



**TRANSPORTATION CABINET**  
Frankfort, Kentucky 40622  
www.transportation.ky.gov/

**Steven L. Beshear**  
Governor

**Michael W. Hancock, P.E.**  
Secretary

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**MEMORANDUM**

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**TO:** Greg Meredith, P.E.  
Chief District Engineer  
District 3 – Bowling Green

**ATTN:** Joe Plunk

**FROM:** John Moore, P.E.  
Director  
Division of Planning 

**DATE:** August 6, 2015

**SUBJECT:** Warren County Traffic Forecast  
Three Springs Road from Long Road to Flea Land Entrance  
Item No. 03-8818.00

In response to your February 2, 2015 request, we are providing the following forecasts on the attached report:

- 2015 and 2039 Average Daily Traffic
- 2015 and 2039 Design Hour Turning Movements
- Truck Percentages and 20 year ESALs

If you have any questions, please call Daniel Hulker of this Division at (502) 782-5064.

JM/DAH/BC

**Attachments**

c/att: Travis Carrico  
Jeff Moore  
Stewart Lich  
Deneatra Henderson  
Dan Hite



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# *Executive Summary*

## **Traffic Forecast Report and Bike/Ped Accommodation Assessment for Warren County Reconstruct Three Springs Rd. from Long Rd. to Entrance of Flea Market Item No. 03-8818.00**

Prepared for:



Prepared by:  
**Daniel Hulker**  
Division of Planning  
Kentucky Transportation Cabinet  
August 6, 2015

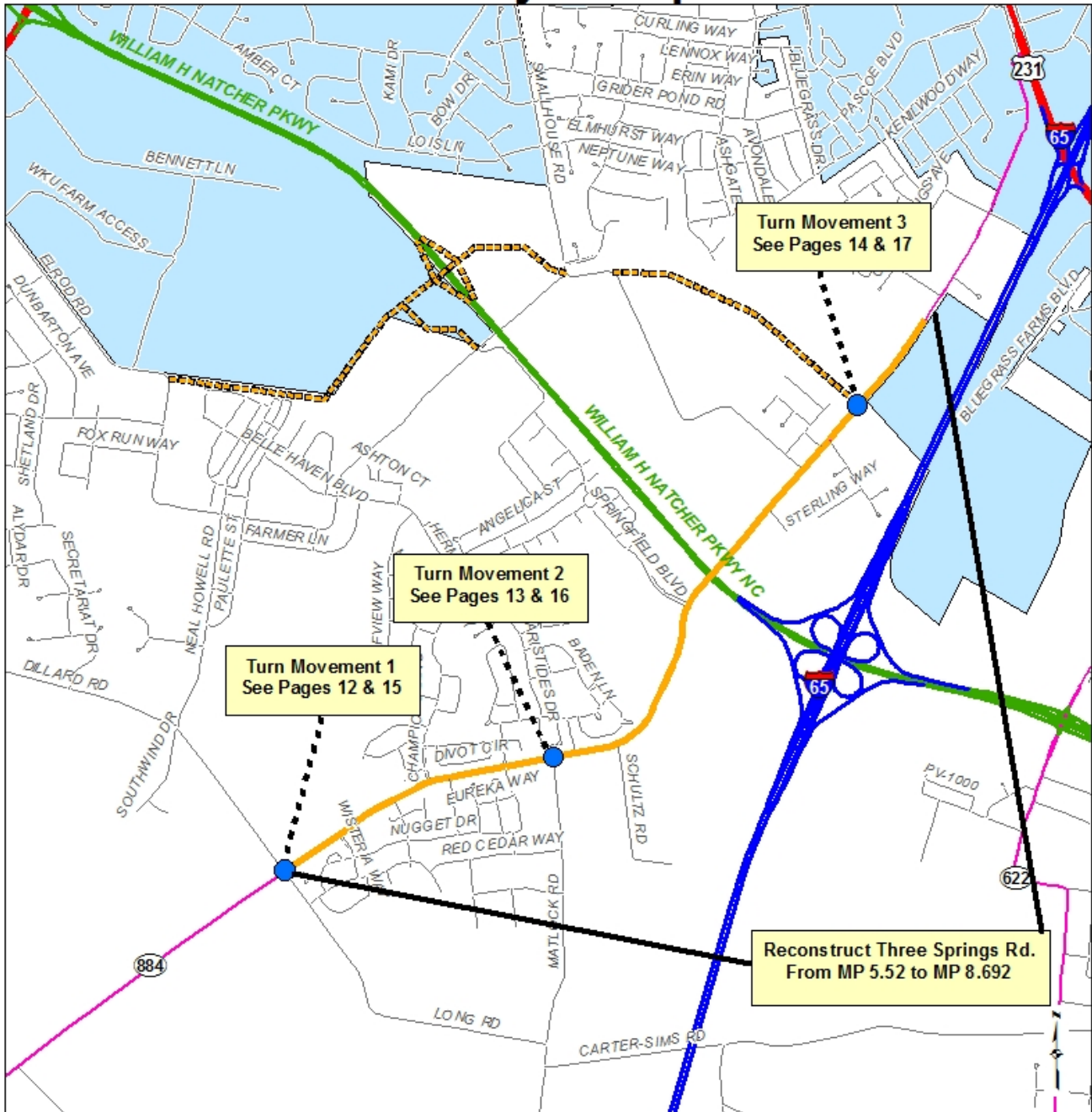
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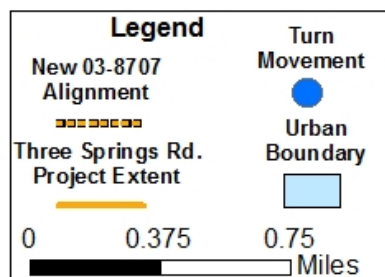
## **Commonly Used Abbreviations and their Descriptions**

ADT	Average Daily Traffic	Without any adjustment
DHV	Design Hour Volume	30 <sup>th</sup> highest hour of a <u>year</u>
ESAL	Equivalent Single Axle Load	A measure of traffic's impact on roadway
%T	Truck Percentage	The percentage of trucks to total volume
FC	Functional Class	Refers to a road's importance
GR	Growth Rate	A value normally compounded annually
PHF	Peak Hour Factor	Considers a 15 minute spike in an hourly count
K-Factor	K-30 <sup>th</sup> hour Factor	DHV divided by ADT (DHV/ADT)
D-Factor	Directional Factor	Percentage of dominant flow to total
MP	Mile Point	Miles increase easterly and northerly
ATR	Automatic Traffic Recorder	A permanent & continuous recording station
KYSTM	Kentucky Statewide Model	A computerized representation of KY roads

# Vicinity Map



**Reconstruct  
 Three Springs Rd.  
 From MP 5.52 to 8.692  
 Item # 03-8818.00**





**Traffic Forecast Executive Summary  
Warren County: Reconstruct Three Springs Rd.  
From Long Rd. to Flea Market Entrance  
Item No. 03-8818.00**

**FORECAST SUMMARY**

This forecast covers the reconstruction of KY 884 (Three Springs Rd.) from milepoint 5.52 at the intersection of Long Rd. and Neal Howell Rd. to milepoint 8.692 at the entrance of the Flea Market. This forecast is adjacent to the forecast for item # 03-8707.00 and assumes the ramps, parkway access and new roads are built.

**FORECAST TYPE**

The following types of forecasts were developed:

- 2015 and 2039 ADT and DHV values
- 2015 and 2039 Daily and Design Hour Build Turn Movements
- 2015 and 2039 Truck Percentages
- 20-year ESALs

**CURRENT-YEAR VOLUMES**

Current year volumes were based upon the three turning movements counted for this project. The three turning movements were counted in March and April of 2015. For more information, see the turning movement pages 12-17.

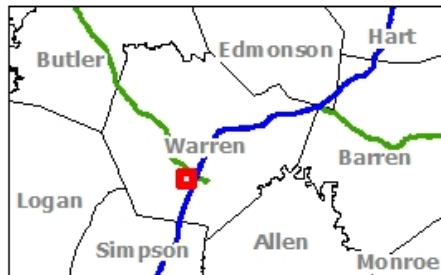
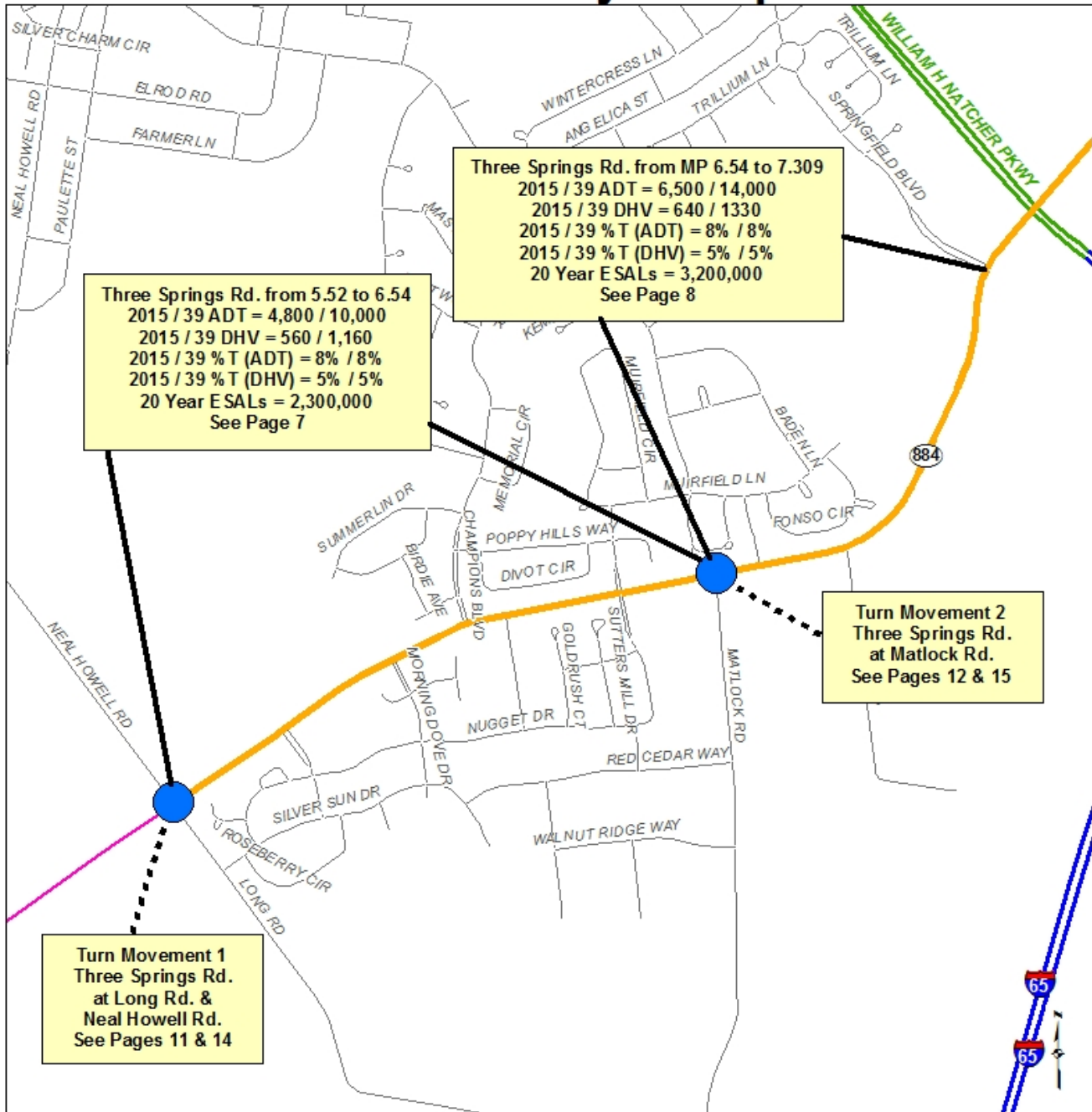
**DESIGN-YEAR/GROWTH FACTORS**

The design hour volumes were based upon the growth rate predicted by the Warren County Traffic Model. The model predicted an annual growth rate of 2% on the segment of the project north of Springfield Blvd. and predicted an annual growth rate of 3% on the two segments south of Springfield Blvd.

**TRUCK PERCENTAGE**

The truck percentages for this project were based upon the functional class average truck percentage for Urban Collectors. Although this project is mostly situated outside of the urban boundary of Bowling Green, the traffic model predicts significant development in the area in the future. The truck percentage used was 8% with a 0% growth rate.

# Summary Map 1



**Reconstruct**  
 Three Springs Rd.  
 From MP 5.52 to 8.692  
 Item # 03-8818.00



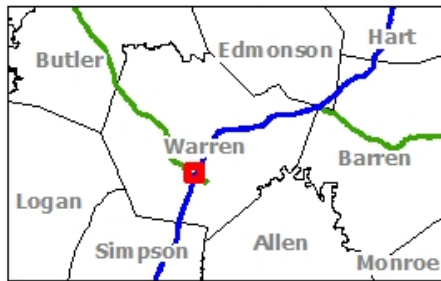
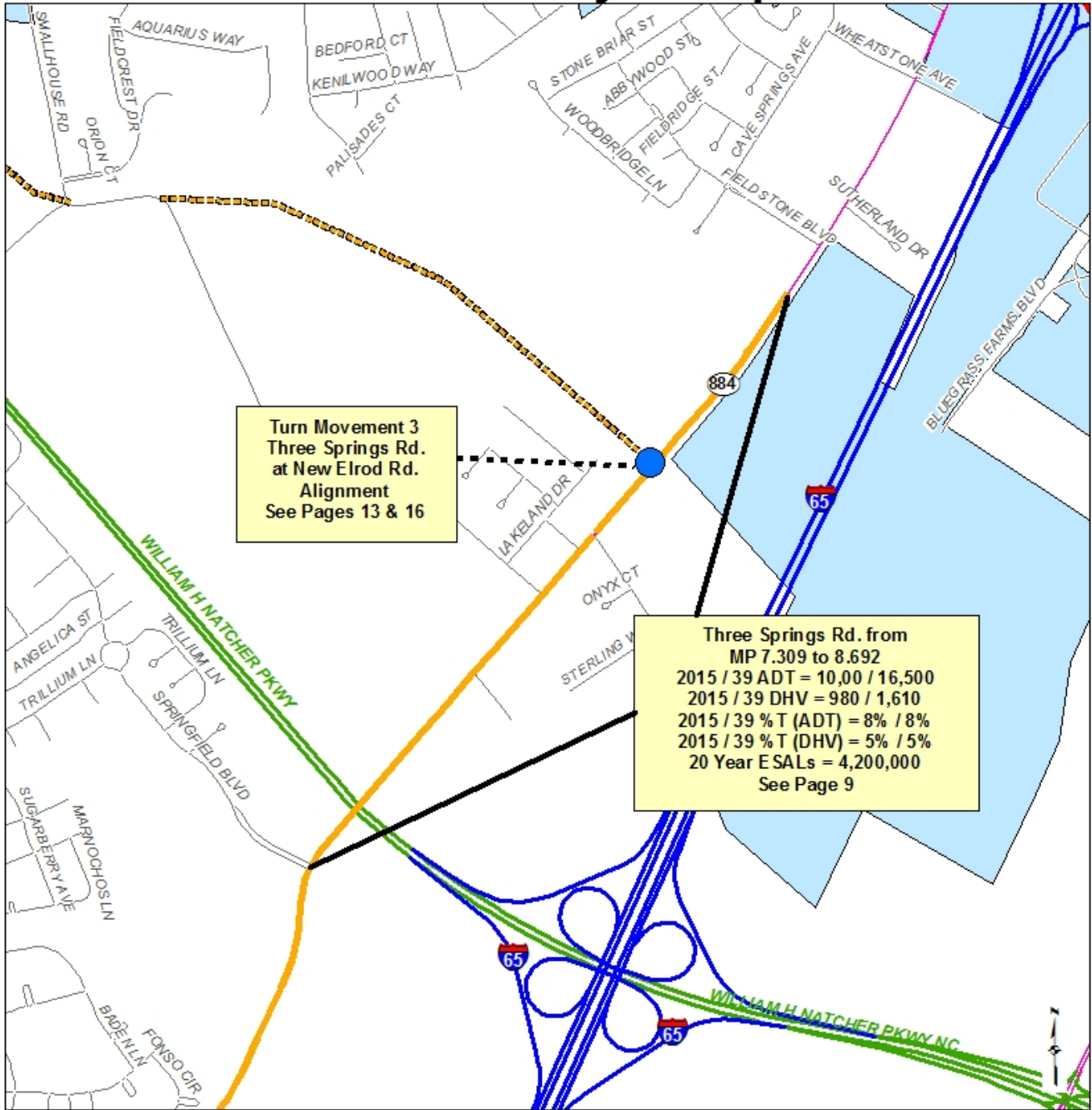
**Legend**

New 03-8707 Alignment  
 Three Springs Rd. Project Extent

Turn Movement  
 Urban Boundary

0 0.175 0.35 Miles

# Summary Map 2



**Reconstruct  
 Three Springs Rd.  
 From MP 5.52 to 8.692  
 Item # 03-8818.00**



**Legend**

New 03-8707 Alignment  
 Three Springs Rd. Project Extent

Turn Movement  
 Urban Boundary

0 0.175 0.35 Miles

# ESAL Information

*Traffic Forecast Technical Report  
Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
Item No. 03-8818.00*

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

**ROUTE ID:**

County	Warren	Date	08/03/15
Road Name	Three Springs Rd.	Forecaster	Daniel Hulker
Functional Class	17 - Urban Collector	MARS No.	8962901D
Project Description	Reconstruct Three Springs Rd from Long Road to Flea Market Entrance	Item No.	03-8818.00
Scenario	Build	Route No.	KY 884
Segment Description	Three Springs Rd. from MP 5.52 to 6.54	Beg. MP	5.52
		End MP	6.54
		T.F. No.	TF 15-009
		No. of Lanes	2
		1 or 2 way	2

**REFERENCES:**

Previous Forecasts	None	K-Factor Value	9.0%
Traffic Volume	114550	K-Factor Source	TM Counts
Milepoint	5.074	PHF	0.9
Truck Percent Milepoint	FC Average N/A	Full Route Unique Identifier	114-KY-0884 -000
ESAL Information	2007 Aggregated ESALS		
Growth Rate	3.1%		

**TRAFFIC PARAMETERS:**

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2015		2019	2029	2039
Volume (AADT)	4800	3.1%	5400	7400	10000
Percent Trucks (%T)	8%	0%	8%	8%	8%
Number of Trucks	380	3.1%	430	590	800
Percent Trucks Hauling Coal (%CT)	0%	0.0%	0%	0%	0%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.100	1.00%	3.226	3.563	3.936
ESALs/Axle (ESAL/A)	0.200	2.00%	0.216	0.264	0.322
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	0	0.00%	0.000	0.000	0.000
ESALs/Axle (ESAL/CA)	0	0.00%	0.000	0.000	0.000

**ESAL CALCULATIONS:** SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 2,300,000

General Comments:

**E- Link in Project Wise**

*Traffic Forecast Technical Report  
Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
Item No. 03-8818.00*

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

**ROUTE ID:**

County	Warren	Date	08/03/15
Road Name	Three Springs Rd.	Forecaster	Daniel Hulker
Functional Class	17 - Urban Collector	MARS No.	8962901D
Project Description	Reconstruct Three Springs Rd from Long Road to Flea Market Entrance	Item No.	03-8818.00
Scenario	Build	Route No.	KY 884
Segment Description	Three Springs Rd. from MP 6.54 to 7.309	Beg. MP	6.54
		End MP	7.309
		T.F. No.	TF 15-009
		No. of Lanes	2
		1 or 2 way	2

**REFERENCES:**

Previous Forecasts	None	K-Factor Value	9.0%
Traffic Volume	114559	K-Factor Source	TM Counts
Milepoint	7.225	PHF	0.9
Truck Percent	FC Average	Full Route Unique Identifier	
Milepoint	N/A		114-KY-0884 -000
ESAL Information	2007 Aggregated ESALS		
Growth Rate	3.1%		

**TRAFFIC PARAMETERS:**

		Present Year	Growth Rate	Construction Year	Median Year	Design Year
		2015		2019	2029	2039
Volume	(AADT)	6500	3.1%	7300	10000	14000
Percent Trucks	(%T)	8%	0%	8%	8%	8%
Number of Trucks		520	3.1%	580	800	1100
Percent Trucks Hauling Coal	(%CT)	0%	0.0%	0%	0%	0%
<i>Non-Coal Trucks:</i>						
Axles/Truck	(A/T)	3.100	1.00%	3.226	3.563	3.936
ESALs/Axle	(ESAL/A)	0.200	2.00%	0.216	0.264	0.322
<i>Coal Trucks:</i>						
Axles/Truck	(A/CT)	0	0.00%	0.000	0.000	0.000
ESALs/Axle	(ESAL/CA)	0	0.00%	0.000	0.000	0.000

**ESAL CALCULATIONS:** SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 3,200,000

General Comments:

**E- Link in Project Wise**

*Traffic Forecast Technical Report  
Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
Item No. 03-8818.00*

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

**ROUTE ID:**

County	Warren
Road Name	Three Springs Rd.
Functional Class	17 - Urban Collector
Project Description	Reconstruct Three Springs Rd from Long Road to Flea Market Entrance
Scenario	Build
Segment Description	Three Springs Rd. from MP 7.309 to 8.692

Date	08/03/15
Forecaster	Daniel Hulker
MARS No.	8962901D
Item No.	03-8818.00
Route No.	KY 884
Beg. MP	7.309
End MP	8.692
T.F. No.	TF 15-009
No. of Lanes	2
1 or 2 way	2

**REFERENCES:**

Previous Forecasts	None
Traffic Volume Milepoint	114A69 8.775
Truck Percent Milepoint	114A69 8.775
ESAL Information	2007 Aggregated ESALS
Growth Rate	2.1%

K-Factor Value	9.0%
K-Factor Source	TM Counts
PHF	0.9

Full Route Unique Identifier

114-KY-0884 -000

**TRAFFIC PARAMETERS:**

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2015		2019	2029	2039
Volume (AADT)	10000	2.1%	11000	13000	17000
Percent Trucks (%T)	8%	0%	8%	8%	8%
Number of Trucks	800	2.1%	880	1000	1400
Percent Trucks Hauling Coal (%CT)	0%	0.0%	0%	0%	0%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.100	1.00%	3.226	3.563	3.936
ESALs/Axle (ESAL/A)	0.200	2.00%	0.216	0.264	0.322
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	0	0.00%	0.000	0.000	0.000
ESALs/Axle (ESAL/CA)	0	0.00%	0.000	0.000	0.000

**ESAL CALCULATIONS:** SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane

4,200,000

General Comments:

**E- Link in Project Wise**



# Turning Movements

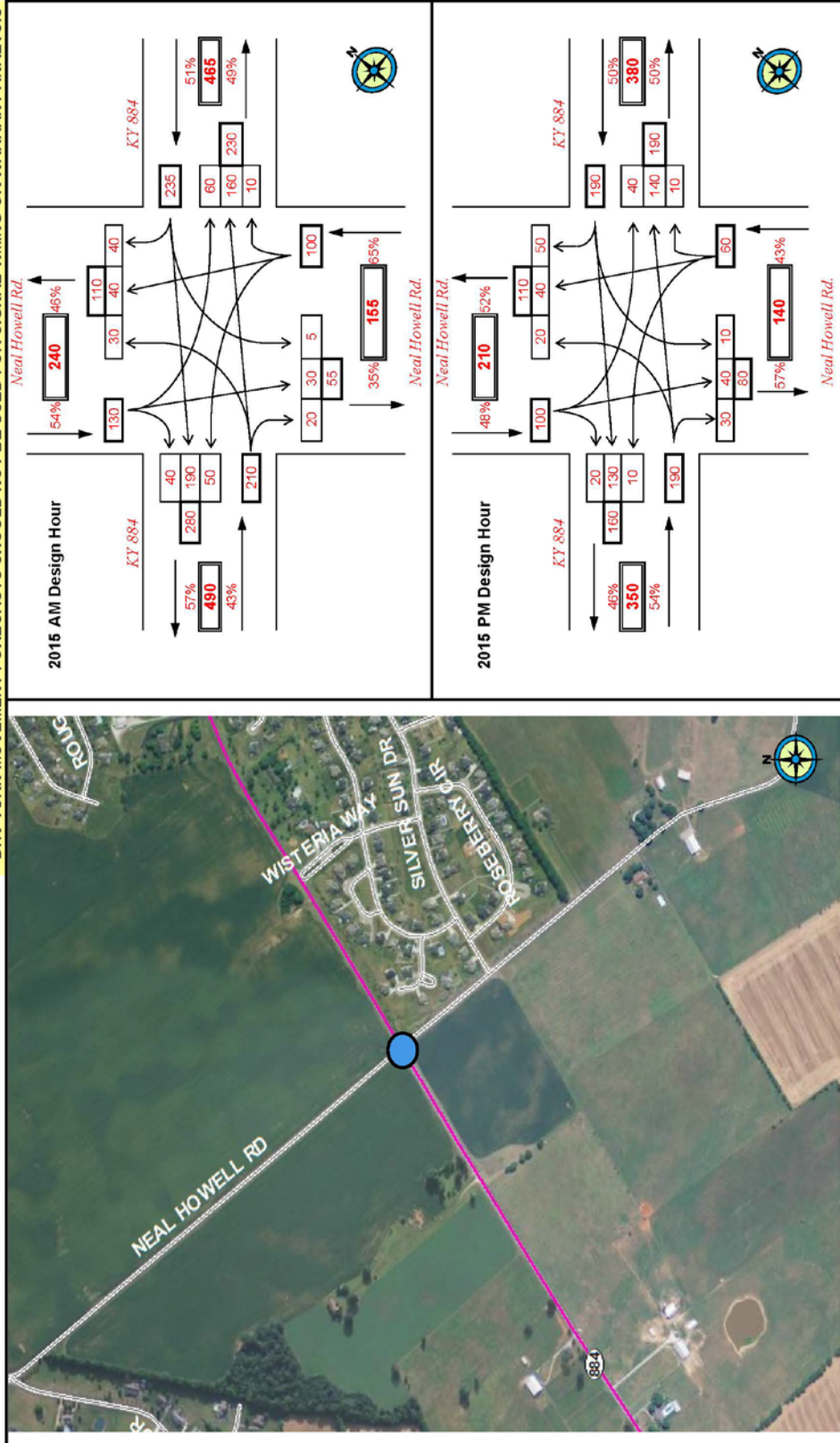
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2015 ADT and Design Hour Volumes  
 INTERSECTION: KY 884 (Three Springs Rd.) at Neal Howell Rd.

Turn Movement 1 (2015)

\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS



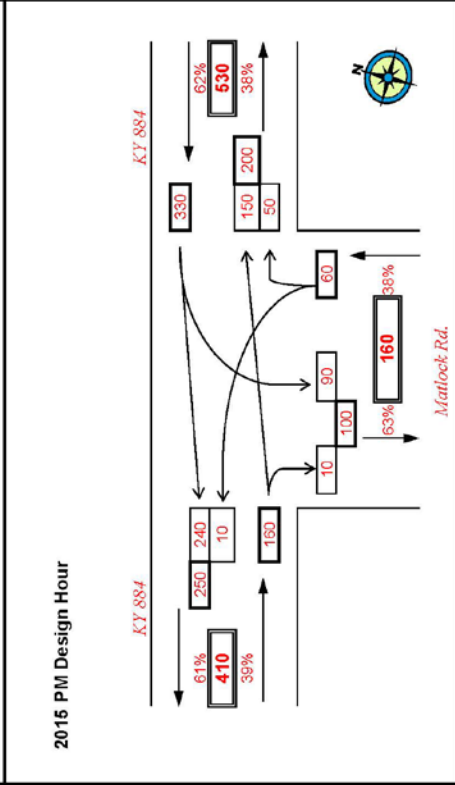
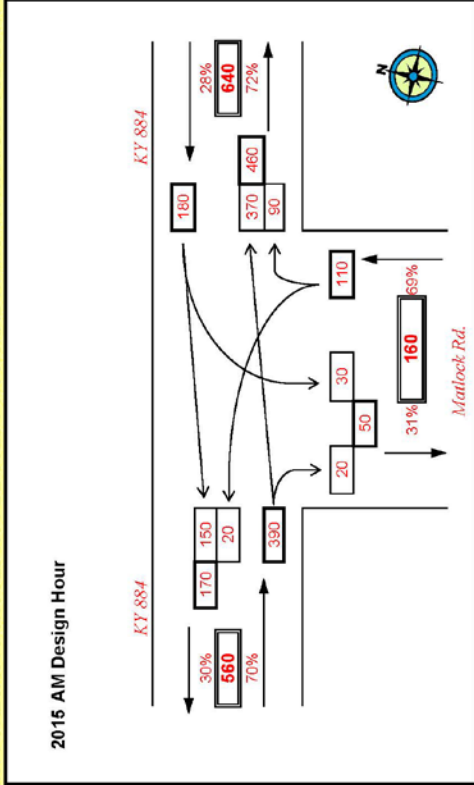
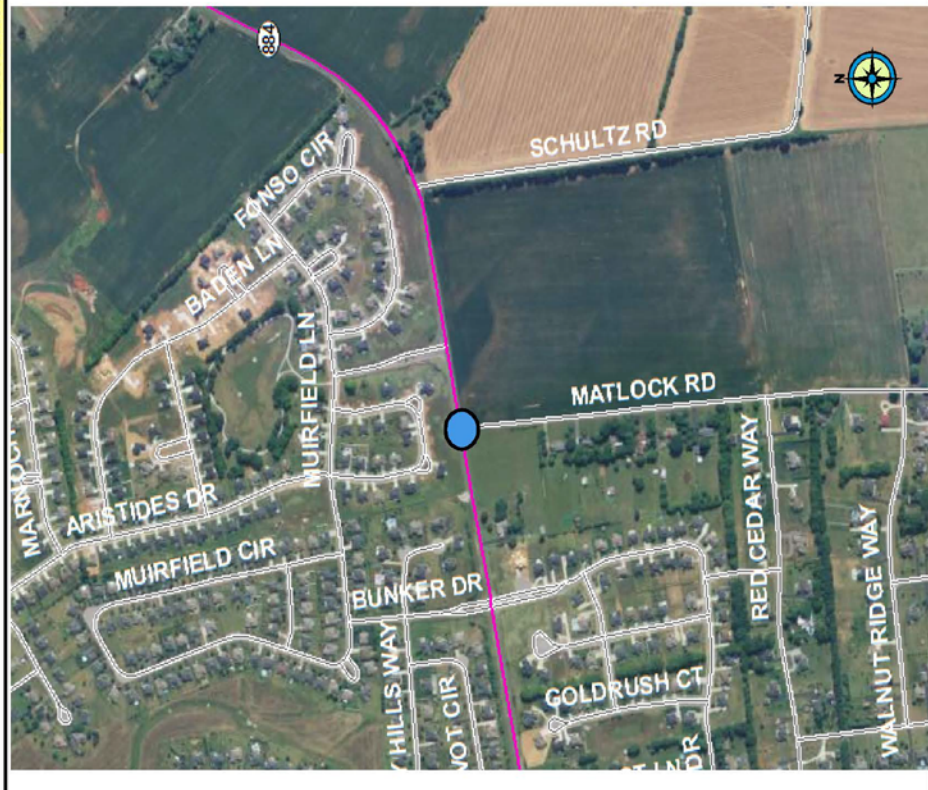
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

**Turn Movement 2 (2015)**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2015 ADT and Design Hour Volumes  
 INTERSECTION: KY 884 (Three Springs Rd.) at Matlock Rd.





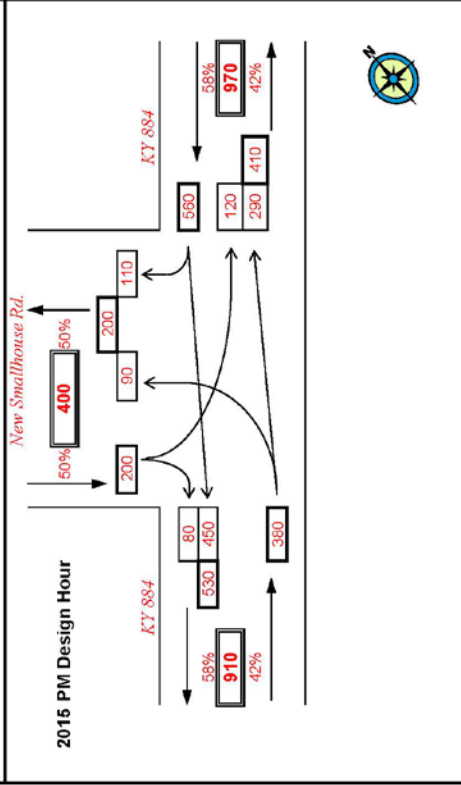
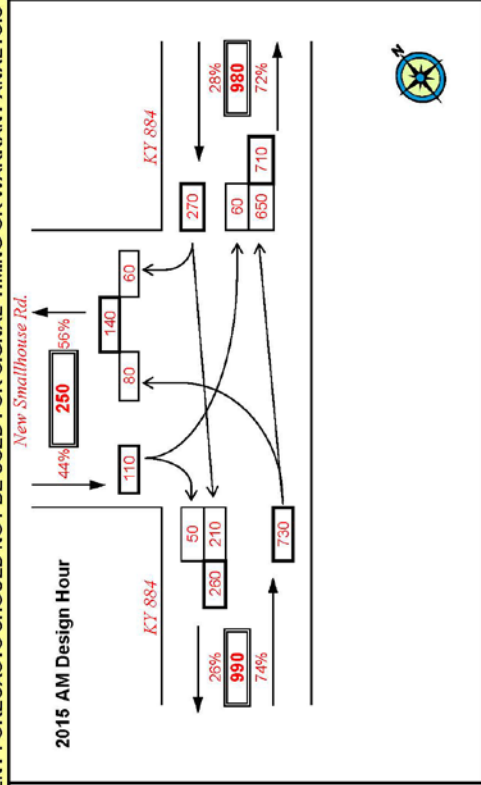
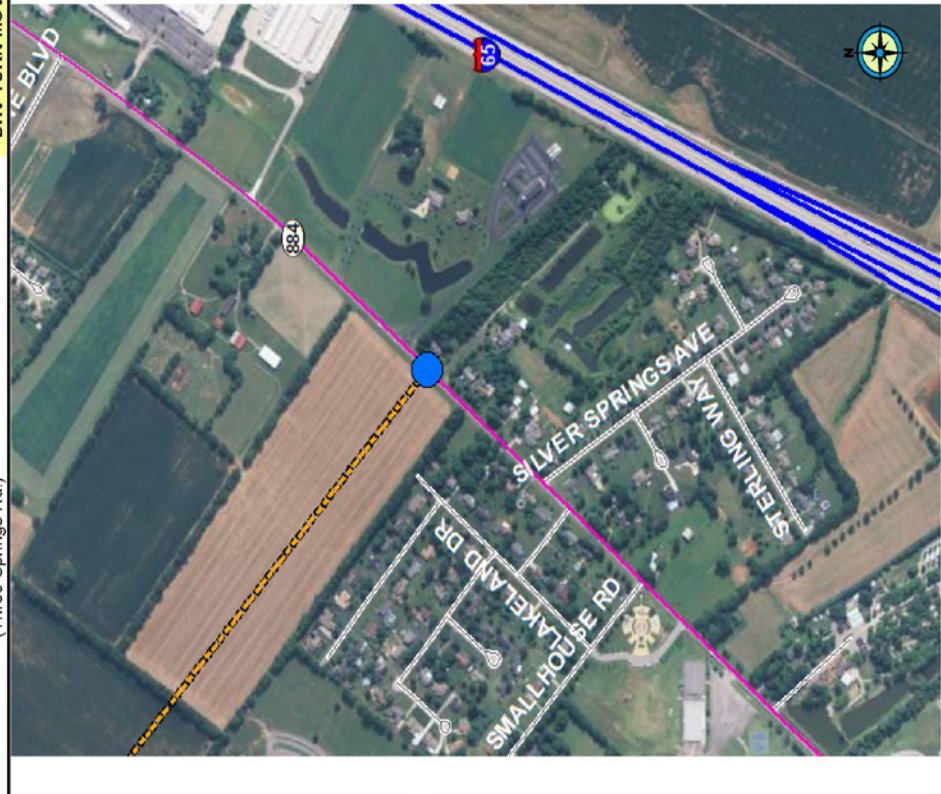
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2015 ADT and Design Hour Volumes  
 INTERSECTION: New Smallhouse Rd. alignment with KY 884  
 (Three Springs Rd.)

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

**Turn Movement 3 (2015)**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



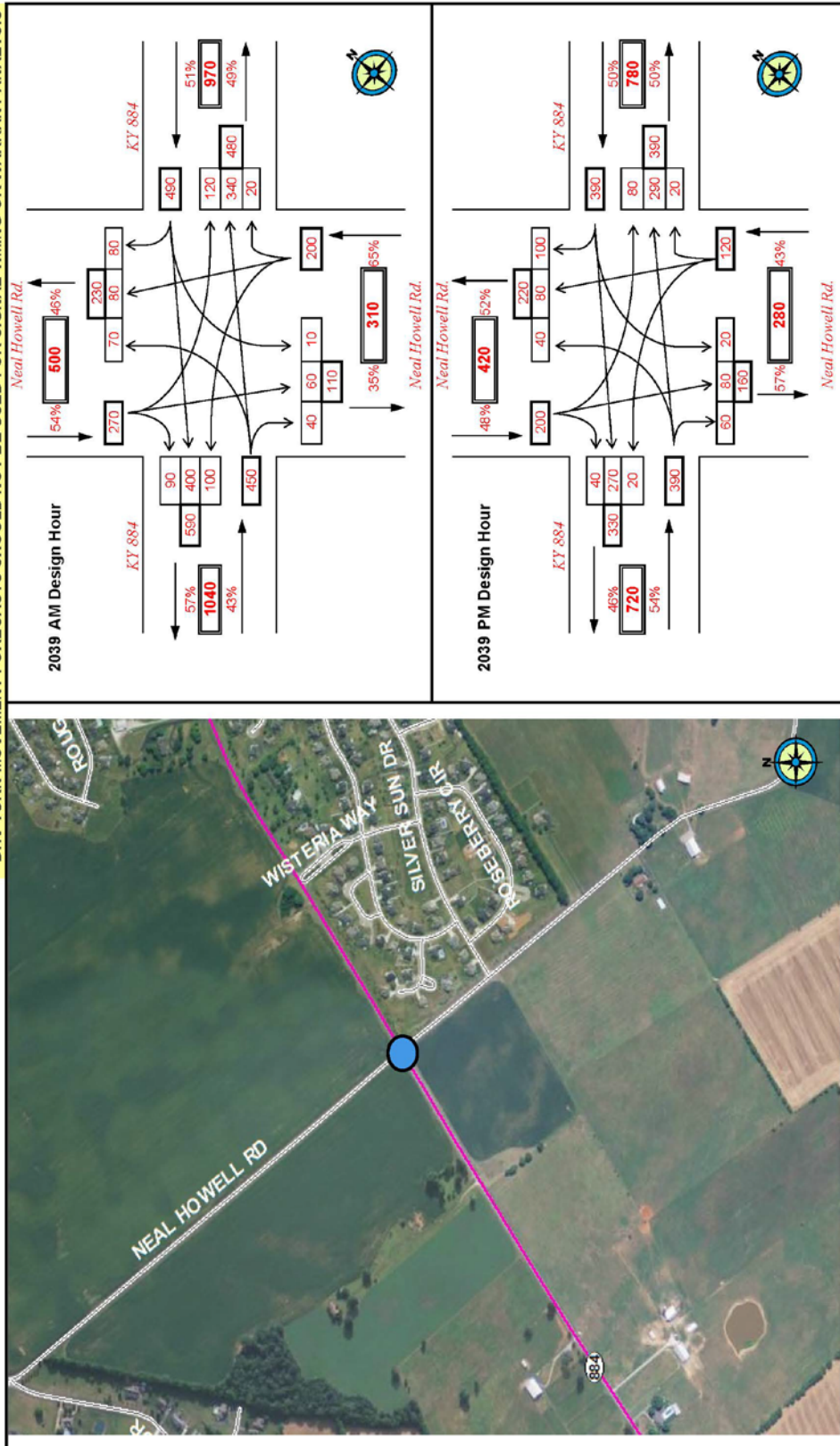
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2039 ADT and Design Hour Volumes  
 INTERSECTION: KY 884 (Three Springs Rd.) at Neal Howell Rd.

**Turn Movement 1 (2039)**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**





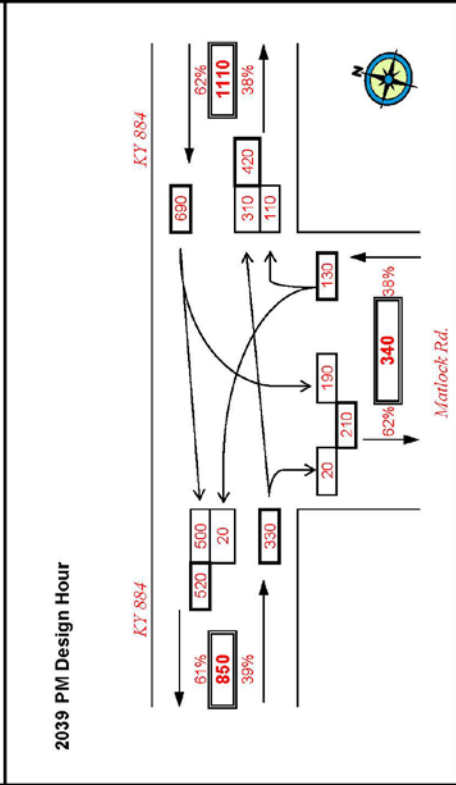
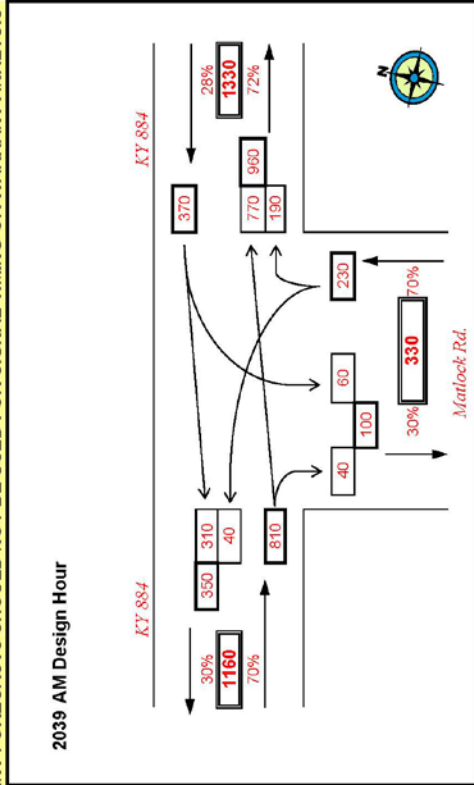
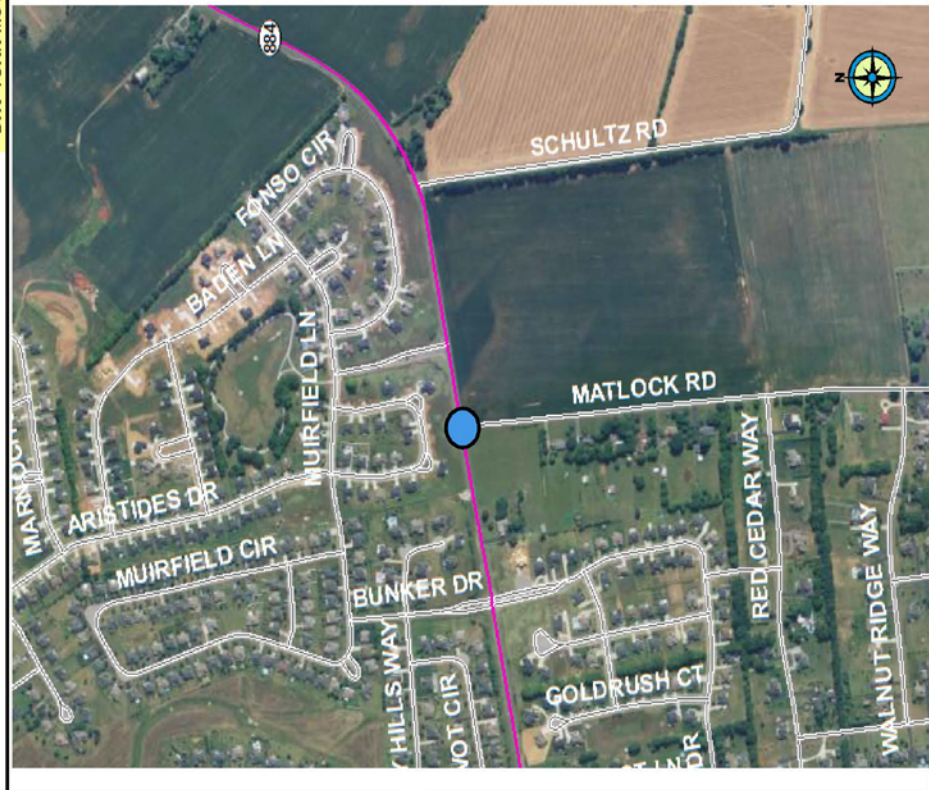
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

**Turn Movement 2 (2039)**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2039 ADT and Design Hour Volumes  
 INTERSECTION: KY 884 (Three Springs Rd.) at Matlock Rd.



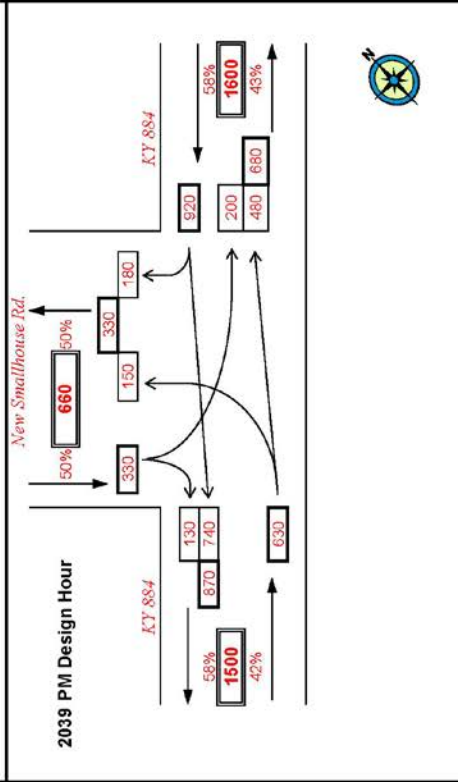
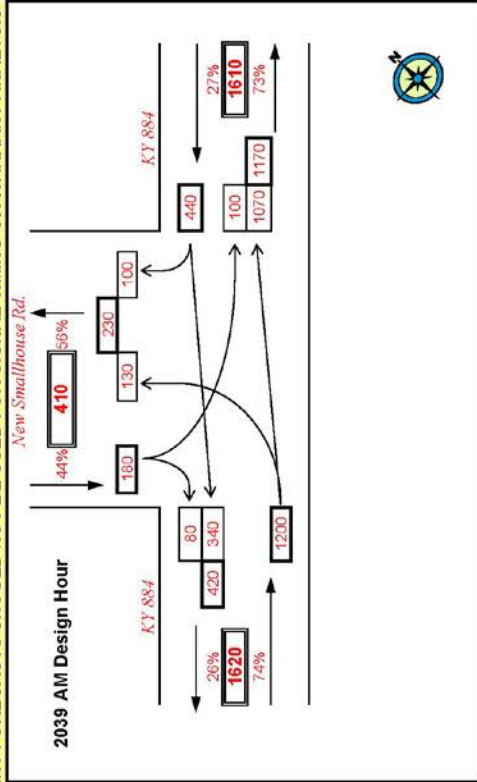
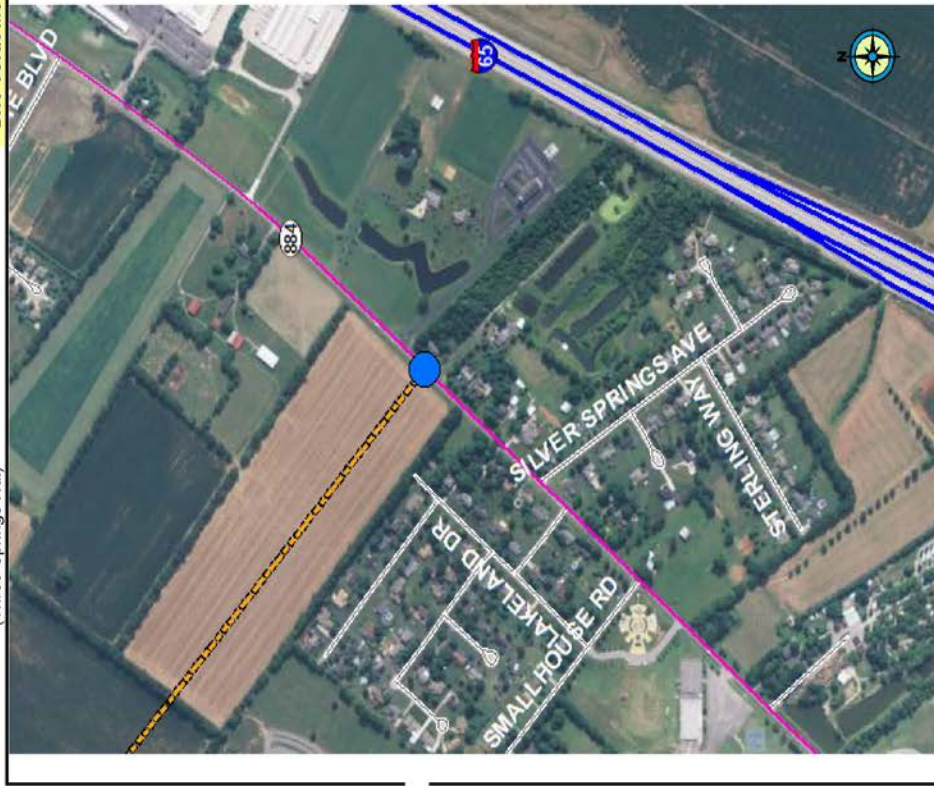
Traffic Forecast Technical Report  
 Warren County: Reconstruct Three Springs Rd. From Long Rd. to Flea Market Entrance  
 Item No. 03-8818.00

PROJECT: Reconstruction of KY 884 from Long Rd. to Flea Market  
 ITEM NUMBER: 03-8818.00 / 03-8852.00  
 MARS NUMBER: 8962901D / 8963101D  
 REQUEST DATE: 2/2/2015  
 ANALYST: Daniel Hulker  
 SCENARIO: 2039 ADT and Design Hour Volumes  
 INTERSECTION: New Smallhouse Rd. alignment with KY 884  
 (Three Springs Rd.)

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2014 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

**Turn Movement 3 (2039)**

**\*\*DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**





## Bicycle and Pedestrian Review for Project #3-8818 & 3-8852

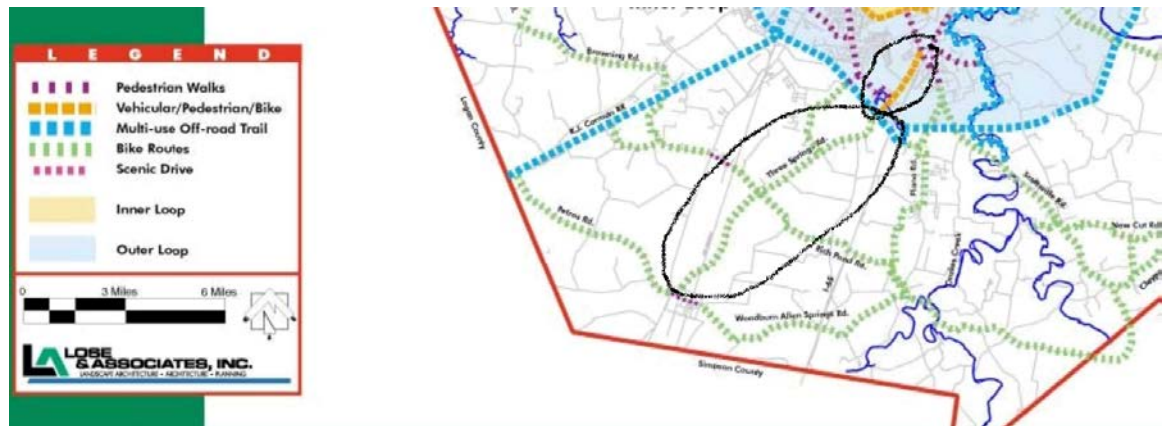
### Project Overview:

The purpose of this project is to increase the safety and mobility for motorists, pedestrians, and bicyclists along the KY 884 (Three Springs Road) Corridor from Long Road to the entrance to Flea Land.

KY 884 (Three Springs Road) is narrow two-lane roadway which serves as a major urban collector for the expanding residential areas in the Three Springs neighborhood of southern Bowling Green. KY 884 provides the primary connection from those residential developments to the major commercial activity centers along US 231 (Scottsville Road) and to the I-65 interchange with US 231. The section of the corridor from Long Road to the entrance to Flea Land also provides direct access to the Griffin Park recreation activities and the Aviation Heritage Park, and indirect access to the Jody Richards Elementary School. With the mix of recreational opportunities in the area and the residential development, there is an interest in expanding the existing mobility opportunities for pedestrians and bicyclists. The increasing traffic volumes and the geometric and capacity limitations of the existing roadway impede the mobility and safety along the corridor.

### Local/regional Planning:

Warren County Bicycle and Pedestrian Plan / [http://warrenpc.org/greenways/master\\_plan.php](http://warrenpc.org/greenways/master_plan.php) This area is specifically mentioned in the local bicycle and pedestrian planning. This is a proposed corridor for a multiuse path network.

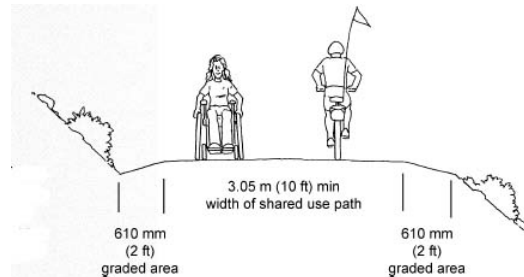


**Existing conditions:**

- KY-884/section 1; from US 231 to Small House Road (MP 9.55-7.9)
  - a. ADT is 9500 (2011 Sta. A69)
  - b. Posted speed limit is 45 MPH (MP 7.9-9.09) & 35 MPH (MP 9.09-9.55)
  - c. No shoulder space
  - d. Bicycle Comfort Index (BCI) is D
- KY-884/section 2; from Small House Road to Matlock Road (MP 7.9-6.52)
  - a. ADT is 6400 (2013 Sta. 559)
  - b. Posted speed limit is 45 MPH
  - c. No shoulder space
  - d. Bicycle Comfort Index (BCI) is D
- KY-884/section 3; from Matlock Road to Long Road (MP 6.52-5.5)
  - a. ADT is 3900 (2013 Sta. 550)
  - b. Posted speed limit is 45 MPH
  - c. No shoulder space
  - d. Bicycle Comfort Index (BCI) is D

**The KYTC Bicycle and Pedestrian program team recommendations are:**

- **Best:** Construct a 10 foot wide (minimum) multiuse facility on one side of the roadway for the entire project area (MP 9.55-5.5) and a 5 foot (or wider) sidewalk on the other side of the roadway. This would provide a BCI ❖ rating A+ (for bicyclists)



- a. This is recommended in the local government's bicycle and pedestrian planning.
  - b. The local government is willing to sign a memorandum of usage agreement (MOU) to accept maintenance responsibilities for this facility.
- **Good:**  
If a curb and gutter design is used: Construct sidewalks and buffered bike lanes (2 foot buffer minimum) on both sides of the roadway. This would provide a BCI ❖ rating A (for bicyclists).

If a rural cross section design is used: Construct buffered bike lanes (2 foot buffer minimum) within an 8 foot (or wider) shoulder in both directions.

Provide a spacing gap in the rumble strip to better accommodate bicyclists, this would provide a BCI ❖ rating A (for bicyclists).

- a. A 2-3 foot painted stripe (buffer space) between the roadway and the bike lane (Figure 1).
- b. Rumble strip/stripe gap spacing of 10-14 feet within the rumble strips/stripes every 40-60 feet (Figure 2).



**Figure 1**

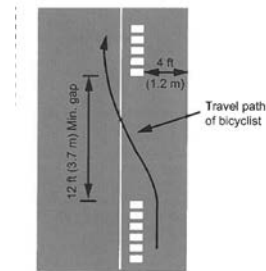


Figure 4-8. Rumble Strips

**Figure 2**

- **Fair:** Construct a shoulder of 8 feet (or wider) on both sides of the roadway. The rumble strip/stripe within the shoulder should accommodate cyclists by providing a 10-14 foot gap every 40-60 feet (Figure 2). This would provide a BCI ❖ rating B.

- ❖ **BCI:** <http://transportation.ky.gov/Bike-Walk/Documents/Bicycle%20Comfort%20Index%20Rating%20-%202014.pdf>

Prepared by:  
**Troy Hearn, Bicycle & Pedestrian Program Coordinator**  
Division of Planning, [www.transportation.ky.gov/Bike-Walk](http://www.transportation.ky.gov/Bike-Walk)  
Kentucky Transportation Cabinet  
August 6, 2015