

Appendix F
KYTC
Traffic Forecast



TRANSPORTATION CABINET

Frankfort, Kentucky 40622
www.transportation.ky.gov/


Steven L. Beshear
Governor

Michael W. Hancock, P.E.
Secretary

MEMORANDUM

TO: Mary Westfall-Holbrook, P.E.
Chief District Engineer
District 12 - Pikeville

ATTN: Mark Westfall, P.E.

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

DATE: January 29, 2014

SUBJECT: Pike County Traffic Forecast
KY 194/KY 632 Planning Study
Item No. N/A

In response to your Oct 14, 2013 request, we are providing the following forecasts on the attached report:

- 2013 and 2040 Truck Percent Forecasts (light/heavy, ADT, DHV).
- 2013 and 2040 ADT and DHV values.
- 2013 and 2040 Daily and Design Hour Turn Movements for Build Scenario
- 20-year ESALs

If you have any questions, please contact Jay Balaji of this Division at (502) 782-5045.

JM/JB/BC

Attachments

c/att: Samuel Hale
Kevin Martin
Dan Hite
Paul Looney



Executive Summary

Traffic Forecast Report Pike County KY 194 / KY 632 Improvements Item No. N/A

Prepared for:



Prepared by:
Jayalakshmi Balaji
Division of Planning
Kentucky Transportation Cabinet
January 29, 2014

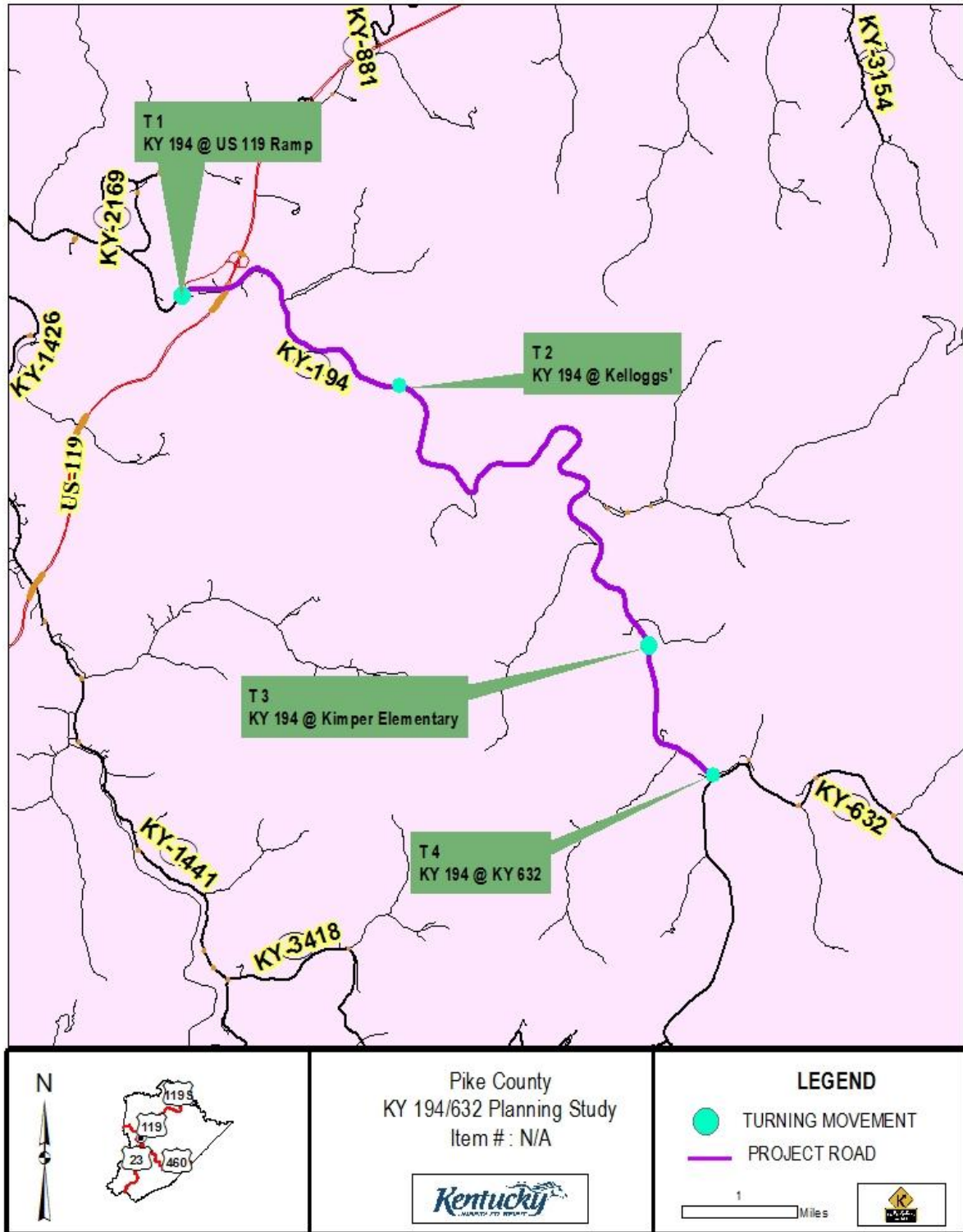
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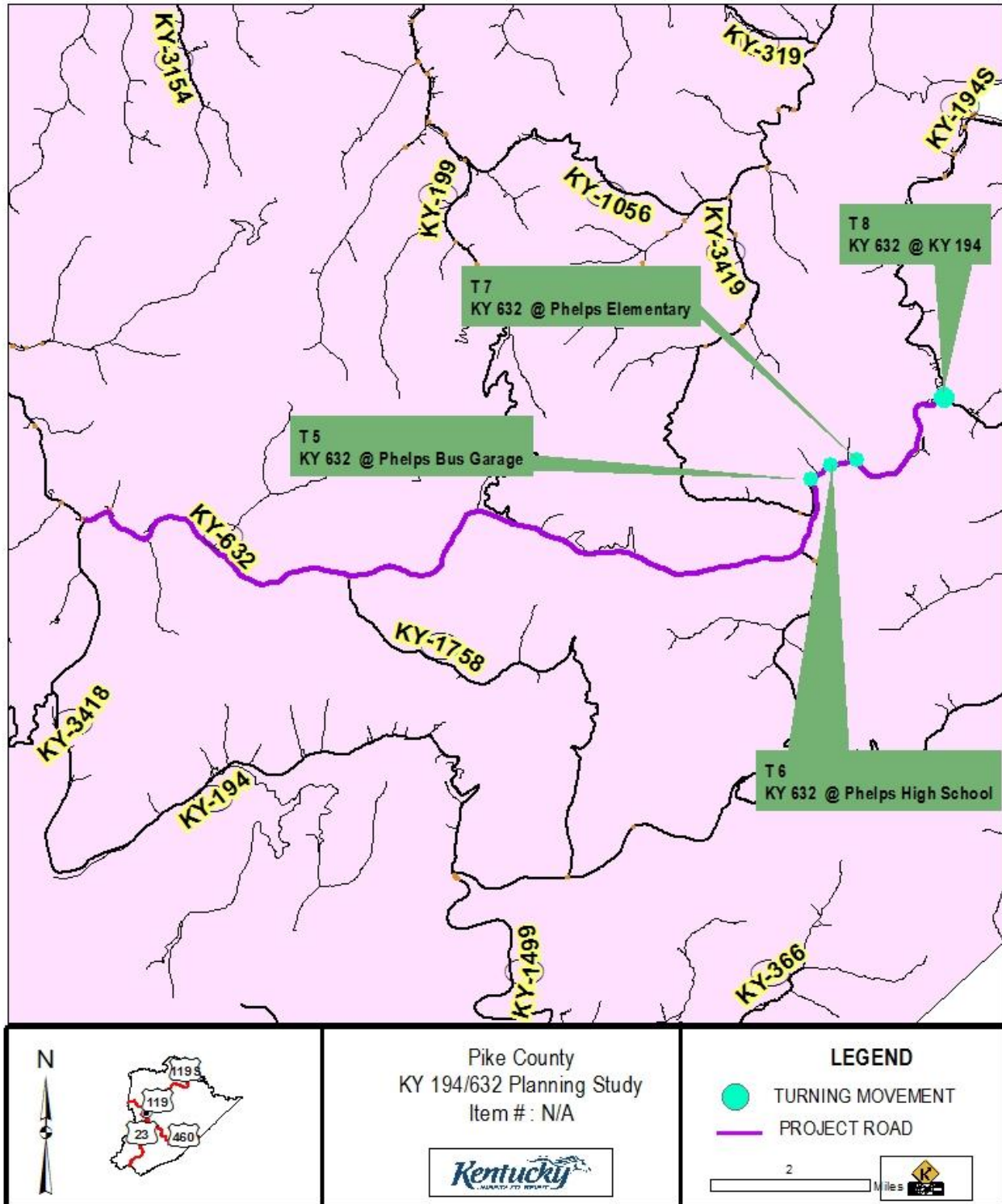
Commonly Used Abbreviations and their Descriptions

ADT	Average Daily Traffic	Without any adjustment
DHV	Design Hour Volume	30 th 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 th 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 (KY 194 MP 17.9 to 26.67)



Vicinity Map (KY 632 MP 0.0 to 14.02)



**Traffic Forecast Executive Summary
Pike County: KY 194/ KY 632 Improvements
Item No. N/A**

FORECAST SUMMARY

The project calls for the improvement of KY 194, starting at the US 119 ramp from MP 17.9 to MP 26.67 and KY 632 from MP 0.0 to MP 14.02. The purpose of this report is to analyze current and future traffic utilizing this facility. The forecast will be used for the design phase of this project to help determine turn lane configurations, pavement thickness, number of lanes, etc.

FORECAST TYPE

The following types of forecasts were developed:

- 2013 and 2040 Truck Percent Forecasts (light/heavy, ADT, DHV).
- 2013 and 2040 ADT and DHV values.
- 2013 and 2040 Daily and Design Hour Turn Movements
- 20-year ESALs.

CURRENT-YEAR VOLUMES

The 2013 ADT volumes were based on historical counts at traffic stations 098281 (MP 20.8) on KY 194, 098302 (MP 0.8) on KY 632 and special turn movement counts performed for this forecast.

DESIGN-YEAR/GROWTH FACTORS

The Kentucky State Data Center estimates the population of Pike County to decline at a rate of 0.65% annually for the next twenty years. Trend line analysis of the traffic stations on KY 194 from MP 15.0 to MP 57 and KY 632 from MP 0 to MP 14, as well as the traffic stations on US 119 from MP 2.0 to MP 14.0 projected a growth rate of 1.0 % to 1.9 %. The presence of Kellogg's plant and several other businesses along this corridor was considered in developing a growth rate. Therefore for the purpose of this forecast a growth rate of 1.0 % was used for segment 2, whereas a growth rate of 1.5 % was used for segment 1, segment 3, and segment 4.

DESIGN HOUR FACTORS

DHVs were estimated by analyzing the most recent hourly volume data collected at stations 098302, 098119, and the turn movement counts done for this forecast. The peak AM and PM volumes were derived by dividing the highest hourly volumes from these counts by the daily total. Functional class design hour factors based on the day and month of these counts were then applied. Finally, the calculated K-factors were used in combination with the ADT forecast to produce the DHVs for 2013 and 2040.

TRUCK PERCENTAGE

A 2012 vehicle classification count conducted on KY 194 at traffic counts station 098281 and 098302 on KY 632 provided a historical truck percentage data for the project road segment. A truck percentage of 9.3%, for KY 194 and a truck percentage of 12.8% for KY 632 were used respectively. This truck percentage is comparable to the functional class average for similar rural minor arterials. Also the corridor under study is a coal haul route. Trend line analysis of class counts at class counts stations on US 119, KY 632, and KY 194 shows a lack of growth in the truck volume. Therefore for the purpose of this forecast a truck growth rate of 0.5 % was used.

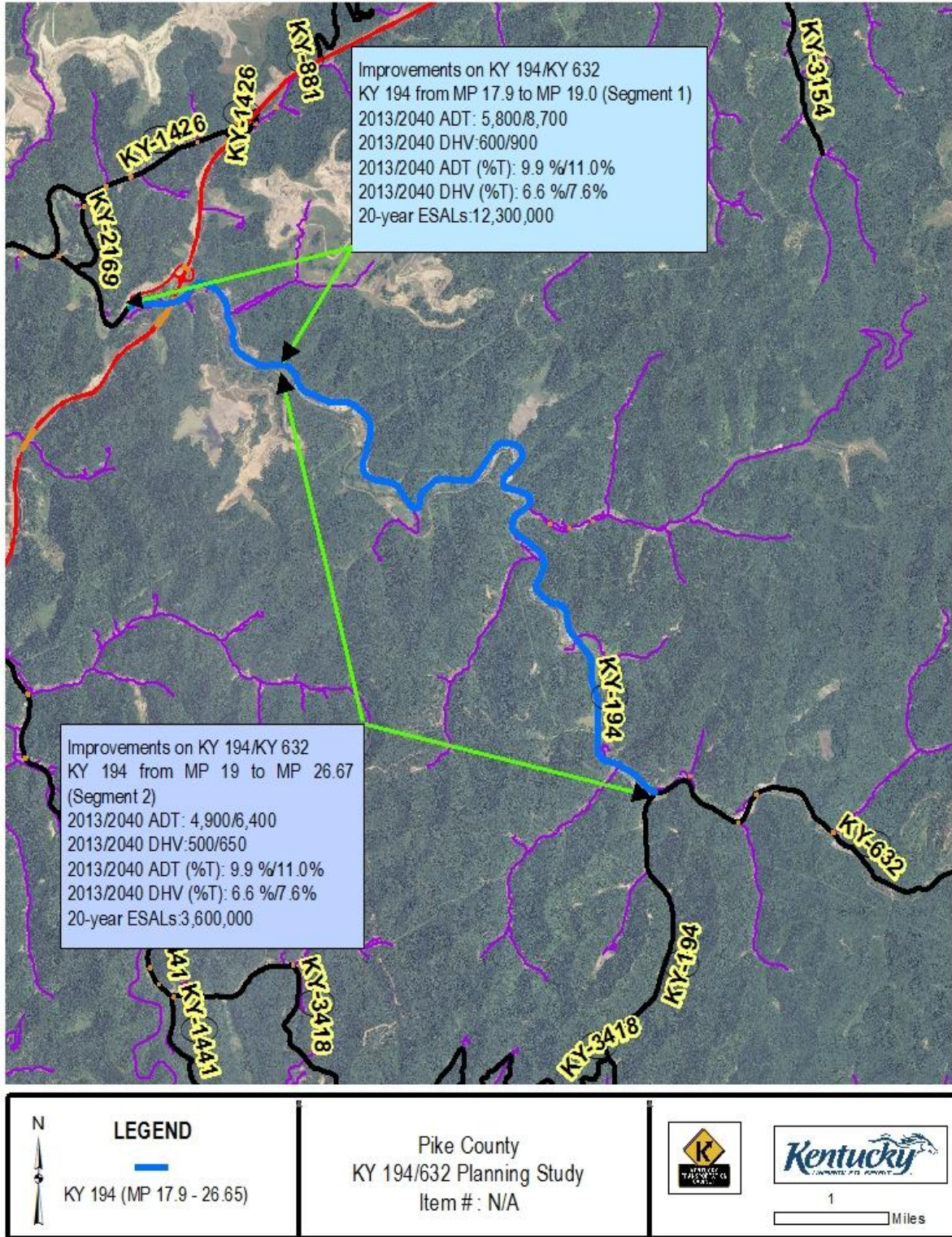
ESALs

Functional class averages from ATR data, traffic counts, and the 2040 ADT projections were used to estimate 20-year ESALs on the project road segment. The 2007 aggregated ESAL report, generated by the Kentucky Transportation Center in collaboration with the Kentucky Transportation Cabinet, were used to grow the important ESAL calculation variables. Four ESAL segments were provided for this forecast.

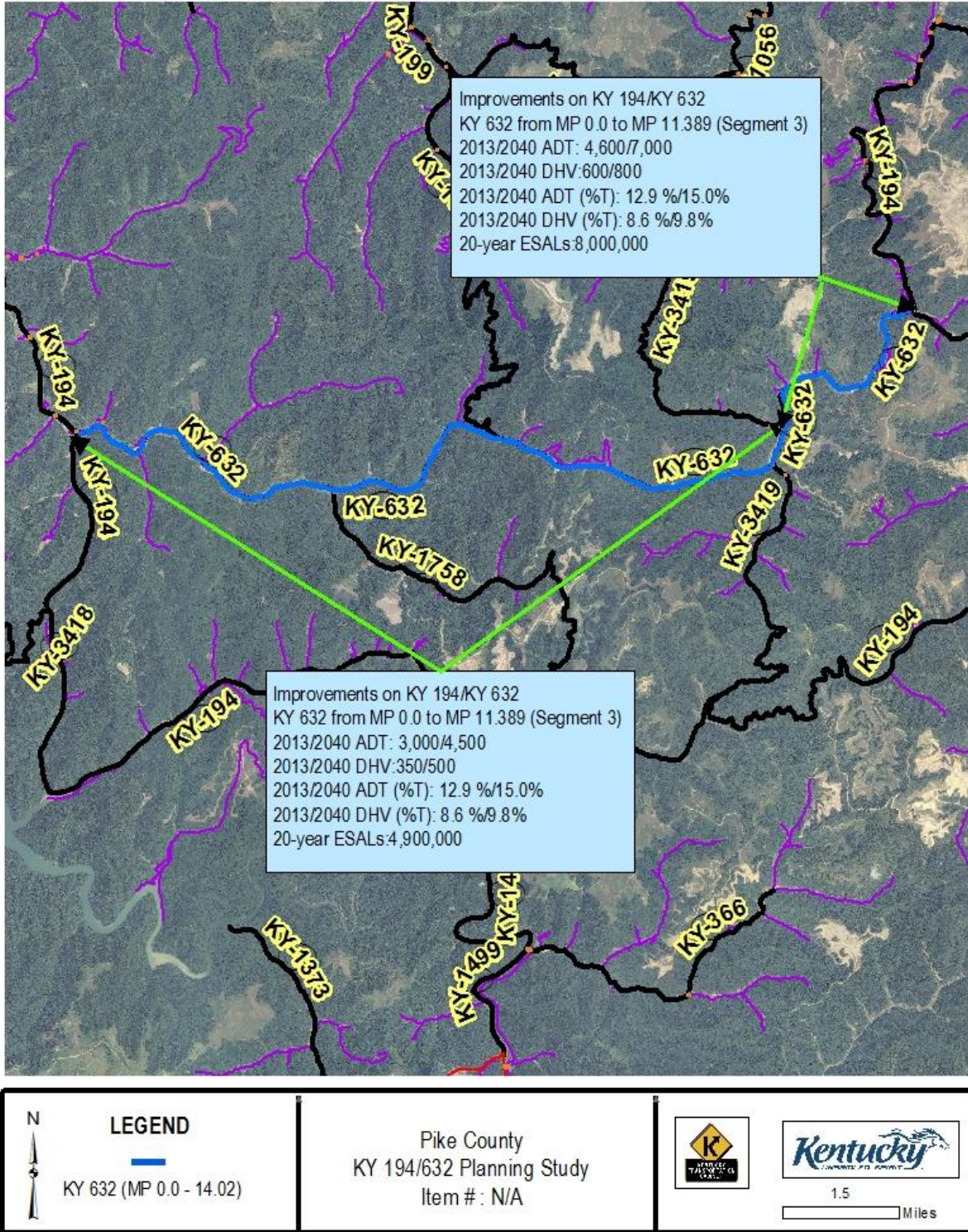
TURN MOVEMENTS

Eight turn movements were analyzed for this project. They occur along KY 194/KY 632 at the intersections of KY 194 at US 119 ramp (T1), KY 194 at Kellogg's (T2), KY 194 at Kimper Elementary (T3), KY 194 at KY 632 (T4), KY 632 @ Phelps Bus Garage (T5), KY 632 @ Phelps High School (T6), KY 632 @ Phelps Elementary (T7), and KY 632 at KY 194(T8). All of these intersections were counted in November 2013. The counts were factored to determine current year ADT and DHV turn movements. ADTs and DHVs do not align in any of the turning movements except T5, T6 and T7 in the current and future year due to many significant access points between the intersections. Also, in T5 and T6 the AM and PM design hours have the same directional bias. This is due to the fact vehicles entering through T6 leaves through T5 to ease the movement of traffic during the peak hour. The current year turn movements were grown using methods described above to determine future year turn movements.

Summary Map for KY 194



Summary Map for KY 632



HISTORICAL POPULATION SUMMARY

	1960	1970	1980	1990	2000	2010	60 - 70	70 - 80	80 - 90	90 - 00	00 - 10
	Population	Population	Population	Population	Population	Population	Pct	Pct	Pct	Pct	Pct
Kentucky	3,038,156	3,220,711	3,660,334	3,686,892	4,041,769	4,339,367	6.0%	13.6%	0.7%	9.6%	7.4%
Pike Co	-	61,059	81,123	72,584	68,736	65,024	-	32.9%	-10.5%	-5.3%	-5.4%
							Change	Change	Change	Change	Change

Sources: US Bureau of the Census; Kentucky State Data Center

FUTURE POPULATION PROJECTIONS SUMMARY

	2010	2015	2020	2025	2030	2035	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35
	Projection	Projection	Projection	Projection	Projection	Projection	Pct	Pct	Pct	Pct	Pct
Kentucky	4,339,367	4,509,429	4,672,754	4,820,390	4,951,178	5,063,331	3.9%	3.6%	3.2%	2.7%	2.3%
Pike Co	65,024	63,666	61,991	59,983	57,679	55,198	-2.1%	-2.6%	-3.2%	-3.8%	-4.3%
							Change	Change	Change	Change	Change

Sources: US Bureau of the Census; Kentucky State Data Center

ANNUAL POPULATION GROWTH RATES FROM HISTORICAL DATA AND PROJECTIONS

	60 - 70	70 - 80	80 - 90	90 - 00	05 - 10	10 - 15	15 - 20	20 - 25	25 - 30	10 - 30	10 - 35
	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR	GR
Kentucky	0.59%	1.29%	0.07%	0.92%	0.77%	0.71%	0.62%	0.54%	0.45%	0.53%	0.62%
Pike Co	-	2.88%	-1.11%	-0.54%	-0.42%	-0.53%	-0.66%	-0.78%	-0.88%	-0.40%	-0.65%

APPENDIX A

TURN MOVEMENTS

2013 TURNING MOVEMENTS

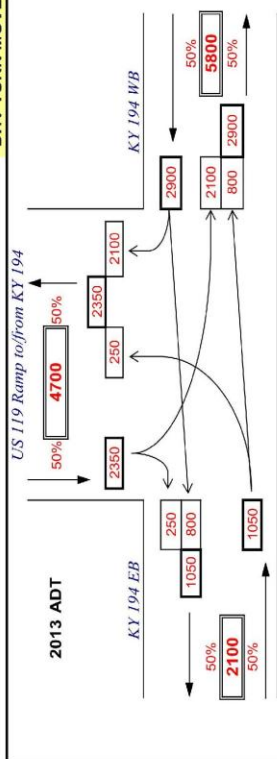
- T1: KY 194 AT US 119 RAMP**
- T2: KY 194 AT KELLOGG'S**
- T3: KY 194 AT KIMPER ELEMENTARY**
- T4: KY 194 AT KY 632 (KIMPER)**
- T5: KY 632 @ PHELPS BUS GARAGE**
- T6: KY 632 @ PHELPS HIGH SCHOOL**
- T7: KY 632 @ PHELPS ELEMENTARY**
- T8: KY 632 @ KY 194 (PHELPS)**

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

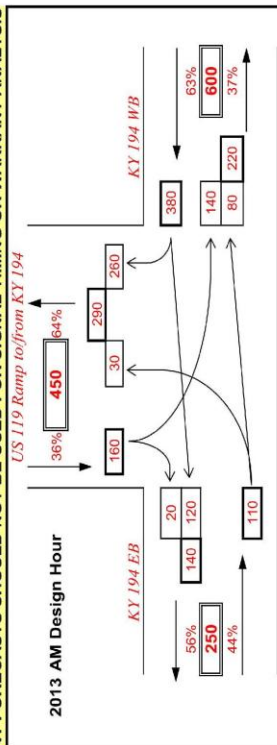
NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: KY 194/KY 632 Improvements
 ITEM NUMBER: N/A
 MARKS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T1: KY 194 @ US 119 RAMP

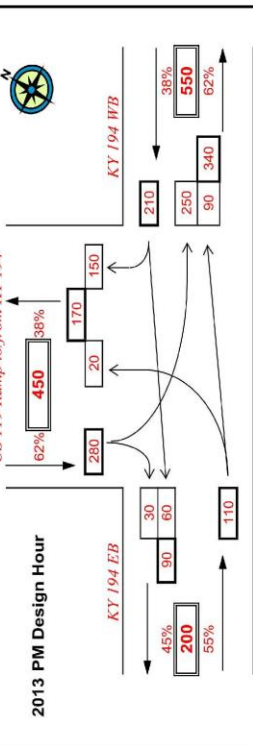
***DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



Note : Individual Turns Not Necessarily Reflective of Precision Shown



Note : Individual Turns Not Necessarily Reflective of Precision Shown. Movements displayed are 30th highest hour of the year estimates. Multiply each maneuver by 0.82 for a Peak Hour Analysis. Movements may not all occur during same hour.



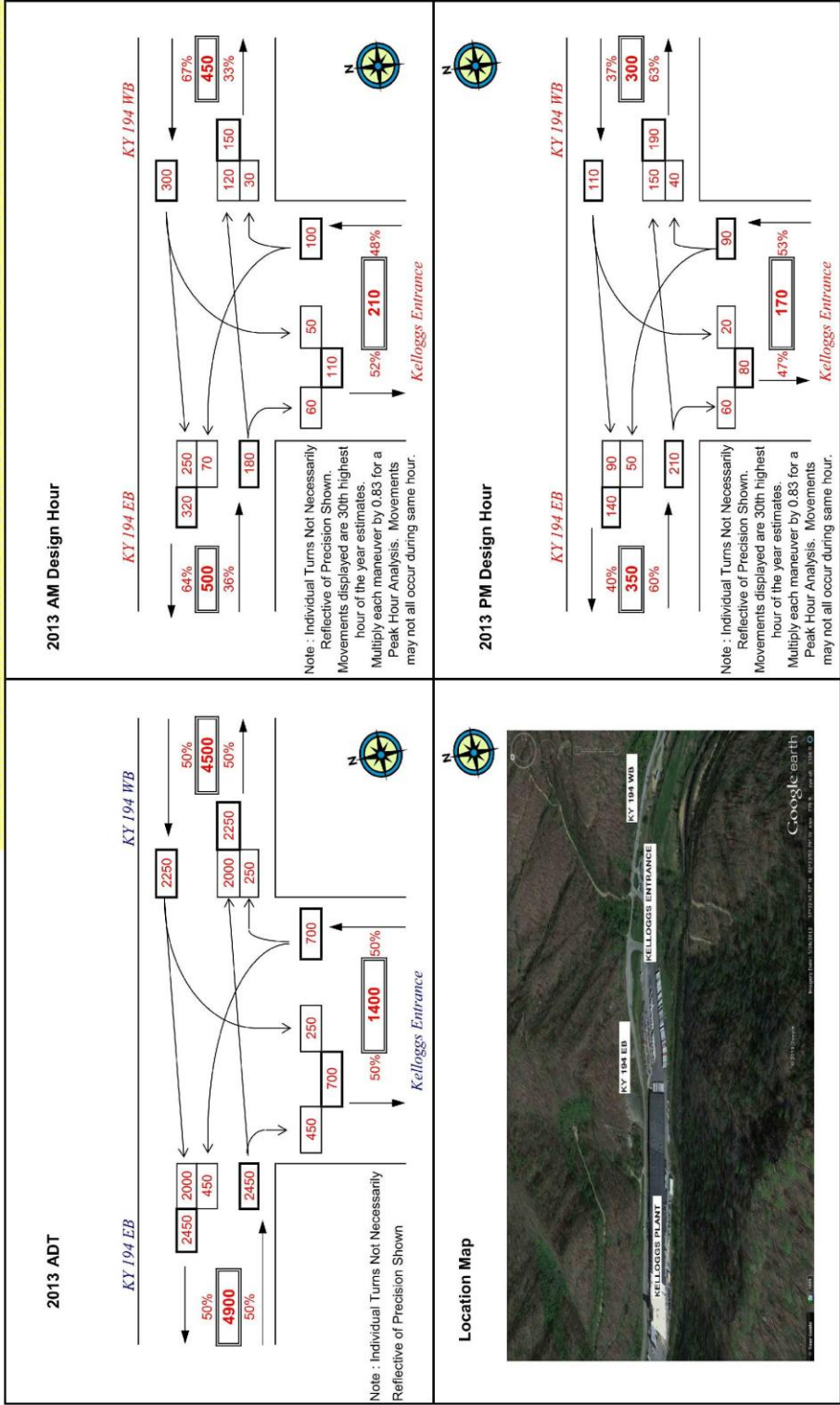
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 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

PROJECT: KY 194/KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T2: KY 194 @ KELLOGGS ENTRANCE

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

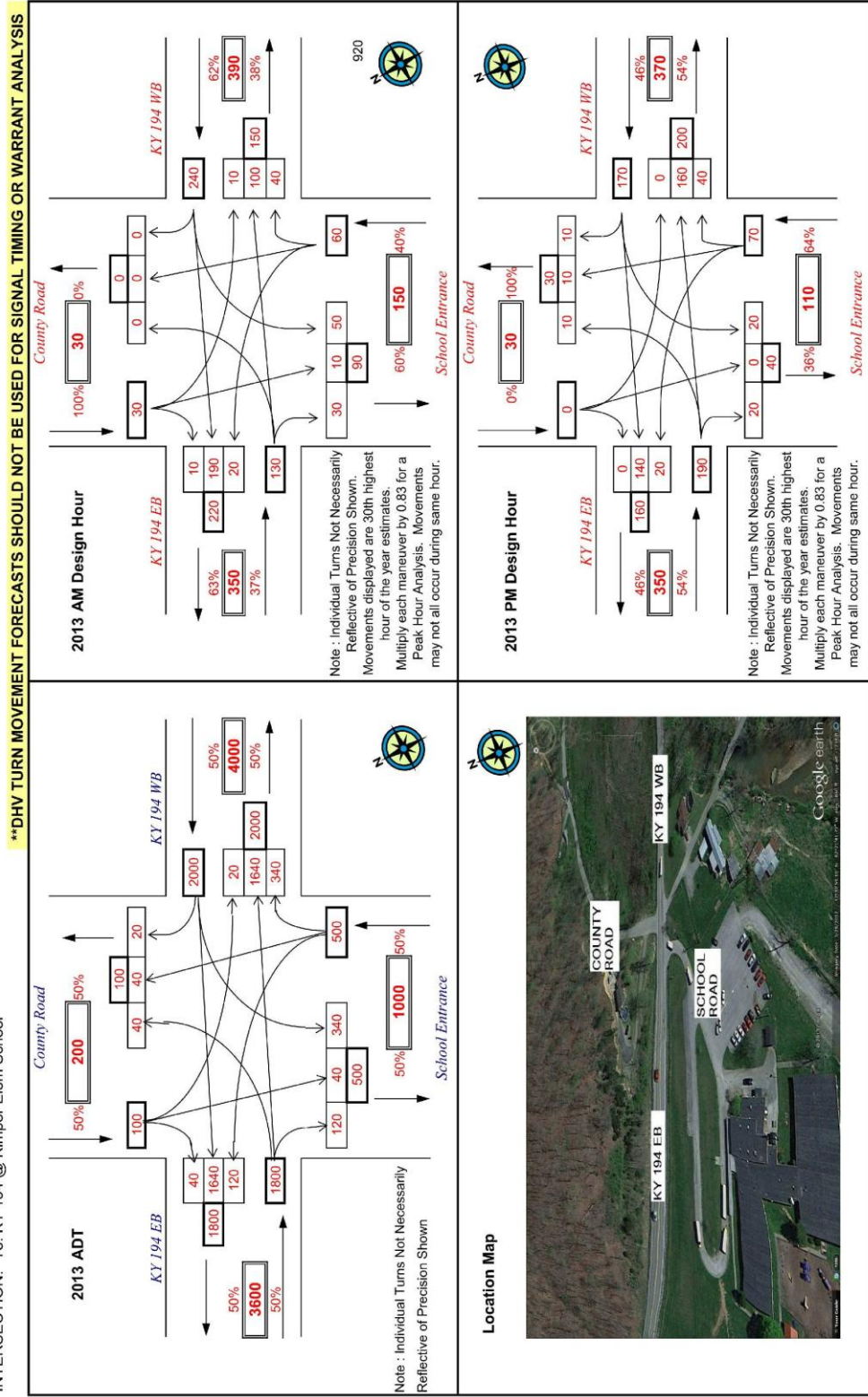
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PROJECT: KY 194/KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T3: KY 194 @ Kimper Elem School

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

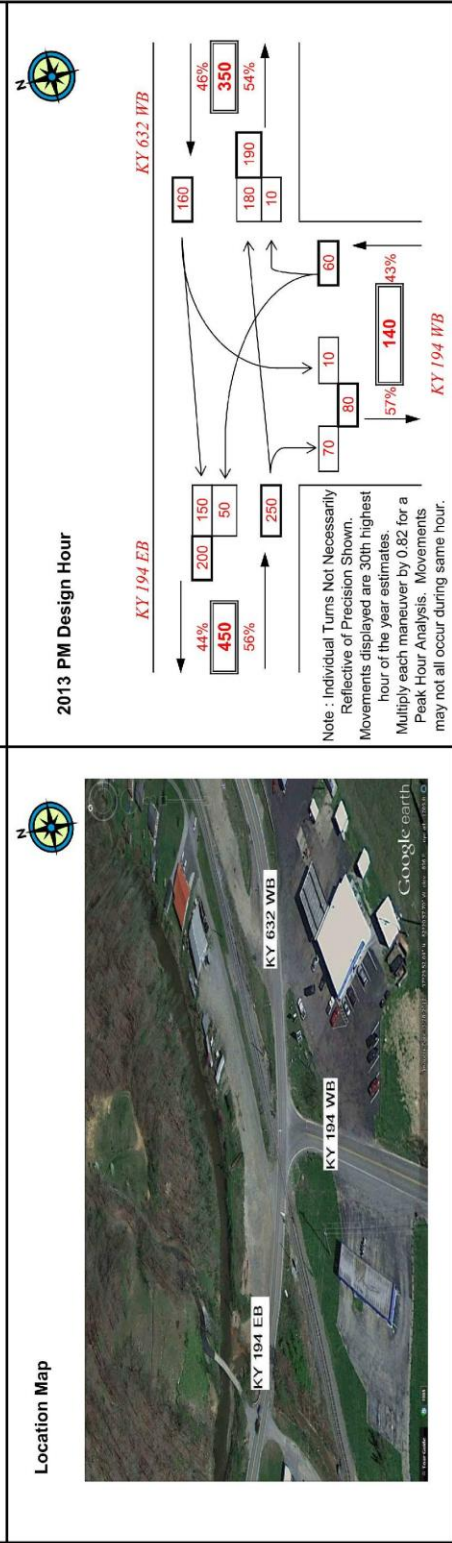
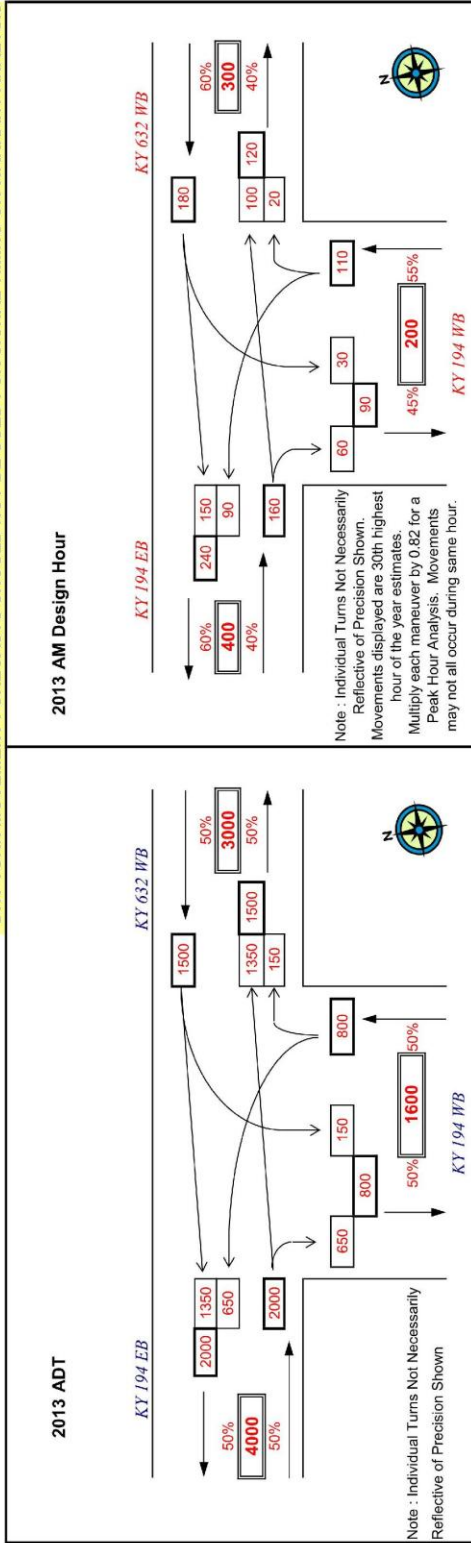


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 Item No. N/A

PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 WARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: JBALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T4: KY 194 @ KY 632 Kimper

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

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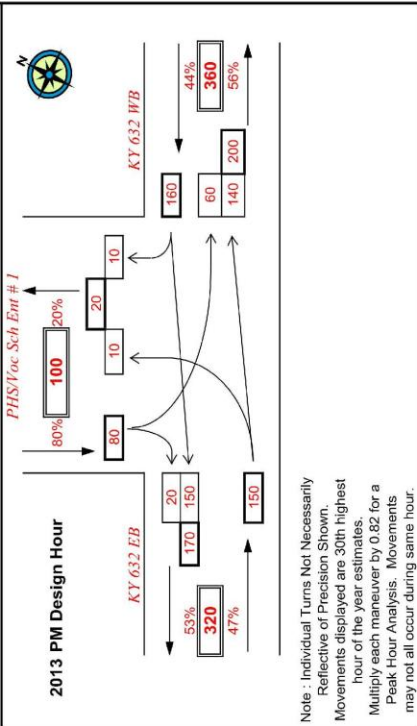
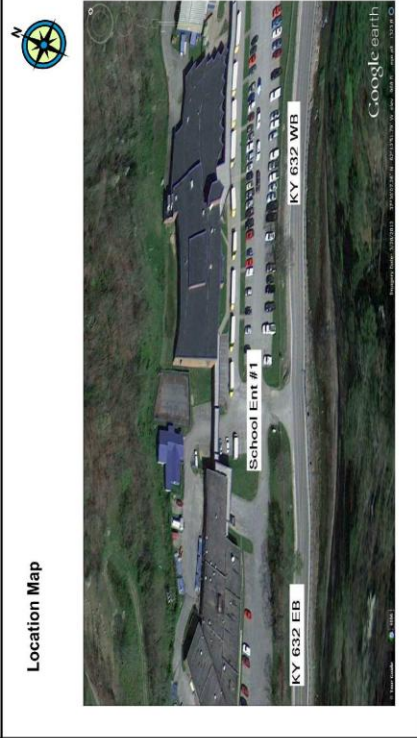
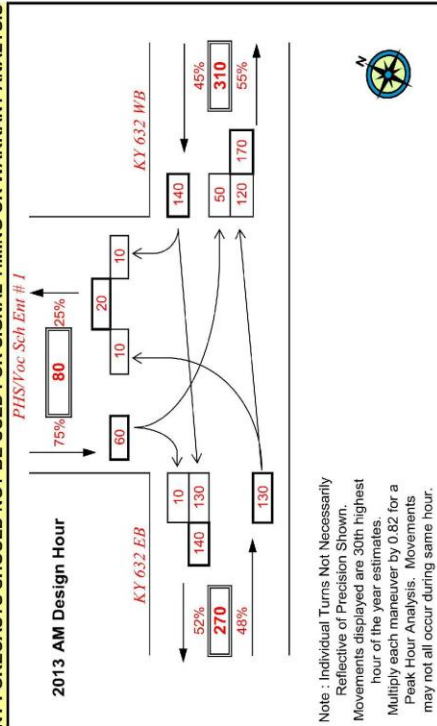
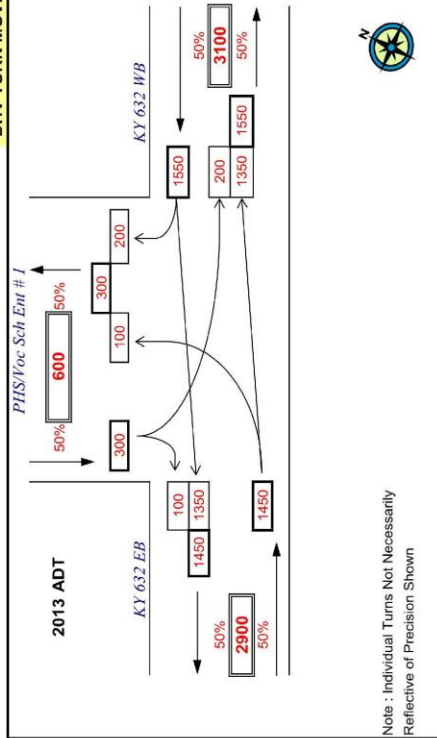


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PROJECT: KY 194/ KY 632 IMPROVEMENT
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T5: KY 632 @ Phelps Sch Bus Garage

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

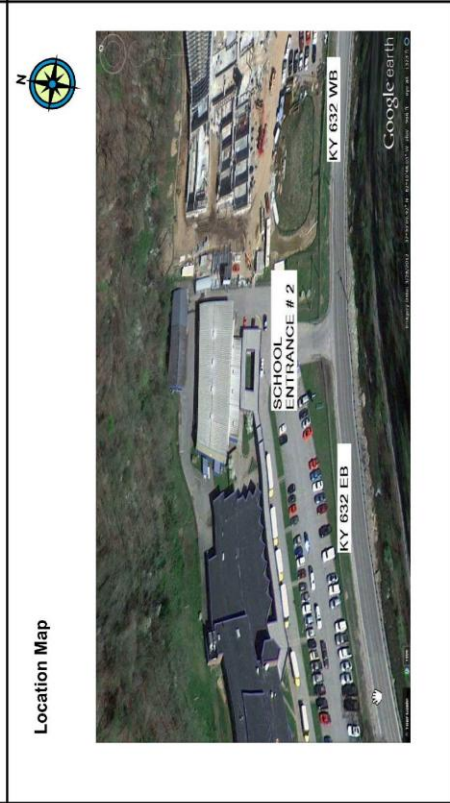
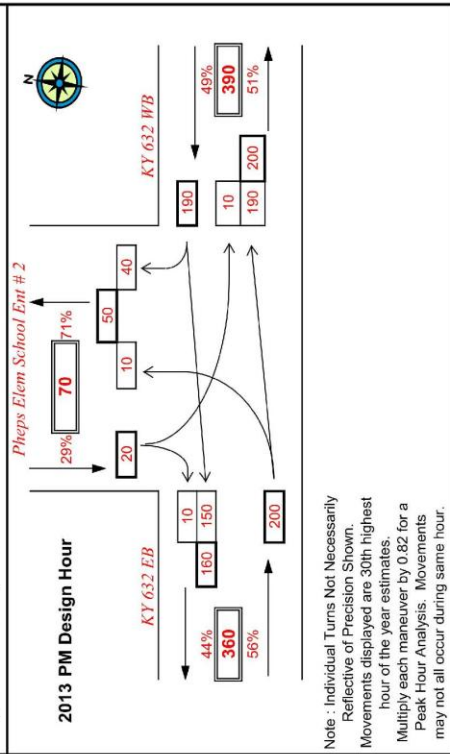
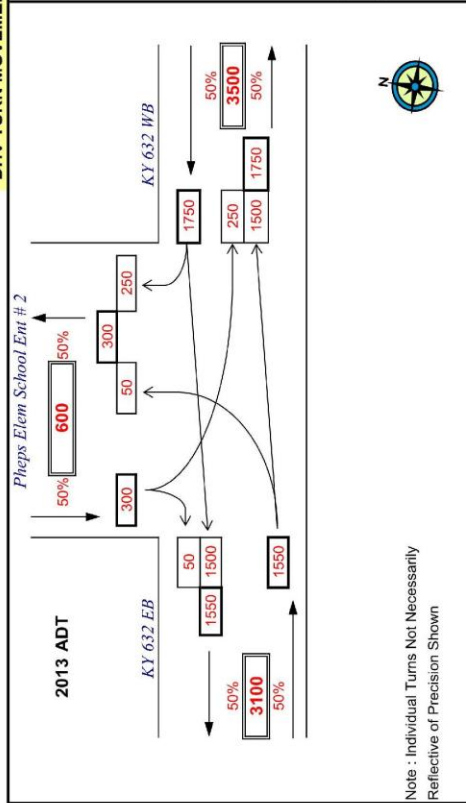
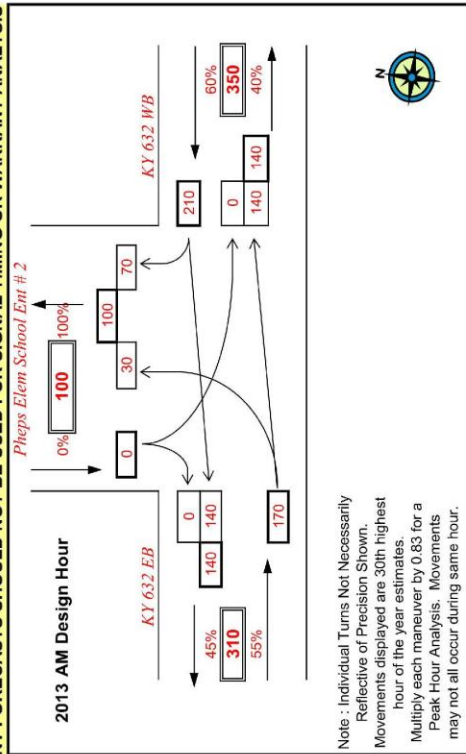


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PROJECT: KY 194 / KY 632 IMPROVEMENT
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T6:KY 632 @ Phelps Elem School Ent # 2

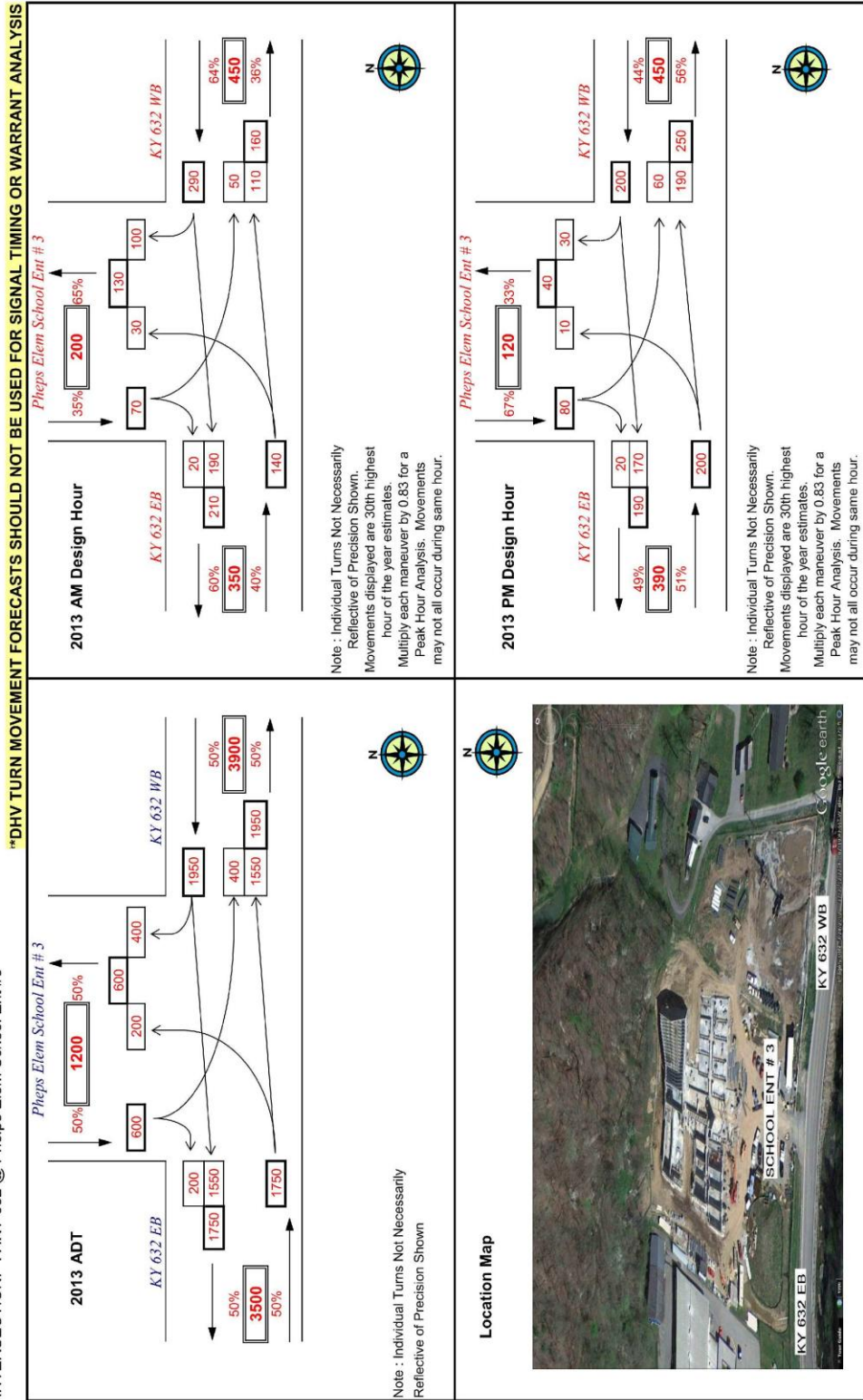
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 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

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PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T7:KY 632 @ Pheleps Elem School Ent #3

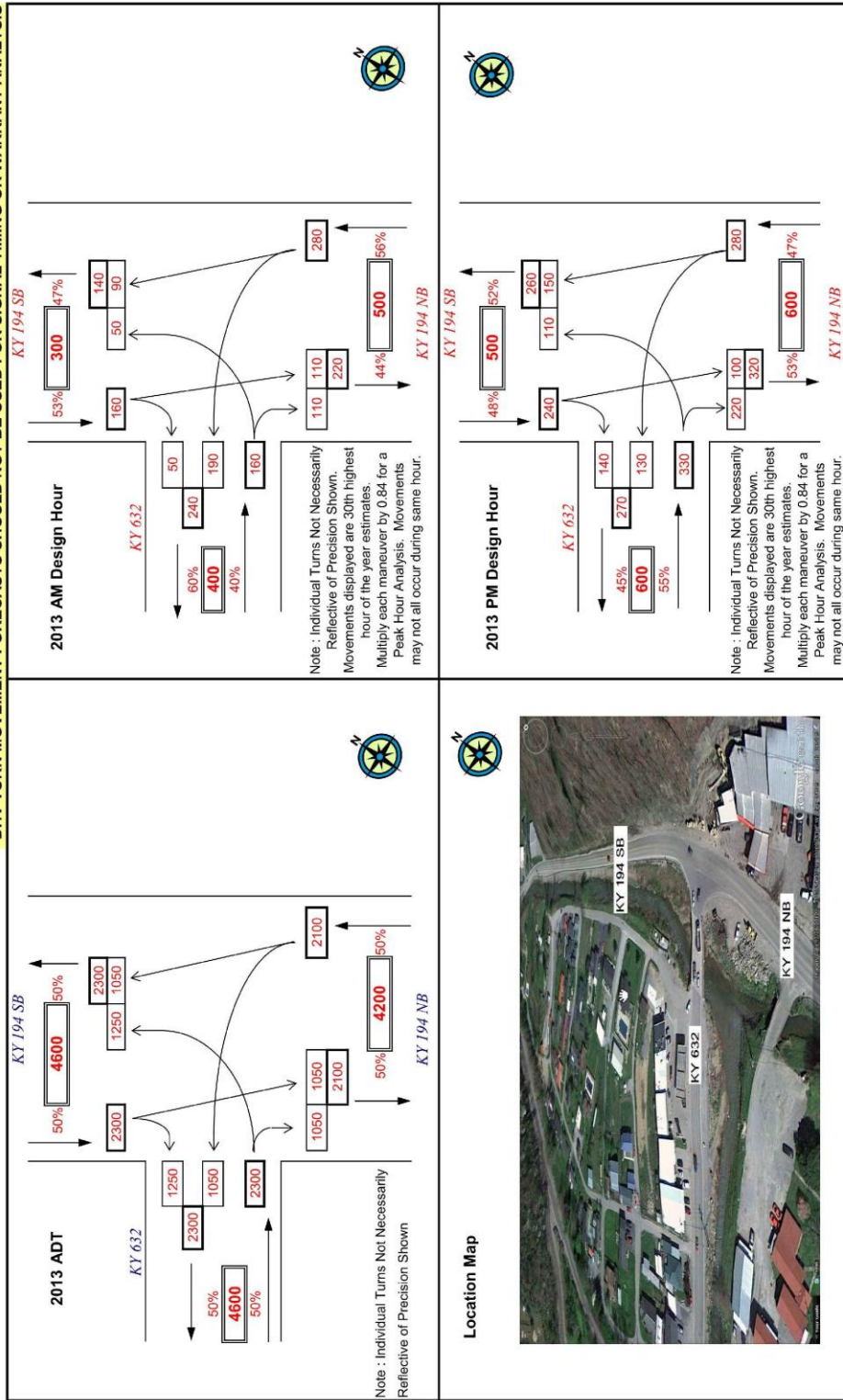


Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
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PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2013 ADT and Design Hour Volumes Build
 INTERSECTION: T8: KY 632 @ KY 194 Phelps

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



2040 TURNING MOVEMENTS

T1: KY 194 AT US 119 RAMP

T2: KY 194 AT KELLOGG'S

T3: KY 194 AT KIMPER ELEMENTARY

T4: KY 194 AT KY 632 (KIMPER)

T5: KY 632 @ PHELPS BUS GARAGE

T6: KY 632 @ PHELPS HIGH SCHOOL

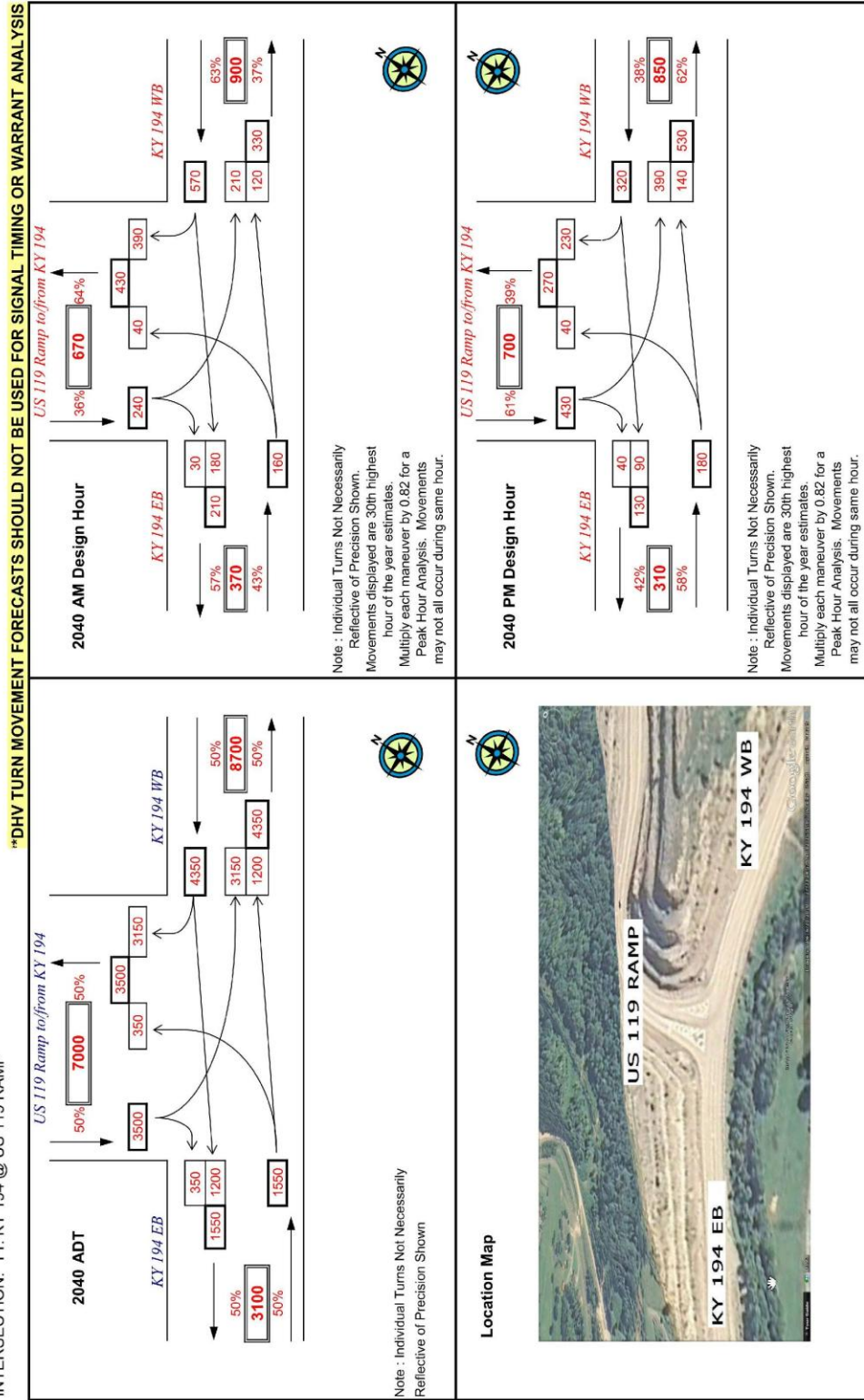
T7: KY 632 @ PHELPS ELEMENTARY

T8: KY 632 @ KY 194 (PHELPS)

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

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PROJECT: KY 194/KY 632 Improvements
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T1: KY 194 @ US 119 RAMP

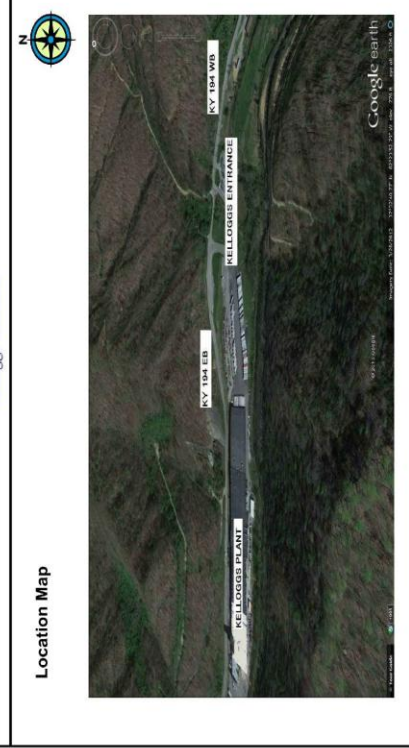
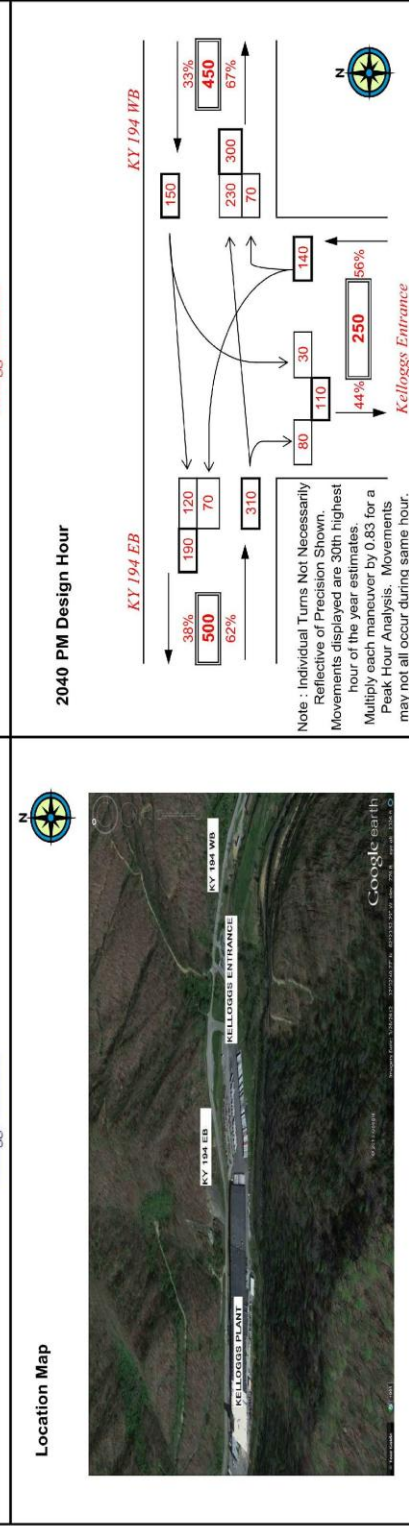
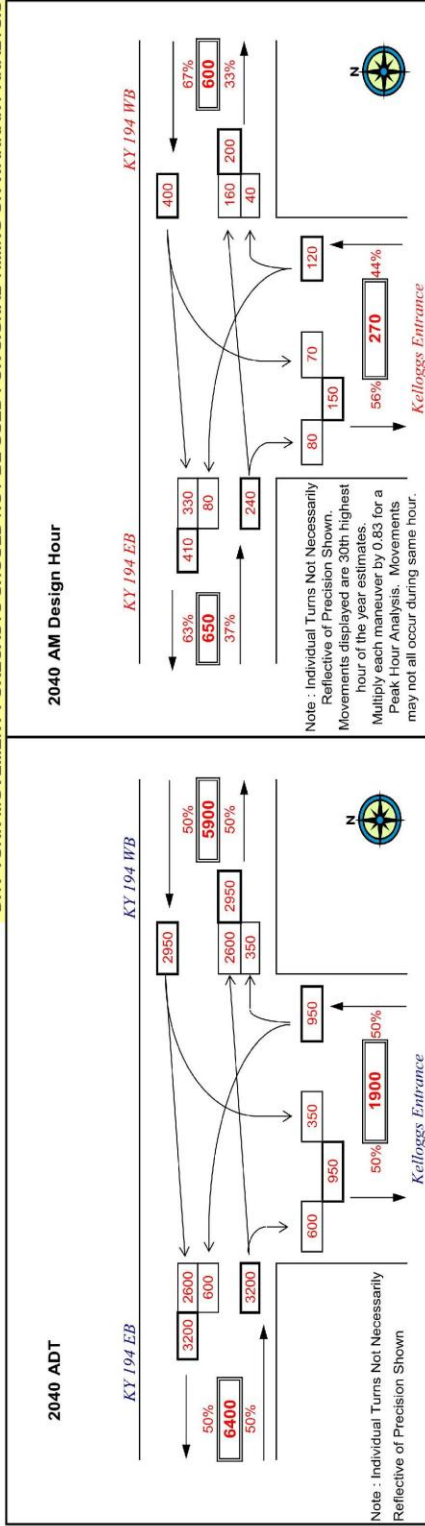


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PROJECT: KY 194/KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T2: KY 194 @ KELLOGGS ENTRANCE

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

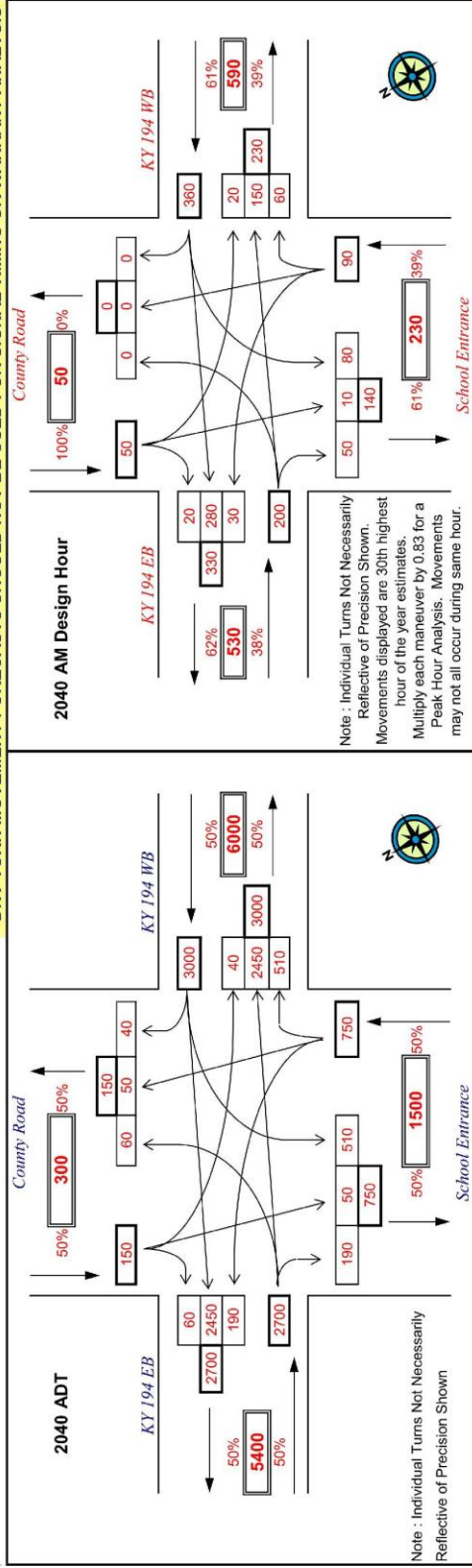


Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
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PROJECT: KY 194/KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T3: KY 194 @ Kimper Elem School

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

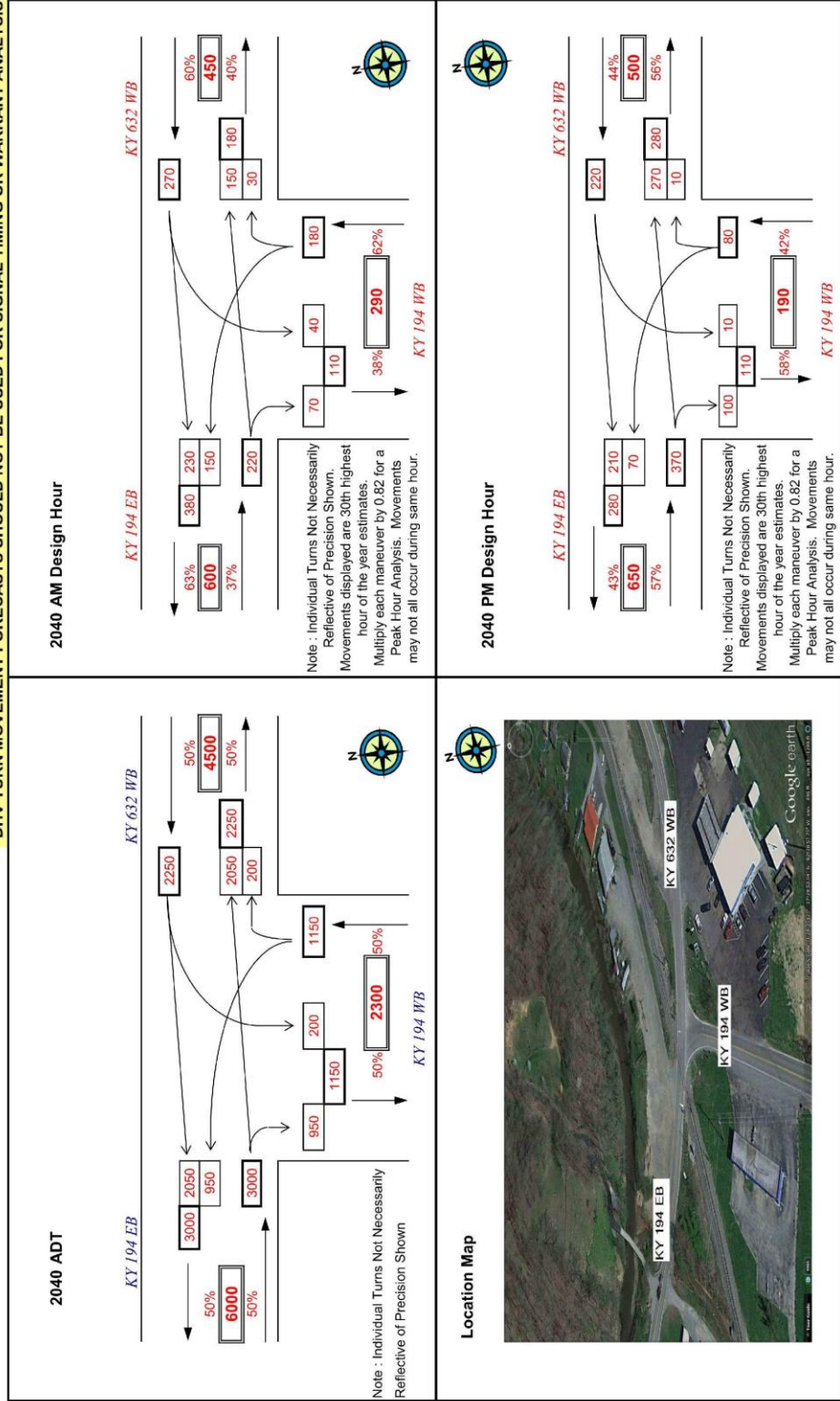
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PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T4: KY 194 @ KY 632 Kimper

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

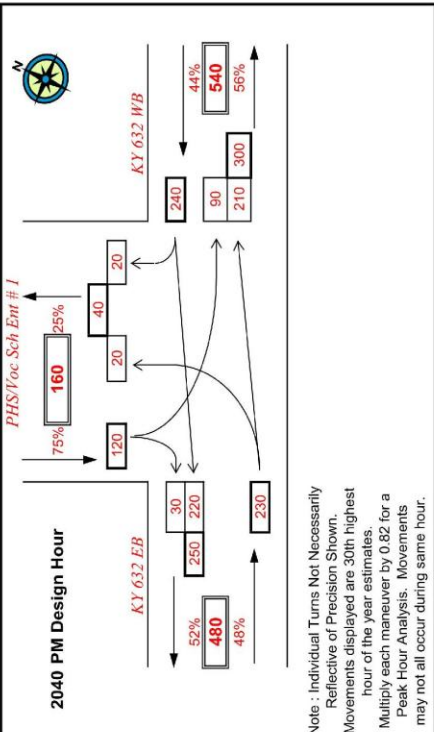
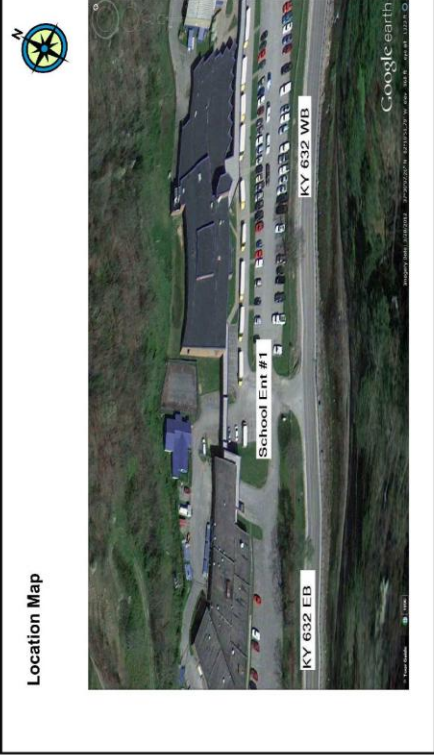
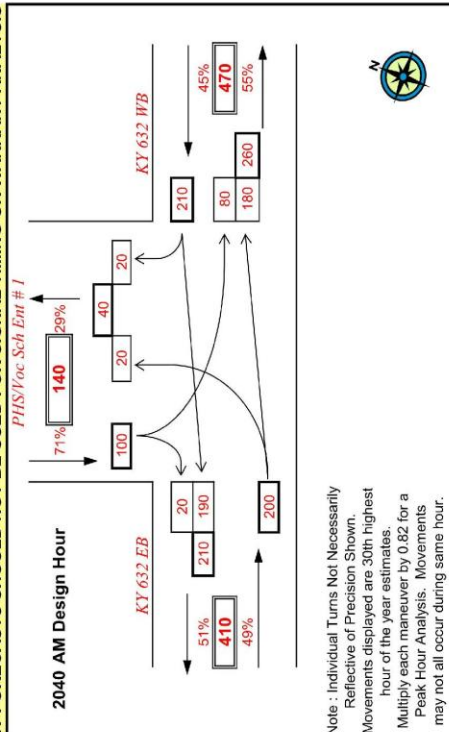
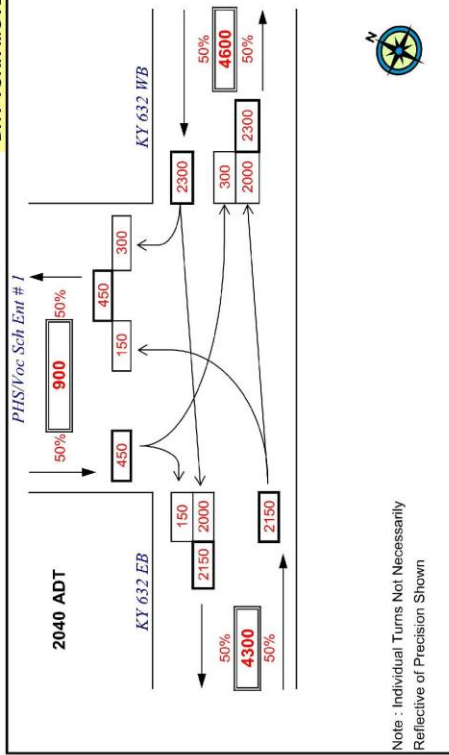


Traffic Forecast Technical Report
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NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: KY 194/ KY 632 IMPROVEMENT
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T5: KY 632 @ Phelps Sch Bus Garage

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

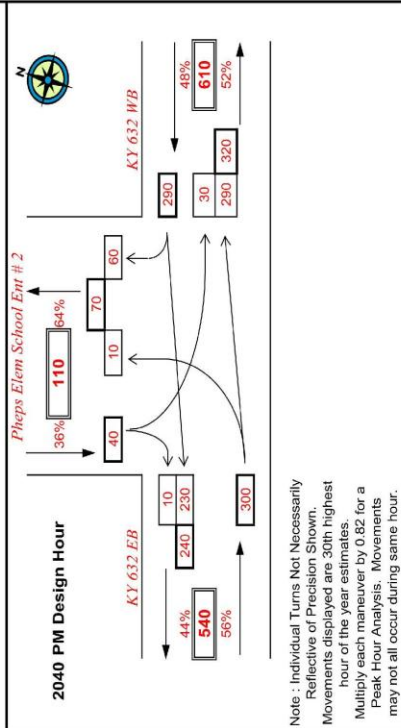
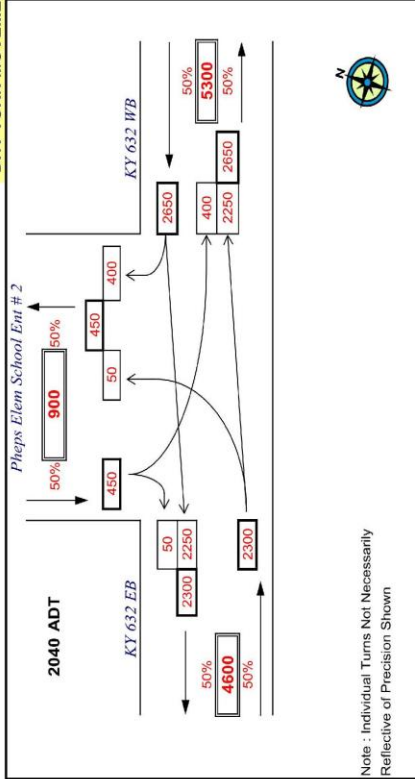
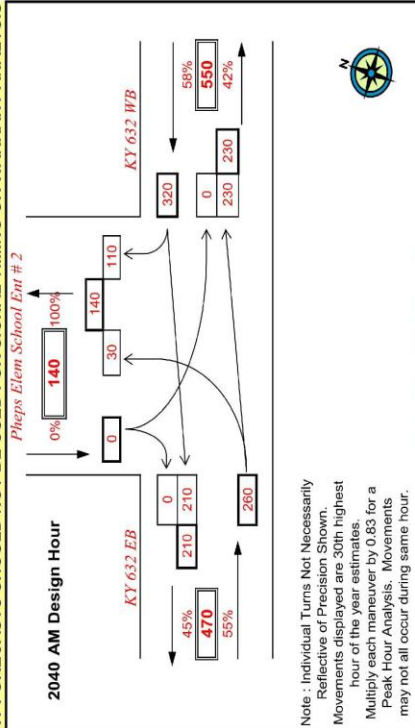


Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: KY 194 / KY 632 IMPROVEMENT
 ITEM NUMBER: N/A
 MARS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T6:KY 632 @ Phelps Elem School Ent # 2

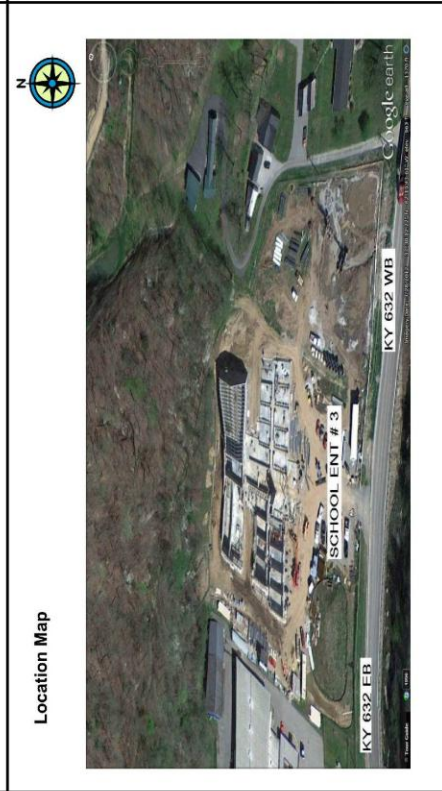
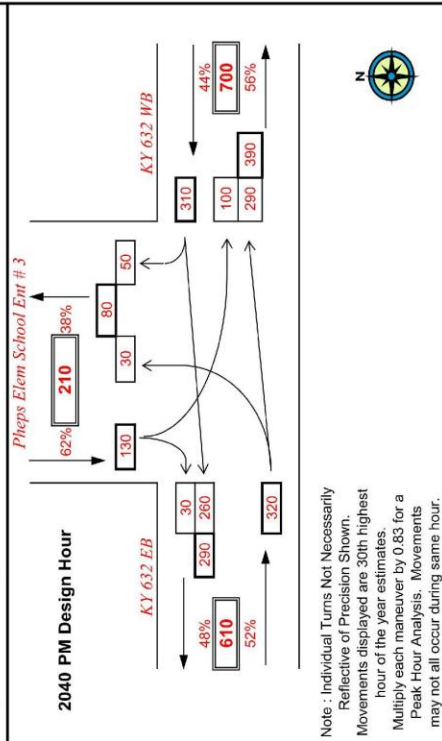
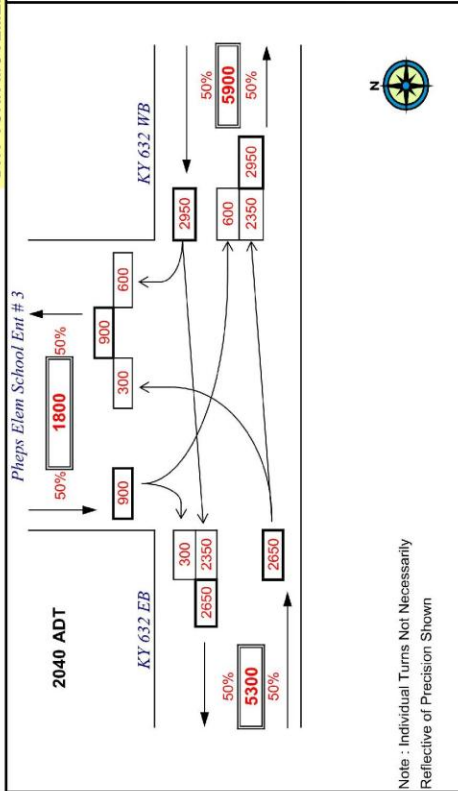
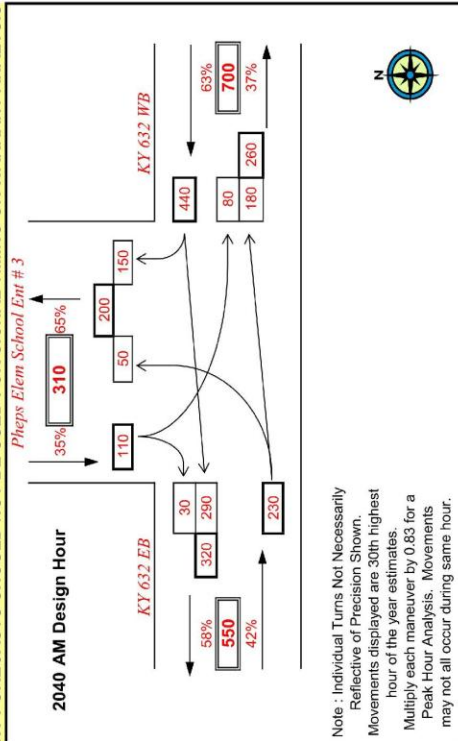
***DHV TURN MOVEMENT FORECASTS SHOULD NOT BE USED FOR SIGNAL TIMING OR WARRANT ANALYSIS**



Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MARKS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T7:KY 632 @ Phelps Elem School Ent #3

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

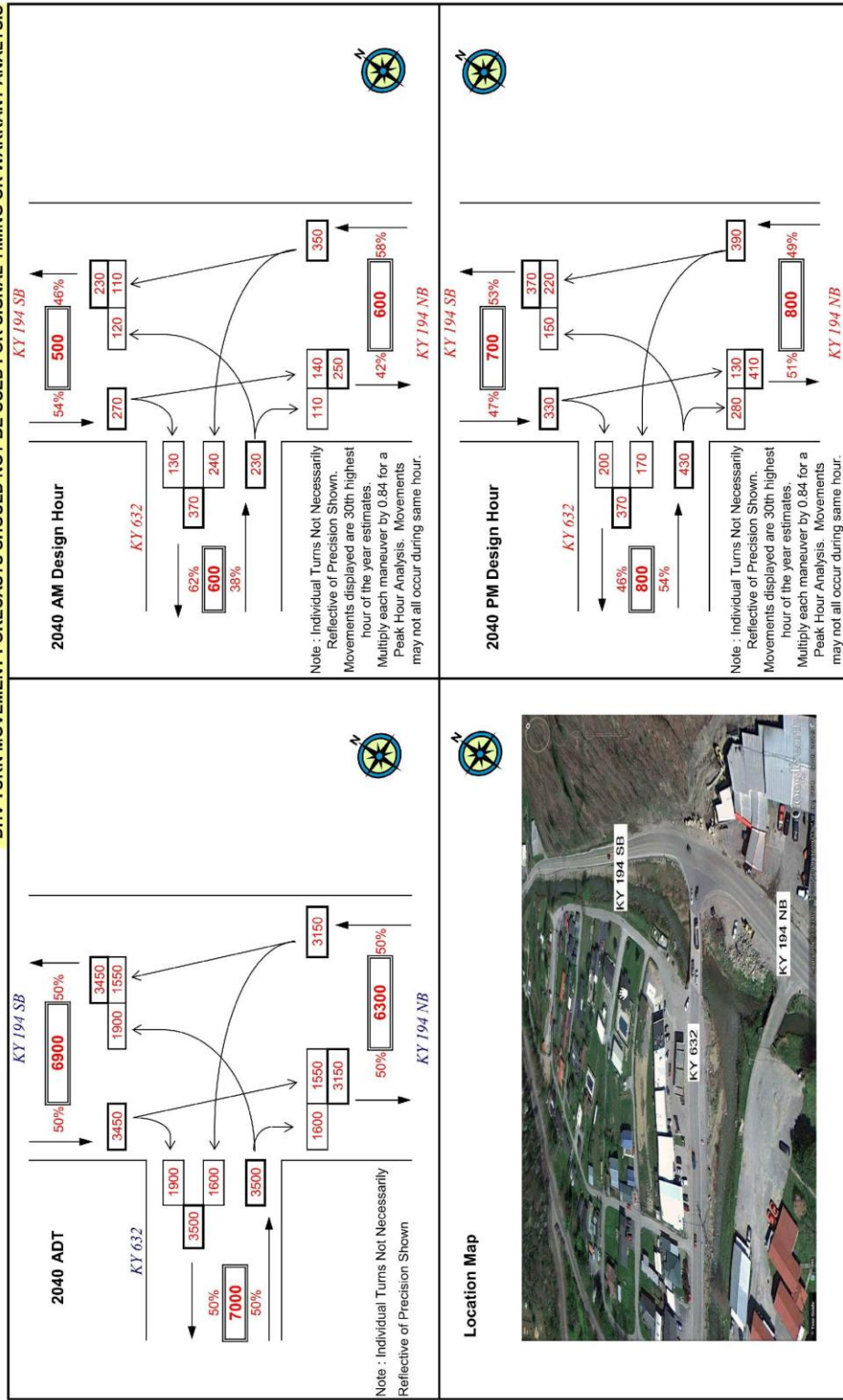


Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

NOTE: K-Factors, Directional Distributions, and Peak Hour Factors were determined from a 2008 Turning Movement Count. AM and PM DHVs represent 30th highest hour estimates for each turn maneuver.

PROJECT: KY 194/ KY 632 IMPROVEMENTS
 ITEM NUMBER: N/A
 MAPS NUMBER: N/A
 REQUEST DATE: 11/26/2013
 ANALYST: J.BALAJI
 SCENARIO: 2040 ADT and Design Hour Volumes Build
 INTERSECTION: T8: KY 632 @ KY 194 Phelps

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



APPENDIX B

ESAL FORECAST SUMMARY SHEETS

SEGMENT 1: KY 194 MP 17.9 TO 19.0

SEGMENT 2: KY 194 MP 19.0 TO 26.67

SEGMENT 3: KY 632 MP 0.0 TO 11.398

SEGMENT 4: KY 194 MP 11.398 TO 14.02

Traffic Forecast Technical Report
Pike County: KY 194 / KY 632 Improvements
Item No. N/A

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

ROUTE ID:

County	Pike	Date	01/29/14
Road Name	KY 194	Forecaster	Jay Balaji
Functional Class	6 - Rural Minor Arterial	MARS No.	N/A
Project Description	Improvements from KY 194 M.P 17.9 to M.P 26.67 and from KY 632 M.P 0.0 to M.P	Item No.	N/A
Scenario	Build	Route No.	KY 194
Segment Description	Segment 1-KY 194 from MP 17.9 to MP 19.0	Beg. MP	17.9
		End MP	19
		T.F. No.	13.045
		No. of Lanes	2
		1 or 2 way	2

REFERENCES:

Previous Forecasts	None	K- Factor Value	10.0%
Traffic Volume Milepoint	TM 1 N/A	K-Factor Source	093298
Truck Percent Milepoint	098281 20.5	PHF	0.85
ESAL Information	20.5	Full Route Unique Identifier	098-KY-0194 -000
Growth Rate	1.50%		

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2013		2020	2030	2040
Volume (AADT)	5800	1.50%	6400	7500	8700
Percent Trucks (%T)	9.9%	0.5%	10%	11%	11%
Number of Trucks	580	2.0%	640	830	960
Percent Trucks Hauling Coal (%CT)	27%	-1.9%	24%	19%	16%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.020	0.00%	3.020	3.020	3.020
ESALs/Axle (ESAL/A)	0.260	1.60%	0.291	0.341	0.399
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	5.123	0.00%	5.123	5.123	5.123
ESALs/Axle (ESAL/CA)	3.3	0.00%	3.300	3.300	3.300

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 12,300,000

General Comments:

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

Improvements on KY 194/KY 632 (Segment 1)

Year	ADT	Car %	Truck %	CT%	AX/T	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2020	6,437	89.7%	10.3%	23.41%	3.02	0.29	5,123	3.3	0.500	564,705
2021	6,534	89.7%	10.3%	22.95%	3.02	0.30	5,123	3.3	0.500	568,242
2022	6,632	89.6%	10.4%	22.50%	3.02	0.30	5,123	3.3	0.500	571,916
2023	6,731	89.6%	10.4%	22.05%	3.02	0.30	5,123	3.3	0.500	575,729
2024	6,832	89.5%	10.5%	21.62%	3.02	0.31	5,123	3.3	0.500	579,688
2025	6,935	89.5%	10.5%	21.20%	3.02	0.31	5,123	3.3	0.500	583,797
2026	7,039	89.4%	10.6%	20.78%	3.02	0.32	5,123	3.3	0.500	588,063
2027	7,144	89.3%	10.7%	20.37%	3.02	0.32	5,123	3.3	0.500	592,491
2028	7,251	89.3%	10.7%	19.97%	3.02	0.33	5,123	3.3	0.500	597,088
2029	7,360	89.2%	10.8%	19.58%	3.02	0.34	5,123	3.3	0.500	601,859
2030	7,471	89.2%	10.8%	19.19%	3.02	0.34	5,123	3.3	0.500	606,811
2031	7,583	89.1%	10.9%	18.81%	3.02	0.35	5,123	3.3	0.500	611,950
2032	7,696	89.1%	10.9%	18.44%	3.02	0.35	5,123	3.3	0.500	617,284
2033	7,812	89.0%	11.0%	18.08%	3.02	0.36	5,123	3.3	0.500	622,820
2034	7,929	89.0%	11.0%	17.72%	3.02	0.36	5,123	3.3	0.500	628,566
2035	8,048	88.9%	11.1%	17.37%	3.02	0.37	5,123	3.3	0.500	634,528
2036	8,169	88.9%	11.1%	17.03%	3.02	0.37	5,123	3.3	0.500	640,715
2037	8,291	88.8%	11.2%	16.70%	3.02	0.38	5,123	3.3	0.500	647,136
2038	8,415	88.7%	11.3%	16.37%	3.02	0.39	5,123	3.3	0.500	653,799
2039	8,542	88.7%	11.3%	16.05%	3.02	0.39	5,123	3.3	0.500	660,712
2040	8,670	88.6%	11.4%	15.73%	3.02	0.40	5,123	3.3	0.500	667,886

5-yr ESALS
2,900,000

10-yr ESALS
5,900,000

15-yr ESALS
9,000,000

20-yr ESALS
12,300,000

*Traffic Forecast Technical Report
Pike County: KY 194 / KY 632 Improvements
Item No. N/A*

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

ROUTE ID:

County	Pike
Road Name	KY 194
Functional Class	6 - Rural Minor Arterial
Project Description	Improvements from KY 194 M.P 17.9 to M.P 26.67 and from KY 632 M.P 0.0 to M.P 26.67
Scenario	Build
Segment Description	Segment 2-KY 194 from MP 19.0 to MP 26.67

Date	01/06/14
Forecaster	Jay Balaji
MARS No.	N/A
Item No.	N/A
Route No.	KY 194
Beg. MP	19
End MP	26.65
T.F. No.	13.045
No. of Lanes	2
1 or 2 way	2

REFERENCES:

Previous Forecasts	None
Traffic Volume Milepoint	TM 2 & 098281 N/A & 20.5
Truck Percent Milepoint	098281 20.5
ESAL Information	20.5
Growth Rate	1.00%

K- Factor Value	10.0%
K-Factor Source	093298
PHF	0.85

Full Route Unique Identifier
098-KY-0194 -000

TRAFFIC PARAMETERS:

		Present Year	Growth Rate	Construction Year	Median Year	Design Year
		2013		2020	2030	2040
Volume	(AADT)	4900	1.00%	5300	5800	6400
Percent Trucks	(%T)	9.9%	0.5%	10%	11%	11%
Number of Trucks		490	1.5%	530	640	700
Percent Trucks Hauling Coal	(%CT)	3%	-1.4%	3%	2%	2%
<i>Non-Coal Trucks:</i>						
Axles/Truck	(A/T)	3.020	0.50%	3.127	3.287	3.455
ESALs/Axle	(ESAL/A)	0.260	1.60%	0.291	0.341	0.399
<i>Coal Trucks:</i>						
Axles/Truck	(A/CT)	5.123	0.00%	5.123	5.123	5.123
ESALs/Axle	(ESAL/CA)	3.3	0.00%	3.300	3.300	3.300

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 3,600,000

General Comments:

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

Improvements on KY 194/KY 632 (Segment 2)

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXIT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2020	5,438	89.7%	10.3%	4879	559	2.68%	3.13	0.29	5.123	3.3	0.500	141,005
2021	5,520	89.7%	10.3%	4949	571	2.63%	3.14	0.30	5.123	3.3	0.500	144,873
2022	5,603	89.6%	10.4%	5021	582	2.58%	3.16	0.30	5.123	3.3	0.500	148,902
2023	5,687	89.6%	10.4%	5093	594	2.53%	3.17	0.30	5.123	3.3	0.500	153,098
2024	5,772	89.5%	10.5%	5166	606	2.48%	3.19	0.31	5.123	3.3	0.500	157,467
2025	5,859	89.5%	10.5%	5241	618	2.43%	3.21	0.31	5.123	3.3	0.500	162,017
2026	5,946	89.4%	10.6%	5316	630	2.38%	3.22	0.32	5.123	3.3	0.500	166,756
2027	6,036	89.3%	10.7%	5393	643	2.33%	3.24	0.32	5.123	3.3	0.500	171,691
2028	6,126	89.3%	10.7%	5470	656	2.29%	3.25	0.33	5.123	3.3	0.500	176,831
2029	6,218	89.2%	10.8%	5549	669	2.24%	3.27	0.34	5.123	3.3	0.500	182,183
2030	6,311	89.2%	10.8%	5629	682	2.20%	3.29	0.34	5.123	3.3	0.500	187,758
2031	6,406	89.1%	10.9%	5710	696	2.15%	3.30	0.35	5.123	3.3	0.500	193,563
2032	6,502	89.1%	10.9%	5792	710	2.11%	3.32	0.35	5.123	3.3	0.500	199,610
2033	6,600	89.0%	11.0%	5875	724	2.07%	3.34	0.36	5.123	3.3	0.500	205,907
2034	6,699	89.0%	11.0%	5960	739	2.03%	3.35	0.36	5.123	3.3	0.500	212,465
2035	6,799	88.9%	11.1%	6045	754	1.99%	3.37	0.37	5.123	3.3	0.500	219,295
2036	6,901	88.9%	11.1%	6132	769	1.95%	3.39	0.37	5.123	3.3	0.500	226,408
2037	7,005	88.8%	11.2%	6220	784	1.91%	3.40	0.38	5.123	3.3	0.500	233,816
2038	7,110	88.7%	11.3%	6310	800	1.88%	3.42	0.39	5.123	3.3	0.500	241,532
2039	7,216	88.7%	11.3%	6400	816	1.84%	3.44	0.39	5.123	3.3	0.500	249,567
2040	7,325	88.6%	11.4%	6492	832	1.80%	3.46	0.40	5.123	3.3	0.500	257,937

5-yr ESALS
800,000

10-yr ESALS
1,700,000

15-yr ESALS
2,700,000

20-yr ESALS
3,900,000

*Traffic Forecast Technical Report
Pike County: KY 194 / KY 632 Improvements
Item No. N/A*

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

ROUTE ID:

County	Pike	Date	01/06/14
Road Name	Upper Johns Creek Road	Forecaster	Jay Balaji
Functional Class	6 - Rural Minor Arterial	MARS No.	N/A
Project Description	Improvements From KY 194 M.P. 17.9 to M.P. 26.67 and From KY 632 M.P. 0.0 to	Item No.	N/A
Scenario	Build	Route No.	KY 632
Segment Description	Segment 3-KY 632 from MP 0 to MP 11.389	Beg. MP	0
		End MP	11.389
		T.F. No.	13.045
		No. of Lanes	2
		1 or 2 way	2

REFERENCES:

Previous Forecasts	None	K- Factor Value	11.0%
Traffic Volume Milepoint	TM 4 & 098302 N/A & 0.2	K-Factor Source	098302
Truck Percent Milepoint	098302 0.8	PHF	0.85
ESAL Information	0.8	Full Route Unique Identifier	098-KY-0632-000
Growth Rate	1.50%		

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2013		2020	2030	2040
Volume (AADT)	3000	1.50%	3300	3900	4500
Percent Trucks (%T)	12.9%	0.5%	13%	14%	15%
Number of Trucks	390	2.0%	430	550	680
Percent Trucks Hauling Coal (%CT)	10%	-2.0%	9%	7%	5%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.530	0.50%	3.655	3.842	4.039
ESALs/Axle (ESAL/A)	0.260	1.60%	0.291	0.341	0.399
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	5.123	0.00%	5.123	5.123	5.123
ESALs/Axle (ESAL/CA)	3.3	0.00%	3.300	3.300	3.300

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 4,900,000

General Comments:

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

Improvements on KY 194/KY 632 (Segment 3)

Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AXT	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALS
2020	3,330	86.7%	13.3%	2886	444	8.34%	3.66	0.29	5.123	3.3	0.500	195,630
2021	3,379	86.6%	13.4%	2927	453	8.17%	3.67	0.30	5.123	3.3	0.500	199,092
2022	3,430	86.5%	13.5%	2968	462	8.01%	3.69	0.30	5.123	3.3	0.500	202,700
2023	3,482	86.5%	13.5%	3011	471	7.86%	3.71	0.30	5.123	3.3	0.500	206,461
2024	3,534	86.4%	13.6%	3053	480	7.70%	3.73	0.31	5.123	3.3	0.500	210,380
2025	3,587	86.3%	13.7%	3097	490	7.55%	3.75	0.31	5.123	3.3	0.500	214,464
2026	3,641	86.3%	13.7%	3141	500	7.40%	3.77	0.32	5.123	3.3	0.500	218,721
2027	3,695	86.2%	13.8%	3185	510	7.26%	3.79	0.32	5.123	3.3	0.500	223,157
2028	3,751	86.1%	13.9%	3230	520	7.11%	3.80	0.33	5.123	3.3	0.500	227,779
2029	3,807	86.1%	13.9%	3276	531	6.97%	3.82	0.34	5.123	3.3	0.500	232,596
2030	3,864	86.0%	14.0%	3323	541	6.84%	3.84	0.34	5.123	3.3	0.500	237,616
2031	3,922	85.9%	14.1%	3370	552	6.70%	3.86	0.35	5.123	3.3	0.500	242,847
2032	3,981	85.9%	14.1%	3418	563	6.57%	3.88	0.35	5.123	3.3	0.500	248,299
2033	4,041	85.8%	14.2%	3466	575	6.44%	3.90	0.36	5.123	3.3	0.500	253,979
2034	4,101	85.7%	14.3%	3515	586	6.31%	3.92	0.36	5.123	3.3	0.500	259,899
2035	4,163	85.6%	14.4%	3565	598	6.19%	3.94	0.37	5.123	3.3	0.500	266,068
2036	4,225	85.6%	14.4%	3615	610	6.07%	3.96	0.37	5.123	3.3	0.500	272,496
2037	4,289	85.5%	14.5%	3666	622	5.95%	3.98	0.38	5.123	3.3	0.500	279,194
2038	4,353	85.4%	14.6%	3718	635	5.83%	4.00	0.39	5.123	3.3	0.500	286,174
2039	4,418	85.3%	14.7%	3771	647	5.72%	4.02	0.39	5.123	3.3	0.500	293,447
2040	4,484	85.3%	14.7%	3824	660	5.60%	4.04	0.40	5.123	3.3	0.500	301,025

5-yr ESALS
1,000,000

10-yr ESALS
2,200,000

15-yr ESALS
3,400,000

20-yr ESALS
4,900,000

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

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

ROUTE ID:

County	Pike	Date	01/29/14
Road Name	Phelps 632 Road	Forecaster	Jay Balaji
Functional Class	6 - Rural Minor Arterial	MARS No.	N/A
Project Description	Improvements From KY 194 M.P. 17.9 to M.P. 26.67 and From KY 632 M.P. 0.0 to	Item No.	N/A
Scenario	Build	Route No.	KY 632
Segment Description	Segment 4-KY 632 from MP 11.389 to MP 14.02	Beg. MP	11.389
		End MP	14.02
		T.F. No.	13.045
		No. of Lanes	2
		1 or 2 way	2

REFERENCES:

Previous Forecasts	None	K- Factor Value	11.7%
Traffic Volume	TM 8 & 098119	K-Factor Source	098302
Milepoint	13.9	PHF	0.85
Truck Percent	098302	Full Route Unique Identifier	098-KY-0632-000
Milepoint	0.8		
ESAL Information	0.8		
Growth Rate	1.50%		

TRAFFIC PARAMETERS:

	Present Year	Growth Rate	Construction Year	Median Year	Design Year
	2013		2020	2030	2040
Volume (AADT)	4600	1.50%	5100	5900	7000
Percent Trucks (%T)	12.9%	0.5%	13%	14%	15%
Number of Trucks	590	2.0%	660	830	1100
Percent Trucks Hauling Coal (%CT)	11%	-2.1%	10%	8%	6%
<i>Non-Coal Trucks:</i>					
Axles/Truck (A/T)	3.530	0.50%	3.655	3.842	4.039
ESALs/Axle (ESAL/A)	0.260	1.60%	0.291	0.341	0.399
<i>Coal Trucks:</i>					
Axles/Truck (A/CT)	5.123	0.00%	5.123	5.123	5.123
ESALs/Axle (ESAL/CA)	3.3	0.00%	3.300	3.300	3.300

ESAL CALCULATIONS: SEE ATTACHED ESAL CALCULATION SHEET

Design ESALs in Critical Lane 8,000,000

General Comments:

Traffic Forecast Technical Report
 Pike County: KY 194 / KY 632 Improvements
 Item No. N/A

Improvements on KY 194/KY 632 (Segment 4)													
Year	ADT	Car %	Truck %	Cars	Trucks	CT%	AX/T	ESAL/AX	AX/CT	ESAL/CA	LDF	ESALs	
2020	5,105	86.7%	13.3%	4425	680	9.70%	3.66	0.29	5.123	3.3	0.500	326,760	
2021	5,182	86.6%	13.4%	4488	694	9.51%	3.67	0.30	5.123	3.3	0.500	332,031	
2022	5,260	86.5%	13.5%	4552	708	9.32%	3.69	0.30	5.123	3.3	0.500	337,525	
2023	5,338	86.5%	13.5%	4616	722	9.14%	3.71	0.30	5.123	3.3	0.500	343,252	
2024	5,419	86.4%	13.6%	4682	737	8.96%	3.73	0.31	5.123	3.3	0.500	349,221	5-yr ESALs 1,700,000
2025	5,500	86.3%	13.7%	4748	751	8.78%	3.75	0.31	5.123	3.3	0.500	355,443	
2026	5,582	86.3%	13.7%	4816	767	8.61%	3.77	0.32	5.123	3.3	0.500	361,927	
2027	5,666	86.2%	13.8%	4884	782	8.44%	3.79	0.32	5.123	3.3	0.500	368,685	
2028	5,751	86.1%	13.9%	4953	798	8.27%	3.80	0.33	5.123	3.3	0.500	375,730	
2029	5,837	86.1%	13.9%	5024	814	8.11%	3.82	0.34	5.123	3.3	0.500	383,071	10-yr ESALs 3,600,000
2030	5,925	86.0%	14.0%	5095	830	7.95%	3.84	0.34	5.123	3.3	0.500	390,723	
2031	6,014	85.9%	14.1%	5167	847	7.80%	3.86	0.35	5.123	3.3	0.500	398,697	
2032	6,104	85.9%	14.1%	5240	864	7.64%	3.88	0.35	5.123	3.3	0.500	407,008	
2033	6,196	85.8%	14.2%	5315	881	7.49%	3.90	0.36	5.123	3.3	0.500	415,670	
2034	6,288	85.7%	14.3%	5390	899	7.34%	3.92	0.36	5.123	3.3	0.500	424,697	15-yr ESALs 5,700,000
2035	6,383	85.6%	14.4%	5466	917	7.20%	3.94	0.37	5.123	3.3	0.500	434,105	
2036	6,479	85.6%	14.4%	5543	935	7.06%	3.96	0.37	5.123	3.3	0.500	443,909	
2037	6,576	85.5%	14.5%	5622	954	6.92%	3.98	0.38	5.123	3.3	0.500	454,127	
2038	6,674	85.4%	14.6%	5701	973	6.78%	4.00	0.39	5.123	3.3	0.500	464,775	
2039	6,774	85.3%	14.7%	5782	993	6.65%	4.02	0.39	5.123	3.3	0.500	475,872	20-yr ESALs 8,000,000
2040	6,876	85.3%	14.7%	5864	1013	6.52%	4.04	0.40	5.123	3.3	0.500	487,436	