

**Rappahannock-Rapidan Regional Commission
2010 Travel Time Survey**



Rappahannock Rapidan
Regional Commission
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June 16, 2010

Introduction

Travel time, or the time required to traverse a route between any two points, is a fundamental measure in transportation. Elements of a travel time study--operating speed, elapsed travel time and duration and frequency of delays are all performance measures that convey a broader picture of how traffic moves. Beginning with the 2007 study and continuing in through this 2010 program, the Rappahannock Rapidan Commission (RRRC) initiated the travel time process for the Planning District Nine (Culpeper, Fauquier, Madison, Orange, Rappahannock counties) region.

The primary utility of the travel time study is to compare over time how traffic flows on a corridor. RRRC intends to perform these studies annually, choosing different corridors to review until a period of five years has elapsed. Therefore, data collected during the initial corridor analyses will serve as the base line for the future measurements. Starting in the sixth year of the study, the same corridor segments that were analyzed five years previous will be re-visited, i.e. segments that were driven in 2007 will be revisited in 2012, 2008 in 2013, 2009 in 2014 and so forth.

RRRC will use the travel time studies, in conjunction with other data such as traffic counts and level of service information, to create an overall Congestion Management System for the PD9 region. Congestion Management Systems are mandated by federal law for metropolitan planning areas and are a useful tool to evaluate and monitor traffic congestion.

Methodology

The “test vehicle” technique was used during this study. This method consists of a vehicle specifically dispatched to drive with the traffic stream for the express purpose of data collection. A stopwatch was started at the beginning of each test run to record the cumulative lapsed time between the starting and end points along each corridor segment. When the test vehicle was stopped or forced to travel slowly (10 miles per hour or below), a second stopwatch was used to measure the duration of each stop/delay. In addition, the location of each stop/delay was recorded. Two data collection runs were made in each direction during the morning (7 to 9 a.m.) and afternoon (4 to 6 p.m.) peak hours for each segment. As much as possible, the test car was driven at the legally posted speed limit and, on segments of four-lane divided highways, in the right lane.

The average travel characteristics are defined below:

Travel Time – Number of minutes needed to travel between two points. Travel time is equivalent to the addition of running time and stop/delay time (*see definitions below*).

Running Time – The time period when the vehicle is in motion.

Stop/Delay Time – The time period when vehicle has stopped moving or has almost stopped moving.

Average Travel Speed – The average speed of travel between two control points, including delays. The average travel speed is computed by taking the length of the highway segment under consideration and dividing it by the average travel time of that segment.

Average Running Speed – The average speed of travel between two control points only when the vehicle is in motion. The average running speed is computed by taking the length of the highway segment under consideration and dividing it by the average running time of that segment.

Study Corridor Segments

The fourth RRRC travel time study measured speed and delay along two corridors – Route 20 through the Town of Orange and Orange County from the western town boundary to Route 3 at Wilderness and Route 28 in Fauquier County from the intersection with Routes 15 & 29 to the county boundary with Prince William County. The segment lengths corresponded with sections delineated by the VDOT Traffic Engineering Division to perform their annual average daily traffic volume estimates.

The two segments measured were 23.4 miles on Route 20 (Corridor A) and 13.7 miles on Route 28 (Corridor B). Taken together these segments are approximately 37 miles in length.

Both corridors can generally be described as rural highways, although Corridor A travels through a small urban area in the Town of Orange. Both study segments are two-lane, non-divided highways. Corridor A does have some areas with a dedicated middle turning lane. The two corridors were selected for study due to the potential for changing growth patterns in each area as well as safety concerns. Corridor A (Route 20) has been studied at various times in the past, including in 2006 and 2007 as part of a two-phased study of the route, inclusive of the Town of Orange and the corridor east to Route 3 in an effort to identify safety improvements along the corridor. Corridor B (Route 28) has seen recent growth near its southern and western terminus around the Bealeton Service District and additional growth is anticipated in that area.

Corridor A contained varying speed limits. Thus, an average posted speed limit was computed. Calculations can be found in Table 1. In Corridor A, speed limits varied from 25 mph to 55 mph. The westbound segment with a 55 mph posted speed limit also was 1/2 of a mile longer than the eastbound 55 mph segment (near the village of Unionville and the intersection with Route 522). There was also an active school zone in Corridor A during the AM with a 4/10 mile segment of 35 mph speeds for both the eastbound and westbound directions. In corridor B, the speed limit for the entire corridor was 45 mph. There were two school zones in this corridor with a 35 mph speed limit. One, near Bealeton, was not active during any of the trips, while the second, located at Southeastern School, was active during westbound trip #2.

Results

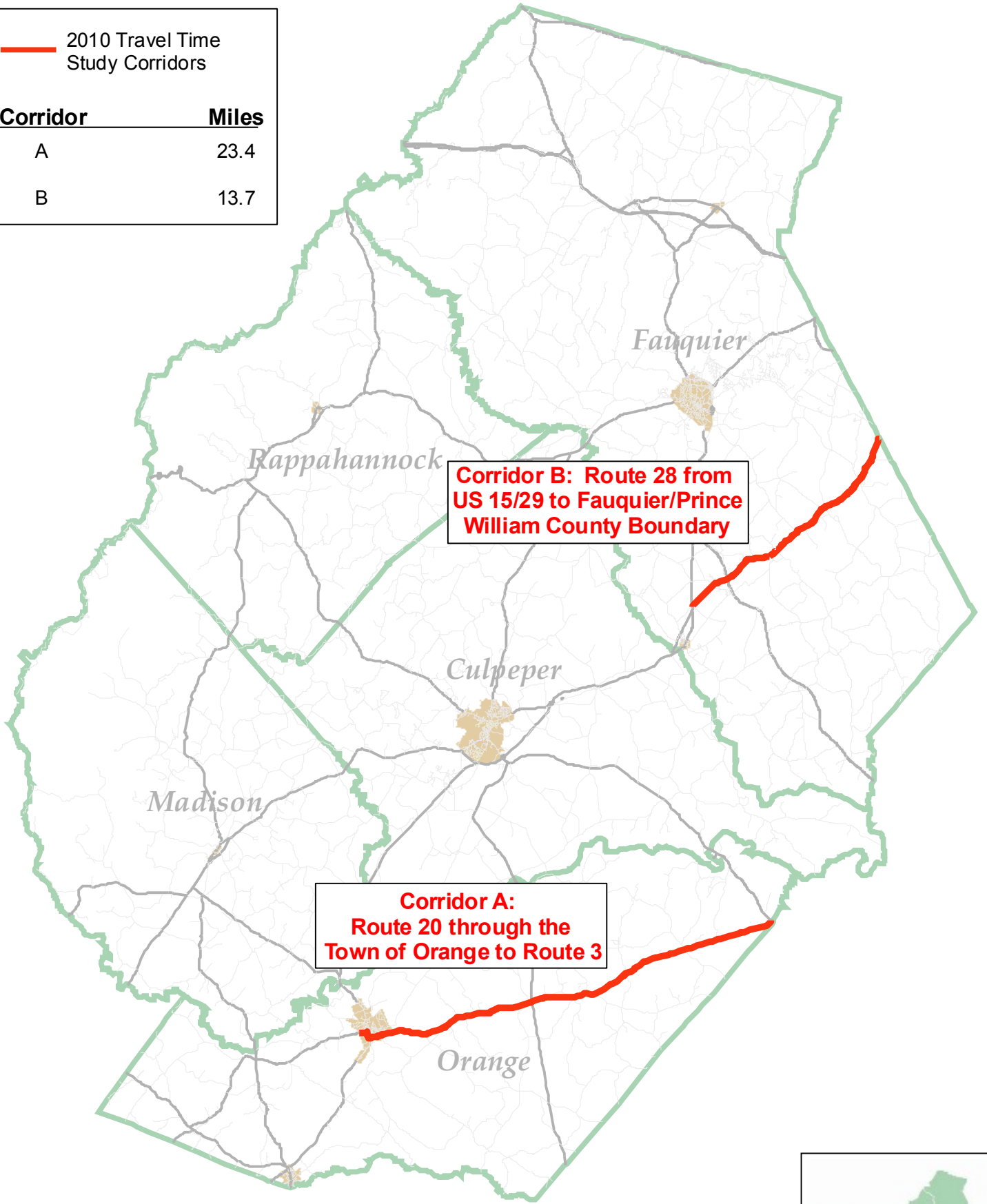
The results of the travel time analysis are summarized in the following tables. Tables 2 through 7 detail the segment analyzed, segment length, travel time, running time, stop/delay time, average posted speed limit, average travel speed, average running speed, difference of average travel speed from posted speed limit during difference of average running speed from posted speed limit and average number of traffic signals per mile of segment analyzed. Tables 8 through 13 specifically delineate the stops/delay in each segment by cause, location, and time of the stop/delay. Delays in each segment corridor varied, with traffic signals the most prevalent cause for delay. Stop signs and vehicle left turns on two-lane segments also contributed delays.

In general, both corridors perform well at the present time. Traffic moves freely and without delay, except where there are traffic signals or stop signs installed. In Corridor A, there were no delays longer than 53 seconds. The longest points of delay in Corridor B were over 1 minute in length at traffic signals (see Tables 8-9), and there were two instances where the test vehicle waited through two cycles of a traffic light in Corridor B. No location resulted in a delay on every trip.

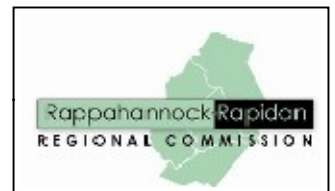
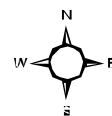
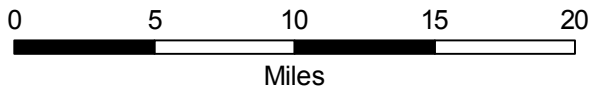
In Corridor A, no major differences were noted between morning and afternoon peak hour trips or between eastbound or westbound trips in the corridor. In Corridor B, traffic average travel and running speeds were two to three miles per hour faster in the AM peak versus the PM peak hours. In the long areas of each corridor without traffic signals (east of the Town of Orange in Corridor A and north and east of Bealeton in Corridor B), traffic generally wanted to move faster than the posted speed limit, as evidenced by other vehicles utilizing passing zones to go around the test vehicle.

2010 RRRC Travel Time Study Corridors

2010 Travel Time Study Corridors	
Corridor	Miles
A	23.4
B	13.7



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2010 RRRC Travel Time Study: Corridor A

Segment Length: 23.4 Miles

Avg Posted Speed Limit:

AM Eastbound: 51.50 mph

AM Westbound: 51.71 mph

PM Eastbound: 51.84 mph

PM Westbound: 52.29 mph

Average Travel Time Through:

Town of Orange: 5:19 (3.3 miles)

Eastbound Trip Averages

AM Peak Average Travel Time: 30:07.5

AM Peak Average Travel Speed: 46.61 mph

AM Peak Average Running Time: 28:46.5

AM Peak Average Running Speed: 48.80 mph

PM Peak Average Travel Time: 30:42.5

PM Peak Average Travel Speed: 45.72 mph

PM Peak Average Running Time: 28:51.5

PM Peak Average Running Speed: 48.65 mph

Westbound Trip Averages

AM Peak Average Travel Time: 29:38.5

AM Peak Average Travel Speed: 47.37 mph

AM Peak Average Running Time: 28:39

AM Peak Average Running Speed: 49.01 mph

PM Peak Average Travel Time: 28:36.5

PM Peak Average Travel Speed: 49.08 mph


PM Peak Average Running Time: 28:14.5

PM Peak Average Running Speed: 49.71 mph

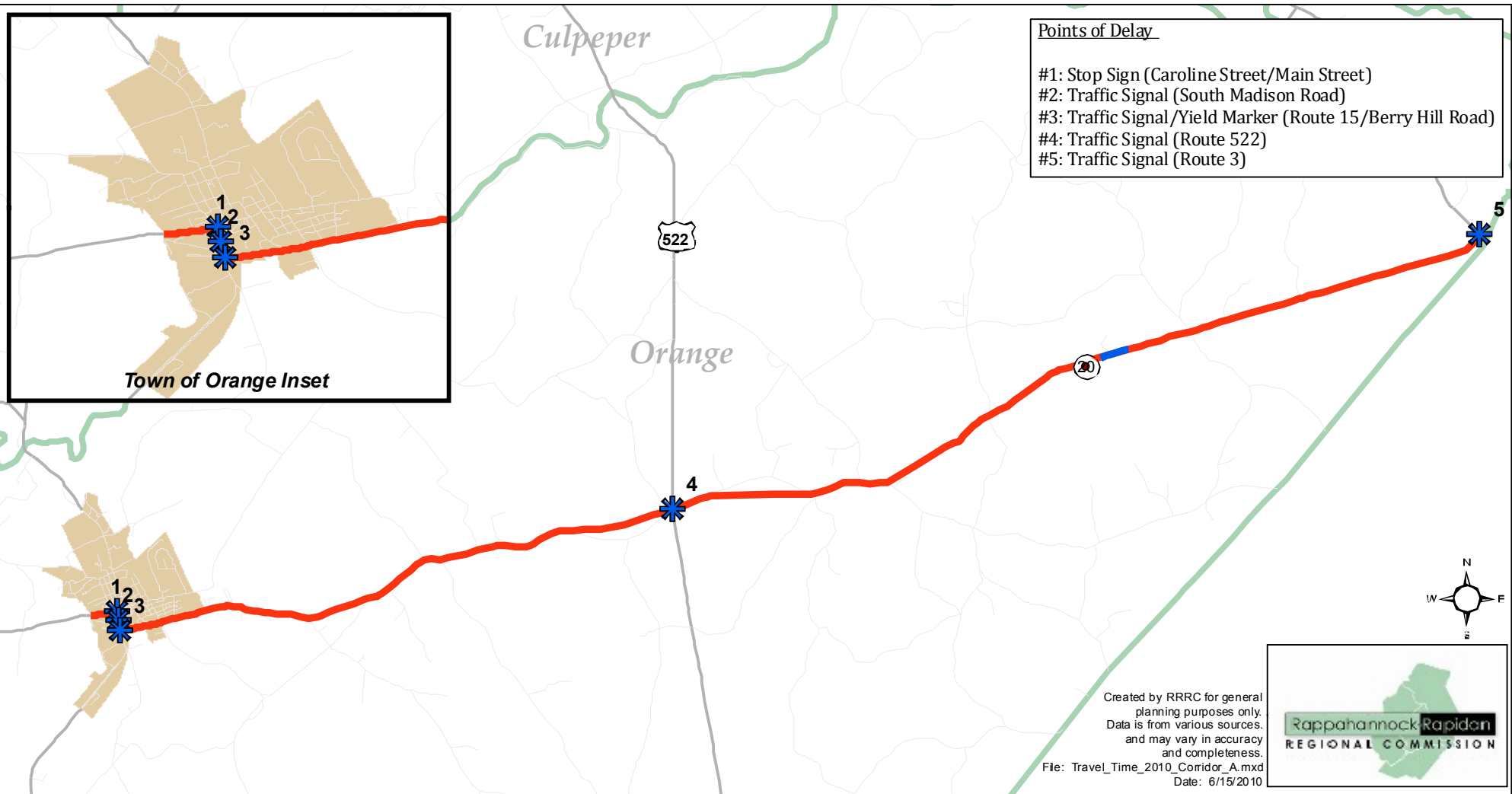
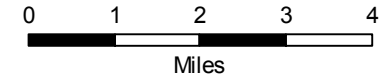
 Points of Delay

 Corridor A

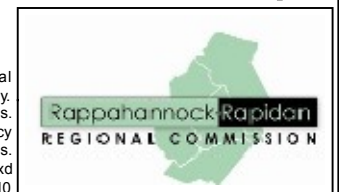
 School Zone

 County Boundary

 Town Boundary



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Date: 6/15/2010



2010 RRRC Travel Time Study: Corridor B

Segment Length: 13.7 Miles

Avg Posted Speed Limit:
 PM Westbound #2: 44.78 mph
 All Other Trips: 45 mph

Eastbound Trip Averages

AM Peak Average Travel Time: 19:29.5
 AM Peak Average Travel Speed: 40.02 mph

AM Peak Average Running Time: 18:52.5
 AM Peak Average Running Speed: 41.32 mph

PM Peak Average Travel Time: 20:19.5
 PM Peak Average Travel Speed: 38.38 mph

PM Peak Average Running Time: 19:35.5
 PM Peak Average Running Speed: 39.81 mph

Westbound Trip Averages

AM Peak Average Travel Time: 19:52
 AM Peak Average Travel Speed: 39.26 mph

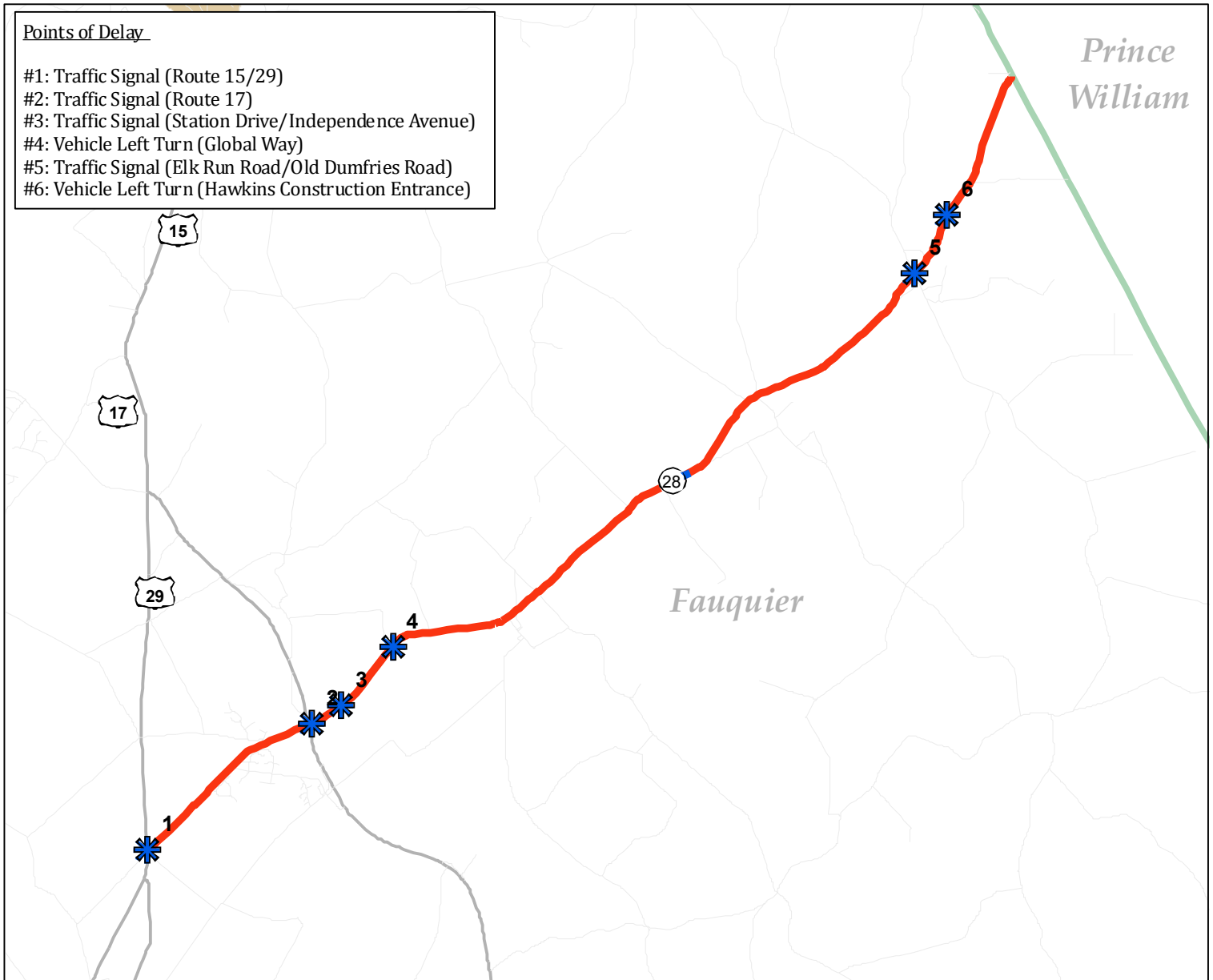
AM Peak Average Running Time: 18:22
 AM Peak Average Running Speed: 42.47 mph

PM Peak Average Travel Time: 22:31
 PM Peak Average Travel Speed: 44.89 mph

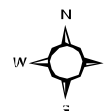
PM Peak Average Running Time: 19:08.5
 PM Peak Average Running Speed: 34.64 mph

Points of Delay

- #1: Traffic Signal (Route 15/29)
- #2: Traffic Signal (Route 17)
- #3: Traffic Signal (Station Drive/Independence Avenue)
- #4: Vehicle Left Turn (Global Way)
- #5: Traffic Signal (Elk Run Road/Old Dumfries Road)
- #6: Vehicle Left Turn (Hawkins Construction Entrance)



- Points of Delay
- School Zone
- Corridor B
- County Boundary
- Town Boundary



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 Data is from various sources and may vary in accuracy and completeness.
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 Date: 6/15/2010

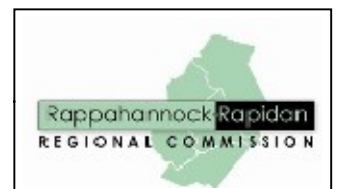


TABLE 1: AVERAGE POSTED SPEED LIMIT CALCULATIONS

	SEGMENT MILES AT x MPH				AVG. POSTED SPEED LIMIT
	25	35	45	55	
CORRIDOR A AM EASTBOUND	0.8	1.8	2.2	18.6	51.50
CORRIDOR A AM WESTBOUND	0.8	1.8	1.7	19.1	51.71
CORRIDOR A PM EASTBOUND	0.8	1.4	2.2	19.0	51.84
CORRIDOR A PM WESTBOUND	0.8	1.4	1.7	19.6	52.29
CORRIDOR B PM WESTBOUND #2	-	0.3	13.4	-	44.78

Calculations were computed using the following equation, where “x” is equal to the total mileage of the corridor segment. Corridor B PM Westbound #2 is used in this example:

$$(0.3/x)(35) + (13.4/x)(45)$$

TABLE 2
CORRIDOR SEGMENT “A” – ROUTE 20 THROUGH TOWN OF ORANGE TO ROUTE 3
AM PEAK (7:00 – 9:00 a.m.)

TRIP ID	Length (Miles)	Travel Time = Running Time+ Stopped/Delay Time (Minutes/Seconds)	Running Time (Minutes/Seconds)	Stop/Delay Time – 10 MPH or Lower (Minutes/Seconds)	Posted Speed Limit (MPH)	Avg. Travel Speed (MPH)	Avg. Running Speed (MPH)	Difference (+/-) of Average Travel Speed from Posted Speed Limit	Difference (+/-) of Average Running Speed from Posted Speed Limit
Eastbound 1	23.4	30:00	28:11	1:49	51.50	46.80	49.82	(-4.70)	(-1.68)
Eastbound 2	23.4	30:15	29:22	0:53	51.50	46.41	47.81	(-5.09)	(-3.69)
Eastbound AVERAGE	23.4	30:07.5	28:46.5	1:21	51.50	46.61	48.80	(-4.89)	(-2.70)
Westbound 1	23.4	30:01	28:51	1:10	51.71	46.77	48.67	(-4.94)	(-3.04)
Westbound 2	23.4	29:16	28:27	0:49	51.71	47.97	49.35	(-3.74)	(-2.36)
Westbound AVERAGE	23.4	29:38.5	28:39	0:59.5	51.71	47.37	49.01	(-4.34)	(-2.70)

Note: Westbound Average speed differs due to shorter 45 mph segment near the village of Unionville and Route 522.

TABLE 3
CORRIDOR SEGMENT “A” – ROUTE 20 THROUGH TOWN OF ORANGE TO ROUTE 3
PM PEAK (4:00 – 6:00 p.m.)

TRIP ID	Length (Miles)	Travel Time = Running Time+ Stopped/Delay Time (Minutes/Seconds)	Running Time (Minutes/Seconds)	Stop/Delay Time – 10 MPH or Lower (Minutes/Seconds)	Posted Speed Limit (MPH)	Avg. Travel Speed (MPH)	Avg. Running Speed (MPH)	Difference (+/-) of Average Travel Speed from Posted Speed Limit	Difference (+/-) of Average Running Speed from Posted Speed Limit
Eastbound 1	23.4	31:29	29:12	2:17	51.84	44.60	48.08	(-7.24)	(-3.76)
Eastbound 2	23.4	29:56	28:31	1:25	51.84	46.90	49.23	(-4.94)	(-2.61)
Eastbound AVERAGE	23.4	30:42.5	28:51.5	1:51	51.84	45.72	48.65	(-6.12)	(-3.19)
Westbound 1	23.4	29:06	28:35	0:31	52.29	48.25	49.12	(-4.04)	(-3.17)
Westbound 2	23.4	28:07	27:54	0:13	52.29	49.93	50.32	(-2.36)	(-1.97)
Westbound AVERAGE	23.4	28:36.5	28:14.5	0:22	52.29	49.08	49.71	(-3.21)	(-2.58)

Note: Westbound Average speed differs due to shorter 45 mph segment near the village of Unionville and Route 522.

TABLE 4
CORRIDOR SEGMENT “B” – ROUTE 28 FROM ROUTES 15/29 TO PRINCE WILLIAM COUNTY
AM PEAK (7:00 – 9:00 a.m.)

TRIP ID	Length (Miles)	Travel Time = Running Time+ Stopped/Delay Time (Minutes/ Seconds)	Running Time (Minutes/ Seconds)	Stop/Delay Time – 10 MPH or Lower (Minutes/ Seconds)	Posted Speed Limit (MPH)	Avg. Travel Speed (MPH)	Avg. Running Speed (MPH)	Difference (+/-) of Average Travel Speed from Posted Speed Limit	Difference (+/-) of Average Running Speed from Posted Speed Limit
Eastbound 1	13.7	18:42	18:42	-	45.0	41.71	41.71	(-3.29)	(-3.29)
Eastbound 2	13.7	20:17	19:03	1:14	45.0	38.46	40.94	(-6.54)	(-4.06)
Eastbound AVERAGE	13.7	19:29.5	18:52.5	0:37	45.0	40.02	41.32	(-4.98)	(-3.68)
Westbound 1	13.7	19:23	18:18	1:05	45.0	40.24	42.62	(-4.76)	(-2.38)
Westbound 2	13.7	20:21	18:26	1:55	45.0	38.33	42.32	(-6.67)	(-2.68)
Westbound AVERAGE	13.7	19:52	18:22	1:30	45.0	39.26	42.47	(-5.74)	(-2.53)

TABLE 5
CORRIDOR SEGMENT “B” – ROUTE 28 FROM ROUTES 15/29 TO PRINCE WILLIAM COUNTY
PM PEAK (4:00 - 6:00 p.m.)

TRIP ID	Length (Miles)	Travel Time = Running Time+ Stopped/Delay Time (Minutes/Seconds)	Running Time (Minutes/Seconds)	Stop/Delay Time – 10 MPH or Lower (Minutes/Seconds)	Posted Speed Limit (MPH)	Average Travel Speed (MPH)	Average Running Speed (MPH)	Difference (+/-) of Average Travel Speed from Posted Speed Limit	Difference (+/-) of Average Running Speed from Posted Speed Limit
Eastbound 1	13.7	20:12	18:55	1:17	45.0	38.61	41.23	(-6.39)	(-3.77)
Eastbound 2	13.7	20:27	20:16	0:11	45.0	38.14	38.49	(-6.86)	(-6.51)
Eastbound AVERAGE	13.7	20:19.5	19:35.5	0:44	45.0	38.38	39.81	(-6.62)	(-5.19)
Westbound 1	13.7	21:58	19:10	2:48	45.0	35.51	40.69	(-9.49)	(-4.31)
Westbound 2	13.7	23:04	19:07	3:57	44.78	33.81	40.80	(-10.97)	(-3.98)
Westbound AVERAGE	13.7	22:31	19:08.5	3:22.5	44.89	34.64	40.75	(-10.25)	(-4.14)

TABLE 6: CORRIDOR A | STOPS/DELAYS (10 MPH or Below) | AM Peak

TRIP ID	Jurisdiction	Stop/Delay Cause	Stop/Delay Location (Intersection)	Stopped/Delay Time (Minutes/Seconds)
Eastbound #1	Town of Orange	Stop Sign	Caroline Street/Main Street	0:10
	Town of Orange	Traffic Signal	Route 15/Berry Hill Road	0:29
	Orange County	Traffic Signal	Route 522	0:33
	Orange County	Traffic Signal	Route 3	0:37
Eastbound #2	Town of Orange	Stop Sign	Caroline Street/Main Street	0:14
	Orange County	Traffic Signal	Route 522	0:18
	Orange County	Traffic Signal	Route 3	0:21
Westbound #1	Orange County	Traffic Signal	Route 522	0:27
	Town of Orange	Yield Marker	Route 15	0:12
	Town of Orange	Traffic Signal	South Madison Road	0:16
	Town of Orange	Stop Sign	Main Street	0:15
Westbound #2	Orange County	Traffic Signal	Route 522	0:09
	Town of Orange	Traffic Signal	South Madison Road	0:10
	Town of Orange	Stop Sign	Main Street	0:30

*Westbound delays at Route 3 were not included in overall travel time. On trip #1, the delay was 0:29 and on trip #2, the delay was 0:48.

TABLE 7: CORRIDOR A | STOPS/DELAYS (10 MPH or Below) | PM Peak

TRIP ID	Jurisdiction	Stop/Delay Cause	Stop/Delay Location (Intersection)	Stopped/Delay Time (Minutes/Seconds)
Eastbound #1	Town of Orange	Stop Sign	Caroline Street/Main Street	0:07
	Town of Orange	Traffic Signal	Route 15/Berry Hill Road	0:34
	Orange County	Traffic Signal	Route 522	0:53
	Orange County	Traffic Signal	Route 3	0:43
Eastbound #2	Town of Orange	Stop Sign	Caroline Street/Main Street	0:07
	Town of Orange	Traffic Signal	South Madison Road	0:18
	Orange County	Traffic Signal	Route 522	0:37
	Orange County	Traffic Signal	Route 3	0:23
Westbound #1	Orange County	Traffic Signal	Route 522	0:04
	Town of Orange	Stop Sign	Caroline Street/Main Street	0:27
Westbound #2	Town of Orange	Yield Marker	Route 15	0:04
	Town of Orange	Stop Sign	Caroline Street/Main Street	0:09

*Westbound delays at Route 3 were not included in overall travel time. On trip #1, the delay was 1:40 and on trip #2, the delay was 1:03.

TABLE 8: CORRIDOR B | STOPS/DELAYS (10 MPH or Below) | AM Peak

TRIP ID	Jurisdiction	Stop/Delay Cause	Stop/Delay Location (Intersection)	Stopped/Delay Time (Minutes/Seconds)
Eastbound #1	-	-	-	-
Eastbound #2	Fauquier County	Traffic Signal	Route 17	1:14
Westbound #1	Fauquier County	Traffic Signal	Route 17	0:47
	Fauquier County	Traffic Signal	Route 29	0:18
Westbound #2	Fauquier County	Traffic Signal	Station Drive/Independence Avenue	0:20
	Fauquier County	Traffic Signal	Route 17	1:07
	Fauquier County	Traffic Signal	Route 29	0:28

TABLE 9: CORRIDOR B | STOPS/DELAYS (10 MPH or Below) | PM Peak

TRIP ID	Jurisdiction	Stop/Delay Cause	Stop/Delay Location (Intersection)	Stopped/Delay Time (Minutes/Seconds)
Eastbound #1	Fauquier County	Traffic Signal	Route 17	1:02
	Fauquier County	Vehicle Left Turn	Global Way	0:09
	Fauquier County	Vehicle Left Turn	Hawkins Construction Entrance	0:06
Eastbound #2	Fauquier County	Traffic Signal	Station Drive/Independence Avenue	0:11
Westbound #1	Fauquier County	Traffic Signal	Station Drive/Independence Avenue	0:12
	Fauquier County	Traffic Signal	Route 17	0:51
	Fauquier County	Traffic Signal	Route 29	1:45*
Westbound #2	Fauquier County	Traffic Signal	Elk Run Road/Old Dumfries Road	0:32
	Fauquier County	Traffic Signal	Route 17	2:53*
	Fauquier County	Traffic Signal	Route 29	0:33

*Delay at Route 29 in during trip Westbound #1 & at Route 17 during Westbound #2 included two cycles of traffic signal.



DISCLAIMER

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The contents of this report reflect the views of the Rappahannock-Rapidan Regional Commission (RRRC). The Commission is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of the US Department of Transportation, Federal Highway Administration, or Virginia Department of Transportation. This report does not constitute a standard, specification, or regulation.