.

Fair:

Urban Portions (MP 0.160-1.369 & 8.420-8.574) - If Curb and Gutter Cross Section is used:

- Construct a sidewalk, 5 feet or wider, on both sides of the roadway for the urban project area (MP 0.160-1.369 & 8.420-8.574).

In Rural Cross Section:

- Construct a shoulder, 6 feet or wider.
  - ✓ The Bicyclists Comfort Index (BCI*) would remain a C.

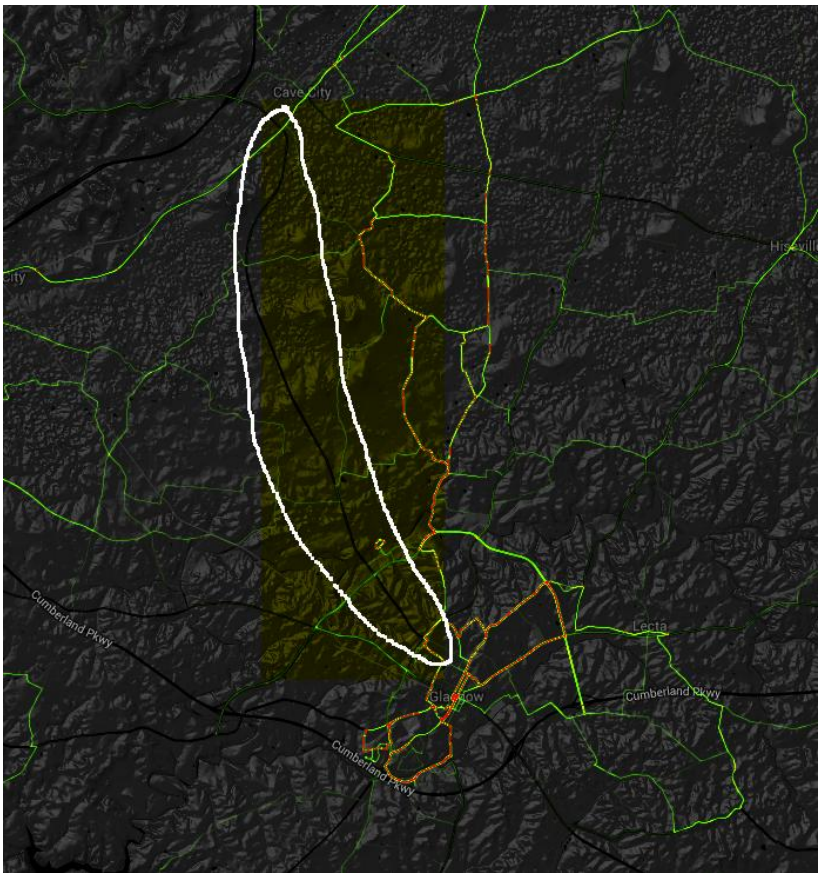


Figure 1 / Strava Heat Source Map for bicycle travel of the project corridor
http://labs.strava.com/heatmap/#12/-85.92090/37.07747/yellow/bike

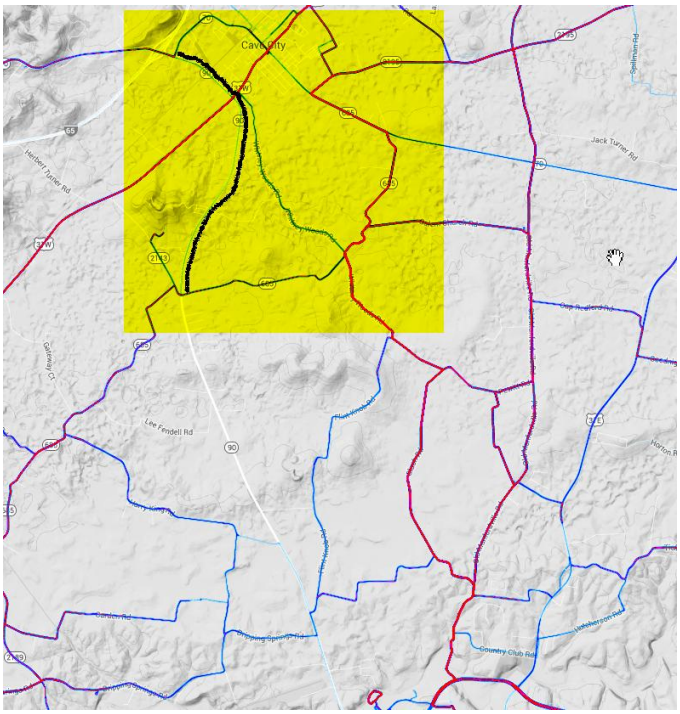


Figure 2 / Strava Heat Source Map for Bicycle Travel Activity around Cave City / **http://labs.strava.com/heatmap/#12/-85.96176/37.13230/gray/bike**

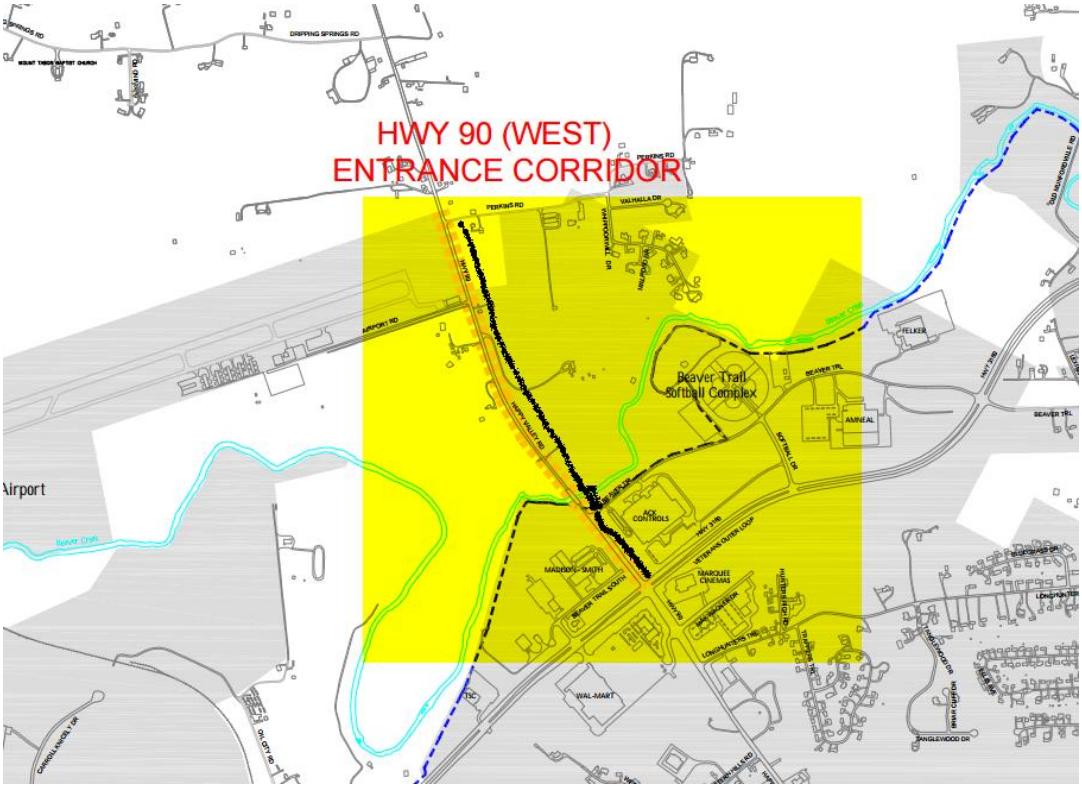


Figure 3 / Proposed Greenway system corridor in Glasgow / **http://www.glasgow-ky.com/planning/Greenway/Greenway.htm** / Chapter 5, page 9

Figure 3A / Example of separated bike lane with curb and gutter cross section

Figure 3B / Example of separated bike area with rural cross section

- FHWA Separated Bicycle Lane Planning & Design Guidance: **https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page00.cfm**

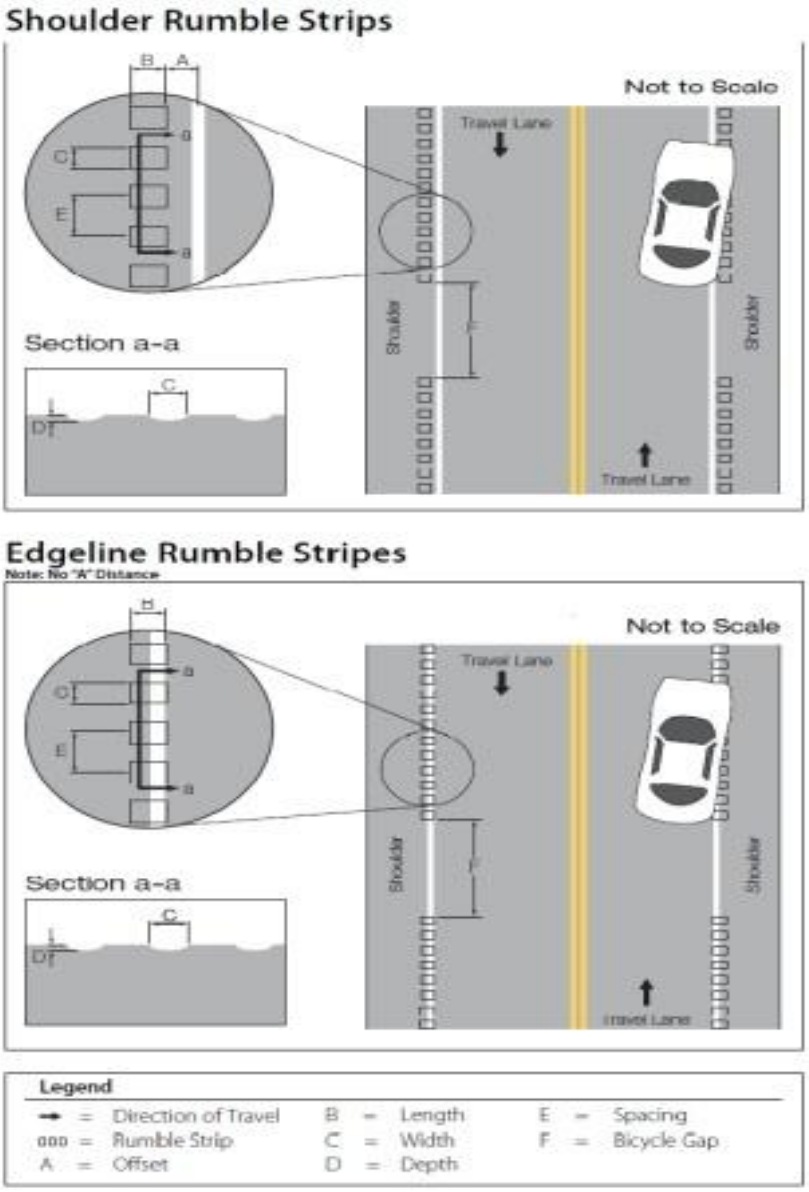


Figure 4 / Gap spacing for shoulder rumble strip/stripes) /
http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/t504039/

Figure 5 / MUTCD signage for city or county bicycle routes/
http://mutcd.fhwa.dot.gov/htm/2009/part9/part9b.htm

- ***Bicyclists Comfort Index (BCI):**
  - **http://transportation.ky.gov/Bike-Walk/Documents/Bicyclists%20Comfort%20Index.pdf**

- The 1999 AASHTO *Guide* provides some qualitative guidance on choosing the appropriate facility type, but largely suggests that bicycle facility selection is a policy decision to be made by State and local agencies. The facility selection guidance is largely centered on the skill levels of bicyclists and what types of facilities they prefer. The 1999 AASHTO *Guide* defines three bicycle user types (these were first defined in a 1994 FHWA report):

  1. Type A (Advanced).
  2. Type B (Basic).
  3. Type C (Children).

  Section 13.3 AASHTO Guidance on Selecting Bicycle Facility Type / **http://www.fhwa.dot.gov/publications/research/safety/pedbike/05085/chapt13.cfm**

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