Improving Traffic Count Accuracy Through Interagency Collaboration

What Was the Need?
Accurate traffic counts are important for budgeting, traffic planning and roadway design. Minnesota has installed 89 automated traffic recorders and weigh-in-motion devices that provide continuous counts of traffic.

However, MnDOT owns thousands of centerline miles of roadways, so it is impractical to install continuous counters at all locations of interest. Consequently, MnDOT uses portable traffic recorders at the vast majority of sites. These PTRs collect data continuously over a short duration, typically 48 hours during a single week, at more than 32,000 sites in the state. MnDOT then uses seasonal adjustment factors to extrapolate these short-term counts to estimate year-round traffic levels at PTR sites.

MnDOT generates these seasonable adjustment factors using Ward's clustering algorithm, a technique for grouping a set of data into clusters that represent sites with similar characteristics. These clusters can be compared from year to year to identify patterns. However, the method is limited because it only creates clusters using weekday traffic data and does not evaluate patterns throughout the year. Moreover, only four or five of these clusters produce monthly adjustments that resemble previously assigned historical factors. Many ATR/WIM sites are only used to adjust counts taken for considerable distances along the same road.

MnDOT wanted to determine if there is a better way to use continuous count and PTR data to accurately estimate traffic volumes.

What Was Our Goal?
This project sought to develop an alternative methodology for calculating seasonal adjustment factors by identifying potential seasonal and weekday-to-weekend traffic patterns. Moreover, it sought to improve ways to match PTR sites to better seasonal adjustment factor sets. Eventually such methods could be used in collaboration with local engineers to accurately characterize patterns at individual sites.

What Did We Do?
The new methodology for calculating seasonal adjustment factors is based on ATR data compiled into a data set of 39 ordered weeks. (Winter is omitted from the data set to keep it comparable with PTR data, which is not collected during that season.) This data is grouped into seasonal traffic patterns for both weekdays and weekends in the spring, summer and fall.

Weekday traffic patterns in each season are categorized as average, high or low relative to the average traffic level across all three seasons at that station. Weekend traffic levels are described as same, high or low relative to the average weekday traffic level at the site. A single site’s traffic pattern would therefore be characterized by six letters: AHA-SHS would indicate a site with average weekday traffic levels in spring and fall and high weekday traffic levels in summer, and weekend traffic levels similar to weekday levels in spring and fall and higher in summer.

To improve the accuracy of year-round traffic estimates generated from short-duration counts, researchers developed a new methodology for calculating seasonal adjustment factors that uses the professional judgment of local engineers to categorize seasonal and weekday-to-weekend traffic patterns on roads in their jurisdictions.
Investigators anticipate using the professional judgment of local engineers to characterize traffic patterns at PTR sites using the same categories, which can then be used to generate seasonal adjustment factors. To evaluate the accuracy of this approach, they created a survey that asks participants to categorize the traffic patterns at several sites based on their experience. Researchers then compared respondents’ answers to the actual data-determined traffic patterns to evaluate the reliability of these answers.

Finally, researchers developed a simulation methodology to evaluate how many weeks of PTR data would be necessary to ensure that short-duration count sites have enough data to correlate with established seasonal patterns.

What Did We Learn?
Researchers characterized traffic patterns at 78 ATR sites. The three most common patterns, each observed at 16 to 19 sites, were AHA-LLL, AHA-HHH and AAL-LLL. Eighteen other traffic patterns were observed, but most at only one or two sites, and none at more than five.

The survey to evaluate the accuracy of professional judgment was only taken by two raters, so results were inconclusive. However, it did reveal the importance of having a training session so that raters could thoroughly understand the concepts before taking the survey.

Based on the data evaluation simulation, most sites can be adequately characterized with one week of PTR data in spring, summer and fall, although some sites with unusual traffic patterns may need additional information.

What’s Next?
Implementing new procedures for developing seasonal adjustment factors based on this research and gathering longer periods of additional traffic count data would require MnDOT to change procedures and methodologies related to how it currently defines seasonal patterns and applies such factors to short duration counts. Discussions of whether the value of making those changes would justify the additional resources they require are pending. This project will help to inform those discussions by providing information about the potential costs related to implementation.