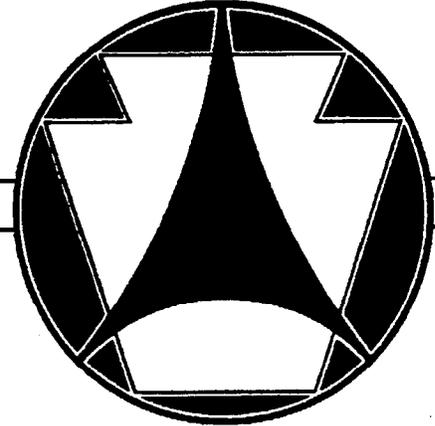




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**COMMONWEALTH OF PENNSYLVANIA  
DEPARTMENT OF TRANSPORTATION**

**PENNDOT RESEARCH**



**TRAFFIC VOLUME MONITORING  
RELATED RESEARCH**

**Transportation Operations and Systems Research and  
Development Partnership  
AGREEMENT NO. 359704, WORK ORDER 93**

**FINAL REPORT**

**May 4, 2001**

**By L.J. French, W. Iskander, M. Jaraiedi**

**PENNSSTATE**



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<b>16. Abstract</b>  <p>The goal of this research project was to investigate two short-term issues currently faced by the Pennsylvania Department of Transportation (PennDOT) relative to its statewide traffic counting program. PennDOT operates 63 Automatic Traffic Recorders (ATR) that are used to calculate adjustment factors to estimate Annual Average Daily Traffic (AADT) from short-term counts. Monthly adjustment factors calculated from 1998 and 1999 data were tested using statistical analysis to determine (1) their statistical significance and (2) short term strategies to improve effectiveness of the program. PennDOT also uses the ATR data along with other short-term counts to calculate annual growth factors for various functional classes and regions across the state. Statistical analysis of this program was conducted to determine its overall quality and to recommend short-term improvements. A second phase of this overall research is anticipated in which longer-term issues with the two programs will be investigated. The study found that there are a number of deficiencies in the current process of estimating growth factors in Pennsylvania. Growth factors were calculated for only 35 of the 42 categories since 7 of them do not contain any sites. If groups that have either a sample size of three or less or precision levels greater than 10 percent are considered to inadequate, then only 14 of the groups, or 40 percent of the 35 groups having at least one site are adequate.</p> <p>In general, the counting program that supports the estimation of growth factors will require some long-range and deep-reaching changes. The program should be reviewed in detail to determine if a different general approach should be adopted. Currently, significant effort is expended taking longer-duration counts at fewer locations. The approach puts more emphasis on "temporal" rather than "spatial" aspects that would have shorter count durations and more locations. The Traffic Monitoring Guide (TMG) recommends more emphasis on the spatial aspects. This approach should be investigated in greater detail to determine if it might yield better results relative to growth factor estimation.</p>					
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Transportation Operations and Systems Research and Development Partnership  
Agreement No. 359704  
Work Order 93

FINAL REPORT

Prepared for

Commonwealth of Pennsylvania  
Department of Transportation

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## SECTION 1 - INTRODUCTION

The goal of this research project was to investigate two short term issues currently faced by the Pennsylvania Department of Transportation (PennDOT) relative to their statewide traffic counting program.

1. PennDOT operates 63 Automatic Traffic Recorders (ATR) that are used to calculate adjustment factors to estimate Annual Average Daily Traffic (AADT) from short term counts. The monthly adjustment factors calculated from the 1998 and 1999 data were tested using statistical analysis to determine (1) their statistical significance and (2) short term strategies to improve the effectiveness of the program.
2. PennDOT also uses the ATR data along with other short term counts to calculate annual growth factors for various functional classes and regions across the state. Statistical analysis of this program was conducted to determine its overall quality and to recommend short term improvements.

A second phase of this overall research is anticipated in which longer term issues with the two programs will be investigated.

Each issue is reported in a separate section. Section 2 covers the ATR analysis, and Section 3 covers the growth factor analysis. Section 4 provides a summary of the recommendations for each analysis. This report also contains two appendices: Appendix A contains the technical material for the ATR analysis and Appendix B contains the technical material for the growth factor analysis.

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## SECTION 2 - AUTOMATED TRAFFIC RECORDER (ATR) ANALYSIS

### 2.1 Introduction

PennDOT operates 63 permanent automated traffic recorders (ATR) throughout the state. Each ATR continuously collects traffic data at its specific fixed location and reports an hourly volume for every hour of the year. PennDOT groups the ATRs into 10 Traffic Pattern Groups (TPG) depending on their functional class and location. The following are the 10 Traffic Pattern Groups established by PennDOT:

1. Urban Interstates
2. Rural Interstates
3. Urban Principal Arterials
4. Rural Principal Arterials
5. Urban Minor Arterials and Collectors
6. North Rural Minor Arterials
7. Central Rural Minor Arterials
8. North Rural Collectors
9. Central Rural Collectors
10. Special Recreational

Monthly factors that can be used to adjust short term Average Daily Traffic (ADT) counts (one or more full weeks) to Annual Average Daily Traffic (AADT) estimates are calculated for each Traffic Pattern Group from the ATR data. For example, if a seven (7) day count is collected on an urban interstate in the month of July, the ADT obtained likely will not be a good estimator of the average daily traffic over an entire year. Therefore, the correction factors calculated from TPG 1 are applied to the ADT in order to make proper adjustments to estimate the yearly average daily traffic on the facility based on the count performed in July.

The Traffic Monitoring Guide (TMG) is a document produced by the Federal Highway Administration that provides guidance on statewide traffic data collection and analysis. Among many other things, this document specifically prescribes procedures for testing whether the sample size in each TPG is sufficient to generate the correction factors needed to expand short term counts into AADT estimates. In this research, these procedures were applied to the 10 TPGs in Pennsylvania to identify deficient groupings for the years 1998 and 1999.

### 2.2 Methodology

For the years 1998 and 1999, the procedures for testing the adequacy of sample size were followed as prescribed in the TMG. In general, the TMG recommends a test of precision for the monthly factors generated by the ATRs in each TPG. The precision is provided in percentage form. If the precision for the overall TPG is less than 10 percent, then the short term correction factors generated from the TPG are considered adequate. If the overall TPG precision is greater than 10 percent, then the grouping is deficient, and it is likely that more ATRs are needed in the sample.

To perform the precision analysis, the following methodology was adhered to for each year:

1. Provided with the raw data from each ATR, the total traffic count for each month was calculated at each ATR.
2. For each month, the average traffic per day (MADT) at each ATR was calculated.
3. For each ATR, the annual average daily traffic (AADT) was calculated.
4. For each ATR, the monthly factor for a given month was calculated as

$$\text{Monthly Factor (for a given month)} = \text{AADT} / \text{MADT}$$

where MADT varied with the month, and AADT was fixed for a given ATR.

5. The ATRs were grouped by TPG, and the following statistics were calculated for each month:
  - a) Average monthly factor - This is a simple average of the monthly factors for a given month across all ATRs in the TPG.
  - b) Standard deviation - This is the sample standard deviation of the monthly factors for a given month across all ATRs in the TPG.
  - c) Coefficient of Variation (CV) - Calculated for each month, this is the value of the standard deviation of the monthly factors divided by the average monthly factor, expressed as a percentage.
  - d) Precision - Calculated for each month according to following equation:

$$\text{PRECISION} = T_{(\alpha/2, n-1)} * \text{CV}\% / (n^{0.5})$$

where T values are found in the table of Student-t distribution

$\alpha = 0.05$ , and represents the probability of rejecting a grouping as deficient when it is truly sufficient

n = sample size (i.e., number of ATRs included), n-1 = degrees of freedom (for use in the Student t-distribution table)

6. For each TPG, the following statistics were calculated:
  - a) Coefficient of Variation (CV) - Calculated as a simple average of the CVs calculated for each month.
  - b) Precision - Calculated as shown in 5(d) above except that the CV calculated in 6(a) is

used.

7. The value for Precision calculated in 6(b) is checked to determine if it is above 10 percent. If so, then the TPG is deficient, and the most likely solution is to add more sites to the TPG.

### 2.3 Results

The Overall Precision Level for each TPG for both 1998 and 1999 is provided in Table 2-1. The details of each analysis, including the monthly factors, are provided in Appendix A. In general, each ATR in a TPG was used unless otherwise noted.

Table 2-1 Overall Precision Levels for Each Traffic Pattern Group

Traffic Pattern Group (TPG)	1998	1999
1 - Urban Interstates	4.09	3.95
2 - Rural Interstates	4.05	3.92
3 - Urban Principal Arterials	4.16	3.12
4 - Rural Principal Arterials	2.52	2.54
5 - Urban Minor Arterials and Collectors	4.97 <sup>A</sup>	5.97
6 - North Rural Minor Arterials	4.52	5.24
7 - Central Rural Minor Arterials	3.59	3.90 <sup>D</sup>
8 - North Rural Collectors	9.75 <sup>B</sup>	10.95
9 - Central Rural Collectors	4.05	4.35
10 - Special Recreational	Not Calculated <sup>C</sup>	Not Calculated <sup>C</sup>

A - Does not include counter 380, which reported invalid data or had other inconsistencies during 1998.

B - Does not include counter 385, which reported invalid data or had other inconsistencies during 1998.

C - The TMG does not recommend a precision analysis for this TPG.

D - Does not include counter 390, which reported invalid data or had other inconsistencies during 1999.

As can be seen, only TPG 8 - North Rural Collectors was found to be deficient, that being in 1999. The precision for this TPG is very close to 10 percent, being just under 10 percent in 1998, and just over in 1999. It is expected that unless additional sites are added to this TPG, the precision will continue to hover around the 10 percent threshold, sometimes indicating a deficient grouping.

With respect to the counters that were not included in the analysis, neither excluding counter 380

from TPG 5 nor excluding counter 390 from TPG 7 is expected to have any impact on the final outcome relative to sample size sufficiency since these groupings have precision levels that are far below 10 percent. However, it is possible that the exclusion of counter 385 from TPG 8 does have an impact, and that if a good count had been obtained and its results included with TPG 8, the grouping may have been found not to be deficient.

For informational purposes, the 1998 data from counter 380 were investigated and found to have significantly higher volumes during the month of December. The 1998 data from counter 385 were investigated and found to have significantly lower volumes in the month of May. For counter 390, volumes were too low during July 1999, leading to a monthly factor of 1.39 when typical values are around 0.9.

#### **2.4 Conclusion**

A precision analysis was performed in conformance with the Traffic Monitoring Guide for the monthly factors generated from nine (9) of the ten (10) Traffic Pattern Groups currently used by PennDOT. Both 1998 and 1999 traffic data were analyzed. Only Traffic Pattern Group 8 - North Rural Collectors was found to be deficient (1999 only). Adding additional sites to this TPG should be considered, particularly if the analysis of future years of data continue to demonstrate deficiencies.

## SECTION 3 - GROWTH FACTOR ANALYSIS

### 3.1 Introduction

PennDOT annually collects traffic data at a large number of sites statewide to calculate annual growth factors for 42 categories of facilities. The traffic data collection to support this endeavor includes the 63 permanent automated traffic recorders (ATR) throughout the state, as well as a number of locations where one week of data is collected three times each year. The characteristics that define the categories in which specific growth factors are calculated include the following:

Facility Type - Interstates or Non-Interstates

Area Type - Urban or Rural

Geography - The state is divided into 11 regions for the interstate groupings, and 10 regions for the non-interstate groupings. The regions are formed by adjacent or nearby whole counties. The regions are shown on a map of the state in Appendix B. The Non-Interstate Groups are numbered 1 through 10 and the Interstate Groups are numbered 11 through 21.

An example of a category for which a specific growth factor is calculated is "Rural Interstate Highways in Group 11 (Erie and Crawford Counties)".

The growth factors can be used for a number of purposes, including the projection of "design year" traffic volumes for specific highway projects under design. More importantly, they are also used for Clean Air Act compliance studies. These compliance studies are the primary motivation behind segregating the state into geographic regions for growth factor analysis.

The Traffic Monitoring Guide (TMG) does not explicitly describe statistical methods for determining the appropriate number of locations needed to achieve a desired precision level for the growth factors. One objective of this research was to perform statistical analysis to determine the adequacy of the current number of locations in each of the 42 categories. The results are then used to recommend short term improvements and draw general conclusions about the effectiveness of the data collection program.

### 3.2 Methodology

A statistical analysis was performed to test if the number of locations in each of the 42 categories was adequate in order to achieve an acceptable precision level for the calculated growth factors. Having no explicit guidance from the TMG, Mr. Antonio Esteve, a statistical expert at the Federal Highway Administration (FHWA) and a major contributor to the TMG, was contacted by telephone. Based on his recommendation a precision analysis similar to the one used in the ATR analysis was performed. The detailed steps of a precision analysis were described in Chapter 2. In general, it was applied to the growth factors in the following way. For each group, the growth factors were calculated from the 1998 and 1999 data. The average growth factor for each category was calculated as a simple average of each of the individual growth factors. The

standard deviation of the growth factors was also calculated. The precision level for the growth factor for each category was then calculated based on the sample size and standard deviation.

Two traffic data bases were provided to perform the analysis. The first included estimates of all missing data, so that if data were not available at a site for one of the two years, it was estimated. The other data base excluded any sites that had missing data. For this research, the analysis was performed for both data bases. However, the analysis that used the data base that excluded the missing data provides a truer indication of the precision level. This is because at least some of the missing data were estimated using growth factors, and because the growth rates are so low (on the order of 2 percent or less) that small errors in estimating the Average Daily Traffic (ADT) can cause large errors in the growth rate.

While not reported in the body of this report, the results of the analysis using the full data base (missing data estimated) can be found in Appendix B. This analysis is interesting because it uses the "full" data base, it shows the maximum number of sites in each group, and to a certain extent, it represents the condition when all sites are available.

### **3.3 Results**

A summary of the results of the analysis of non-interstate facilities are shown in Tables 3-1 (rural) and 3-2 (urban). A summary of the results for the interstates are shown in Tables 3-3 (rural) and 3-4 (urban). The full details of the analysis are provided in Appendix B.

Table 3-1 Rural Non-Interstates Growth Factor Analysis (No Missing Data Included)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
1	2	-1.3%	24.62%	2	0
2	4	1.9%	1.69%	3	1
3	10	-0.3%	3.07%	10	0
4	11	-1.6%	2.77%	10	1
5	1	6.0%	---	0	1
6	3	-2.0%	9.00%	3	0
7	2	4.3%	36.69%	1	1
8	1	-1.4%	---	1	0
9	2	-0.7%	4.4%	2	0
10	2	-0.6%	14.2%	2	0

Table 3-2 Urban Non-Interstates Growth Factor Analysis (No Missing Data Included)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
1	3	1.6%	2.46%	3	0
2	15	1.1%	2.53%	2	13
3	3	1.6%	11.19%	1	2
4	5	1.9%	5.44%	3	2
5	3	-3.4%	4.30%	1	2
6	5	1.2%	8.25%	0	5
7	14	0.2%	2.96%	2	12
8	8	0.9%	5.11%	0	8
9	4	0.4%	6.55%	0	4
10	0	---	---	0	0

Table 3-3 Rural Interstates Growth Factor Analysis (No Missing Data Included)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
11	3	4.4%	12.96%	1	2
12	5	3.2%	4.42%	2	3
13	2	2.8%	4.76%	2	0
14	0	---	---	0	0
15	4	2.1%	6.47%	2	2
16	2	-1.2%	18.04%	0	2
17	1	0.4%	---	0	1
18	0	---	---	0	0
19	0	---	---	0	0
20	2	3.5%	18.22%	2	0
21	1	0.1%	---	0	1

Table 3-4 Urban Interstates Growth Factor Analysis (No Missing Data Included)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
11	0	---	---	0	0
12	1	4.0%	---	0	1
13	6	2.5%	3.12%	2	4
14	2	1.8%	7.52%	0	2
15	0	---	---	0	0
16	7	3.7%	3.65%	1	6
17	3	6.5%	6.96%	1	2
18	5	4.5%	6.42%	1	4
19	3	3.6%	14.34%	1	2
20	3	4.5%	8.78%	1	2
21	0	---	---	0	0

In investigating Tables 3-1 through 3-4, three significant items were noticed:

- (1) Seven (7) groups have a sample size of zero.
- (2) Thirteen (13) groups have precision levels that stand out as higher than the rest of the groups. Five (5) of these are groups with a sample size of one (1), for which a precision level cannot be calculated. The other eight (8) groups have calculated precision levels that are relatively high.
- (3) Two (2) of the groupings have an unnecessarily large number of short term counts.

### 3.3.1 Groups with a Sample Size of Zero

The following groups had a sample size of zero:

- (1) Urban Non-Interstates - Group 10 - This group covers Pike, Monroe, and Wayne counties. These counties are in northeastern Pennsylvania, which has only limited urbanized areas (Stroudsburg).
- (2) Rural Interstates - Group 14 - This group covers Bedford and Blair counties, which have only the newly constructed I-99 (other than the Pennsylvania Turnpike). This group has a SHRP weight-in-motion site that can provide continuous counts. These data were not included in this analysis.
- (3) Rural Interstates - Group 18 - This group covers Bucks, Montgomery, Chester, Delaware, and Philadelphia counties in the southeastern corner of the state. Most of this area is highly urbanized.
- (4) Rural Interstates - Group 19 - This group covers Berks, Lehigh, and Northampton, which is also a primarily urbanized area (Allentown).
- (5) Urban Interstates - Group 11 - This group covers Erie and Crawford County. Only a limited portion of I-79 is within the city limits of Erie.
- (6) Urban Interstates - Group 15 - It covers Franklin, Fulton, and Huntingdon counties. It has no urban interstates.
- (7) Urban Interstates - Group 21 - There are no urban interstates in this area, which covers Carbon, Monroe, Pike and Wayne counties.

Of the groups with a sample size of zero, only "Rural Interstates - Group 14" has a strong potential for adding sites. "Urban Non-Interstates - Group 10" also has a small potential for adding sites if some can be identified in the Stroudsburg area. Note that in no instance was a group caused to have no sites available due to missing data.

### 3.3.2 Groups with Growth Factors Having High Precision Levels

There were five (5) groups with a sample size of one (1). When the sample size is one (1), the calculation of standard deviation is not possible. This precludes the calculation of a precision level. The five (5) groups with a sample size of one (1) and no calculations for precision are as

follows:

- (1) Rural Non-Interstates - Group 5 - This group covers south-central Pennsylvania in the area of Harrisburg. The only site is a short term count station located on US 11 in Perry County.
- (2) Rural Non-Interstates - Group 8 - This group includes Berks, Lehigh, and Northampton counties in eastern Pennsylvania. The only site is an ATR located on US 309 in Lehigh County.
- (3) Rural Interstates - Group 17 - This group is comprised of York and Lancaster counties. The only site is a short term counter on I-83 in York County.
- (4) Rural Interstates - Group 21 - This group is comprised of Carbon, Monroe, Pike, and Wayne Counties. The only site is a short term counter on I-84 in Pike County.
- (5) Urban Interstates - Group 12 - This group covers a large 25 county area in northern Pennsylvania, and has one short term counter located on I-80 in Columbia County.

None of these five groups had additional counters that were lost due to missing data. Each had only the single counter location.

With respect to the groups for which a precision could be calculated, no threshold in the precision level was recommended by either the TMG or Mr. Esteve, above which the group is labeled insufficient. However, it was noted that in general, the precision level for each group was less than 10 percent (the smaller the precision level the better). Since this was the threshold for the monthly factor statistical analysis, it will also be applied for this analysis. However, it must be noted that this is an arbitrary threshold selected by the researchers after a qualitative investigation of the results. Also, just because a group has a precision level less than 10 percent does not guarantee the quality of the growth factor estimate. In general, for groups having a sample size of three (3) or less, the growth factor should be considered highly questionable.

The growth factors for the eight (8) groups that had a precision level that exceeded 10 percent are as follows, in rank order with the highest level first:

- (1) Rural Non-Interstates - Group 7 - Precision = 36.7% Covering the Philadelphia area in southeastern Pennsylvania, this group has one (1) ATR site and one (1) short term count location.
- (2) Rural Non-Interstates - Group 1 - Precision = 24.6% Covering northwestern Pennsylvania, this group has two (2) ATR sites and no (0) short term count locations.
- (3) Rural Interstates - Group 20 - Precision = 18.2% This group covers the I-81 corridor in northeastern Pennsylvania, and also has a portion of I-80, I-380, I-84, and the northeast extension of the Pennsylvania Turnpike. It has two (2) ATR sites and no (0) short term count locations.

- (4) Rural Interstates - Group 16 - Precision = 18.0% This group covers the Harrisburg area in south-central Pennsylvania, and includes I-81, I-78, and the Pennsylvania Turnpike. It has no (0) ATR sites and two (2) short term count locations.
- (5) Urban Interstates - Group 19 - Precision = 14.3% This group covers Lehigh, Berks, and Northampton counties, including I-78, I-176, and the northeastern extension of the Turnpike. It has one (1) ATR site and two (2) short term count locations.
- (6) Rural Non-Interstates - Group 10 - Precision = 14.2% This group covers Monroe, Pike, and Wayne counties in northeastern Pennsylvania. It has two (2) ATR sites and no (0) short term count locations.
- (7) Rural Interstates - Group 11 - Precision = 13.0% Covering Erie and Crawford counties in northwestern Pennsylvania, it has one (1) ATR site and two (2) short term count locations.
- (8) Urban Non-Interstates - Group 3 - Precision = 11.2% Covering a vast area of north-central Pennsylvania, and having only Williamsport as a significant urban area, this group has one (1) ATR site and two (2) short term count locations.

It is interesting to note that none of the groups lost sites due to missing data, however, in some cases one direction of a site was lost. As such, these groups cannot necessarily be expected to improve without additional sites being added.

### 3.3.3 Groups with Extra Short Term Counts

Two groups were identified as having significantly more short term counts than the rest of the groups. They are as follows:

- (1) Urban Non-Interstates - Group 2 - Covering all of southwestern Pennsylvania, including Pittsburgh, this group had a total of 15 sites, but only 13 when the sites with missing data were eliminated. Thirteen (13) of these sites are short term count locations
- (2) Urban Non-Interstates - Group 7 - Covering the Philadelphia urbanized area in southeastern Pennsylvania, this group had 18 sites, and 12 when the sites with missing data were eliminated. Sixteen (16) of these sites are short term count locations.

There are a high number of short term count locations in these groups because the counting hardware was not initially installed for the purpose of estimating growth factors. These counting stations were installed because of general concerns over placing other types of temporary traffic counting equipment (e.g., pneumatic tubes) amidst the high traffic volumes. It is possible that not all of these sites are necessary for the calculation of growth factors. Two (2) of the sites from Group 2 and six (6) of the sites from Group 7 were eliminated due to missing data without a detrimental impact on precision. Furthermore, counters that may be eliminated due to their close proximity to other counters (as recommended by the Department) are as follows:

Group 2 - Urban Non-Interstates: Sites 55, 104, 2155, 4632, 4654 and 30385

Group 7 - Urban Non-Interstates: Sites 710, 1754, 1782 and 4899.

In addition, Group 4 - Rural Non-Interstates has 10 ATR sites and a single short term site. The short term site may be considered for elimination because the 10 ATRs alone provide a higher sample size than most groups.

The above mentioned sites were eliminated from their respective groups and the precision levels recalculated. The results are contained in Appendix B and a summary of the results is shown in Table 3-5. As can be seen, in no case was the precision level for a group seriously impacted. However, the growth rates were changed somewhat, particularly for Group 2 - Non-Urban Interstates. Elimination of the above mentioned sites can be considered for the upcoming year as a short-term strategy to make the program more efficient only if the potential impact on the growth factors is acceptable to the Department. Analysis of a more spatial approach to data collection will be carried out in Phase 2 of this research. However, the high variability of the growth rate with the addition / elimination of a few counters suggests that the Department may improve their program by providing more spatial coverage of each geographic area.

Table 3-5 Comparison of Precision Levels with Excess Short Term Sites Excluded

Group	Sample Size with Counters Eliminated	Updated Growth Rate	Previous Growth Rate	Updated Standard Deviation	Updated Precision Level	Previous Precision Level
2 - Urban Non-Int.	9	-0.2%	1.1%	5%	3.82%	2.53%
7 - Urban Non-Int.	10	0.9%	0.2%	6%	3.93%	2.96%
4 - Rural Non-Int.	10	-1.2%	-1.6%	4%	2.97%	3.42%

### 3.4 Interstate Growth Factor Analysis

In 1999, PennDOT calculated a single statewide growth rate for rural interstates and a single statewide growth rate for urban interstates, effectively ignoring the geographic groupings. An Analysis of Variance (ANOVA) procedure was performed on the interstate count data to determine if this approach can be justified by statistical analysis. This analysis can determine if there is a statistically significant difference between the growth rates across the different geographical groups. If a statistically significant difference was found across the geographical groups, then it could be concluded that the growth rates across geographic regions should not have been pooled to form a single statewide growth rate. Likewise, if no statistically significant difference was detected, then it could be concluded that it was acceptable to calculate the single rate. The results of analysis for urban and rural interstates are contained in Appendix B. A summary of the results are shown in Table 3-6.

Table 3-6 ANOVA Analysis Summary

Facility Type	F calculated	F critical (alpha = 0.05)	Statistically Significant at 0.05?
Urban Interstates	0.353	2.464	No
Rural Interstates	0.523	2.913	No

The key values are the Calculated and Critical "F" values. If the Calculated F value is greater than the Critical F value, then there is a statistically significant difference. As can be seen, the Calculated F values are far below the Critical F values in both cases, indicating that there was no difference, and that it was acceptable to use the single growth factor. Please note that the critical F value is based in part on the confidence level, which was selected as 95 percent (alpha = 0.05).

In spite of the fact that the results of this analysis indicated that there was no statistically significant difference across the different geographic groupings, it is not recommended to permanently eliminate the geographic regions. It is likely that there is a significant difference in traffic growth across the different regions of the state. In this case, the data were insufficient to detect the difference. The results of this analysis can only be used to conclude that the best use of the data available for 1999 was to calculate a single statewide growth rate.

Finally, this analysis was performed using the "Analysis ToolPak" add-in for Microsoft Excel (Version 97). If the data are set up as shown in Appendix B, the "Anova: Single Factor" tool (under "Tools" - "Data Analysis") can be used to perform the analysis.

### 3.5 Conclusions and Recommendations

Overall, there are a number of deficiencies in the current process of estimating growth factors in Pennsylvania. Growth factors were calculated for only 35 of the 42 categories since seven (7) of them do not contain any sites. If groups that have either a sample size of three (3) or less or

precision levels greater than ten percent are considered inadequate, then only 14 of the groups, or 40 percent of the 35 groups having at least one site, are adequate.

In general, the counting program that supports the estimation of growth factors will require some long range and deep reaching changes. The program should be reviewed in detail to determine if a different general approach should be adopted. Currently, significant effort is expended taking longer duration counts at fewer locations. This approach puts more emphasis on "temporal" rather than "spatial" aspects that would have shorter count durations and more locations. The Traffic Monitoring Guide (TMG) recommends more emphasis on the spatial aspects. This approach should be investigated in greater detail to determine if it might yield better results relative to growth factor estimation.

## SECTION 4 - SUMMARY OF CONCLUSIONS

In summary, the key findings of this study are presented below.

### Automated Traffic Recorder (ATR) Analysis

- A precision analysis was performed using the monthly factors derived from the 1998 and 1999 ATR data.
- Traffic Pattern Group 8 - North Rural Collectors was found to be deficient in 1999. Additional sites should be considered.
- The Traffic Monitoring Guide does not recommend performing a precision analysis for recreational groups, which in this case is Traffic Pattern Group 10. This group has only one (1) site. Additional sites might be considered if this group is a priority to the Department.

### Growth Factor Analysis

- A precision analysis was performed using the growth factors calculated from the 1998 and 1999 ATR and short term traffic counts.
- Overall, there are a number of deficiencies in the current process of estimating growth factors in Pennsylvania. Only 14 of the groups, or 40 percent of the 35 groups having at least one site, are adequate.
- The counting program that supports the estimation of growth factors will require some long range and deep reaching changes.
- The current program puts more emphasis on "temporal" rather than "spatial" aspects of traffic data collection. The Traffic Monitoring Guide (TMG) recommends more emphasis on the spatial aspects. The spatial approach should be investigated in greater detail to determine if it might yield better results relative to growth factor estimation.
- In the short term, PennDOT can consider eliminating a few of the excess short term counts in the Urban Non-Interstate Groups 2 and 7, and the Rural Non-Interstate Group 4. However, it is likely that PennDOT will want to continue collecting the counts in some fashion (perhaps a shorter duration), as their complete elimination might have a significant impact on the growth factor of their respective groups.
- The decision to calculate a single statewide growth factor for rural interstates and a single statewide growth factor for urban interstates in 1999 was statistically justified.

**APPENDIX A**

**ATR Precision Analysis Worksheets**

**YEAR 1998**

**Traffic Pattern Group 1 - Urban Interstates**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
205	1.11	1.03	1.04	1.00	0.94	0.87	1.00	0.97	0.99	1.03	1.04	1.02
208	1.19	1.06	1.05	0.88	1.04	0.95	0.92	0.92	0.99	0.99	1.03	1.04
210	1.13	1.02	0.99	0.96	1.05	0.96	0.94	0.94	0.99	0.98	1.03	1.06
309	1.06	0.96	0.99	1.01	1.05	1.04	0.95	0.97	0.95	0.97	1.01	1.06
376	1.20	1.11	1.11	0.98	0.99	0.91	0.87	0.90	0.94	0.98	1.04	1.07
377	1.09	1.04	1.02	0.99	1.01	1.00	0.98	0.97	0.99	0.97	1.00	0.97
394	1.28	1.19	1.11	1.01	0.97	0.90	0.84	0.93	0.92	0.94	1.01	1.06
<b>Average</b>	1.15	1.06	1.04	0.98	1.01	0.95	0.93	0.94	0.97	0.98	1.02	1.04
<b>Std. Dev.</b>	0.08	0.07	0.05	0.04	0.04	0.06	0.05	0.03	0.03	0.03	0.02	0.04
<b>CV</b>	6.75	6.99	4.80	4.57	4.09	6.23	5.91	2.94	2.86	2.81	1.69	3.37
<b>Precision</b>	6.24	6.47	4.44	4.22	3.78	5.76	5.47	2.72	2.64	2.60	1.57	3.12

**Traffic Pattern Group 1 Monthly Factors - Overall Statistics**

**Average** 1.01  
**CV** 4.42  
**Precision** 4.09

Overall Precision is less than 10%, therefore TPG 1 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 7  
T= 2.447

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 2 - Rural Interstates

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
207	1.38	1.27	1.22	1.03	0.99	0.88	0.74	0.75	0.91	0.98	1.11	1.19
216	1.30	1.24	1.16	0.99	0.94	0.95	0.82	0.78	0.95	1.00	1.06	1.08
370	1.24	1.14	1.07	1.00	0.96	0.92	0.87	0.93	0.95	0.96	1.01	1.07
371	1.53	1.37	1.23	0.98	0.85	0.84	0.77	0.72	0.97	1.02	1.07	1.33
372	1.46	1.24	1.15	1.03	0.95	0.90	0.84	0.79	0.92	0.93	1.01	1.13
373	1.24	1.14	1.07	0.95	1.01	0.96	0.89	0.90	0.99	0.94	1.02	1.00
374	1.34	1.22	1.14	1.01	0.95	0.91	0.81	0.81	0.96	0.92	1.07	1.14
392	1.32	1.26	1.20	1.05	0.97	0.91	0.75	0.82	0.92	0.95	1.05	1.15
393	1.22	1.21	1.12	1.04	1.00	0.91	0.81	0.85	0.98	0.96	1.02	1.07
Avg	1.34	1.23	1.15	1.01	0.96	0.91	0.81	0.82	0.95	0.96	1.05	1.13
Std. Dev.	0.10	0.07	0.06	0.03	0.05	0.03	0.05	0.07	0.03	0.03	0.04	0.09
CV	7.79	5.65	5.03	3.19	5.17	3.80	6.26	8.30	2.89	3.36	3.44	8.34
Precision	5.99	4.34	3.87	2.45	3.97	2.92	4.81	6.38	2.22	2.58	2.64	6.41

A-4

Traffic Pattern Group 2 Monthly Factors - Overall Statistics

Average 1.03  
 CV 5.27  
 Precision 4.05

Overall Precision is less than 10%, therefore TPG 2 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 9  
 T= 2.306

Note: This page is valid only for n=5 through 13.

\*Do not put any entry in any row between 5 and 17 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 3 - Urban Other Principal Arterials

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
8	1.10	1.04	1.01	0.96	0.94	0.92	0.99	1.05	0.98	0.94	1.01	1.09
203	1.08	1.01	1.01	0.99	1.00	0.98	0.99	1.02	0.99	0.95	0.96	1.03
206	1.08	1.01	0.99	0.96	1.03	1.01	1.02	1.06	0.93	0.91	0.98	1.06
301	1.09	1.01	1.03	0.95	0.92	0.89	0.95	1.00	1.03	1.02	1.08	1.08
304	1.19	1.11	1.08	0.97	0.97	0.95	0.93	0.91	0.96	0.96	1.02	1.03
330	1.04	0.99	0.98	0.90	1.03	1.01	1.07	1.11	0.95	0.93	0.95	1.09
375	1.09	1.02	1.00	1.00	0.97	0.93	0.91	0.92	1.01	1.08	1.08	1.03
Avg	1.09	1.03	1.01	0.96	0.98	0.96	0.98	1.01	0.98	0.97	1.01	1.06
Std. Dev.	0.05	0.04	0.03	0.03	0.04	0.05	0.05	0.07	0.04	0.06	0.05	0.03
CV	4.18	3.67	3.13	3.52	4.27	4.90	5.59	7.15	3.60	5.99	5.33	2.69
Precision	3.87	3.39	2.89	3.26	3.95	4.53	5.17	6.61	3.33	5.54	4.93	2.49

Traffic Pattern Group 3 Monthly Factors - Overall Statistics

Average 1.00  
 CV 4.50  
 Precision 4.16

Overall Precision is less than 10%, therefore TPG 3 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 7  
 T= 2.447

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

**Traffic Pattern Group 4 - Rural Other Principal Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
4	1.33	1.23	1.23	1.00	0.89	0.92	0.83	0.87	0.93	0.89	1.03	1.14
19	1.14	1.08	1.03	0.98	0.95	0.97	0.96	0.95	0.93	0.94	1.05	1.09
24	1.22	1.13	1.06	1.00	0.95	0.97	0.91	0.90	0.93	0.94	0.99	1.10
323	1.24	1.15	1.08	0.99	0.95	0.96	0.90	0.93	0.95	0.92	0.98	1.05
326	1.23	1.09	1.09	0.97	0.95	0.94	0.92	0.92	0.92	0.95	1.05	1.08
334	1.15	1.09	1.05	0.98	0.98	0.94	0.92	0.93	0.94	0.95	1.04	1.12
349	1.12	1.05	1.03	0.97	0.99	0.96	0.96	0.95	0.98	0.97	1.02	1.04
360	1.20	1.11	1.07	0.98	0.95	0.94	0.89	0.92	0.98	0.96	1.04	1.05
363	1.27	1.15	1.14	0.98	0.85	0.97	0.87	0.89	0.95	0.93	1.04	1.16
378	1.16	1.09	1.08	0.98	0.97	0.97	0.95	0.95	0.97	0.95	1.01	0.98
Avg	1.21	1.12	1.08	0.98	0.94	0.95	0.91	0.92	0.95	0.94	1.02	1.08
Std. Dev.	0.06	0.05	0.06	0.01	0.04	0.02	0.04	0.03	0.02	0.02	0.02	0.05
CV	5.37	4.54	5.49	1.25	4.41	1.78	4.49	2.89	2.32	2.39	2.41	4.87
Precision	3.84	3.25	3.93	0.89	3.15	1.28	3.22	2.07	1.66	1.71	1.72	3.48

**Traffic Pattern Group 4 Monthly Factors - Overall Statistics**

Average 1.01  
 CV 3.52  
 Precision 2.52

Overall Precision is less than 10%, therefore TPG 4 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 10  
 T= 2.262

Note: This page is valid only for n=5 through 13.

\*Do not put any entry in any row between 5 and 17 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 5 - Urban Minor Arterials, Collectors, Local Roads

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
18	1.16	1.12	1.09	0.96	0.94	0.93	0.92	0.92	0.96	0.97	1.03	1.09
20	1.12	1.06	1.05	0.99	0.94	0.92	0.91	0.97	1.01	1.01	1.03	1.04
379	1.12	1.10	1.04	0.95	0.95	0.96	0.94	0.98	1.00	0.98	1.00	1.01
381	1.08	1.08	1.06	0.97	0.99	1.01	0.97	0.95	0.95	1.01	0.93	1.02
382	1.13	1.08	1.04	0.91	0.89	0.87	0.86	1.06	1.21	1.05	1.01	1.04
Avg	1.12	1.09	1.06	0.96	0.94	0.94	0.92	0.98	1.03	1.00	1.00	1.04
Std. Dev.	0.02	0.01	0.01	0.03	0.04	0.06	0.05	0.05	0.11	0.03	0.04	0.01
CV	1.88	1.30	0.91	3.63	4.46	6.37	5.46	4.79	10.88	2.69	4.41	1.26
Precision	2.33	1.82	1.12	4.50	5.53	7.91	6.78	5.94	13.51	3.34	5.48	1.57

Traffic Pattern Group 5 Monthly Factors - Overall Statistics

Average 1.01  
 CV 4.00  
 Precision 4.97

Overall Precision is less than 10%, therefore TPG 5 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 5  
 T= 2.776

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Counter 380 reported invalid data in 1998. The following are the monthly factors calculated from it.

|| 380 || 2.37 2.07 1.88 1.69 1.65 1.67 1.70 1.70 1.82 1.96 1.82 1.91 0.17 ||

**Traffic Pattern Group 6 - North Rural Minor Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2	1.34	1.19	1.19	1.00	0.93	0.91	0.85	0.77	0.96	0.96	1.05	1.16
3	1.24	1.13	1.13	1.00	0.94	0.96	0.92	0.89	0.94	0.88	1.03	1.06
27	1.40	1.27	1.28	1.05	0.92	0.90	0.80	0.83	0.92	0.89	0.97	1.18
48	1.25	1.18	1.13	1.02	0.92	0.92	0.86	0.82	0.95	0.96	1.06	1.14
51	1.21	1.12	1.13	1.00	0.95	0.94	0.90	0.93	0.94	0.92	0.99	1.06
328	1.17	1.10	1.06	0.97	0.91	0.93	0.90	0.94*	0.97	0.97	1.04	1.13
Avg	1.27	1.17	1.16	1.01	0.93	0.93	0.87	0.86	0.95	0.93	1.02	1.12
Std. Dev.	0.08	0.06	0.08	0.03	0.01	0.02	0.04	0.07	0.02	0.04	0.03	0.05
CV	6.58	5.27	6.50	2.64	1.48	2.58	5.02	7.87	2.03	4.12	3.26	4.33
Precision	6.91	5.53	6.83	2.77	1.55	2.71	5.26	8.26	2.13	4.32	3.42	4.54

**Traffic Pattern Group 6 Monthly Factors - Overall Statistics**

Average 1.02  
 CV 4.31  
 Precision 4.52

Overall Precision is less than 10%, therefore TPG 6 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 7 - Central Rural Minor Arterials

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1.13	1.05	1.09	0.97	0.92	0.89	0.88	0.91	1.00	1.06	1.12	1.10
15	1.16	1.10	1.06	0.96	0.98	0.95	0.93	0.95	0.98	0.91	1.01	1.08
40	1.13	1.06	1.03	0.97	0.94	0.97	0.96	0.97	0.98	0.96	1.03	1.06
367	1.19	1.13	1.08	0.95	0.93	0.96	0.92	0.89	0.96	0.96	1.03	1.11
390	1.09	1.03	0.99	0.91	0.94	0.95	1.00	0.97	1.00	0.99	1.06	1.10
391	1.18	1.11	1.07	0.99	0.96	0.96	0.94	0.92	0.96	0.95	0.99	1.03
Avg	1.15	1.08	1.05	0.96	0.94	0.95	0.94	0.94	0.98	0.97	1.04	1.08
Std. Dev.	0.04	0.04	0.04	0.03	0.02	0.03	0.04	0.03	0.02	0.05	0.05	0.03
CV	3.33	3.53	3.59	2.83	2.33	3.12	4.21	3.60	2.06	5.02	4.47	2.91
Precision	3.49	3.71	3.77	2.97	2.45	3.28	4.42	3.78	2.16	5.27	4.69	3.06

Traffic Pattern Group 7 Monthly Factors - Overall Statistics

Average 1.01  
 CV 3.42  
 Precision 3.59

Overall Precision is less than 10%, therefore TPG 7 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 8 - North Rural Collectors and Rural Roads

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
5	1.22	1.15	1.08	0.97	0.89	0.86	0.87	0.88	0.98	1.03	1.12	1.14
29	1.28	1.19	1.12	1.00	0.91	0.94	0.89	0.90	0.94	0.94	1.00	1.07
383	1.05	1.33	0.96	0.92	0.83	0.93	0.90	0.99	1.02	1.02	1.10	1.14
384	1.37	1.26	1.25	1.08	0.82	0.90	0.79	0.84	0.92	0.99	1.06	1.10
Avg	1.23	1.23	1.10	0.99	0.86	0.91	0.86	0.90	0.97	0.99	1.07	1.11
Std. Dev.	0.13	0.08	0.12	0.07	0.04	0.03	0.05	0.07	0.04	0.04	0.05	0.03
CV	10.90	6.65	10.95	6.79	4.79	3.82	5.85	7.25	4.49	4.27	4.71	3.08
Precision	17.34	10.58	17.41	10.80	7.63	6.07	9.31	11.53	7.15	6.80	7.50	4.90

Traffic Pattern Group 8 Monthly Factors - Overall Statistics

Average 1.02  
 CV 6.13  
 Precision 9.75

Overall Precision is less than 10%, therefore TPG 8 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 4  
 T= 3.182

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Counter 385 reported invalid data in 1998. The following are the monthly factors calculated from it.

385	1.27	1.16	1.60	2.29	13.24	0.67	0.67	0.64	0.61	0.96	0.95	1.04	
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Traffic Pattern Group 9 - Central Rural Collectors and Local Roads

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
362	1.14	1.08	1.04	0.95	0.97	0.94	0.83	1.04	1.00	0.97	1.06	1.05
364	1.21	1.15	1.12	0.99	0.92	0.90	0.87	0.88	0.95	0.98	1.07	1.10
386	1.20	1.12	1.04	0.95	0.96	0.93	0.91	0.89	0.96	0.95	1.07	1.13
387	1.27	1.20	1.13	0.97	0.96	0.87	0.90	0.87	0.97	0.96	1.01	1.07
388	1.30	1.13	1.08	0.97	0.91	0.93	0.90	0.94	0.96	0.93	1.04	1.05
389	1.09	1.04	1.03	0.94	0.93	1.01	0.97	0.98	0.95	0.96	1.04	1.08
<b>Avg</b>	1.20	1.12	1.07	0.96	0.94	0.93	0.90	0.93	0.97	0.96	1.05	1.08
<b>Std. Dev.</b>	0.08	0.05	0.04	0.02	0.03	0.05	0.05	0.07	0.02	0.02	0.02	0.03
<b>CV</b>	6.67	4.84	4.07	1.98	2.67	5.03	5.18	7.14	2.09	1.62	2.11	2.87
<b>Precision</b>	7.00	5.08	4.27	2.08	2.80	5.28	5.44	7.49	2.19	1.70	2.21	3.02

Traffic Pattern Group 9 Monthly Factors - Overall Statistics

Average 1.01  
 CV 3.86  
 Precision 4.05

Overall Precision is less than 10%, therefore TPG 9 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 10 - Special Recreational

Counter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
306	1.38	1.30	1.33	1.14	0.91	0.87	0.70	0.73	0.89	0.98	1.17	1.26

According to the TMG, no analysis was performed for the recreational group

**YEAR 1999**

Traffic Pattern Group 1 - Urban Interstates

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
205	1.16	1.06	1.06	0.98	0.99	0.93	0.96	0.98	0.97	0.95	0.98	1.02
208	1.21	1.03	1.02	0.98	0.99	0.95	0.97	0.93	0.97	0.97	0.99	1.03
210	1.21	0.99	0.98	0.98	1.00	0.95	0.97	0.93	0.99	1.00	1.01	1.04
309	1.06	0.95	0.97	1.00	1.07	1.03	0.95	0.95	0.94	1.04	0.99	1.06
376	1.27	1.12	1.10	0.98	1.00	0.91	0.91	0.92	0.95	0.95	0.97	1.04
377	1.09	1.03	1.00	0.98	0.99	0.98	0.98	0.99	1.04	0.99	0.97	0.96
394	1.38	1.21	1.05	1.01	0.96	0.90	0.88	0.85	0.98	0.96	0.99	1.07
Average	1.20	1.06	1.03	0.99	1.00	0.95	0.94	0.94	0.98	0.98	0.99	1.03
Std. Dev.	0.11	0.09	0.05	0.01	0.03	0.04	0.04	0.05	0.03	0.03	0.01	0.04
CV	8.94	8.25	4.63	1.09	3.25	4.64	3.90	5.20	3.37	3.18	1.41	3.42
Precision	8.26	7.63	4.29	1.01	3.01	4.29	3.60	4.81	3.12	2.94	1.31	3.17

A-14

Traffic Pattern Group 1 Monthly Factors - Overall Statistics

Average 1.01  
 CV 4.27  
 Precision 3.95

Overall Precision is less than 10%, therefore TPG 1 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 7  
 T= 2.447

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 2 - Rural Interstates

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
207	1.53	1.30	1.23	1.07	0.96	0.85	0.73	0.74	0.91	0.98	1.06	1.20
216	1.41	1.22	1.16	0.95	0.92	0.93	0.80	0.79	0.97	1.01	1.08	1.09
370	1.24	1.12	1.09	1.03	0.99	0.92	0.90	0.89	0.95	0.96	0.99	1.03
371	1.49	1.34	1.25	1.00	0.92	0.85	0.76	0.76	0.97	1.00	0.96	1.26
372	1.46	1.22	1.14	1.02	0.96	0.88	0.82	0.81	0.94	0.96	1.05	1.07
373	1.28	1.14	1.10	0.95	0.98	0.94	0.90	0.91	0.97	0.95	0.98	1.03
374	1.47	1.22	1.15	1.01	0.93	0.90	0.83	0.82	0.95	0.92	1.04	1.12
392	1.47	1.31	1.20	1.06	0.97	0.91	0.83	0.80	0.92	0.93	0.93	1.07
393	1.28	1.19	1.11	1.03	1.00	0.92	0.84	0.87	0.94	0.97	1.02	1.00
<b>Avg</b>	1.40	1.23	1.16	1.01	0.96	0.90	0.82	0.82	0.95	0.96	1.01	1.10
<b>Std. Dev.</b>	0.11	0.08	0.06	0.04	0.03	0.03	0.06	0.06	0.02	0.03	0.05	0.08
<b>CV</b>	7.73	6.10	4.80	4.20	3.12	3.49	6.77	6.95	2.41	3.12	4.96	7.58
<b>Precision</b>	5.94	4.69	3.69	3.23	2.40	2.69	5.20	5.35	1.85	2.40	3.81	5.83

Traffic Pattern Group 2 Monthly Factors - Overall Statistics

Average 1.03  
 CV 5.10  
 Precision 3.92

Overall Precision is less than 10%, therefore TPG 2 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 9

T= 2.306

Note: This page is valid only for n=5 through 13.

\*Do not put any entry in any row between 5 and 17 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

**Traffic Pattern Group 3 - Urban Other Principal Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
8	1.15	1.03	1.00	0.94	0.97	0.94	1.02	1.05	0.97	0.96	0.99	1.02
203	1.15	1.00	0.99	0.97	0.99	0.96	0.98	0.99	1.00	0.99	0.99	1.01
206	1.13	0.99	0.96	0.95	1.02	0.97	1.03	1.01	0.96	0.94	0.99	1.07
301	1.22	1.07	1.05	0.98	0.95	0.89	0.92	0.93	0.96	0.99	1.04	1.08
304	1.27	1.07	1.05	0.94	0.97	0.97	0.93	0.90	0.99	0.97	1.00	1.03
330	1.19	1.05	1.02	0.96	0.96	0.94	1.04	1.04	0.98	0.94	0.97	0.97
375	1.25	1.06	1.05	1.01	1.02	0.92	0.93	0.93	0.96	0.97	0.98	0.99
Avg	1.19	1.04	1.02	0.96	0.98	0.94	0.98	0.98	0.97	0.97	1.00	1.03
Std. Dev.	0.05	0.03	0.03	0.03	0.03	0.03	0.05	0.06	0.01	0.02	0.02	0.04
CV	4.44	3.20	3.43	2.64	2.81	3.05	5.23	5.78	1.54	2.22	2.14	4.03
Precision	4.11	2.96	3.17	2.44	2.60	2.82	4.84	5.34	1.42	2.05	1.98	3.73

**Traffic Pattern Group 3 Monthly Factors - Overall Statistics**

Average 1.00  
 CV 3.38  
 Precision 3.12

Overall Precision is less than 10%, therefore TPG 3 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 7  
 T= 2.447

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

**Traffic Pattern Group 4 - Rural Other Principal Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
4	1.33	1.23	1.22	1.01	0.90	0.92	0.83	0.90	0.94	0.89	1.00	1.11
19	1.29	1.12	1.06	0.98	0.95	0.91	0.94	0.95	0.92	0.94	1.00	1.05
24	1.35	1.11	1.08	0.97	0.95	0.96	0.93	0.90	0.93	0.93	0.96	1.07
323	1.34	1.12	1.13	0.97	0.95	0.91	0.90	0.90	0.97	0.92	0.98	1.08
326	1.26	1.05	1.04	0.95	0.95	0.92	0.93	0.92	0.95	0.99	1.04	1.09
334	1.21	1.08	1.05	0.98	0.98	0.94	0.96	0.92	0.94	0.94	1.01	1.07
349	1.16	1.03	1.01	0.97	0.98	0.94	0.97	0.95	1.00	0.98	1.01	1.03
360	1.28	1.07	1.07	0.96	0.94	0.96	0.92	0.94	1.01	0.95	0.99	1.02
363	1.25	1.14	1.13	0.99	0.96	0.93	0.86	0.88	0.92	0.93	1.01	1.14
378	1.16	1.07	1.05	0.96	0.95	0.96	0.94	0.95	0.97	0.97	1.03	1.04
<b>Avg</b>	1.26	1.10	1.08	0.98	0.95	0.94	0.92	0.92	0.96	0.94	1.00	1.07
<b>Std. Dev.</b>	0.07	0.06	0.06	0.02	0.03	0.02	0.04	0.03	0.03	0.03	0.02	0.04
<b>CV</b>	5.55	5.13	5.67	1.69	2.63	2.08	4.65	2.75	3.21	3.30	2.33	3.58
<b>Precision</b>	3.97	3.67	4.05	1.21	1.88	1.49	3.32	1.96	2.29	2.36	1.66	2.56

A.17

**Traffic Pattern Group 4 Monthly Factors - Overall Statistics**

Average 1.01  
 CV 3.55  
 Precision 2.54

Overall Precision is less than 10%, therefore TPG 4 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 10

T= 2.262

Note: This page is valid only for n=5 through 13.

\*Do not put any entry in any row between 5 and 17 unless you have all 12 monthly factors.

**Traffic Pattern Group 5 - Urban Minor Arterials, Collectors, Local Roads**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
18	1.26	1.14	1.10	0.94	0.93	0.93	0.93	0.94	0.95	0.96	0.99	1.05
20	1.27	1.09	1.06	0.98	0.94	0.90	0.91	0.96	0.98	1.00	1.03	1.00
379	1.32	1.16	1.14	1.04	1.02	1.01	1.00	0.79	0.80	0.86	1.05	1.07
380	1.17	1.05	1.02	1.04	0.92	0.93	0.99	0.96	0.97	0.97	1.02	1.01
381	1.16	1.18	1.02	0.87	0.87	0.90	0.97	1.00	1.02	0.99	1.10	1.04
382	1.30	1.16	1.13	0.98	0.91	0.91	0.90	0.94	0.94	0.95	1.00	1.03
Avg	1.25	1.13	1.08	0.97	0.93	0.93	0.95	0.93	0.94	0.95	1.03	1.04
Std. Dev.	0.07	0.06	0.06	0.07	0.06	0.05	0.04	0.08	0.08	0.06	0.04	0.03
CV	5.89	4.89	5.14	6.93	5.92	5.22	4.74	8.84	8.82	5.86	3.58	2.49
Precision	6.19	5.13	5.39	7.27	6.21	5.48	4.97	9.28	9.26	6.15	3.75	2.61

**Traffic Pattern Group 5 Monthly Factors - Overall Statistics**

Average 1.01  
 CV 5.69  
 Precision 5.97

Overall Precision is less than 10%, therefore TPG 5 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors.  
 In this case, the Counter number must entered along with all 12 monthly factors

**Traffic Pattern Group 6 - North Rural Minor Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2	1.42	1.20	1.16	1.00	0.91	0.88	0.83	0.81	0.95	0.98	1.05	1.14
3	1.37	1.17	1.16	0.97	0.92	0.93	0.90	0.91	0.93	0.92	0.96	1.06
27	1.59	1.34	1.31	1.04	0.90	0.87	0.76	0.84	0.91	0.90	0.93	1.19
48	1.31	1.17	1.14	1.01	0.93	0.91	0.85	0.83	0.95	0.98	1.04	1.10
51	1.30	1.14	1.11	1.00	0.95	0.93	0.93	0.91	0.96	0.94	0.96	1.00
328	1.26	1.13	1.10	0.96	0.90	0.90	0.91	0.95	0.96	0.96	1.02	1.10
Avg	1.38	1.19	1.16	1.00	0.92	0.90	0.86	0.87	0.94	0.95	0.99	1.10
Std. Dev.	0.12	0.08	0.08	0.03	0.02	0.03	0.06	0.05	0.02	0.03	0.05	0.06
CV	8.85	6.57	6.58	3.05	2.09	2.97	7.05	6.25	2.04	3.54	5.06	5.89
Precision	9.28	6.89	6.90	3.20	2.19	3.12	7.40	6.56	2.14	3.71	5.31	6.18

**Traffic Pattern Group 6 Monthly Factors - Overall Statistics**

Average 1.02  
 CV 4.99  
 Precision 5.24

Overall Precision is less than 10%, therefore TPG 6 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

**Traffic Pattern Group 7 - Central Rural Minor Arterials**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1.11	1.11	1.11	1.01	0.96	0.91	0.86	0.90	0.97	1.00	1.06	1.12
15	1.23	1.09	1.07	0.94	0.95	0.91	0.93	0.94	0.98	0.93	1.01	1.11
40	1.14	1.05	1.02	0.96	0.94	0.95	0.96	0.98	0.98	0.99	1.02	1.04
367	1.31	1.13	1.10	0.96	0.94	0.94	0.92	0.88	0.96	0.96	0.98	1.08
391	1.27	1.11	1.06	0.95	0.93	0.94	0.94	0.93	0.98	0.94	0.99	1.06
Avg	1.21	1.10	1.07	0.96	0.94	0.93	0.92	0.92	0.97	0.96	1.01	1.08
Std. Dev.	0.08	0.03	0.04	0.03	0.01	0.02	0.04	0.04	0.01	0.03	0.03	0.03
CV	6.86	2.75	3.35	2.66	1.07	2.12	4.34	4.39	1.02	2.96	2.99	3.17
Precision	8.52	3.41	4.16	3.30	1.33	2.63	5.39	5.45	1.26	3.67	3.71	3.93

**Traffic Pattern Group 7 Monthly Factors - Overall Statistics**

Average 1.01  
 CV 3.14  
 Precision 3.90

Overall Precision is less than 10%, therefore TPG 7 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 5  
 T= 2.776

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Counter 390 reported in valid data in 1999. The following are the monthly factors calculated from it.

390	1.10	0.98	0.96	0.89	0.92	0.90	1.39	0.98	0.98	0.97	1.03	1.04
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**Traffic Pattern Group 8 - North Rural Collectors and Rural Roads**

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
5	1.30	1.11	1.09	0.93	0.80	0.82	0.86	0.90	1.05	1.22	1.03	1.17
29	1.36	1.21	1.20	0.99	0.88	0.90	0.88	0.93	0.95	0.93	0.95	1.05
383	1.27	1.11	1.07	0.97	0.90	0.94	0.97	0.98	1.01	0.99	0.93	0.95
384	1.58	1.29	1.29	1.01	0.85	0.79	0.73	0.83	1.01	1.04	1.07	1.12
385	1.44	1.25	1.24	1.05	0.96	0.96	0.86	0.76	0.67	1.06	1.08	1.22
<b>Avg</b>	1.39	1.19	1.18	0.99	0.88	0.88	0.86	0.88	0.94	1.05	1.01	1.10
<b>Std. Dev.</b>	0.12	0.08	0.09	0.04	0.06	0.08	0.08	0.09	0.15	0.11	0.07	0.11
<b>CV</b>	8.87	6.87	7.97	4.35	6.68	8.54	9.84	9.79	16.38	10.24	6.80	9.56
<b>Precision</b>	11.01	8.53	9.89	5.40	8.30	10.61	12.21	12.15	20.33	12.71	8.44	11.87

**Traffic Pattern Group 8 Monthly Factors - Overall Statistics**

**Average 1.03**  
**CV 8.82**  
**Precision 10.95**

Overall Precision is greater than 10%, therefore TPG 8 grouping is deficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 5

T= 2.776

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

Traffic Pattern Group 9 - Central Rural Collectors and Local Roads

Counter*	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
362	1.21	1.08	1.07	0.96	0.98	0.93	0.88	1.00	0.99	0.96	1.02	1.01
364	1.31	1.16	1.13	0.97	0.92	0.86	0.85	0.88	0.96	1.00	1.07	1.09
386	1.30	1.12	1.09	0.95	0.90	0.89	0.90	0.87	0.96	1.03	1.05	1.11
387	1.36	1.14	1.09	0.95	0.93	0.91	0.94	0.89	0.97	0.96	0.97	1.07
388	1.32	1.13	1.06	0.92	0.94	0.95	0.94	0.94	0.96	0.97	1.00	0.99
389	1.13	0.95	1.07	0.98	0.97	0.97	0.95	0.86	1.00	1.01	1.07	1.10
Avg	1.27	1.10	1.08	0.96	0.94	0.92	0.91	0.91	0.97	0.99	1.03	1.06
Std. Dev.	0.09	0.08	0.03	0.02	0.03	0.04	0.04	0.06	0.02	0.03	0.04	0.05
CV	6.82	7.11	2.40	1.98	3.19	4.37	4.33	6.09	1.89	3.15	3.99	4.46
Precision	7.16	7.46	2.52	2.08	3.35	4.59	4.54	6.40	1.99	3.31	4.19	4.69

Traffic Pattern Group 9 Monthly Factors - Overall Statistics

Average 1.01  
 CV 4.15  
 Precision 4.35

Overall Precision is less than 10%, therefore TPG 9 grouping is sufficient.

Note: CV = Coefficient of Variation, CV and Precision are expressed in %.

n= 6  
 T= 2.571

Note: This page is valid only for n=2 through 10.

\*Do not put any entry in any row between 5 and 14 unless you have all 12 monthly factors. In this case, the Counter number must entered along with all 12 monthly factors

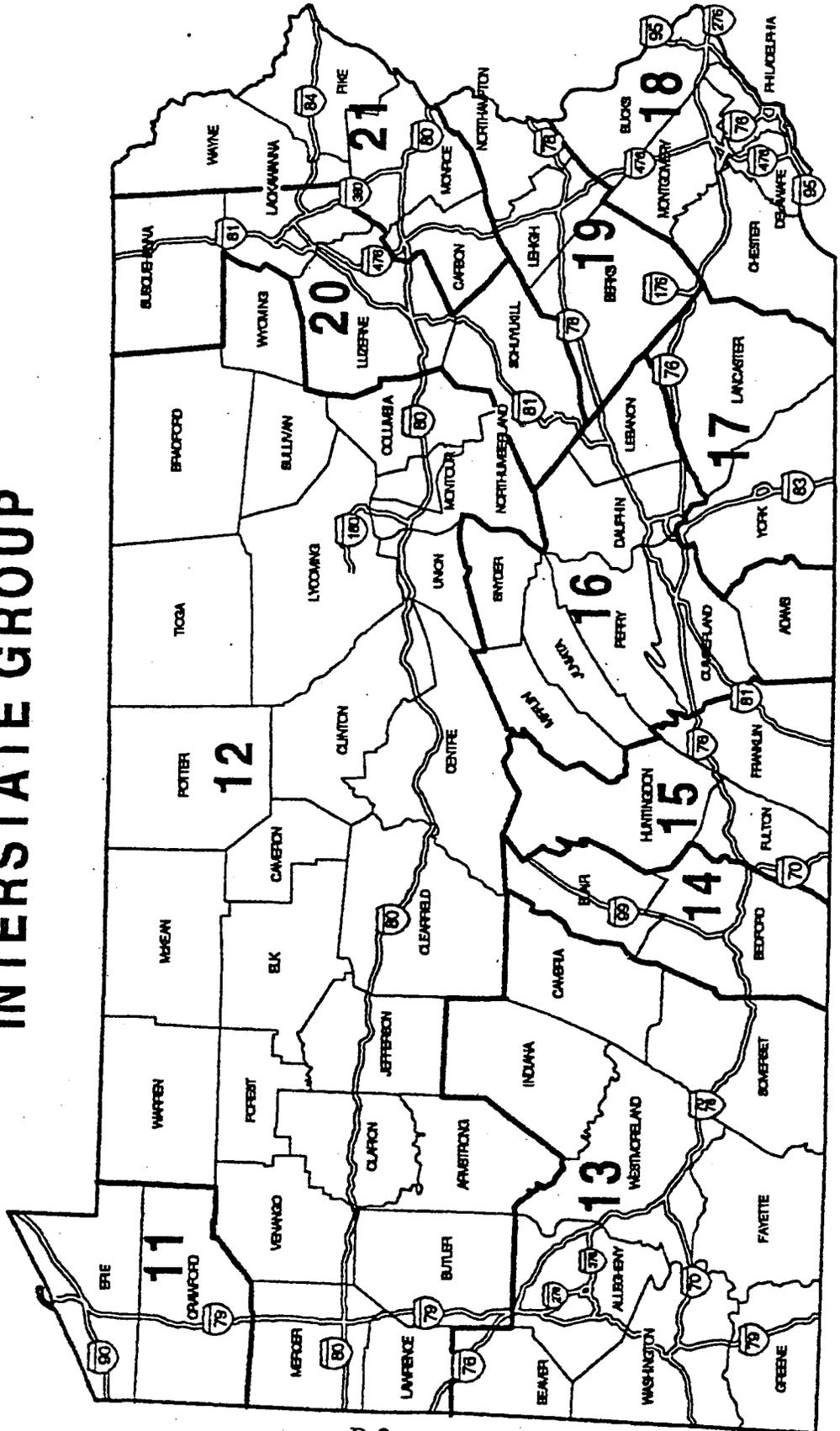
**Traffic Pattern Group 10 - Special Recreational**

Counter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
306	1.49	1.26	1.31	1.11	0.90	0.83	0.69	0.76	0.91	1.01	1.16	1.23

According to the TMG, no analysis was performed for the recreational group

**APPENDIX B**  
**Growth Factor Analysis Technical Material**

# CONTROL COUNT PROGRAM INTERSTATE GROUP



# CONTROL COUNT PROGRAM NON-INTERSTATE GROUP

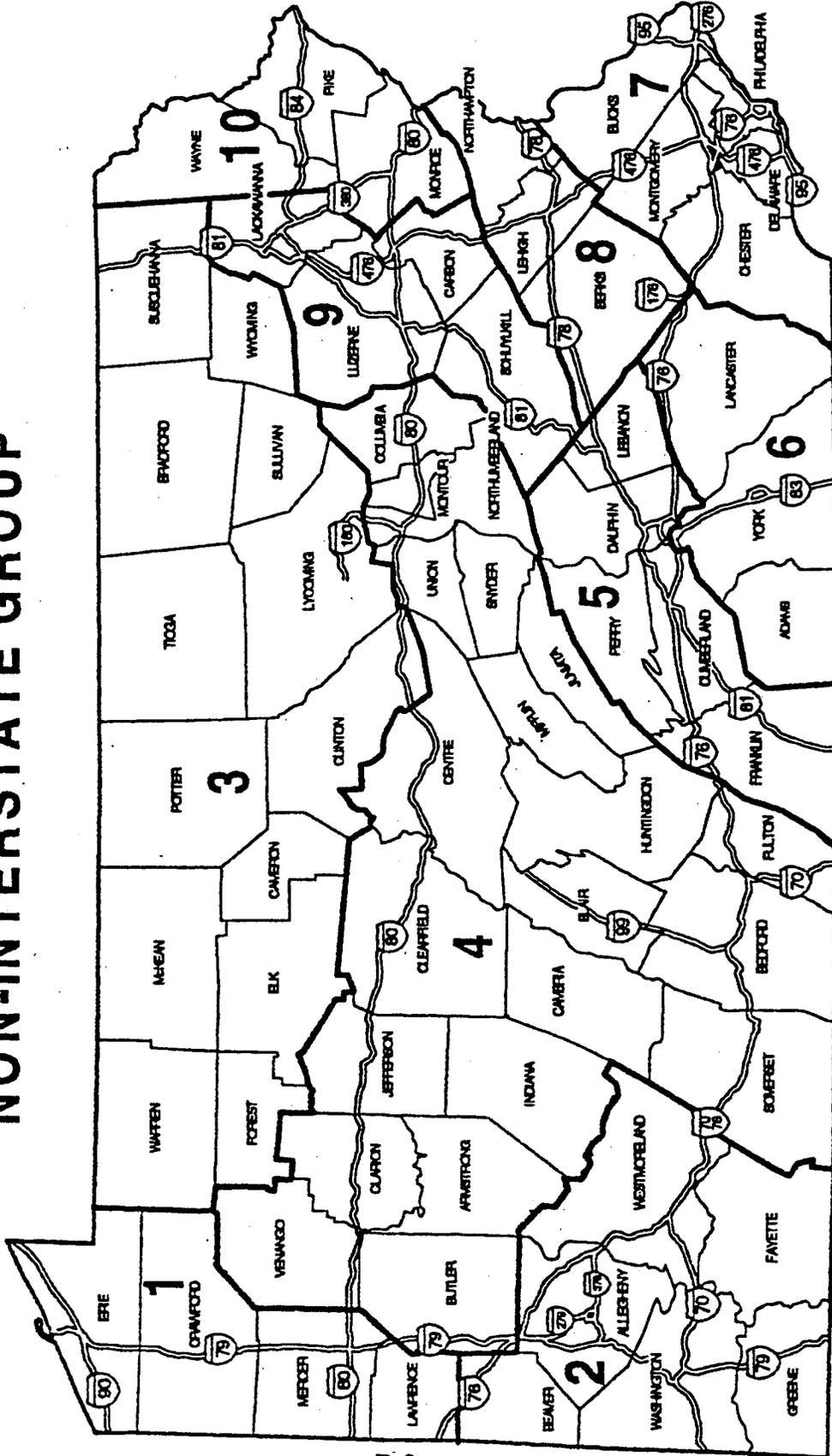


Table B-1 Rural Non-Interstates Growth Factor Analysis (Missing Data Estimated)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
1	2	-1.3%	24.62%	2	0
2	6	9.0%	12.11%	3	3
3	10	-0.3%	3.07%	10	0
4	12	-2.6%	3.42%	10	2
5	1	6.0%	---	0	1
6	3	-2.0%	9.00%	3	0
7	2	5.2%	47.52%	1	1
8	1	-1.4%	---	1	0
9	2	-0.7%	4.40%	2	0
10	2	0.6%	14.21%	2	0

Table B-2 Urban Non-Interstates Growth Factor Analysis (Missing Data Estimated)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
1	4	-3.4%	16.46%	3	1
2	15	1.3%	2.71%	2	13
3	3	1.6%	11.19%	1	2
4	6	3.9%	6.34%	3	3
5	3	-0.5%	9.42%	1	2
6	6	7.6%	7.35%	0	6
7	18	1.5%	4.99%	2	16
8	9	-1.1%	7.11%	0	9
9	5	-3.8%	12.79%	0	5
10	0	---	---	0	0

Table B-3 Rural Interstates Growth Factor Analysis (Missing Data Estimated)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
11	3	4.4%	12.96%	1	2
12	6	4.7%	4.96%	2	4
13	2	2.8%	4.76%	2	0
14	0	---	---	0	0
15	4	2.1%	6.47%	2	2
16	2	5.5%	1.49%	0	2
17	1	5.6%	---	0	1
18	0	---	---	0	0
19	0	---	---	0	0
20	2	3.5%	18.22%	2	0
21	1	0.1%	---	0	1

Table B-4 Urban Interstates Growth Factor Analysis (Missing Data Estimated)

Group Number	Sample Size	Growth Rate (%)	Precision (%)	# of ATR Stations	# of Short Term Count Stations
11	0	---	---	0	0
12	1	4.0%	---	0	1
13	6	2.5%	3.12%	2	4
14	2	1.8%	7.52%	0	2
15	0	---	---	0	0
16	7	3.7%	3.65%	1	6
17	3	6.5%	6.96%	1	2
18	5	4.5%	6.42%	1	4
19	3	3.6%	14.34%	1	2
20	3	4.5%	8.78%	1	2
21	0	---	---	0	0

**Control Count Group Precision Analysis  
Non-Interstate Groups Excluding Missing Data -  
Omitting Select Short Term Counters  
1998 - 1999**

**Group #4 - Rural Facilities**

Counties - Venango, Butler, Clarion, Armstrong, Indiana, Jefferson, Clearfield, Cambria, Somerset, Bedford, Fulton, Blair, Huntingdon, Centre, Mifflin, Juniata, Snyder, Union, Montour, Northumberland & Columbia

Overall Performance			
Sample Size	10	T-Value	2.262
Average Growth Factor	0.988	Precision(%)	2.97
Standard Deviation	0.04		
Coefficient of Variation	4.15		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3	ATR (TPG 6)	PA 255	Clearfield	5,796	5,818	Rural	1.00
15	ATR (TPG 7)	US 522	Fulton	5,502	5,624	Rural	1.02
323	ATR (TPG 4)	US 220	Bedford	3,539	3,595	Rural	1.02
326	ATR (TPG 4)	US 322	Clarion	11,985	11,559	Rural	0.96
328	ATR (TPG 6)	PA 150	Centre	6,210	6,262	Rural	1.01
360	ATR (TPG 4)	US 219	Clearfield	2,587	2,534	Rural	0.98
367	ATR (TPG 7)	PA 45	Union	6,543	6,464	Rural	0.99
386	ATR (TPG 9)	PA 254	Montour	2,125	2,165	Rural	1.02
387	ATR (TPG 9)	SR 2031	Somerset	3,349	3,330	Rural	0.99
389	ATR (TPG 9)	PA 536	Jefferson	2,543	2,247	Rural	0.88

**Group #2 - Urban Facilities**

Counties - Beaver, Allegheny, Westmoreland, Washington, Greene, Fayette

Overall Performance			
Sample Size	9	T-Value	2.306
Average Growth Factor	0.998	Precision(%)	3.82
Standard Deviation	0.05		
Coefficient of Variation	4.97		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
44	Short Term	PA 8	Allegheny	33,243	34,132	Urban	1.03
135	Short Term	SR 3038	Allegheny	8,306	8,382	Urban	1.01
290	Short Term	PA 60	Beaver	31,220	29,611	Urban	0.95
2162	Short Term	US 119	Fayette	24,402	25,717	Urban	1.05
4642	Short Term	PA 56	Westmoreland	24,632	22,972	Urban	0.93
10155	Short Term	SR 1009	Washington	10,064	10,728	Urban	1.07
10464	Short Term	PA 906	Westmoreland	3,908	3,932	Urban	1.01
203	ATR (TPG 3)	PA 65	Pittsburgh	20660	20719	Urban	1.00
375	ATR (TPG 3)	US 22/30	Pittsburgh	24335	22714	Urban	0.93

**Group #7 - Urban Facilities**

Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia

Overall Performance			
Sample Size	10	T-Value	2.262
Average Growth Factor	1.009	Precision(%)	3.93
Standard Deviation	0.06		
Coefficient of Variation	5.49		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
717	Short Term	PA 309	Bucks	20,444	18,761	Urban	0.92
1282	Short Term	US 202	Chester	38,976	39,454	Urban	1.01
1298	Short Term	US 422	Chester	20,587	21,657	Urban	1.05
1757	Short Term	PA 3	Delaware	20,501	21,677	Urban	1.06
1771	Short Term	US 322	Delaware	31,826	32,802	Urban	1.03
3846	Short Term	PA 309	Montgomery	53,740	51,610	Urban	0.96
3853	Short Term	US 422	Montgomery	80,304	85,843	Urban	1.07
4893	Short Term	PA 63	Philadelphia	30,635	32,421	Urban	1.06
8	ATR (TPG 3)	PA 73	Philadelphia	17946	17971	Urban	1.00
330	ATR (TPG 3)	PA 532	Philadelphia	12994	12091	Urban	0.93

**ANOVA ANALYSIS OF THE URBAN INTERSTATE GROUPS GROWTH FACTORS (1998-99)**

**Urban Interstate Growth Factors Listed by Group**

12 - Urban	13 - Urban	14 - Urban	16 - Urban	17 - Urban	18 - Urban	19 - Urban	20 - Urban
1.04	1.07	1.02	1.10	1.04	1.12	1.08	1.05
	1.03	1.01	1.03	1.10	0.97	0.97	1.08
	1.04		1.07	1.06	1.06	1.06	1.00
	1.03		1.03		1.05		
	0.98		0.99		1.02		
	1.00		1.05				
			0.99				

Anova: Single Factor - Urban Interstate Growth Factors

**SUMMARY**

Groups	Count	Sum	Average	Variance
12 - Urban	1	1.04	1.04	#DIV/0!
13 - Urban	6	6.15	1.03	0.0009
14 - Urban	2	2.04	1.02	0.0001
16 - Urban	7	7.26	1.04	0.0017
17 - Urban	3	3.19	1.06	0.0009
18 - Urban	5	5.23	1.05	0.0029
19 - Urban	3	3.11	1.04	0.0036
20 - Urban	3	3.13	1.04	0.0014

**ANOVA**

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.004	7	0.001	0.353	0.919	2.464
Within Groups	0.038	22	0.002			
Total	0.042	29				

0.353 < 2.464, no statistically significant difference in the groupings

**ANOVA ANALYSIS OF THE RURAL INTERSTATE GROUPS GROWTH FACTORS (1998-99)**

Rural Interstate Growth Factors Listed by Group

11 - Rural	12 - Rural	13 - Rural	15 - Rural	16 - Rural	17 - Rural	20 - Rural	21 - Rural
0.99	1.05	1.02	0.96	0.97	1.00	1.02	1.00
1.10	1.05	1.03	1.04	1.00		1.05	
1.03	0.97		1.02				
	1.07		1.06				
	1.02						

Anova: Single Factor - Rural Interstate Groups

**SUMMARY**

Groups	Count	Sum	Average	Variance
11 - Rural	3	3.13	1.04	0.0030
12 - Rural	5	5.16	1.03	0.0013
13 - Rural	2	2.06	1.03	0.0000
15 - Rural	4	4.08	1.02	0.0017
16 - Rural	2	1.98	0.99	0.0004
17 - Rural	1	1.00	1.00	#DIV/0!
20 - Rural	2	2.07	1.04	0.0004
21 - Rural	1	1.00	1.00	#DIV/0!

**ANOVA**

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.005	7	0.001	0.523	0.801	2.913
Within Groups	0.017	12	0.001			
Total	0.023	19				

0.523 < 2.913, no statistically significant difference in the groupings

**Control Count Group Precision Analysis  
Non-Interstate Groups Excluding Missing Data  
1998 - 1999**

**Group #1 - Rural Facilities**

**Counties - Erie, Crawford, Mercer & Lawrence**

**Overall Performance**

Sample Size	2	T-Value	12.706
Average Growth Factor	0.987	Precision(%)	24.62
Standard Deviation	0.03		
Coefficient of Variation	2.74		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1	ATR (TPG 7)	US 20	Erie	4693	4540	Rural	0.97
2	ATR (TPG 6)	PA 77	Crawford	2129	2141	Rural	1.01

**Group #2 - Rural Facilities**

**Counties - Beaver, Allegheny, Westmoreland, Washington, Greene, Fayette**

**Overall Performance**

Sample Size	4	T-Value	3.182
Average Growth Factor	1.019	Precision(%)	1.69
Standard Deviation	0.01		
Coefficient of Variation	1.06		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2107	Short Term	PA 21	Fayette	11,933	12,318	Rural	1.03
24	ATR (TPG 4)	US 22	Westmoreland	17003	17113	Rural	1.01
378	ATR (TPG 4)	US 40	Fayette	10813	10980	Rural	1.02
19	ATR (TPG 4)	PA 88	Washington	8285	8462	Rural	1.02

**Group #3 - Rural Facilities**

**Counties - Warren, Forest, McKean, Elk, Cameron, Potter, Clinton, Tioga  
Lycoming, Bradford, Sullivan, Wyoming & Susquehanna**

**Overall Performance**

Sample Size	10	T-Value	2.262
Average Growth Factor	0.997	Precision(%)	3.07
Standard Deviation	0.04		
Coefficient of Variation	4.29		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4	ATR (TPG 4)	US 6	Tioga	2961	3000	Rural	1.01
5	ATR (TPG 8)	SR 1043	Bradford	1328	1243	Rural	0.94
27	ATR (TPG 6)	PA 66/948	Elk	2653	2601	Rural	0.98
29	ATR (TPG 8)	PA 267	Susquehanna	1153	1129	Rural	0.98
48	ATR (TPG 6)	US 11	Susquehanna	4256	4293	Rural	1.01
51	ATR (TPG 6)	PA 44	Potter	3632	3836	Rural	1.06
363	ATR (TPG 4)	US 219	McKean	4593	4579	Rural	1.00
383	ATR (TPG 8)	PA 150	Clinton	4183	3949	Rural	0.94
384	ATR (TPG 8)	SR 4022	Tioga	558	549	Rural	0.98
385	ATR (TPG 8)	SR 3002	Warren	2117	2264	Rural	1.07

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**Group #4 - Rural Facilities****Counties - Venango, Butler, Clarion, Armstrong, Indiana, Jefferson, Clearfield, Cambria  
Somerset, Bedford, Fulton, Blair, Huntingdon, Centre, Mifflin, Juniata, Snyder, Union,  
Montour, Northumberland & Columbia****Overall Performance**

Sample Size	11	T-Value	2.228
Average Growth Factor	0.984	Precision(%)	2.77
Standard Deviation	0.04		
Coefficient of Variation	4.13		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4954	Short Term	PA 8	Venango	7,126	6,759	Rural	0.95
3	ATR (TPG 6)	PA 255	Clearfield	5,796	5,818	Rural	1.00
15	ATR (TPG 7)	US 522	Fulton	5,502	5,624	Rural	1.02
323	ATR (TPG 4)	US 220	Bedford	3,539	3,595	Rural	1.02
326	ATR (TPG 4)	US 322	Clarion	11,985	11,559	Rural	0.96
328	ATR (TPG 6)	PA 150	Centre	6,210	6,262	Rural	1.01
360	ATR (TPG 4)	US 219	Clearfield	2,587	2,534	Rural	0.98
367	ATR (TPG 7)	PA 45	Union	6,543	6,464	Rural	0.99
386	ATR (TPG 9)	PA 254	Montour	2,125	2,165	Rural	1.02
387	ATR (TPG 9)	SR 2031	Somerset	3,349	3,330	Rural	0.99
389	ATR (TPG 9)	PA 536	Jefferson	2,543	2,247	Rural	0.88

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**Group #5 - Rural Facilities****Counties - Franklin, Cumberland, Perry, Dauphin & Lebanon****Overall Performance**

Sample Size	1	T-Value	2.262
Average Growth Factor	1.060	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4040	Short Term	US 11	Perry	15,841	16,785	Rural	1.06

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**Group #6 - Rural Facilities****Counties - Adams, York & Lancaster****Overall Performance**

Sample Size	3	T-Value	4.303
Average Growth Factor	0.980	Precision(%)	9.00
Standard Deviation	0.04		
Coefficient of Variation	3.62		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
334	ATR (TPG 4)	US 30	York	15334	15393	Rural	1.00
362	ATR (TPG 9)	PA 24	York	5398	5386	Rural	1.00
390	ATR (TPG 7)	PA 230	Lancaster	6615	6215	Rural	0.94

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**Group #7 - Rural Facilities**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.043	Precision(%)	36.69
Standard Deviation	0.04		
Coefficient of Variation	4.08		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
10465	Short Term	US 1	Chester	4,252	4,564	Rural	1.07
391	ATR (TPG 7)	PA 23	Chester	7996	8101	Rural	1.01

**Group #8 - Rural Facilities**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	0.986	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
349	ATR (TPG 4)	US 309	Lehigh	35899	35391	Rural	0.99

**Group #9 - Rural Facilities**  
**Counties - Luzerne, Schuylkill, Carbon & Lackawanna**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	0.993	Precision(%)	4.40
Standard Deviation	0.00		
Coefficient of Variation	0.49		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
40	ATR (TPG 7)	US 209	Schuylkill	4873	4856	Rural	1.00
364	ATR (TPG 9)	PA 307	Lackawanna	5402	5346	Rural	0.99

**Group #10 - Rural Facilities**  
**Counties - Pike, Monroe & Wayne**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.006	Precision(%)	14.21
Standard Deviation	0.02		
Coefficient of Variation	1.58		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
306	ATR (TPG 10)	PA 507	Pike	5643	5742	Rural	1.02
388	ATR (TPG 9)	SR 3004	Monroe	2818	2804	Rural	1.00

**Group #1 - Urban Facilities**  
**Counties - Erie, Crawford, Mercer & Lawrence**

Overall Performance			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.016	Precision(%)	2.46
Standard Deviation	0.01		
Coefficient of Variation	0.99		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
20	ATR (TPG 5)	PA 65	New Castle	8234	8424	Urban	1.02
301	ATR (TPG 3)	PA 5	Erie	17418	17501	Urban	1.00
381	ATR (TPG 5)	SR 3019	Sharon	710	725	Urban	1.02

**Group #2 - Urban Facilities**  
**Counties - Beaver, Allegheny, Westmoreland, Washington, Greene, Fayette**

Overall Performance			
Sample Size	15°	T-Value	2.145
Average Growth Factor	1.011	Precision(%)	2.53
Standard Deviation	0.05		
Coefficient of Variation	4.58		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
44	Short Term	PA 8	Allegheny	33,243	34,132	Urban	1.03
55	Short Term	US 22	Allegheny	54,334	54,517	Urban	1.00
104	Short Term	PA 885	Allegheny	24,824	24,675	Urban	0.99
135	Short Term	SR 3038	Allegheny	8,306	8,382	Urban	1.01
290	Short Term	PA 60	Beaver	31,220	29,611	Urban	0.95
2155	Short Term	US 119	Fayette	20,627	20,996	Urban	1.02
2162	Short Term	US 119	Fayette	24,402	25,717	Urban	1.05
4632	Short Term	US 30	Westmoreland	32,811	34,081	Urban	1.04
4642	Short Term	PA 56	Westmoreland	24,632	22,972	Urban	0.93
4654	Short Term	US 119	Westmoreland	22,978	25,046	Urban	1.09
10155	Short Term	SR 1009	Washington	10,064	10,728	Urban	1.07
10464	Short Term	PA 906	Westmoreland	3,908	3,932	Urban	1.01
30385	Short Term	PA 65	Beaver	25,826	27,039	Urban	1.05
203	ATR (TPG 3)	PA 65	Pittsburgh	20660	20719	Urban	1.00
375	ATR (TPG 3)	US 22/30	Pittsburgh	24335	22714	Urban	0.93

**Group #3 - Urban Facilities**  
**Counties - Warren, Forest, McKean, Elk, Cameron, Potter, Clinton, Tioga**  
**Lycoming, Bradford, Sullivan, Wyoming & Susquehanna**

Overall Performance			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.016	Precision(%)	11.19
Standard Deviation	0.05		
Coefficient of Variation	4.50		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3397	Short Term	US 220	Lycoming	23,853	23,746	Urban	1.00
10676	Short Term	US 15	Lycoming	16,190	17,297	Urban	1.07
304	ATR (TPG 3)	US 15	Williamsport	28545	28089	Urban	0.98

**Group #4 - Urban Facilities**

Counties - Venango, Butler, Clarion, Armstrong, Indiana, Jefferson, Clearfield, Cambria  
Somerset, Bedford, Fulton, Blair, Huntingdon, Centre, Mifflin, Juniata, Snyder, Union,  
Montour, Northumberland & Columbia

**Overall Performance**

Sample Size	5	T-Value	2.776
Average Growth Factor	1.019	Precision(%)	5.44
Standard Deviation	0.04		
Coefficient of Variation	4.38		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
969	Short Term	PA 56	Cambria	24,020	22,778	Urban	0.95
984	Short Term	US 219	Cambria	22,135	23,280	Urban	1.05
18	ATR (TPG 5)	PA 38	Butler	7335	7383	Urban	1.01
379	ATR (TPG 5)	SR 4013	Altoona	1550	1641	Urban	1.06
382	ATR (TPG 5)	SR 3005	Johnstown	1999	2063	Urban	1.03

**Group #5 - Urban Facilities**

Counties - Franklin, Cumberland, Perry, Dauphin & Lebanon

**Overall Performance**

Sample Size	3	T-Value	4.303
Average Growth Factor	0.969	Precision(%)	4.30
Standard Deviation	0.02		
Coefficient of Variation	1.73		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1678	Short Term	US 22	Dauphin	19,597	18,744	Urban	0.96
10458	Short Term	PA 581	Cumberland	32,481	31,228	Urban	0.96
206	ATR (TPG 3)	H.T. Bridge	Harrisburg	29509	29146	Urban	0.99

**Group #6 - Urban Facilities**

Counties - Adams, York & Lancaster

**Overall Performance**

Sample Size	5	T-Value	2.776
Average Growth Factor	1.012	Precision(%)	8.25
Standard Deviation	0.07		
Coefficient of Variation	6.65		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2762	Short Term	US 30	Lancaster	26,435	29,055	Urban	1.10
2767	Short Term	US 30	Lancaster	66,160	64,268	Urban	0.97
2768	Short Term	US 30	Lancaster	24,657	22,877	Urban	0.93
2772	Short Term	US 30	Lancaster	18,501	18,678	Urban	1.01
2790	Short Term	US 222	Lancaster	36,386	38,362	Urban	1.05

**Group #7 - Urban Facilities**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	14	T-Value	2.160
Average Growth Factor	1.002	Precision(%)	2.96
Standard Deviation	0.05		
Coefficient of Variation	5.13		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
710	Short Term	US 202	Bucks	27,604	27,428	Urban	0.99
717	Short Term	PA 309	Bucks	20,444	18,761	Urban	0.92
1282	Short Term	US 202	Chester	38,976	39,454	Urban	1.01
1298	Short Term	US 422	Chester	20,587	21,657	Urban	1.05
1754	Short Term	US 1	Delaware	45,373	45,523	Urban	1.00
1757	Short Term	PA 3	Delaware	20,501	21,677	Urban	1.06
1771	Short Term	US 322	Delaware	31,826	32,802	Urban	1.03
1782	Short Term	SR 2016	Delaware	37,690	34,835	Urban	0.92
3846	Short Term	PA 309	Montgomery	53,740	51,610	Urban	0.96
3853	Short Term	US 422	Montgomery	80,304	85,843	Urban	1.07
4893	Short Term	PA 63	Philadelphia	30,635	32,421	Urban	1.06
4899	Short Term	PA 291	Philadelphia	49,498	50,224	Urban	1.01
8	ATR (TPG 3)	PA 73	Philadelphia	17946	17971	Urban	1.00
330	ATR (TPG 3)	PA 532	Philadelphia	12994	12091	Urban	0.93

**Group #8 - Urban Facilities**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	8	T-Value	2.365
Average Growth Factor	1.009	Precision(%)	5.11
Standard Deviation	0.06		
Coefficient of Variation	6.12		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
398	Short Term	US 422	Berks	27,973	29,186	Urban	1.04
400	Short Term	US 422	Berks	24,446	26,479	Urban	1.08
401	Short Term	US 422	Berks	25,385	25,283	Urban	1.00
3062	Short Term	US 22	Lehigh	26,051	27,535	Urban	1.06
3064	Short Term	US 22	Lehigh	74,826	74,270	Urban	0.99
3091	Short Term	PA 309	Lehigh	21,348	22,491	Urban	1.05
3097	Short Term	PA 378	Lehigh	18,077	16,438	Urban	0.91
3924	Short Term	US 22	Northampton	42,224	39,527	Urban	0.94

**Group #9 - Urban Facilities**  
**Counties - Luzerne, Schuylkill, Carbon & Lackawanna**

<b>Overall Performance</b>			
Sample Size	4	T-Value	3.182
Average Growth Factor	1.004	Precision(%)	6.55
Standard Deviation	0.04		
Coefficient of Variation	4.12		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2575	Short Term	US 11	Lackawanna	40,117	37,906	Urban	0.94
2724	Short Term	SR 3022	Lackawanna	20,075	20,895	Urban	1.04
3164	Short Term	PA 29	Luzerne	14,297	14,436	Urban	1.01
3204	Short Term	PA 309	Luzerne	35,348	36,037	Urban	1.02

**Group #10 - Urban Facilities**  
**Counties - Pike, Monroe & Wayne**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Control Count Group Precision Analysis  
Interstate Groups with Missing Data Eliminated  
1998 - 1999**

**Group #11 - Rural Interstates  
Counties - Erie & Crawford**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.044	Precision(%)	12.96
Standard Deviation	0.05		
Coefficient of Variation	5.22		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1575	Short Term	I-79	Crawford	17,003	16,917	Rural	0.99
1997	Short Term	I-90	Erie	17,952	19,790	Rural	1.10
207	ATR (TPG 2)	I-90	Erie	20,083	20,751	Rural	1.03

**Group #12 - Rural Interstates**

**Counties - Mercer, Lawrence, Butler, Venango, Clarion, Armstrong, Forest, Warren, Jefferson  
Clearfield, Elk, McKean, Cameron, Potter, Clinton, Centre, Tioga, Lycoming, Union,  
Northumberland, Montour, Columbia, Sullivan, Bradford, Wyoming**

<b>Overall Performance</b>			
Sample Size	5	T-Value	2.776
Average Growth Factor	1.032	Precision(%)	4.42
Standard Deviation	0.04		
Coefficient of Variation	3.56		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3654	Short Term	I-80	Mercer	27,127	28,396	Rural	1.05
1542	Short Term	I-80	Columbia	28,117	29,438	Rural	1.05
4333	Short Term	I-80	Union	20,288	19,731	Rural	0.97
372	ATR (TPG 2)	I-80	Union	22,948	24,528	Rural	1.07
374	ATR (TPG 2)	I-79	Butler	31,196	31,967	Rural	1.02

**Group #13 - Rural Interstates**

**Counties - Beaver, Washington, Allegheny, Westmoreland, Indiana, Cambria,  
Greene, Fayette & Somerset**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.028	Precision(%)	4.76
Standard Deviation	0.01		
Coefficient of Variation	0.53		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
370	ATR (TPG 2)	I-70	Westmoreland	29,493	30,210	Rural	1.02
393	ATR (TPG 2)	I-70	Washington	25,957	26,788	Rural	1.03

**Group #14 - Rural Interstates**  
**Counties - Bedford & Blair**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #15 - Rural Interstates**  
**Counties - Franklin, Fulton & Huntingdon**

<b>Overall Performance</b>			
Sample Size	4	T-Value	3.182
Average Growth Factor	1.021	Precision(%)	6.47
Standard Deviation	0.04		
Coefficient of Variation	4.07		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2332	Short Term	I-81	Franklin	37,756	36,316	Rural	0.96
2334	Short Term	I-81	Franklin	36,501	38,059	Rural	1.04
371	ATR (TPG 2)	I-70	Fulton	17,364	17,778	Rural	1.02
373	ATR (TPG 2)	I-81	Franklin	38,370	40,506	Rural	1.06

**Group #16 - Rural Interstates**  
**Counties - Adams, Cumberland, Perry, Dauphin, Lebanon, Juniata, Mifflin & Snyder**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	0.988	Precision(%)	18.04
Standard Deviation	0.02		
Coefficient of Variation	2.01		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1694	Short Term	I-81	Dauphin	28,480	27,733	Rural	0.97
3030	Short Term	I-81	Lebanon	24,207	24,251	Rural	1.00

**Group #17 - Rural Interstates**  
**Counties - York & Lancaster**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	1.004	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4750	Short Term	I-83	York	17,092	17,168	Rural	1.00

**Group #18 - Rural Interstates**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #19 - Rural Interstates**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #20 - Rural Interstates**  
**Counties - Susquehanna, Lackawanna, Luzerne & Schuylkill**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.035	Precision(%)	18.22
Standard Deviation	0.02		
Coefficient of Variation	2.03		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
216	ATR (TPG 2)	I-81	Susquehanna	24,464	24,961	Rural	1.02
392	ATR (TPG 2)	I-80	Luzerne	19,996	20,996	Rural	1.05

**Group #21 - Rural Interstates**  
**Counties - Carbon, Monroe, Pike & Wayne**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	1.001	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4079	Short Term	I-84	Pike	23,586	23,619	Rural	1.00

**Group #11 - Urban Interstates**  
**Counties - Erie & Crawford**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #12 - Urban Interstates**

**Counties - Mercer, Lawrence, Butler, Venango, Clarion, Armstrong, Forest, Warren, Jefferson, Clearfield, Elk, McKean, Cameron, Potter, Clinton, Centre, Tioga, Lycoming, Union, Northumberland, Montour, Columbia, Sullivan, Bradford, Wyoming**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	1.040	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1538	Short Term	I-80	Columbia	32,342	33,631	Urban	1.04

**Group #13 - Urban Interstates**

**Counties - Beaver, Washington, Allegheny, Westmoreland, Indiana, Cambria, Greene, Fayette & Somerset**

<b>Overall Performance</b>			
Sample Size	6	T-Value	2.571
Average Growth Factor	1.025	Precision(%)	3.12
Standard Deviation	0.03		
Coefficient of Variation	2.98		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
83	Short Term	I-79	Allegheny	37,114	39,787	Urban	1.07
4544	Short Term	I-70	Washington	32,865	33,812	Urban	1.03
4545	Short Term	I-70	Washington	44,702	46,286	Urban	1.04
4551	Short Term	I-70	Washington	30,626	31,617	Urban	1.03
208	ATR (TPG 1)	I-376	Pittsburgh	65,299	64,300	Urban	0.98
309	ATR (TPG 1)	I-279	Pittsburgh	106,981	106,938	Urban	1.00

**Group #14 - Urban Interstates**

**Counties - Bedford & Blair**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.018	Precision(%)	7.52
Standard Deviation	0.01		
Coefficient of Variation	0.84		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
12405	Short Term	I-99	Blair	29,809	30,537	Urban	1.02
12406	Short Term	I-99	Blair	36,216	36,664	Urban	1.01

**Group #15 - Urban Interstates**  
**Counties - Franklin, Fulton & Huntingdon**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #16 - Urban Interstates**  
**Counties - Adams, Cumberland, Perry, Dauphin, Lebanon, Juniata, Mifflin & Snyder**

<b>Overall Performance</b>			
Sample Size	7	T-Value	2.447
Average Growth Factor	1.037	Precision(%)	3.65
Standard Deviation	0.04		
Coefficient of Variation	3.94		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1622	Short Term	I-81	Cumberland	49,237	54,114	Urban	1.10
1628	Short Term	I-83	Cumberland	58,119	59,703	Urban	1.03
1692	Short Term	I-81	Dauphin	72,103	77,495	Urban	1.07
1695	Short Term	I-83	Dauphin	90,187	93,049	Urban	1.03
1696	Short Term	I-83	Dauphin	45,485	45,002	Urban	0.99
1698	Short Term	I-83	Dauphin	72,815	76,172	Urban	1.05
210	ATR (TPG 1)	I-83	Harrisburg	104,008	102,896	Urban	0.99

**Group #17 - Urban Interstates**  
**Counties - York & Lancaster**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.065	Precision(%)	6.96
Standard Deviation	0.03		
Coefficient of Variation	2.80		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4757	Short Term	I-83	York	57,155	59,297	Urban	1.04
4765	Short Term	I-83	York	54,273	59,517	Urban	1.10
205	ATR (TPG 1)	I-83	York	40,657	43,098	Urban	1.06

**Group #18 - Urban Interstates**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	5	T-Value	2.776
Average Growth Factor	1.045	Precision(%)	6.42
Standard Deviation	0.05		
Coefficient of Variation	5.17		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1778	Short Term	I-476	Delaware	91,734	102,381	Urban	1.12
3838	Short Term	I-76	Montgomery	96,187	93,323	Urban	0.97
3839	Short Term	I-76	Montgomery	107,609	114,523	Urban	1.06
3840	Short Term	I-76	Montgomery	111,985	118,140	Urban	1.05
377	ATR (TPG 2)	I-95	Philadelphia	48,991	50,030	Urban	1.02

**Group #19 - Urban Interstates**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.036	Precision(%)	14.34
Standard Deviation	0.06		
Coefficient of Variation	5.77		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3073	Short Term	I-78	Lehigh	32,344	34,824	Urban	1.08
3076	Short Term	I-78	Lehigh	35,760	34,589	Urban	0.97
394	ATR (TPG 1)	I-78	Allentown	38,908	41,387	Urban	1.06

**Group #20 - Urban Interstates**  
**Counties - Susquehanna, Lackawanna, Luzerne & Schuylkill**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.045	Precision(%)	8.78
Standard Deviation	0.04		
Coefficient of Variation	3.53		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2583	Short Term	I-81	Lackawanna	39,089	41,118	Urban	1.05
2590	Short Term	I-84	Lackawanna	44,136	47,566	Urban	1.08
376	ATR (TPG 1)	I-81	Wilkes-Barre	45,718	45,943	Urban	1.00

**Group #21 - Urban Interstates**  
**Counties - Carbon, Monroe, Pike & Wayne**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Control Count Group Precision Analysis  
Non-Interstate Groups with Missing Data Estimated  
1998 - 1999**

**Group #1 - Rural Facilities  
Counties - Erie, Crawford, Mercer & Lawrence**

**Overall Performance**

Sample Size	2	T-Value	12.706
Average Growth Factor	0.99	Precision(%)	24.62
Standard Deviation	0.03		
Coefficient of Variation	2.74		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1	ATR (TPG 7)	US 20	Erie	4693	4540	Rural	0.97
2	ATR (TPG 6)	PA 77	Crawford	2129	2141	Rural	1.01

**Group #2 - Rural Facilities  
Counties - Beaver, Allegheny, Westmoreland, Washington, Greene, Fayette**

**Overall Performance**

Sample Size	6	T-Value	2.571
Average Growth Factor	1.09	Precision(%)	12.11
Standard Deviation	0.13		
Coefficient of Variation	11.54		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2107	Short Term	PA 21	Fayette	11,933	12,318	Rural	1.03
2131	Short Term	PA 51	Fayette	15,565	17,709	Rural	1.14
4535	Short Term	PA 19	Washington	14,693	19,501	Rural	1.33
24	ATR (TPG 4)	US 22	Westmoreland	17003	17113	Rural	1.01
378	ATR (TPG 4)	US 40	Fayette	10813	10980	Rural	1.02
19	ATR (TPG 4)	PA 88	Washington	8285	8462	Rural	1.02

**Group #3 - Rural Facilities  
Counties - Warren, Forest, McKean, Elk, Cameron, Potter, Clinton, Tioga  
Lycoming, Bradford, Sullivan, Wyoming & Susquehanna**

**Overall Performance**

Sample Size	10	T-Value	2.262
Average Growth Factor	1.00	Precision(%)	3.07
Standard Deviation	0.04		
Coefficient of Variation	4.29		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4	ATR (TPG 4)	US 6	Tioga	2961	3000	Rural	1.01
5	ATR (TPG 8)	SR 1043	Bradford	1328	1243	Rural	0.94
27	ATR (TPG 6)	PA 66/948	Elk	2653	2601	Rural	0.98
29	ATR (TPG 8)	PA 267	Susquehanna	1153	1129	Rural	0.98
48	ATR (TPG 6)	US 11	Susquehanna	4256	4293	Rural	1.01
51	ATR (TPG 6)	PA 44	Potter	3632	3836	Rural	1.06
363	ATR (TPG 4)	US 219	McKean	4593	4579	Rural	1.00
383	ATR (TPG 8)	PA 150	Clinton	4183	3949	Rural	0.94
384	ATR (TPG 8)	SR 4022	Tioga	558	549	Rural	0.98
385	ATR (TPG 8)	SR 3002	Warren	2117	2264	Rural	1.07

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**Group #4 - Rural Facilities****Counties - Venango, Butler, Clarion, Armstrong, Indiana, Jefferson, Clearfield, Cambria  
Somerset, Bedford, Fulton, Blair, Huntingdon, Centre, Mifflin, Juniata, Snyder, Union,  
Montour, Northumberland & Columbia****Overall Performance**

Sample Size	12	T-Value	2.201
Average Growth Factor	0.97	Precision(%)	3.42
Standard Deviation	0.05		
Coefficient of Variation	5.38		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4954	Short Term	PA 8	Venango	7,126	6,759	Rural	0.95
11693	Short Term	PA 26	Centre	9,618	8,294	Rural	0.86
3	ATR (TPG 6)	PA 255	Clearfield	5,796	5,818	Rural	1.00
15	ATR (TPG 7)	US 522	Fulton	5,502	5,624	Rural	1.02
323	ATR (TPG 4)	US 220	Bedford	3,539	3,595	Rural	1.02
326	ATR (TPG 4)	US 322	Clarion	11,985	11,559	Rural	0.96
328	ATR (TPG 6)	PA 150	Centre	6,210	6,262	Rural	1.01
360	ATR (TPG 4)	US 219	Clearfield	2,587	2,534	Rural	0.98
367	ATR (TPG 7)	PA 45	Union	6,543	6,464	Rural	0.99
386	ATR (TPG 9)	PA 254	Montour	2,125	2,165	Rural	1.02
387	ATR (TPG 9)	SR 2031	Somerset	3,349	3,330	Rural	0.99
389	ATR (TPG 9)	PA 536	Jefferson	2,543	2,247	Rural	0.88

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**Group #5 - Rural Facilities****Counties - Franklin, Cumberland, Perry, Dauphin & Lebanon****Overall Performance**

Sample Size	1	T-Value	2.262
Average Growth Factor	1.06	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4040	Short Term	US 11	Perry	15,841	16,785	Rural	1.06

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**Group #6 - Rural Facilities****Counties - Adams, York & Lancaster****Overall Performance**

Sample Size	3	T-Value	4.303
Average Growth Factor	0.98	Precision(%)	9.00
Standard Deviation	0.04		
Coefficient of Variation	3.62		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
334	ATR (TPG 4)	US 30	York	15334	15393	Rural	1.00
362	ATR (TPG 9)	PA 24	York	5398	5386	Rural	1.00
390	ATR (TPG 7)	PA 230	Lancaster	6615	6215	Rural	0.94

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**Group #7 - Rural Facilities**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.05	Precision(%)	47.52
Standard Deviation	0.06		
Coefficient of Variation	5.29		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
10465	Short Term	US 1	Chester	8,492	9,272	Rural	1.09
391	ATR (TPG 7)	PA 23	Chester	7996	8101	Rural	1.01

**Group #8 - Rural Facilities**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	0.99	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
349	ATR (TPG 4)	US 309	Lehigh	35899	35391	Rural	0.99

**Group #9 - Rural Facilities**  
**Counties - Luzerne, Schuylkill, Carbon & Lackawanna**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	0.99	Precision(%)	4.40
Standard Deviation	0.00		
Coefficient of Variation	0.49		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
40	ATR (TPG 7)	US 209	Schuylkill	4873	4856	Rural	1.00
364	ATR (TPG 9)	PA 307	Lackawanna	5402	5346	Rural	0.99

**Group #10 - Rural Facilities**  
**Counties - Pike, Monroe & Wayne**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.01	Precision(%)	14.21
Standard Deviation	0.02		
Coefficient of Variation	1.58		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
306	ATR (TPG 10)	PA 507	Pike	5643	5742	Rural	1.02
388	ATR (TPG 9)	SR 3004	Monroe	2818	2804	Rural	1.00

**Group #1 - Urban Facilities**  
**Counties - Erie, Crawford, Mercer & Lawrence**

<b>Overall Performance</b>			
Sample Size	4	T-Value	3.182
Average Growth Factor	0.97	Precision(%)	16.46
Standard Deviation	0.10		
Coefficient of Variation	10.35		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
6124	Short-Term	PA 5	Erie	31,241	25,524	Urban	0.82
20	ATR (TPG 5)	PA 65	New Castle	8234	8424	Urban	1.02
301	ATR (TPG 3)	PA 5	Erie	17418	17501	Urban	1.00
381	ATR (TPG 5)	SR 3019	Sharon	710	725	Urban	1.02

**Group #2 - Urban Facilities**  
**Counties - Beaver, Allegheny, Westmoreland, Washington, Greene, Fayette**

<b>Overall Performance</b>			
Sample Size	15	T-Value	2.145
Average Growth Factor	1.01	Precision(%)	2.71
Standard Deviation	0.05		
Coefficient of Variation	4.89		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
44	Short Term	PA 8	Allegheny	33,243	34,132	Urban	1.03
55	Short Term	US 22	Allegheny	54,334	54,517	Urban	1.00
104	Short Term	PA 885	Allegheny	24,824	24,675	Urban	0.99
135	Short Term	SR 3038	Allegheny	8,306	8,382	Urban	1.01
290	Short Term	PA 60	Beaver	31,220	29,611	Urban	0.95
2155	Short Term	US 119	Fayette	20,627	20,996	Urban	1.02
2162	Short Term	US 119	Fayette	24,402	25,717	Urban	1.05
4632	Short Term	US 30	Westmoreland	32,811	34,081	Urban	1.04
4642	Short Term	PA 56	Westmoreland	24,632	22,972	Urban	0.93
4654	Short Term	US 119	Westmoreland	22,978	25,046	Urban	1.09
10155	Short Term	SR 1009	Washington	19,527	21,436	Urban	1.10
10464	Short Term	PA 906	Westmoreland	3,908	3,932	Urban	1.01
30385	Short Term	PA 65	Beaver	25,826	27,039	Urban	1.05
203	ATR (TPG 3)	PA 65	Pittsburgh	20660	20719	Urban	1.00
375	ATR (TPG 3)	US 22/30	Pittsburgh	24335	22714	Urban	0.93

**Group #3 - Urban Facilities**  
**Counties - Warren, Forest, McKean, Elk, Cameron, Potter, Clinton, Tioga  
 Lycoming, Bradford, Sullivan, Wyoming & Susquehanna**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.02	Precision(%)	11.19
Standard Deviation	0.05		
Coefficient of Variation	4.50		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3397	Short Term	US 220	Lycoming	23,853	23,746	Urban	1.00
10676	Short Term	US 15	Lycoming	16,190	17,297	Urban	1.07
304	ATR (TPG 3)	US 15	Williamsport	28545	28089	Urban	0.98

**Group #4 - Urban Facilities**

Counties - Venango, Butler, Clarion, Armstrong, Indiana, Jefferson, Clearfield, Cambria  
Somerset, Bedford, Fulton, Blair, Huntingdon, Centre, Mifflin, Juniata, Snyder, Union,  
Montour, Northumberland & Columbia

**Overall Performance**

Sample Size	6	T-Value	2.571
Average Growth Factor	1.04	Precision(%)	6.34
Standard Deviation	0.06		
Coefficient of Variation	6.04		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
969	Short Term	PA 56	Cambria	24,020	22,778	Urban	0.95
984	Short Term	US 219	Cambria	22,135	23,280	Urban	1.05
1136	Short Term	PA 26	Centre	23,114	26,304	Urban	1.14
18	ATR (TPG 5)	PA 38	Butler	7335	7383	Urban	1.01
379	ATR (TPG 5)	SR 4013	Altoona	1550	1641	Urban	1.06
382	ATR (TPG 5)	SR 3005	Johnstown	1999	2063	Urban	1.03

**Group #5 - Urban Facilities**

Counties - Franklin, Cumberland, Perry, Dauphin & Lebanon

**Overall Performance**

Sample Size	3	T-Value	4.303
Average Growth Factor	0.99	Precision(%)	9.42
Standard Deviation	0.04		
Coefficient of Variation	3.79		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1678	Short Term	US 22	Dauphin	37,692	39,041	Urban	1.04
10458	Short Term	PA 581	Cumberland	32,481	31,228	Urban	0.96
206	ATR (TPG 3)	H.T. Bridge	Harrisburg	29509	29146	Urban	0.99

**Group #6 - Urban Facilities**

Counties - Adams, York & Lancaster

**Overall Performance**

Sample Size	6	T-Value	2.571
Average Growth Factor	1.08	Precision(%)	7.35
Standard Deviation	0.08		
Coefficient of Variation	7.00		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2761	Short Term	US 30	Lancaster	40,833	46,654	Urban	1.14
2762	Short Term	US 30	Lancaster	49,111	55,328	Urban	1.13
2767	Short Term	US 30	Lancaster	66,160	64,268	Urban	0.97
2768	Short Term	US 30	Lancaster	47,232	54,338	Urban	1.15
2772	Short Term	US 30	Lancaster	18,501	18,678	Urban	1.01
2790	Short Term	US 222	Lancaster	36,386	38,362	Urban	1.05

**Group #7 - Urban Facilities**

**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

**Overall Performance**

Sample Size	18	T-Value	2.110
Average Growth Factor	1.01	Precision(%)	4.99
Standard Deviation	0.10		
Coefficient of Variation	10.02		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
710	Short Term	US 202	Bucks	27,604	27,428	Urban	0.99
717	Short Term	PA 309	Bucks	41,158	37,249	Urban	0.91
718	Short Term	PA 309	Bucks	35,369	27,784	Urban	0.79
1282	Short Term	US 202	Chester	38,976	39,454	Urban	1.01
1298	Short Term	US 422	Chester	20,587	21,657	Urban	1.05
1754	Short Term	US 1	Delaware	45,373	45,523	Urban	1.00
1757	Short Term	PA 3	Delaware	40,219	43,382	Urban	1.08
1760	Short Term	US 30	Delaware	33,230	39,568	Urban	1.19
1771	Short Term	US 322	Delaware	31,826	32,802	Urban	1.03
1782	Short Term	SR 2016	Delaware	37,690	34,835	Urban	0.92
3846	Short Term	PA 309	Montgomery	53,740	51,610	Urban	0.96
3853	Short Term	US 422	Montgomery	80,304	85,843	Urban	1.07
3860	Short Term	PA 611	Montgomery	27,199	31,000	Urban	1.14
4893	Short Term	PA 63	Philadelphia	66,444	64,378	Urban	0.97
4899	Short Term	PA 291	Philadelphia	49,498	50,224	Urban	1.01
4901	Short Term	PA 611	Philadelphia	44,668	53,669	Urban	1.20
8	ATR (TPG 3)	PA 73	Philadelphia	17946	17971	Urban	1.00
330	ATR (TPG 3)	PA 532	Philadelphia	12994	12091	Urban	0.93

**Group #8 - Urban Facilities**

**Counties - Berks, Lehigh & Northampton**

**Overall Performance**

Sample Size	9	T-Value	2.306
Average Growth Factor	0.99	Precision(%)	7.11
Standard Deviation	0.09		
Coefficient of Variation	9.25		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
398	Short Term	US 422	Berks	27,973	29,186	Urban	1.04
400	Short Term	US 422	Berks	49,948	48,834	Urban	0.98
401	Short Term	US 422	Berks	47,700	50,847	Urban	1.07
3062	Short Term	US 22	Lehigh	49,185	53,745	Urban	1.09
3064	Short Term	US 22	Lehigh	74,826	74,270	Urban	0.99
3091	Short Term	PA 309	Lehigh	41,164	44,474	Urban	1.08
3097	Short Term	PA 378	Lehigh	35,228	30,210	Urban	0.86
3924	Short Term	US 22	Northampton	42,224	39,527	Urban	0.94
3929	Short Term	US 33	Northampton	36,278	30,920	Urban	0.85

**Group #9 - Urban Facilities**  
**Counties - Luzerne, Schuylkill, Carbon & Lackawanna**

<b>Overall Performance</b>			
Sample Size	5	T-Value	2.776
Average Growth Factor	0.96	Precision(%)	12.79
Standard Deviation	0.10		
Coefficient of Variation	10.30		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2565	Short Term	SR 6006	Lackawanna	27,299	21,758	Urban	0.80
2575	Short Term	US 11	Lackawanna	40,117	37,906	Urban	0.94
2724	Short Term	SR 3022	Lackawanna	20,075	20,895	Urban	1.04
3164	Short Term	PA 29	Luzerne	14,297	14,436	Urban	1.01
3204	Short Term	PA 309	Luzerne	35,348	36,037	Urban	1.02

**Group #10 - Urban Facilities**  
**Counties - Pike, Monroe & Wayne**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Control Count Group Precision Analysis  
Interstate Groups with Missing Data Estimated  
1998 - 1999**

**Group #11 - Rural Interstates  
Counties - Erie & Crawford**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.04	Precision(%)	12.96
Standard Deviation	0.05		
Coefficient of Variation	5.22		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1575	Short Term	I-79	Crawford	17,003	16,917	Rural	0.99
1997	Short Term	I-90	Erie	17,952	19,790	Rural	1.10
207	ATR (TPG 2)	I-90	Erie	20,083	20,751	Rural	1.03

**Group #12 - Rural Interstates**

**Counties - Mercer, Lawrence, Butler, Venango, Clarion, Armstrong, Forest, Warren, Jefferson Clearfield, Elk, McKean, Cameron, Potter, Clinton, Centre, Tioga, Lycoming, Union, Northumberland, Montour, Columbia, Sullivan, Bradford, Wyoming**

<b>Overall Performance</b>			
Sample Size	6	T-Value	2.571
Average Growth Factor	1.05	Precision(%)	4.96
Standard Deviation	0.05		
Coefficient of Variation	4.72		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3654	Short Term	I-80	Mercer	27,127	28,396	Rural	1.05
1542	Short Term	I-80	Columbia	28,117	29,438	Rural	1.05
3917	Short Term	I-80	Montour	27,125	30,450	Rural	1.12
4333	Short Term	I-80	Union	20,288	19,731	Rural	0.97
372	ATR (TPG 2)	I-80	Union	22,948	24,528	Rural	1.07
374	ATR (TPG 2)	I-79	Butler	31,196	31,967	Rural	1.02

**Group #13 - Rural Interstates**

**Counties - Beaver, Washington, Allegheny, Westmoreland, Indiana, Cambria, Greene, Fayette & Somerset**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.03	Precision(%)	4.76
Standard Deviation	0.01		
Coefficient of Variation	0.53		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
370	ATR (TPG 2)	I-70	Westmoreland	29,493	30,210	Rural	1.02
393	ATR (TPG 2)	I-70	Washington	25,957	26,788	Rural	1.03

**Group #14 - Rural Interstates**  
**Counties - Bedford & Blair**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #15 - Rural Interstates**  
**Counties - Franklin, Fulton & Huntingdon**

<b>Overall Performance</b>			
Sample Size	4	T-Value	3.182
Average Growth Factor	1.02	Precision(%)	6.47
Standard Deviation	0.04		
Coefficient of Variation	4.07		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2332	Short Term	I-81	Franklin	37,756	36,316	Rural	0.96
2334	Short Term	I-81	Franklin	36,501	38,059	Rural	1.04
371	ATR (TPG 2)	I-70	Fulton	17,364	17,778	Rural	1.02
373	ATR (TPG 2)	I-81	Franklin	38,370	40,506	Rural	1.06

**Group #16 - Rural Interstates**  
**Counties - Adams, Cumberland, Perry, Dauphin, Lebanon, Juniata, Mifflin & Snyder**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.05	Precision(%)	1.49
Standard Deviation	0.00		
Coefficient of Variation	0.17		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1694	Short Term	I-81	Dauphin	56,286	59,301	Rural	1.05
3030	Short Term	I-81	Lebanon	48,414	51,127	Rural	1.06

**Group #17 - Rural Interstates**  
**Counties - York & Lancaster**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	1.06	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4750	Short Term	I-83	York	34,785	36,736	Rural	1.06
NO SITES IN THIS GROUP							

**Group #18 - Rural Interstates**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #19 - Rural Interstates**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #20 - Rural Interstates**  
**Counties - Susquehanna, Lackawanna, Luzerne & Schuylkill**

<b>Overall Performance</b>			
Sample Size	2	T-Value	12.706
Average Growth Factor	1.04	Precision(%)	18.22
Standard Deviation	0.02		
Coefficient of Variation	2.03		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
216	ATR (TPG 2)	I-81	Susquehanna	24,464	24,961	Rural	1.02
392	ATR (TPG 2)	I-80	Luzerne	19,996	20,996	Rural	1.05

**Group #21 - Rural Interstates**  
**Counties - Carbon, Monroe, Pike & Wayne**

<b>Overall Performance</b>			
Sample Size	1	T-Value	2.262
Average Growth Factor	1.00	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County Pike	AADT		Urban/Rural	Growth Factor
				1998	1999		
4079	Short Term	I-84		23,586	23,619	Rural	1.00

**Group #15 - Urban Interstates**  
**Counties - Franklin, Fulton & Huntingdon**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							

**Group #16 - Urban Interstates**  
**Counties - Adams, Cumberland, Perry, Dauphin, Lebanon, Juniata, Mifflin & Snyder**

<b>Overall Performance</b>			
Sample Size	7	T-Value	2.447
Average Growth Factor	1.04	Precision(%)	3.65
Standard Deviation	0.04		
Coefficient of Variation	3.94		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1622	Short Term	I-81	Cumberland	49,237	54,114	Urban	1.10
1628	Short Term	I-83	Cumberland	58,119	59,703	Urban	1.03
1692	Short Term	I-81	Dauphin	72,103	77,495	Urban	1.07
1695	Short Term	I-83	Dauphin	90,187	93,049	Urban	1.03
1696	Short Term	I-83	Dauphin	45,485	45,002	Urban	0.99
1698	Short Term	I-83	Dauphin	72,815	76,172	Urban	1.05
210	ATR (TPG 1)	I-83	Harrisburg	104,008	102,896	Urban	0.99

**Group #17 - Urban Interstates**  
**Counties - York & Lancaster**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.06	Precision(%)	6.96
Standard Deviation	0.03		
Coefficient of Variation	2.80		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
4757	Short Term	I-83	York	57,155	59,297	Urban	1.04
4765	Short Term	I-83	York	54,273	59,517	Urban	1.10
205	ATR (TPG 1)	I-83	York	40,657	43,098	Urban	1.06

**Group #18 - Urban Interstates**  
**Counties - Bucks, Montgomery, Chester, Delaware & Philadelphia**

<b>Overall Performance</b>			
Sample Size	5	T-Value	2.776
Average Growth Factor	1.05	Precision(%)	6.42
Standard Deviation	0.05		
Coefficient of Variation	5.17		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
1778	Short Term	I-476	Delaware	91,734	102,381	Urban	1.12
3838	Short Term	I-76	Montgomery	96,187	93,323	Urban	0.97
3839	Short Term	I-76	Montgomery	107,609	114,523	Urban	1.06
3840	Short Term	I-76	Montgomery	111,985	118,140	Urban	1.05
377	ATR (TPG 2)	I-95	Philadelphia	48,991	50,030	Urban	1.02

**Group #19 - Urban Interstates**  
**Counties - Berks, Lehigh & Northampton**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.04	Precision(%)	14.34
Standard Deviation	0.06		
Coefficient of Variation	5.77		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
3073	Short Term	I-78	Lehigh	32,344	34,824	Urban	1.08
3076	Short Term	I-78	Lehigh	35,760	34,589	Urban	0.97
394	ATR (TPG 1)	I-78	Allentown	38,908	41,387	Urban	1.06

**Group #20 - Urban Interstates**  
**Counties - Susquehanna, Lackawanna, Luzerne & Schuylkill**

<b>Overall Performance</b>			
Sample Size	3	T-Value	4.303
Average Growth Factor	1.04	Precision(%)	8.78
Standard Deviation	0.04		
Coefficient of Variation	3.53		

**Individual Counter Data**

SITE#	Counter Type	State Route	County	AADT		Urban/Rural	Growth Factor
				1998	1999		
2583	Short Term	I-81	Lackawanna	39,089	41,118	Urban	1.05
2590	Short Term	I-84	Lackawanna	44,136	47,566	Urban	1.08
376	ATR (TPG 1)	I-81	Wilkes-Barre	45,718	45,943	Urban	1.00

**Group #21 - Urban Interstates**  
**Counties - Carbon, Monroe, Pike & Wayne**

<b>Overall Performance</b>			
Sample Size	0	T-Value	2.262
Average Growth Factor	#DIV/0!	Precision(%)	#DIV/0!
Standard Deviation	#DIV/0!		
Coefficient of Variation	#DIV/0!		

**Individual Counter Data**

SITE#	Counter Type	State Route	Urban Area or County	AADT		Urban/Rural	Growth Factor
				1998	1999		
NO SITES IN THIS GROUP							