

STATE OF RHODE ISLAND AND PROVIDENCE
PLANTATIONS



Rhode Island Department of Transportation

ROADWAY LIGHTING CURFEW
IMPLEMENTATION PLAN

March 25, 2010

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1. INTRODUCTION/OVERVIEW

The Rhode Island Department of Transportation (RIDOT) is continually implementing new initiatives and strategies to more effectively utilize the limited funding available to maintain the State's transportation infrastructure. One such proposed initiative is to implement a street lighting "curfew" on most of RIDOTS freeway and expressway facilities during the early morning hours when traffic volumes are low. It is important to note that RIDOT provides lighting only on limited access roadways and not on secondary roadways.

According to the American Association of State Highway and Transportation Officials' (AASHTO), Roadway Lighting Design Guide, dated October of 2005, "lighting curfews represent the active operation of the system, allowing for energy savings, greater flexibility in resource allocation, and reduction of light-trespass. However, officials implementing such options should be aware of consequences and conduct meaningful studies of costs and benefits."




The purpose of this document is to outline the plan of action for implementing the lighting curfew. It is proposed that the first step be to implement a "study phase" at a few trial locations to empirically identify the cost savings and to evaluate any potential positive and/or negative consequences. The duration of this phase would be three (3) months from which the data for this time period would be compared to the same period of time in the previous year (2009).

A review of the traffic data revealed that traffic volumes decrease dramatically during the hours of midnight to 5AM on Sunday through Thursday and 2 to 5AM on Friday and Saturday. For this reason, it is proposed that the curfew be implemented only during these time periods.

1.1. ANTICIPATED COST & SAVINGS OF FULL IMPLEMENTATION

In 2009 the RIDOT spent a total of \$ 1,947,510.94 on lights along limited access roadways, other secondary state highways and park-n-ride lots statewide. \$1,297,844.38 of this amount was for metered highway lights owned and maintained by the RIDOT and \$649,666.56 for those owned and maintained by the National Grid.

Assuming that the three (3) months study phase, on the trial roadways, indicates that there is a substantial cost savings and minimal safety risk, the lighting curfew will be fully implemented on the following roadway segments:

-  Route 4
-  Route 6 (from I-295 to Hartford Ave.)
-  Route 146

- ✚ Route 403
- ✚ Route 138 (Except for N. Kingstown Interchange)
- ✚ Interstate 95 (Exits 5-8)I
- ✚ Interstate 295 (Exit 1-9)
- ✚ Route 10 (From Park Ave to Reservoir Ave ; Westminster St. East of I-95 ; At Cranston St. and Niantic Ave Intersection)

The roadway segments shown below will not be included in the full curfew implementation due to their location, high crash rates and/or restriction to lights ownership.

- ✚ Interstate 195
- ✚ East Shore Expressway/Wampanoag Trail (Rt. 114)
- ✚ S curves around Pawtucket on I-95 (Estimated 3% electric cost)
- National Grid Owned and Maintained Lighting Systems**
- ✚ Route 10 (Westminster St. to Pontiac Ave.)
- ✚ Dean St. Interchange
- ✚ Route 6 (From Onlyville to Hartford Ave)
- ✚ Interstate 95 (Exit 1 to 4)
- ✚ Interstate 295 (Exit 10 to 11)
- ✚ Route 138 (Interchange of N. Kingston)
- ✚

1.1.1. COST OF FULL IMPLEMENTATION

The initial cost of implementation is anticipated to be minimal. It is estimated to be approximately \$20,000 for the purchase and installation of the approximately 50 time clocks needed.

1.1.2. SAVINGS WITH FUL IMPLEMENTATION

The savings associated with the implementation of a light curfew represents roughly 1/3 of the total cost of highway lighting on the proposed routs, owned and maintained by the RIDOT.

Total cost of all **RIDOT owned** highway lighting in 2009 = \$1,237,248.74

Estimated Annual Savings with Curfew (33% reduction) = \$408,292.1*

NOTE: the actual savings may be significantly higher since: 1) National Grid is seeking a rate increase and 2) RIDOT will eventually replace National Grid owned lights with RIDOT owned and metered systems.

The implementation of a light curfew during targeted hours (12 AM to 5 AM Sunday through Thursday and 2 AM to 5PM on Friday and Saturday) will result in a **36 percent (%)** reduction of light-hours as shown in “Table 1” below.

Table 1: Lighting Operation Hours

	Per Year (h)	Per Month (h)	Per Week (h)	Per Day (h)
Total Hours of Highway Lighting (2009)	4175.0	347.9	87.0	12.4
Total Hours of Highway Lighting (With Curfew)	2686.5	223.9	56.0	8.0

2. TRAFFIC DATA ANALYSIS

2.1. SELECTED TRIAL ROADWAYS

The following roads were selected to as trial roadways during the “study phase”:

- Interstate 295 Intersection with Rt. 6
- Route 6 (I-295 to Hartford Avenue)
- Route 4
- Route 403

The lighting curfew on these trial roadway segments will be implemented for study duration of three (3) months starting April 15, 2010. In making these selections variables such as volumes, crash rates, route locations and feasibility were taken in consideration. Time-Clock-Controllers have already been installed at these locations by the RIDOT Maintenance Division. Cost savings and traffic data analyses of the trial routes have been completed and are described below.

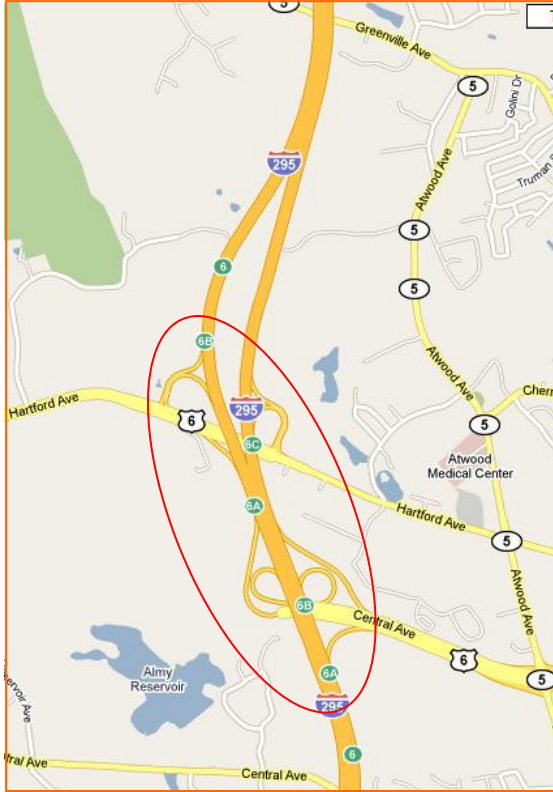
2.1.1. Cost and Benefits

Table 2: Selected Trial Roads Lighting Costs and Savings per Year

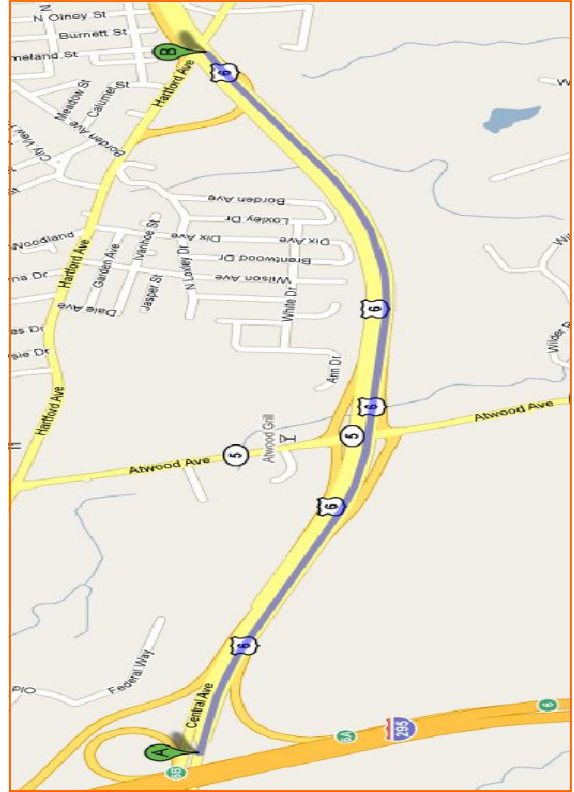
	I-295 (Exit 1-9)	Route 6 (I-295- Hartford Ave.)	Route 4	Route 403
Total Cost of Highway Lights in 2009	\$160,853.29	\$51,783.21	\$60,355.97	\$19,020.12
Total Cost of Highway Lights After Curfew	\$102,946.11	\$33,141.25	\$38,627.82	\$12,172.88
Total Savings of Highway Lights	\$57,907.18	\$18,641.96	\$21,728.15	\$6,847.24
Cost of Installing Control Clocks (Labor included)	\$1,500.00	\$1,500.00	\$2,700.00	\$600.00
Variable Message Signs (V.M.S)	\$22 per day	\$22 per day	\$22 per day	\$22 per day
Cost of Advisory Signs	\$600.00 per sign	\$600.00 per sign	\$600.00 per sign	\$600.00 per sign

Yearly Grand Total Savings =	\$105,124.53
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I-295 @ Rt. 6



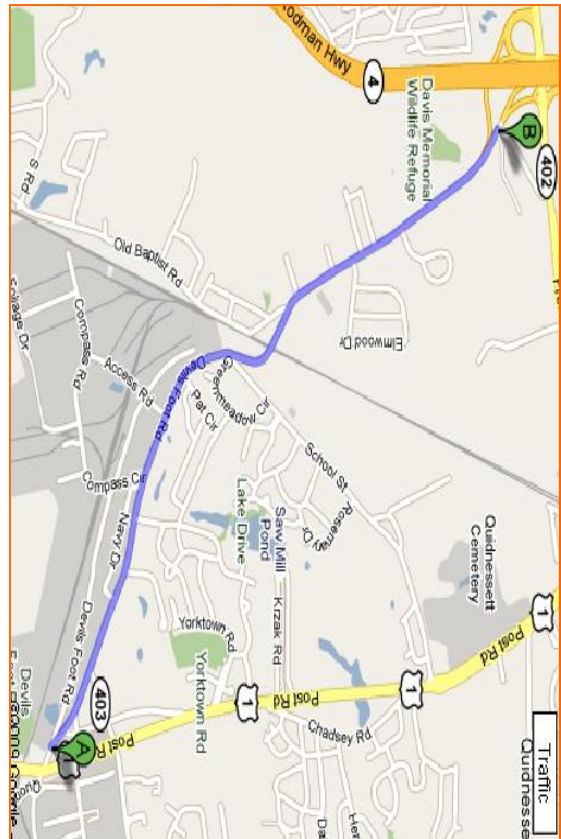
ROUTE 6



ROUTE 4



Route 403

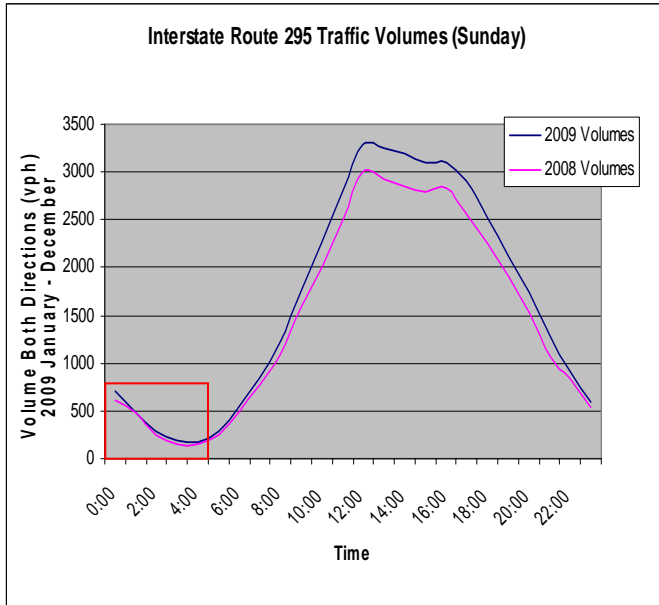


2.2. DATA INTERPRETATION

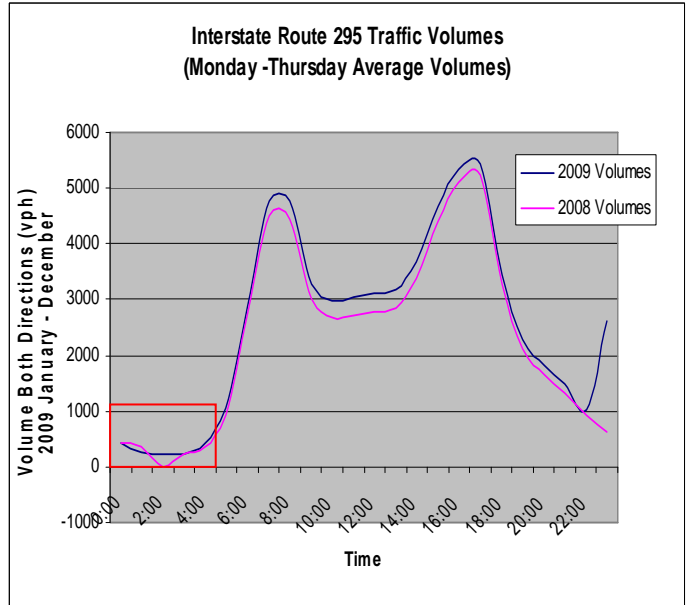
2.2.1. INTERSTATE 295

2.2.1.1. VOLUME DATA

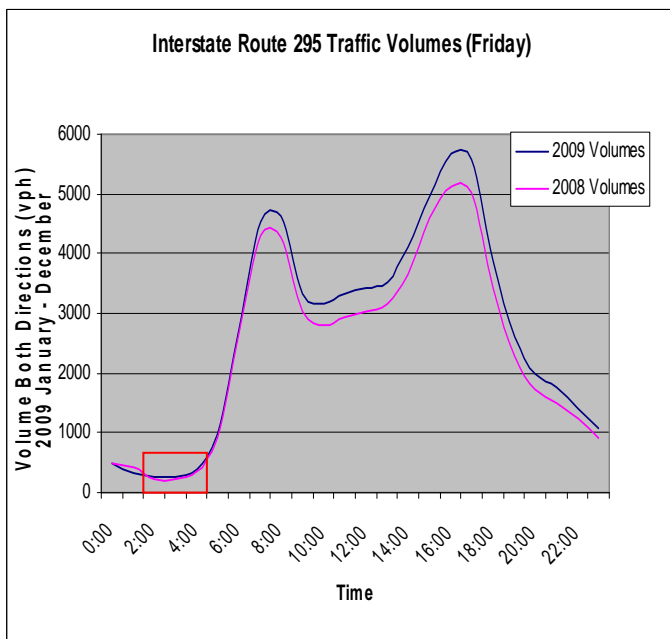
Graph 1



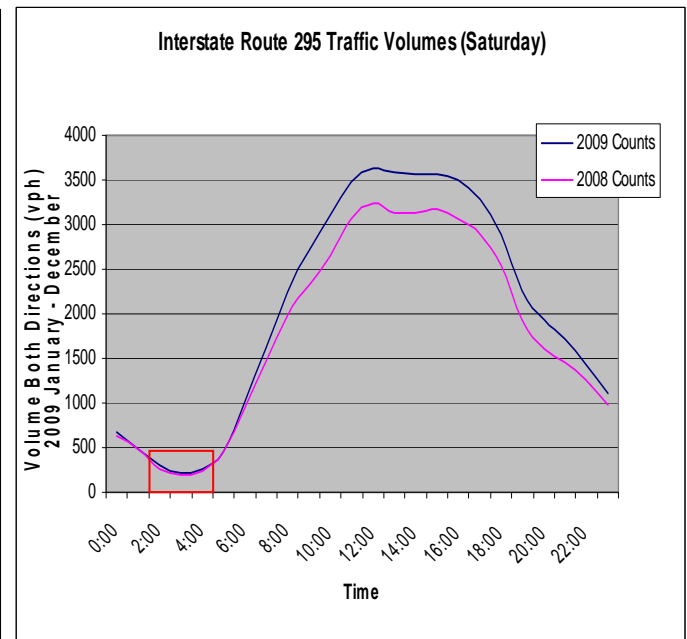
Graph 2



Graph 3



Graph 4



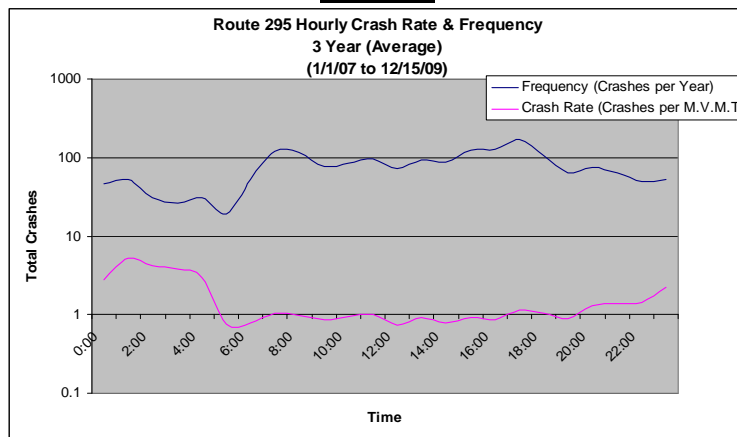
2.2.1.2. CRASH DATA

Table 3

Route 295 Total Hourly Crashes							
	Fatal	Non-Capacitating	Prop. Dam.	Unk. Inju.	TOTAL	AHT*24	Crash Rate
12:00 - 01:00 AM	2	13	30	1	46	12988	2.7716002
01:00 - 02:00 AM	1	16	34	2	53	8012	5.1766637
02:00 - 03:00 AM	0	5	26	0	31	5788	4.1912947
03:00 - 04:00 AM	1	7	16	2	26	5404	3.7650698
04:00 - 05:00 AM	2	5	22	2	31	8204	2.9569982
05:00 - 06:00 AM	1	5	13	0	19	19516	0.7618646
06:00 - 07:00 AM	0	10	43	0	53	53484	0.7754736
07:00 - 08:00 AM	2	36	80	1	119	89268	1.0431966
08:00 - 09:00 AM	1	25	90	1	117	94016	0.9738658
09:00 - 10:00 AM	1	18	59	0	78	71852	0.8495144
10:00 - 11:00 AM	1	25	58	2	86	70024	0.9610955
11:00 - 12:00 AM	1	19	77	0	97	74636	1.0170409
12:00 - 01:00 PM	2	12	59	0	73	78280	0.7297718
01:00 - 02:00 PM	3	19	70	1	93	78884	0.9225906
02:00 - 03:00 PM	1	21	63	2	87	87376	0.7791878
03:00 - 04:00 PM	4	26	89	3	122	104016	0.9178563
04:00 - 05:00 PM	6	24	93	3	126	115288	0.8552665
05:00 - 06:00 PM	0	41	127	3	171	115648	1.1571056
06:00 - 07:00 PM	0	26	79	1	106	79596	1.0421486
07:00 - 08:00 PM	0	11	52	1	64	55580	0.9011072
08:00 - 09:00 PM	3	12	56	3	74	44500	1.3013279
09:00 - 10:00 PM	3	19	41	1	64	36624	1.3675059
10:00 - 11:00 PM	3	9	38	0	50	27188	1.4391557
11:00 - 12:00 PM	2	20	30	1	53	18936	2.1902952
	40	424	1345	30	1839	Avg. Crash Rate =	1.6186249

Note: The average Crash Rate corresponding to the curfew hours (12-5AM) = **3.772**

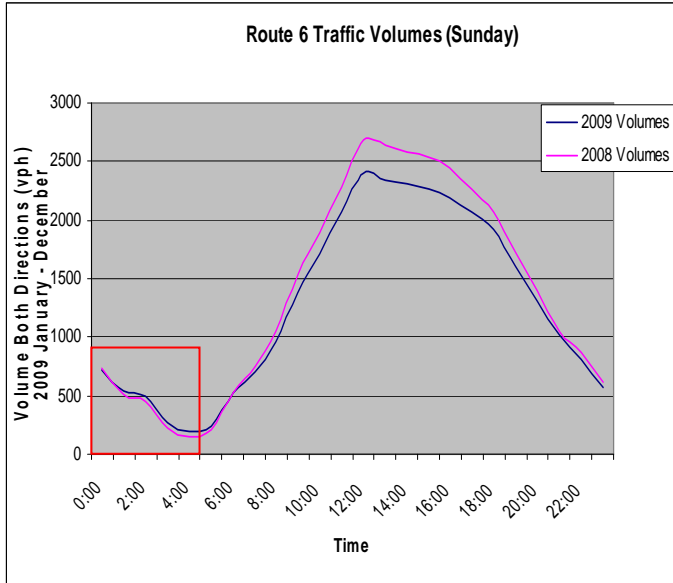
Graph 5



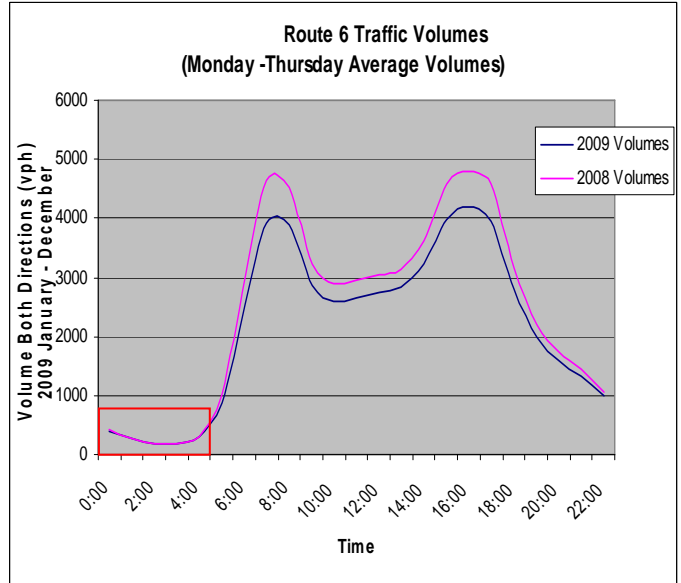
M.V.M.T = Million Vehicle Miles Traveled

2.2.2. ROUTE 6 (From I-295 to Hartford Ave.)
2.2.2.1. VOULUME DATA

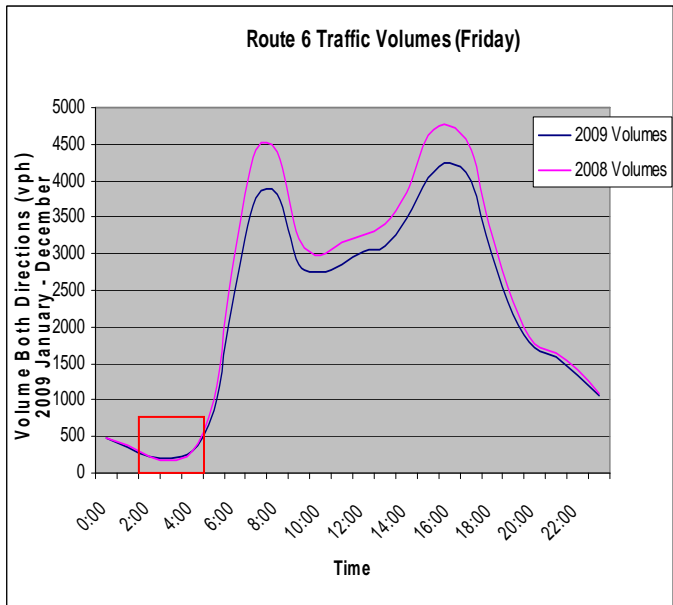
Graph 6



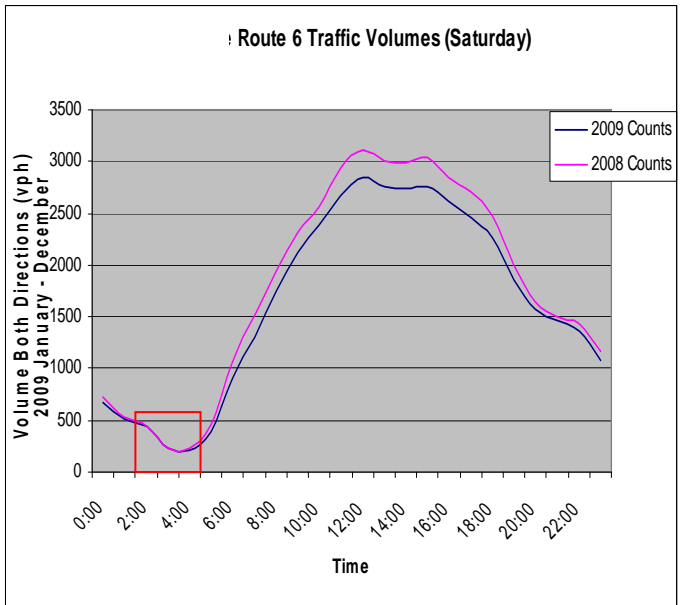
Graph 7



Graph 8



Graph 9



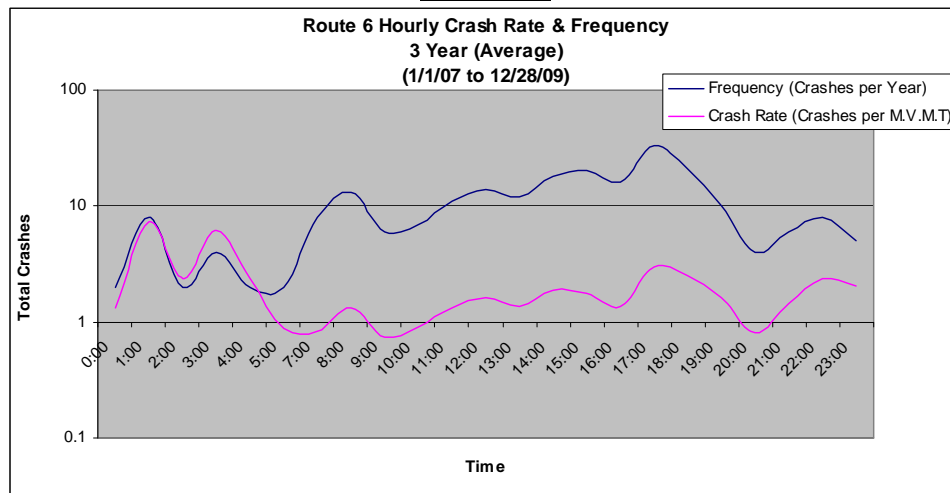
2.2.2.2. CRASH DATA

Table 3

Route 6 Total Hourly Crashes								
	Fatal	No Injuries	Non-Capacitating	Complaints of pain	Unk. Inju.	TOTAL	AHT*24	Crash Rate
12:00 - 01:00 AM	0	2	0	0	0	2	11648	1.306722
01:00 - 02:00 AM	0	3	1	4	0	8	8416	7.234173
02:00 - 03:00 AM	0	2	0	0	0	2	6448	2.36053
03:00 - 04:00 AM	0	4	0	0	0	4	4912	6.197353
04:00 - 05:00 AM	0	2	0	0	0	2	6504	2.340206
05:00 - 06:00 AM	0	1	0	1	1	2	17072	0.891559
07:00 - 08:00 AM	0	5	0	3	0	8	73200	0.831732
08:00 - 09:00 AM	0	9	1	3	0	13	75616	1.308381
09:00 - 10:00 AM	0	5	0	1	0	6	60992	0.748657
10:00 - 11:00 AM	0	6	0	1	0	7	58888	0.90464
11:00 - 12:00 AM	0	6	0	5	0	11	62448	1.340537
12:00 - 01:00 PM	0	11	1	2	0	14	66144	1.610802
01:00 - 02:00 PM	0	9	0	3	0	12	67000	1.363048
02:00 - 03:00 PM	0	14	0	4	1	18	73448	1.865079
03:00 - 04:00 PM	0	13	1	6	1	20	85672	1.776625
04:00 - 05:00 PM	0	12	1	3	0	16	88336	1.378437
05:00 - 06:00 PM	0	26	0	7	0	33	83368	3.012445
06:00 - 07:00 PM	0	14	0	7	0	21	62944	2.53904
07:00 - 08:00 PM	0	8	0	2	0	10	46520	1.635931
08:00 - 09:00 PM	0	3	0	1	0	4	37528	0.811165
09:00 - 10:00 PM	0	4	1	1	0	6	32072	1.423737
10:00 - 11:00 PM	0	7	0	1	0	8	25744	2.364932
11:00 - 12:00 PM	0	4	0	1	0	5	18688	2.03616
	0	170	6	56	3	232	Avg. Crash Rate =	1.970079

Note: The average Crash Rate corresponding to the curfew hours (12-5AM) = **3.888**

Graph 10

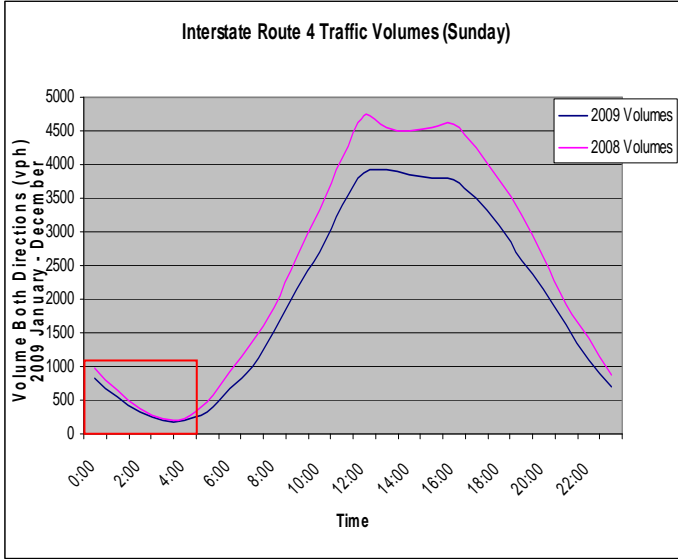


M.V.M.T = Million Vehicle Miles Traveled

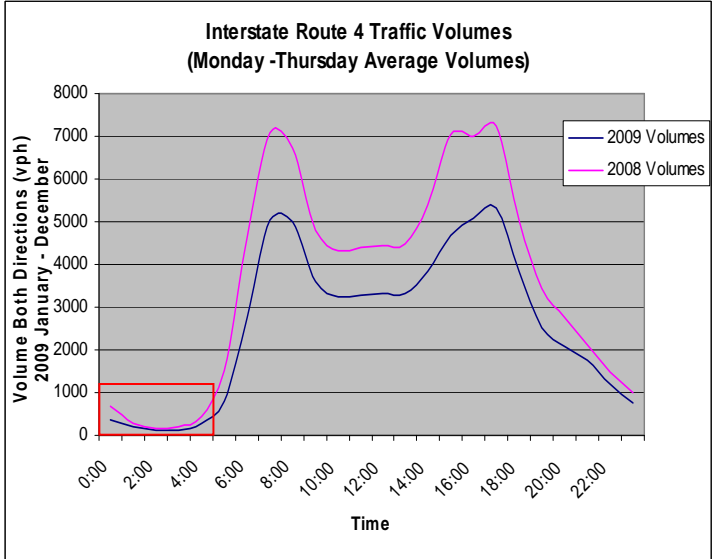
2.2.3. ROUTE 4 (From Route 1 in N. Kingston to Route 295 in Warwick)

2.2.3.1. VOLUME DATA

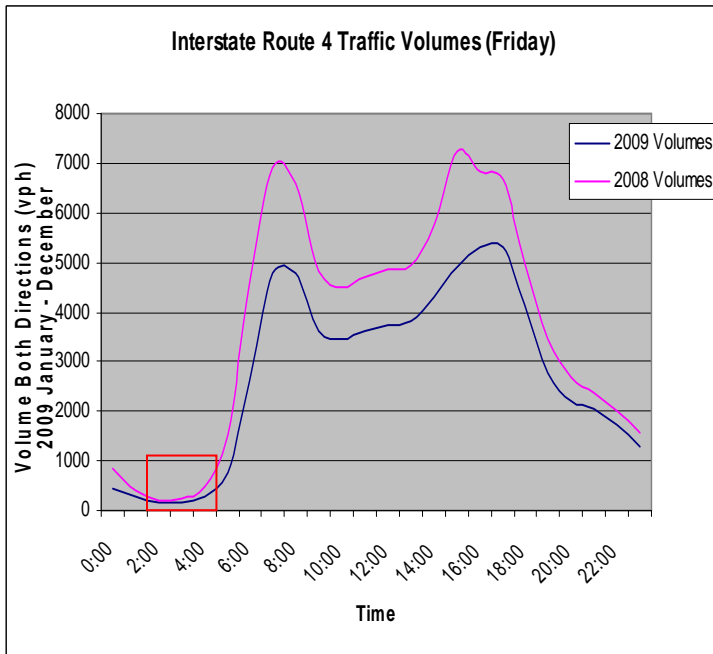
Graph 11



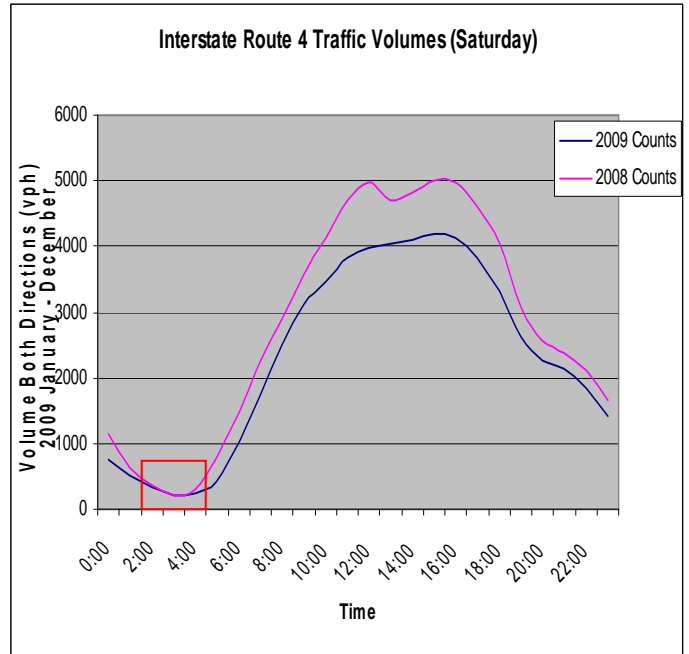
Graph 12



Graph 13



Graph 14



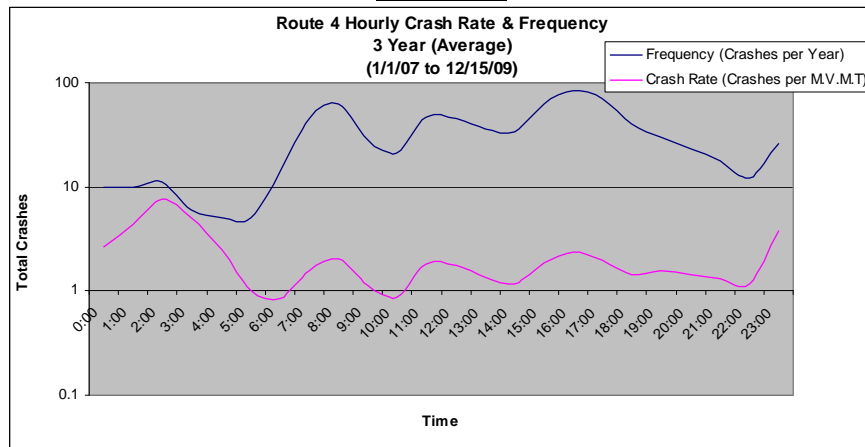
2.2.3.2. CRASH DATA

Graph 4

Route 4 Total Hourly Crashes							
	Fatal	Non-Capacitating	Prop. Dam.	Unk. Inju.	TOTAL	AHT*24	Crash Rate
12:00 - 01:00 AM	1	3	4	2	10	12096	2.663122
01:00 - 02:00 AM	0	0	10	0	10	7440	4.329721
02:00 - 03:00 AM	0	3	8	0	11	4632	7.649921
03:00 - 04:00 AM	0	1	5	0	6	3792	5.097013
04:00 - 05:00 AM	0	1	4	0	5	6456	2.49482
05:00 - 06:00 AM	0	1	4	0	5	16176	0.995707
06:00 - 07:00 AM	1	3	10	0	14	52608	0.857253
07:00 - 08:00 AM	2	7	37	0	46	94896	1.561503
08:00 - 09:00 AM	1	12	49	1	63	98472	2.060918
09:00 - 10:00 AM	2	4	21	1	28	79680	1.131987
10:00 - 11:00 AM	0	4	17	0	21	77304	0.875085
11:00 - 12:00 AM	2	6	38	1	47	82344	1.838649
12:00 - 01:00 PM	0	6	40	0	46	85056	1.742151
01:00 - 02:00 PM	0	7	29	0	36	85704	1.353113
02:00 - 03:00 PM	0	7	27	0	34	94608	1.157668
03:00 - 04:00 PM	0	10	53	0	63	108264	1.874517
04:00 - 05:00 PM	0	24	61	0	85	114816	2.384786
05:00 - 06:00 PM	0	14	57	0	71	116160	1.968949
06:00 - 07:00 PM	1	2	35	2	40	89064	1.44674
07:00 - 08:00 PM	0	4	26	0	30	62160	1.554687
08:00 - 09:00 PM	0	5	18	0	23	50976	1.453433
09:00 - 10:00 PM	1	5	12	0	18	44088	1.315179
10:00 - 11:00 PM	0	3	9	0	12	32640	1.184306
11:00 - 12:00 PM	1	7	18	0	26	22080	3.793212
	12	139	592	7	750	Avg. Crash Rate =	2.199352

Note: The average Crash Rate corresponding to the curfew hours (12-5AM) = 4.447

Graph 13



M.V.M.T = Million Vehicle Miles Traveled

2.2.4. ROUTE 403

2.2.4.1. VOLUME DATA

No volume data is available for this route. Counting stations have been put in place, although they remain out of order.

2.2.4.2. CRASH DATA

Graph 5

Route 403 Total Hourly Crashes					
	Fatal	Non-Capacitating	Prop. Dam.	Unk. Inju.	TOTAL
12:00 - 01:00 AM	0	1	0	10	11
01:00 - 02:00 AM	0	0	0	11	11
02:00 - 03:00 AM	0	0	0	10	10
03:00 - 04:00 AM	0	0	0	7	7
04:00 - 05:00 AM	0	0	0	11	11
05:00 - 06:00 AM	0	0	0	7	7
06:00 - 07:00 AM	0	0	0	25	25
07:00 - 08:00 AM	0	0	0	22	22
08:00 - 09:00 AM	0	1	0	34	35
09:00 - 10:00 AM	0	0	0	19	19
10:00 - 11:00 AM	0	0	0	10	10
11:00 - 12:00 AM	0	0	0	13	13
12:00 - 01:00 PM	0	1	0	26	27
01:00 - 02:00 PM	0	1	0	22	23
02:00 - 03:00 PM	0	0	0	26	26
03:00 - 04:00 PM	0	1	0	25	26
04:00 - 05:00 PM	0	1	0	36	37
05:00 - 06:00 PM	0	0	0	36	36
06:00 - 07:00 PM	0	0	0	21	21
07:00 - 08:00 PM	0	0	0	9	9
08:00 - 09:00 PM	0	2	0	12	14
09:00 - 10:00 PM	0	0	0	16	16
10:00 - 11:00 PM	0	0	0	12	12
11:00 - 12:00 PM	0	0	0	12	12
	0	8	0	432	440

Due to the missing volume data, crash rate before and after the curfew implementation cannot be calculated for this roadway. In stead, only the hourly crashes along this route are shown in the table above.

2.3. ADISORY/WARNING MESSAGES

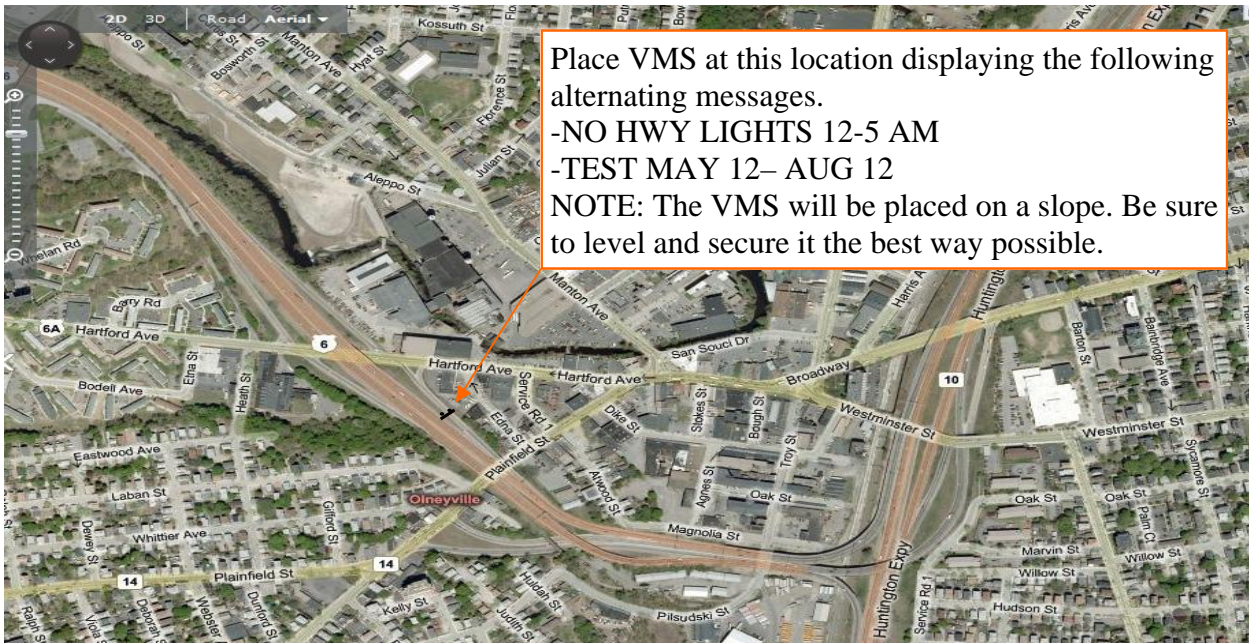
2.3.1. VARIABLE MESSAGE SIGN (V.M.S)

Variable Message Signs will be placed in advance of the trial segments notifying drivers of the curfew times. These devices are to be programmed and put in place by April 14th. The messages to be displayed are illustrated below.

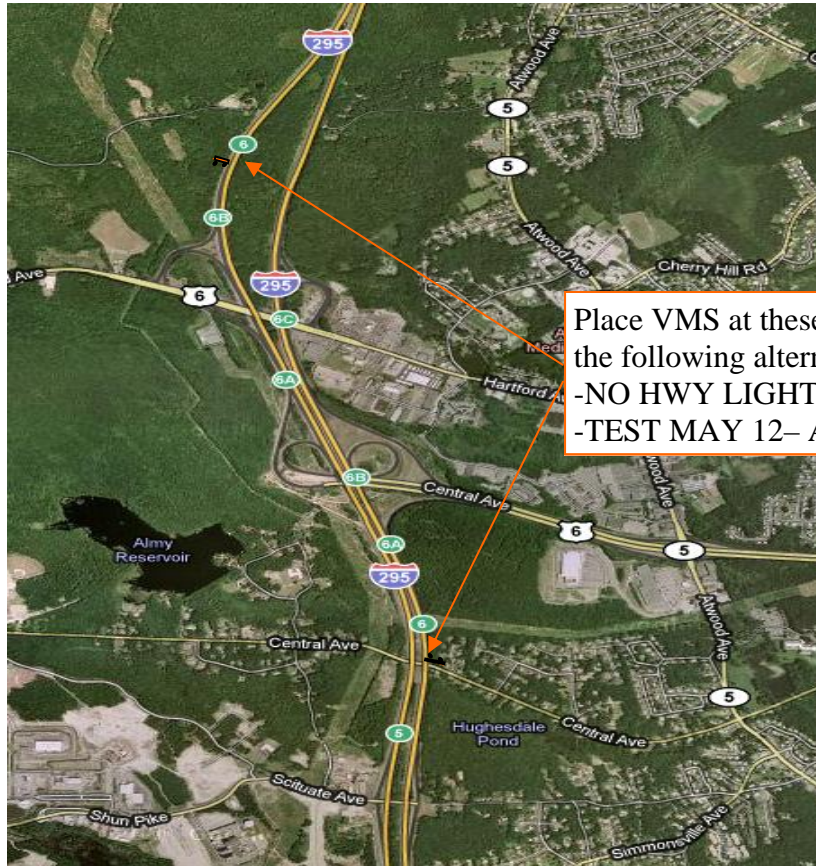


2.3.2. VARIABLE MESSAGE SIGN (V.M.S) LOCATIONS

ROUTE 6 WESTBOUND

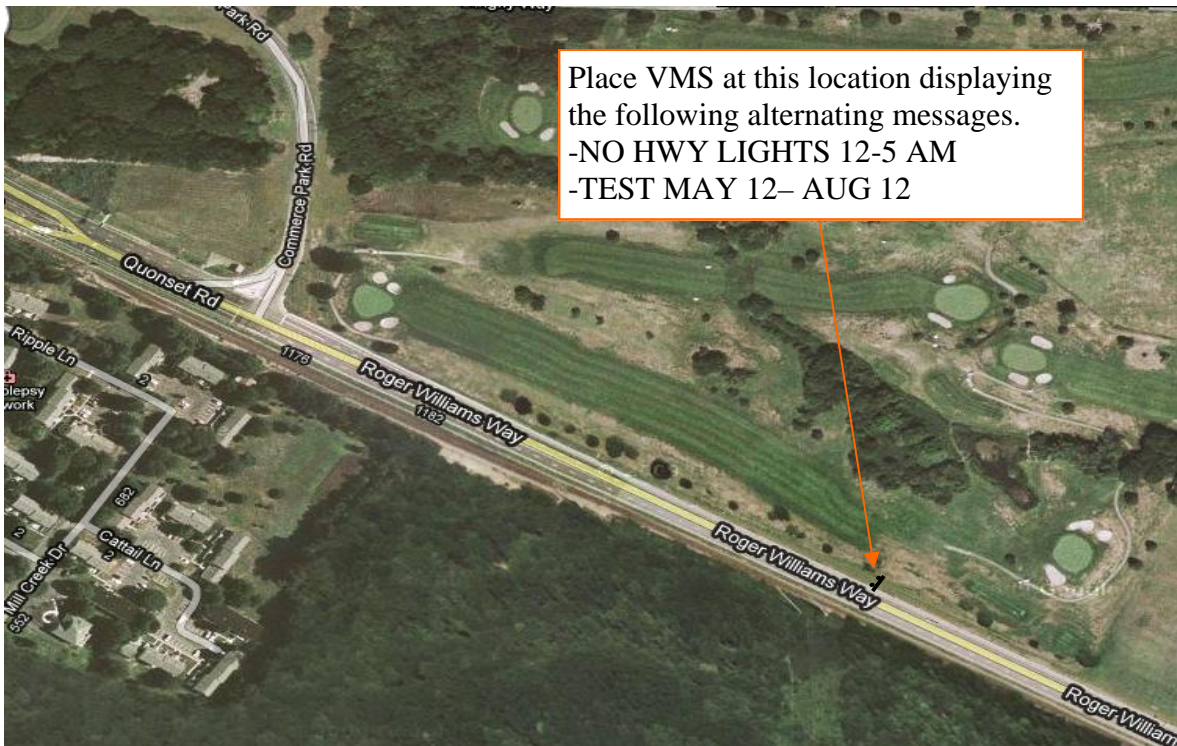


I-295 INTERSECTION WITH RT. 6



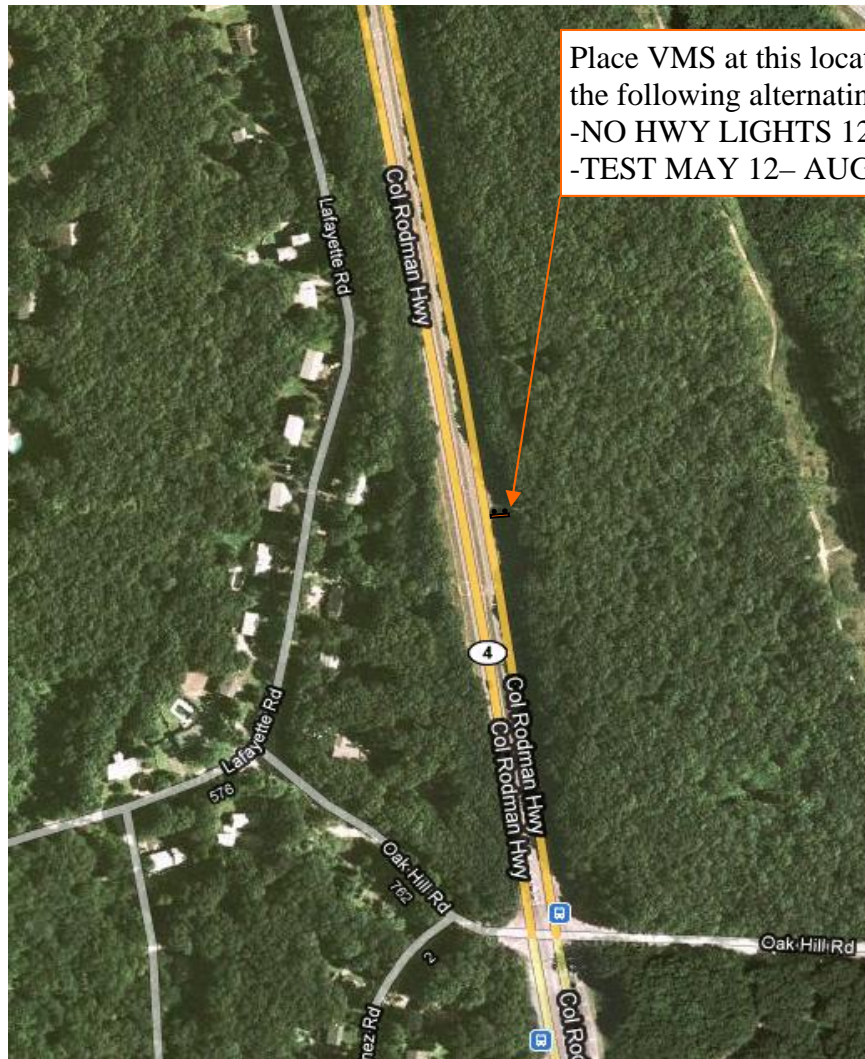
Place VMS at these locations displaying the following alternating messages.
-NO HWY LIGHTS 12-5 AM
-TEST MAY 12- AUG 12

ROUTE 403 WESTBOUND (BEGINNING)



Place VMS at this location displaying the following alternating messages.
-NO HWY LIGHTS 12-5 AM
-TEST MAY 12- AUG 12

ROUTE 4 NORTHBOUND



Place VMS at this location displaying the following alternating messages.
-NO HWY LIGHTS 12-5 AM
-TEST MAY 12- AUG 12

2.4. ISSUE PRESS RELEASE

Press releases to announce curfew will be prepared by the Traffic and Communications' Departments and issued on (to be determined).

2.5. ROADWAY CLEANUP (MAINTENANCE DIVISION)



SUMMARY

RIDOT will turn off the street lighting on freeway facilities throughout the state, during the late night/early morning hours when traffic is very low, in an effort to reduce electricity costs and allow for the more effective utilization of the limited funding available to maintain the State's transportation infrastructure.

RIDOT follows the [AASHTO Roadway Lighting Design Guide](#) to determine the most appropriate locations for lighting. Typically, RIDOT installs lighting on Limited Access freeways and some high traffic, high crash secondary roadways. AASHTO Guidelines allow for lighting curfew if implemented on a limited basis during low volume conditions. Also, AASHTO recommends a study be performed on such roadways to identify consequences that may arise from a curfew.

The first step would be to implement a "study phase" at a few trial locations to empirically identify the cost savings and to evaluate any potential positive and/or negative consequences. The duration of this phase would be three (3) months from which the data for this time period would be compared to the same period of time in the previous year (2009).

The selected trial locations are segments of Interstate 295, Route 6, Route 4 and Route 403. Volume and crash information has been completed for these roadways, as shown in this report. This information will allow us to perform a before-and-after analysis of the change before fully adopting this idea on other State roads and highways.

The savings associated with this curfew is estimated to be between \$400,000 and \$500,000 per year.

APPENDIX A - Lighting Curfew Implementation Plan

The required steps and implementation status is as follows:

Step 1) Calculate anticipated cost savings for full implementation.

Status: Complete

Step 2) Select trial roadways.

Status: Complete

Step 3) Select curfew times.

Status: Complete

- Midnight to 5 AM (Sun-Thurs) and 2 AM to 5PM (Fri and Sat)

Note: Selection of trial roadways and time periods based on many factors including hourly traffic volume, hourly crash data, AASHTO Roadway Lighting Design Guide recommendations, and lighting system capabilities.

Step 4) Select trial start date.

Status: Complete

- April 15, 2010

Step 5) Install time clocks on trial roads.

Status: Complete

Step 6) Issue press release to announce curfew.

Status: To be completed upon project approval

Step 7) Place VMS signs with pre-programmed message the on trial roadways by April 12th.

Status: To be completed upon project approval

Note: Will need a minimum of 8 VMS signs and possibly some static signs.

Step 8) Perform before/after crash study on trial roadways.

Status: To be completed

Step 9) Decision to fully implement or discontinue lighting curfew.

Status: To be determined.