Data Services Engineering Division
Office of Planning and Preliminary Engineering
Maryland State Highway Administration

Assessment of Short Term Program Count Sites Suitable for Non-Intrusive Technology in Maryland

October 2014

Summary

A decision analysis was undertaken to identify locations suitable for the use of non-intrusive technology when conducting traffic counts. The parameters considered were maximum speed limit, the Annual Average Daily Traffic (AADT) and its distribution across all lanes. A total of 5813 mainline locations (excluding ramps) were identified, selected and used for this analysis and 785 sites were categorized suitable for Non-Intrusive Technology (NIT) in view of high speed and or high traffic volume location.

Table of Contents

List of Tables

1. Introduction

The Maryland State Highway Administration is committed to safety for it personnel who work on collecting data in the field including employees and contractors. The Traffic Monitoring System (TMS) Team of the Data Services Engineering Division (DSED) has indentified “get out of the roadway” as a primary goal as part of its business plan.

A review of 5,813 sites utilizing short-term program counts was undertaken to identify sites for use of non-intrusive technology using Multi-Criteria Decision Analysis approach.

2. Background

The 48-hours duration short term Program Counts collect Volume, Speed, and Vehicle Class statewide on a three (3) or six (6) year cycle from numerous locations. The data collection is conducted with pneumatic tubes placed across a road covering all lanes by traffic count personnel. There may be disruption to the traffic while the placement and removal is conducted, along with the concern for personal safety.

3. Methodology

A review of various parameters was done based on judgments of traffic personnel who are involved directly in the process to utilize their valuable direct collective experience. Four parameters were selected in the first analysis. They are Speed, AADT, AADT per Lane and Total Numbers of Lanes.

We collected records of locations from the MD SHA Highway Management Information System (HMIS) database using the SQL command mentioned in Appendix 1. The data was exported to analyze in Microsoft Excel. A total of 5,813 mainline locations (excluding ramps) were identified, selected and used for this analysis.

For each parameter of interest, we grouped each location using a scoring level of 1 to 4 on a sliding scale based on perceived increased in risk. We then combined these scores to obtain a weighted score using the formula to provide equal weights to speed and volume AADT data.

We combined the scores from each separate score. The combined scores ranged from 4-16. This score was normalized to 100.

4. Annual Average Daily Traffic (AADT)

The AADT as shown below in Table 1, tells us about the projected daily volume of traffic moving across a given road. As there is very large range in values, the data was grouped into four (4) categories based on percentile, to establish a threshold of acceptance.

Table 1 Assigned Score for AADT

AADT	No of Records	Percentage	Percentile	Assigned Score
167816	59	1.0%	>= 0.99	4
58858	232	4.0%	>= 0.95	3
35450	291	5.0%	>= 0.90	2
35450	5230	90.0%	< 0.90	1

5. Total Number of Lanes

As per discussions with traffic count personnel, the total number of lanes reflects increased time and difficulty in setting up the short term Program Count. As such, a single lane, one way road is easier to set up than stopping traffic on multiple lane roads.

Table 2 Assigned Score for Number of Lanes

No of Lanes	No of Records	Percentage	Percentile	Assigned Score
>= 6 lanes	88	1.51%	>= 0.90	4
>= 4 lanes	1576	27.12%	>= 0.75	3
>= 2 lanes	4059	69.84%	>= 0.50	2
< 2 lanes	89	1.53%	< 0.50	1

6. AADT per lane

The AADT data was further analyzed and normalized to provide AADT values per traffic lane.

Table 3 Assigned Score for AADT per Lane

AADT per Lane	No of Records	Percentage	Percentile	Assigned Score
23960	59	1.0%	>= 0.99	4
12031	232	4.0%	>= 0.95	3
8746	291	5.0%	>= 0.90	2
8746	5230	90.0%	<0.90	1

7. Maximum Speed Limit

The speed data was grouped into four categories using cut off values of 50 mph, 40 mph and 30 mph corresponding to 90, 75 and 50 percentile. We reason that high speed decreases the time for drivers to respond to presence of traffic personnel working in the roadway.

Table 4 Assigned Score for Speed

Maximum Speed Limit	No of Records	Percentage	Percentile	Assigned Score
>=50 mph	1174	20.20%	>=0.90	4
>=40 mph	796	13.70%	>=0.75	3
>=30 mph	1044	17.96%	>=0.50	2
<30 mph	2798	48.14%	<0.50	1

8. Roadway prefix is not an indicator of speed

The data in Table 5 below shows the distribution of maximum speed based on the road type label. A single roadway prefix can be present for roads with wide range in traffic speeds. The max speed limit of IS and US labeled roads is from 25mph to 65mph. Hence the absolute value of speed provides a better measure of risk compared to

roadway prefix or label, e.g. an Interstate at 25 mph speed limit usually presents a lesser risk compared to a high speed county road.

Table 5 Distribution of speed and road type label

Speed (mph)	CO	GV	IS	MD	MU	SR	US
15						SR	
20					MU	SR	
25	CO	GV	IS	MD	MU		US
30	CO		IS	MD	MU	SR	US
35	CO	GV	IS	MD	MU		US
40	CO		IS	MD	MU		US
45	CO	GV	IS	MD			US
50	CO	GV	IS	MD			US
55	CO		IS	MD			US
60			IS				
65			IS				US

9. Results

The combined final scores were normalized to scale of 100 that were assigned a Final Priority Score utilizing 95th percentile and 90th percentile cut off value as thresholds.

The work of installing or removing the tubes is usually undertaken in low traffic times at night when volumes may be low, but speed is the same or in fact may increase. Similarly, the total number lane increases the difficulty of setup.

Table 6 Final Priority Score Assigned To Previous Locations

Criteria	No of Records	Percentage	Percentile	Final Priority Score
>=75	301	5.2%	> 95th percentile	High
<75 to >=50	484	8.3%	>90th percentile	Medium
<50	5027	86.5%	<90th percentile	Low

10. Discussion

Based on the above analysis, sites in the top 10 percentile (785 sites) category corresponding to high and medium priority score were selected to be labeled as suitable for non-intrusive count technology.

This sample will be reviewed by the TMS Team. The team will review each site to account for items or restrictions specific to each location and use practical information gained by traffic personnel.

11. Implementation aid for new short term program count site

When new term short program count sites are identified for use, we can use the model data analyzed from this analysis to flag them as a site for non-intrusive counts. For instance, calculating from the above corresponding tables

[Lane score+ speed score + AADT score + AADT per lane] /16*100

- Hypothetical site-A is in a six-lane with 55 mph speed limit with AADT of 74,000. Final priority score= (4+4+3+3)/16*100 =87.5 .This would fall in high priority (> 95th percentile) and hence can be classified as site for Non-Intrusive count
- Hypothetical site is in a two-lane with 40 mph speed limit with AADT of 24000. Final Priority Score = (2+3+1+3)/16*100 =56.25 .This would fall in medium priority (> 90th percentile)
- Hypothetical site-C is s two-lane with 30 mph with AADT of 14000. Final priority score = (2+1+1+1)/16*100 =31.25. Hence this would fall in low priority (<90th percentile)

12. Future work:

The traffic count data is on a gradual scale and as such sensitivity analysis will be undertaken using both weighted score and log transformed data.