Traffic Monitoring for Volume Data

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Outline

- What traffic monitoring is
- Why we do traffic monitoring
- Approaches for volume data monitoring
- Methods for volume data processing

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What Traffic Monitoring Is

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What Traffic Monitoring Is

Traffic monitoring is to obtain ***quantitative*** data and information on the <u>number</u> and <u>types</u> of vehicles or person travelling on roadways at a given time. It typically covers:
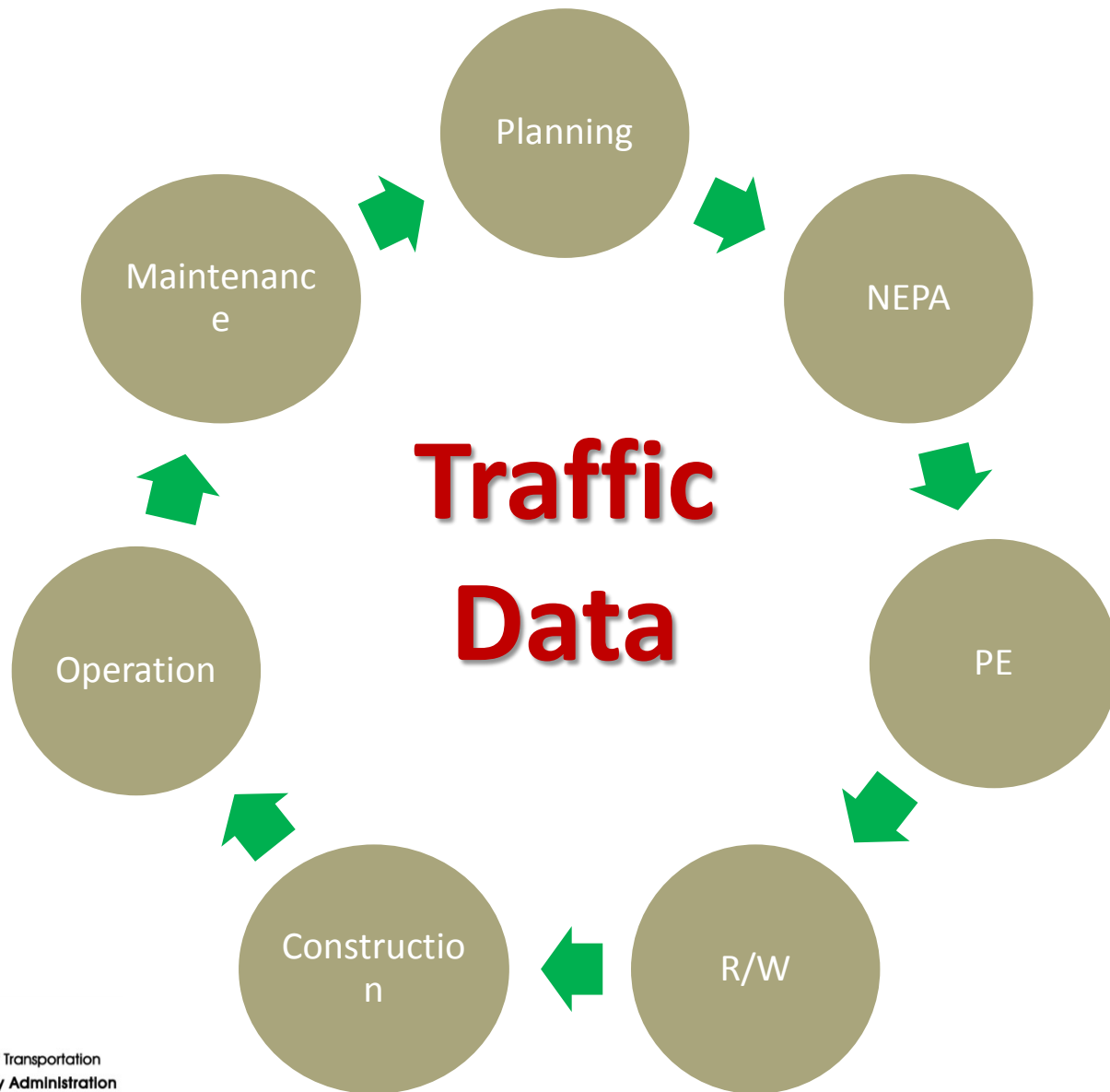
Volume

Class

Weight

Speed

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Why We Do Traffic Monitoring

Why Traffic Monitoring

Why Traffic Monitoring

- ✓ **Monthly,** State highway agencies deliver hourly volume, class, and weight Data from Continuous Count Stations to the FHWA via TMAS.

- ✓ **Annually**, State highway agencies deliver annualized traffic data to the FHWA under HPMS for system coverage.

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How We Do Traffic Monitoring Volume

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Traffic Volume

The number of vehicles or pedestrians passing through a uniform section of roadway without any diverging or merging during a given time period is called traffic volume

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Motorized, Nonmotorized and Pedestrian Volume

- Motorized traffic volume refers to the number of vehicles covering all the 13 vehicle types defined by the FHWA classification scheme. The essence is that vehicles are powered by external power

- Nonmotorized traffic volume refers to bicycle, tricycle or other non externally powered travel devices

- Pedestrian traffic volume refers to walk or running of people without relying on any external devices

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Volume Data Items

- The most common volume data item is the *annua*l average *daily* traffic – AADT

- But depending on the specific study or program objective, items could also be a) *annual* average peak hour, b) annual peak season hour, and c) any other hour, daily specifications.

- For example, annual average is reasonable for motorized vehicles. Is it reasonable for bicycle given seasonality affects bicycle travels significantly?

Monitoring Program Types

- Statewide Traffic Monitoring

- Regional and Sub-regional Traffic Monitoring

- Roadway Facility Specific Traffic Monitoring

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Statewide Traffic Monitoring Objective

- Provide a statewide perspective on travel demand

- Supply data and information meeting State and Federal needs such as the HPMS and TMAS

- Offer data as the primary source for all general queries about road usages

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Regional and Sub-regional Traffic Monitoring

- Regional and sub-regional traffic monitoring are designed and deployed to answer questions where statewide systems can not provide

- Systems operated by local metropolitan Planning Organizations and Council of Governments are examples of such regional and sub regional systems.

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Roadway Facility Specific Monitoring

- These are typically project level traffic monitoring.

- Data are collected to answer specific project level questions such as congestion, speed, noise, and operational needs.

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Traffic Monitoring Approaches

- ## Continuous Count Program
  - ✓ Data from continuous count program provides not only volume data but also patterns such as day of week, week of month, month of year patterns.

- ## Portable Count Program
  - ✓ Portable counts refer to short duration (e.g., 48 hours) counts where volume and/or class data are gathered.
  - ✓ Portable count data can be converted to annualized data through information gained from Continuous Count data.

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Continuous Count Volume Data Processing – AASHTO AADT

$$\frac{1}{7}\sum_{i=1}^{7}[\frac{1}{12}\sum_{j=1}^{12}[\frac{1}{n}\sum_{k=1}^{n}[Volume_{ijk}]]]$$

Volume_ijk is the daily traffic for day K of day of week i in month j

i = day of week (Monday, Tuesday,,, Sunday)

j = month of year (1, 2, 3,,, 12)

k = the first day of the week in a month where data is available

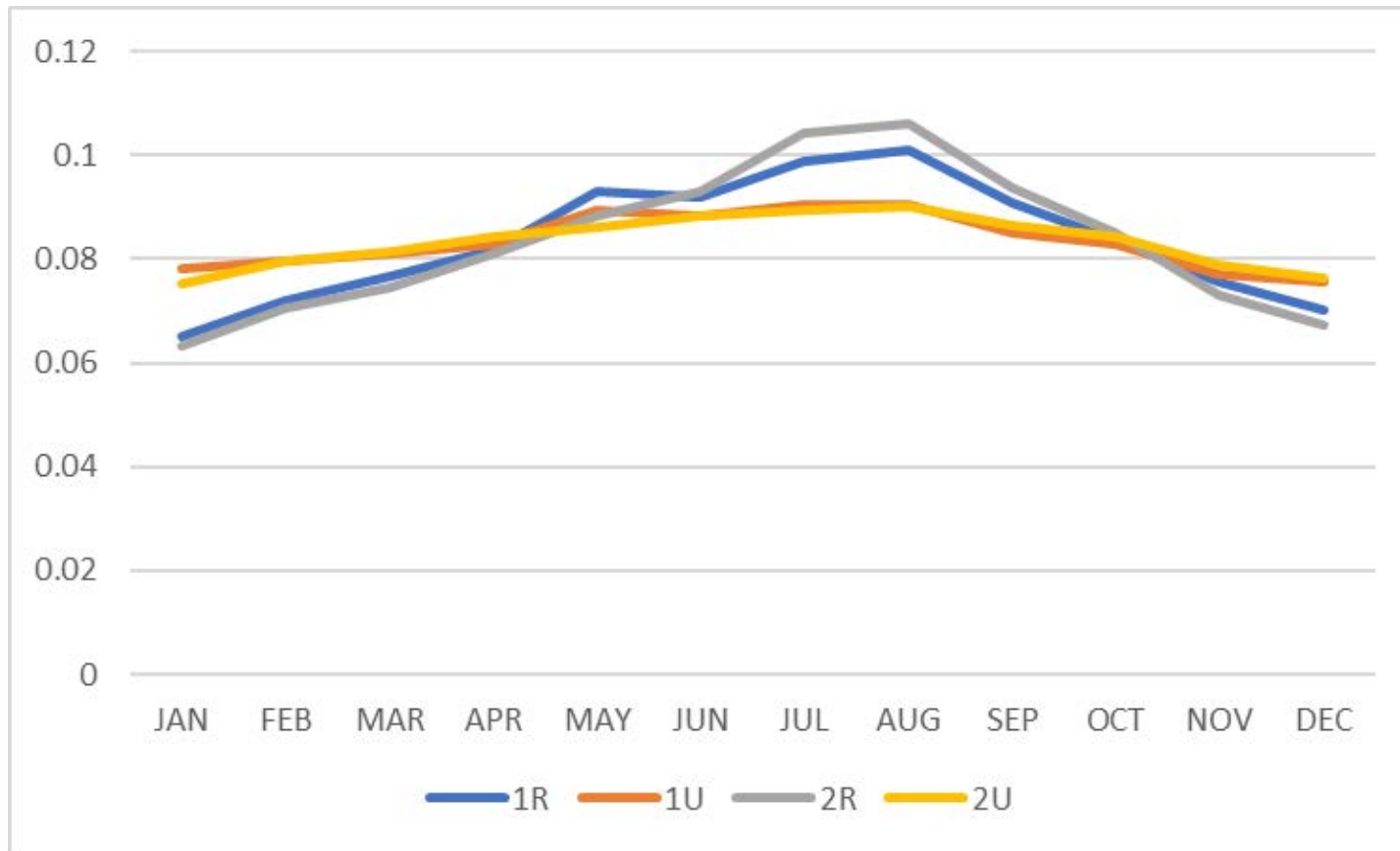n = number of days available for that day of week during that month

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Continuous Count Volume Data Processing – Monthly Factor

Assumption – continuous counter typify existing temporal variation

$$MF_{(monthly\ factor\ for\ month\ I)} = \frac{AADT}{MADT(i)}$$

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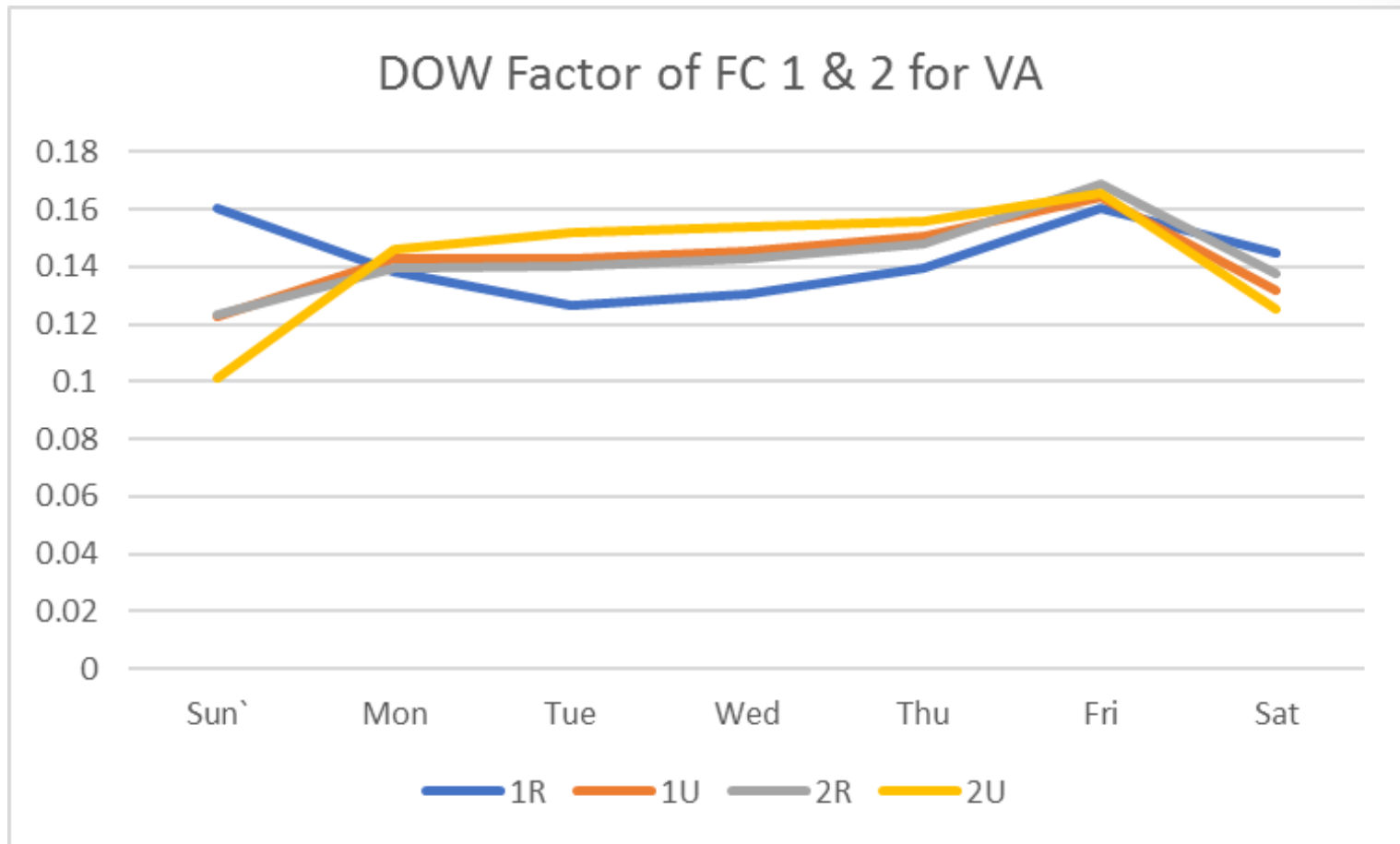# Monthly patterns (%) for State of WA for FC 1 and 2

Continuous Count Program – Day of Week Factor

- Significant changes in traffic volumes during the week
- The monitoring program should collect data that allow a State to describe DOW variations
- The monitoring program should allow this knowledge to be shared with the users of the traffic data and applied to individual locations
- The traffic monitoring data analyses will be inaccurate without considering DOW

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DOW Example - VA

DOW Factor of FC 1 & 2 for VA

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Axle Correction Factor Processing

Axle correction factors can is the inverse of the average number of axles per vehicle. In the example below, the factor would be 0.40 (the inverse of 2.49)

FHWA Vehicle Class (A)	Daily Vehicle Volume (B)	Average Number of Axles Per Vehicle	Total Number of Axles
1	100	2.0	200.0
2	1,400	2.2	3,080
3	45	2.3	103.5
4	15	2.1	31.5
5	20	2.0	40.0
6	40	3.0	120.0
7	5	4.2	21.0
8	15	3.9	58.5
9	120	5.0	600.0
10	5	6.4	32.0
11	15	4.9	73.5
12	5	6.0	30.0
13	10	7.5	75.0
Total Volume	1,795	Total Number of Axles	4,465.0
		Average Number of Axles Per Vehicle	2.49

Portable/Short-Duration Count

- Portable counts provide most statewide and system-wide data to supplement continuous count for all geographical locations and all roadway functional classes.

- Portable counts receive significant emphasis and attention

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Location of Short-Duration Count

- locations need to cover the system over the 3 year and 6 year counting cycle per HPMS needs.

- locations to meet requirements of other state specifications

- count locations and data collection needs of specific projects that will require data in the next year or two

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Potable Count Data Processing

$$AADT_{hi} = VOL_{hi} \times M_h \times D_h \times A_i \times G_h$$

Where:

$AADT_{hi}$ = the annual average daily travel at location i of factor group h

VOL_{hi} = the 48-hour axle volume at location i of factor group h

M_h = the applicable seasonal (monthly) factor for factor group h

D_h = the applicable DOW factor for factor group h (if needed)

A_i = the applicable axle-correction factor for location i (if needed)

G_h = the applicable growth factor for factor group h (if needed)

HPMS Traffic Data Collection – Per TMG and HPMS Field Manual

- All NHS, Interstate, Other Freeways and Expressways, other Principles Arterial, and HPMS sections require to be **field counted** <u>at least once every 3 years.</u>

- All other functional class roadways require to be **field counted** <u>at least once every 6 years</u>.

- Ramps data require to be **field counted** <u>at least once every 6 years.</u>

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Summary

- Volume data offer fundamental information for a wide range of parameters such as AADT, MADT, monthly factor, DOW factor, directional factor, k-factor, axle factor, etc.

- Volume data provide fundamental information to all State's highway program and project development.

- Volume data are critical for data programs such as TMAS and HPMS.

- TMG offers specific procedures and guides

Thank You!

FHWA 2018 Highway Information Seminar, Arlington, VA

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