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Traffic Counts Literature Website Search for Brad Mettam D1
Caltrans Division of Research, Innovation & System Information (DRISI)
By Lee Provost   November 12, 2014

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PROBLEM STATEMENT

Routinely Caltrans Districts need more funding for performing their traffic volume counts. Traffic counts are collected and reported differently in each of the 12 Districts, as well as operations, resources allocated and performance measures are inconsistent in each District. The amount of data collected and the time it's collected may vary. Additionally, the way the data and money flows for traffic counts is complicated. Questions arise not only on how this data is collected but how the data ends up being reported to FHWA. In an effort to analyze the value of traffic counts a literature search was requested to look at what other state DOT's are doing for traffic counts (continuous count, frequency) performance measures, funding resources (how much money is devoted) and operations (who's in charge).

BACKGROUND GENERAL

Caltrans is conducting a separate value analysis review of how it funds, performs, and reports traffic volumes on the State Highway System. Each District is responsible for determining appropriate locations, conducting or collecting traffic volume information (alternatively referred to as traffic census or traffic counts) and reporting that information to HQ, and ultimately FHWA. A better understanding is needed of the state's practice in traffic counts and/or census, including information on: operations and processes; performance measures; and ways or identifying funding or levels of funding for these activities. One idea is to do a search on what other DOT states are doing for Traffic Counts, including: Operations, Resources and Performance Measures.

FLOW OF MONEY AND DATA TRAFFIC COUNTS

Vehicles are counted travelling over a point or a road length distance. These are based on the volume, or number of cars/trucks passing a certain point. These counts are used to determine the annual average daily traffic (AADT) and the vehicle miles travelled (VMT). The vehicles can be counted by inductive loop detectors placed in the pavement which are used generally in more urban areas or by pneumatic hoses laid across the pavement that mechanically count traffic in more rural areas. Some may use traffic cameras. But each Caltrans District collects this data differently. This raises some questions: How does this difference affect the overall traffic counts? Who is in charge of this data? Who makes the judgment decisions on rounding up or normalizing the traffic count data? What is the traffic count actual expenditures per District and overall for Caltrans?

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Currently the District resources flow for Traffic Counts are as follows:

$ Money Resources Flow$

State Budget-DRISI-DOTP-District
Planning-District Planning Deputies-
District Traffic Ops

 # Data Flow District#

Traffic Ops collects via counters- HQ
Traffic Ops-TSI database-to all users
FHWA- then DRISI gets information from
FHWA on various topics, but not traffic
counts. Information is massaged from
Districts in HQ, and then it gets massaged
again at FHWA.

A consultant will be hired starting in January 2015 to conduct surveys on District traffic count collection data and processes.

LITERATURE SEARCH SUMMARY

Traffic Count Questions:

A literature website search was performed on 4 topics concerning traffic counts and what other state departments of transportation (DOTs) are doing:

1. TRAFFIC COUNTS- How are traffic counts collected? Once every 3 years? Continuously?
2. PERFORMANCE MEASURES- are they used?
3. OPERATIONS-Who's in charge of the traffic count operations?
4. RESOURCES: How much does the state DOT budget spend (percentage) on traffic counts?

Traffic Counts Brief Answers:

1. Most all use AADT, VMT and interactive Maps. They follow the FHWA reporting guidelines.
2. No, but some states are developing them. Most searches yielded HPMS accidents/fatalities.
3. Typically each state has their own Traffic Operations who coordinate with local jurisdictions for counts.
4. State DOT expenditure reports were found, but not specific costs on traffic counts per state.

SUMMARY AND RECOMMENDATION

The literature search found that traffic counts are similarly collected and reported by the states DOT's, such as for AADT or VMT. As for performance measures, states haven't published what traffic count performance measures based on FHWA's Map-21 they are specifically using, such as VMT or some other standard measurement. Most searches yielded what states are reporting with respect to the Highway Safety Performance Measures (HPMS), such as roadway accidents or fatalities. It appears that states are working with their local metropolitan transportation organizations (MPO's), transit agencies, local counties and cities to cooperatively set targets and develop performance measures; however, most states are in their early stages of implementing these targets. Caltrans is working with San Diego Area Council of Governments (SANDAG) on performance measures, but currently are only focused on lowering greenhouse gas emissions (GHG).

As for operations and costs, a percentage of traffic counts of a total amount spent, for the state budget or operations were not found in the search. These specifics would take many hours and require a survey of the states on their traffic count expenditures. Perhaps there is a national conference, consortium or coalition of states that share information on their traffic counts that could be found with a more detailed search. Caltrans Division of Traffic Operations would be a good start. Or contacting the local FHWA office to see how they collect and report road expenditures/statistics for Caltrans. The SCOR/RAC AASHTO survey of states via the state research Division chief may be an option or DRISI can help with facilitation of a survey of Caltrans or other states using Survey Monkey. Another recommendation may be to conduct a full research preliminary investigation.

DETAILS OF THE 4 LITERATURE REVIEWS

1. What are other State DOT's doing for their Traffic Volume Counts?

Key Word Literature Search: Traffic volume counts state DOT (Department of Transportation)

SUMMARY

State Department of Transportation (DOT) post their traffic counts such as the Average Annual Daily Traffic (AADT) and Vehicle Miles Travelled (VMT) on their website along with their Traffic Volume interactive maps. (A table is included to list these attributes.) Most follow the Federal Highway Administration (FHWA) guidelines on collecting and reporting these annual traffic counts; therefore, they are similar to Caltrans.

A DOT Arizona DOT
http://www.azdot.gov/planning/DataandAnalysis/average-annual-daily-traffic

Average Annual Daily Traffic (AADT): The annualized average 24-hour volume of vehicles at a given point or section of highway is called a traffic count. It is normally calculated by determining the volume of vehicles during a given period and dividing that number by the number of days in that period.

Traffic Counts are obtained by two methods: 1.) Automatic Traffic Recorder (ATRs) and 2.) Coverage Counts.

The ATRs collect data 24 hours a day, 365 days annually, for each lane. The equipment records traffic volumes, speed and classification of vehicles. MPD uses this data to develop seasonal factors, daily factors, axle factors and estimate vehicle miles of travel (VMT). These factors are applied to all coverage counts. Coverage counts are needed to ensure that adequate geographic coverage exists for all roads under the jurisdiction of the state highway authority. In simple terms, coverage counts are data collection efforts that are undertaken to ensure that at least some data exist for all roads maintained by the agency.

Caltrans - California DOT

http://traffic-counts.dot.ca.gov/

Caltrans Vehicle Miles Travelled (VMT) and Traffic Counts are listed. Caltrans traffic counts are summarized annually into four categories: 1. Traffic Volumes (Annual Average Daily Traffic (AADT)) for all vehicles on California State Highways, 2. Truck Traffic (Annual Average Daily Truck Traffic on California State Highways), 3. Ramp Volumes on California State Freeways, 4. Peak Hour Volume Data consists of hourly volume relationships and traffic monitoring sites on the State Highway System Morning (AM) and evening (PM) peak periods are expressed as a percentage of Annual Average Daily Traffic (AADT). This website has traffic counts that can be downloaded.

GDOT   Georgia DOT New Traffic Counts System

https://www.dot.ga.gov/informationcenter/statistics/Pages/default.aspx

Georgia DOT provides Annual Average Daily Traffic (AADT) counts for every roadway segment of Georgia's State Highway System. These AADT counts are collected from permanent and portable traffic data collection devices and the counts are updated annually. This system also provides the current year, non-official, hourly raw traffic data counts that are collected from permanent traffic data collection devices.

Maryland DOT- SHA – State Highway Administration

http://sha.maryland.gov/Traffic_Volume_Maps/Traffic_Volume_Maps.pdf
http://www.marylandroads.com/oppen/HISD%20Traffic%20Monitoring%20System%20Program.pdf

The Maryland Traffic Volume Maps depict the Annual Average Daily Traffic (AADT) at various locations on Maryland's roadways by county. Traffic Volume data is collected from over 3000 program count stations and 79 ATR's, located throughout Maryland. Program count data is collected (both directions) at regular locations on a three year cycle (one-third of these are counted each year). The other two-thirds are factored based on the past yearly growth of an associated ATR. Counters are placed for 48 hours on a Monday or Tuesday and are picked up that Thursday or Friday, respectively. The ATR and toll count data is collected on a continuous basis. Toll station data is provided by the Maryland Transportation Authority.

Maryland State Highway Administration's Traffic Monitoring program is responsible for the collection, processing, analysis, summary and reporting of Maryland highway traffic count data. It includes a database to store traffic count data, a user interface allowing SHA traffic engineers throughout Maryland's seven engineering districts to request special project counts as required, and an Internet based reporting system providing access to all validated traffic count data using a series of pre-defined reports. All short term traffic counts are now performed by consultants on contract to HISD. The maintenance of the permanent counters remains the responsibility of HISD. The counts include volume, vehicle classification counts, turning movement, delay and vehicle occupancy counts.

MassDOT   Massachusetts

http://www.mhd.state.ma.us/default.asp?pgid=content/traffic01&sid=about

Mass DOT conducts an *annual* traffic data collection program. This data is available online by autoroute and city/town list or as an interactive map. You can view data for a specific town from the Town Index, for numbered routes from the Numbered Route Index, or you can use the interactive map to browse data by area. You can also download the complete spreadsheets using the links below.

A traffic counting program is conducted each year by the Statewide Traffic Data Collection program. The program involves the systematic collection of traffic data utilizing automatic traffic recorders located on various roadways throughout the state. The traffic counts compiled in this document are of four types:

1. Continuous: The continuous count program consists of stations which are being counted hourly every day of the year
2. Coverage: The coverage count program consists of counts spread across a three year counting cycle. Each traffic count is of a 48-hour duration and is repeated once every three years.
3. Classification: The classification count program consisted of a total of 212 counts. Each traffic count is of a 48-hour duration.
4. Special: All requests for traffic related data come under this program and includes providing traffic data for the Department's pavement, highway and bridge design efforts. This Includes pavement rehabilitation, construction, maintenance, construction staging and traffic management.

MDOT Michigan DOT
http://www.michigan.gov/mdot/0,4616,7-151-11151_11033-22141--,00.html

Traffic Monitoring Information System: Michigan collects traffic volumes on its trunkline system on an *annual* basis. A variety of data is collected, which includes: Short Counts (Definitions), Vehicle Classifications, (Definitions) and Annual Average Daily Traffic (AADT) (Definitions). It was difficult to figure out what was actually counted, but the 3-year average was not mentioned.

N DOT- Nevada DOT
https://www.nevadadot.com/reports_pubs/traffic_report/

NDOT's annual traffic reports provide details on the amount of traffic on certain locations on Nevada roads. Along with speed monitoring and vehicle occupancy and vehicle classification reports, this data provides important information for traffic engineers and others. The annual traffic reports are published by the Nevada Department of Transportation Traffic Information Division in cooperation with the Federal Highway Administration.

The 2013 Annual Traffic Report has hourly traffic volumes monitored continuously at 98 locations statewide. These sites commonly referred to as Automatic Traffic Recorders (ATR's). In addition, traffic volumes were collected in short periods (7days) and factored to Annual Average Daily Traffic (AADT's). These summary statistics including a ten-year history (if available) are presented by county in the Annual Average Daily Traffic Count Stations portion of the report.

NYS DOT New York
https://www.dot.ny.gov/divisions/engineering/applications/traffic-data-viewer
https://www.dot.ny.gov/divisions/engineering/applications/traffic-data-viewer/tdv-definitions#ContinuousCountProgram

NYS DOT has fixed and portable counters. They use Continuous counters program at permanent sites for collecting volume, speed, vehicle ID (e.g. truck weight) at 24 hours per day, 365 days per year. They use short count for their Inventory at a location once every 3 years for the Federal and State Highway system and for county and town roads. They have an interactive map called "data viewer".

O DOT   Oregon DOT
http://www.oregon.gov/odot/td/tdata/pages/tsm/tvt.aspx
http://www.oregon.gov/ODOT/TD/TDATA/Pages/tsm/tvt.aspx#Traffic_Volume_Tables

The Transportation Systems Monitoring (TSM) Unit has the mission to formulate a system to collect and process traffic related data on Oregon´s Highways. TSM provides traffic volumes, flow maps, trends, manual counts and vehicle class on state highways to Federal, State, Local, private and public constituents. This website has multiple listing of traffic counts but specifics on how the counts are actually done, such as AADT, annually or every 3 years was not found.

The Traffic Counting Program Page provides access to the web version of the Oregon State Highway Transportation Volume Tables, including the Permanent Traffic Recorder section and the Interchange Ramp Volume Diagrams.

TX DOT -Texas DOT
http://www.txdot.gov/inside-txdot/division/transportation-planning/maps/traffic.html

It was difficult to find much information on Texas Traffic Counts. It appears that they are divided into regional reports. TxDOT annually collects, on average 82,000 short term, traffic counts, 1,000 manual traffic counts and more than 300 long term counts. They collect data 24 hours a day, 365 days a year to support federal, state, regional and local transportation entities.

District Traffic maps show the Annual Average Daily Traffic (AADT) counts on TxDOT-maintained roads. Twenty-four-hour counts, with truck and seasonal factors, are applied. They are organized by our 25 districts and by the year collected. Other regions are also listed with interactive maps, such as North Central Texas COG- Regional Traffic Count http://www.nctcog.org/trans/data/tcins/ , or Houston Regional Traffic Count Map http://ttihouston.tamu.edu/hgac/trafficcountmap/.

WisDOT-Wisconsin State- Interactive Traffic Count Map
http://www.dot.wisconsin.gov/travel/counts/

WisDOT traffic counts are part of an **interactive map** that allows you to view counts anywhere in the state. The search, pan and zoom features of the map are based on the Google Maps interface. The best way to search for a location in the address box is to insert "WI" after the community name. This will eliminate Google taking you to similar named locations elsewhere in the country. Short-term counts are collected over a *three-year cycle* at nearly 26,000 rural and urban locations throughout the state. Data from 2000 to 2010 is available on downloadable traffic count PDFs.

Traffic counts are reported as the number of vehicles expected to pass a given location on an average day of the year. This value is called the "annual average daily traffic" or AADT and are represented on traffic count or traffic volume maps. The AADT is based on a short-term traffic count, usually 48 hours, taken at the location. This count is then adjusted for the variation in traffic volume throughout the year and the average number of axles per vehicle.

WS DOT Washington
http://www.wsdot.wa.gov/mapsdata/travel/annualtrafficreport.htm
http://www.wsdot.wa.gov/mapsdata/tools/traffictrends/

WS DOT has a Traffic Volume Map with Traffic Counts, Annual Traffic Report and Peak Hour Report. The Annual Traffic Report (ATR) summarizes traffic data maintained by the Washington State Department of Transportation for the State Highway System. The report includes Annual Average Daily Traffic (AADT) figures and truck percentages, when available, for locations where data collection has occurred within the past four years. Also included are: a list of Permanent Traffic Recorder (PTR) station locations; an annual summary of data from all operational PTR stations; a table of Average Weekday Traffic (AWDT) to AADT conversion factors from all operational PTR stations; a ten-year history of AADTs from PTR stations, ferry systems and toll crossings; and Annual Vehicle Miles of Travel (AVMT) information for the State Highway System.

The Peak Hour Report is a list of the highest volume hours of the year at our Permanent Traffic Recorder sites. It summarizes the top 200 hours of the year by site and by direction. The Peak Hour report is used for estimating the volume of traffic used in the design process by Planning offices, Traffic offices and engineers.

FHWA- FEDERAL HIGHWAY ADMINISTRATION –Highway Performance Monitoring System
http://www.fhwa.dot.gov/   http://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/

Required of each state and U.S. territory by the FHWA, the HPMS is the national database of highway information. Roadway extent, use, condition and performance data are collected by and for the states and submitted to the FHWA on an annual basis. From a national perspective, the FHWA's primary intent with this program is to provide Congress with a policy tool for major highway legislation and funding decisions. The summary data are intended to provide general information on the use, extent, condition, and performance of the public roads, particularly on the lower functional systems (minor collectors in rural areas and local roads in any area). For example, non Federal-aid roads do not require section-level detail and can be summarized from State and local sources. These sources include statewide highway databases, inventory management systems, Intelligent Transportation Systems (ITS), traffic monitoring systems, and data made available from local governments and Metropolitan Planning Organizations (MPOs).

Please refer to the Appendix for the Spreadsheet for the State's Comparison

2. State DOT Performance Measures on Traffic Counts

SUMMARY
A website search on *performance measures on traffic counts* was conducted to see what other State Department of Transportation (DOT) agencies are doing as well as the national counter parts, such as the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA) and the California State Office of Traffic Safety. Most lead to *traffic safety* performance measures, to reduce traffic fatalities and accidents on highways, which all tie in their performance measures with the new MAP-21 safety performance management implementation. However, states haven't published what traffic counts performance measures based on Map-21 they are specifically using, such as Vehicle Miles Travelled (VMT) or some other standard measurement. Most searches yielded what states are reporting with respect to the Highway Safety Performance Measures (HPMS). States are working with their local Metropolitan Transportation Organizations (MPO's), transit agencies, local counties and cities to cooperatively set targets and develop performance measures, however, most states are in their early stages of implementing these targets.   Caltrans is working with San Diego Area Council of Governments (SANDAG), but currently are only focused on lowering greenhouse gas emissions (GHG).

States

Caltrans- Traffic Census- Traffic Counts
http://traffic-counts.dot.ca.gov/

Traffic Volumes, Truck traffic, Ramp Volumes, Peak Hour Volume Data and Vehicle Miles Travelled are listed on this website. No interactive map.

CA Office of Traffic Safety- Data and Statistics
http://www.ots.ca.gov/Media_and_Research/Data_and_Statistics.asp

California Traffic Safety Quick Stats (Fast Facts)

The California Office of Traffic Safety's mission is to effectively and efficiently administer traffic safety grant funds to reduce traffic deaths, injuries, and economic losses.

Caltrans Webinar 9-9-2014 "Let's Talk Performance: Collaboration to Set Targets"
https://connectdotcqpub1.connectsolutions.com/content/connect/c1/7/en/events/event/private/939419705/1094649767/event_registration.html?sco-id=1098746464&_charset_=utf-8

Katie Benour, Caltrans Chief of Division of Transportation Planning and Elisa Arias, Principal Regional Planner of SANDAG talked on how they can collaborate their targets. Basically for now, SANDAG is just focusing on reducing green house gas emissions (GHG) and they are looking at the total and congested VMT's per captia as indicators.

CA- San Joaquin Council of Governments (SJCOG) Travel Demand Management Plan Aug 2010
file:///C:/Users/s115436/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.IE5/TLO1GTKF/2010_Regional_TDM_Plan%5B1%5D.pdf

The greenhouse gas emissions (GHG) reductions were calculated from estimated reductions of commute trips and VMT, which were derived based on a change in travel behavior as a result of travel demand management (TDM) applications. Appendix C presents the analysis results for TDM impacts on greenhouse gases (GHG) in terms of CO_2 equivalent for the years 2020 and 2035.

GDOT   Georgia Performance Measures Dashboard
https://www.dot.ga.gov/informationcenter/statistics/performance/Pages/default.aspx

No actual listing of established performance measures. A website showing statistics on how GDOT meets their own standards, in percentages, such as number of bridges meeting their standards, 89% or the average speed during peak hour traffic, 36 mph.

MDOT – Michigan Transportation Performance Measures
http://www.michigan.gov/documents/mdot/MDOT-Performance_Measures_Report_289930_7.pdf

Based on a long range transportation plan, conditions are reported based on meeting targets: Green 90%, Yellow 75% and Red below 75%. Freeway and road conditions, transit services and crash severity reductions are examples of conditions reported.

Iowa State University- Work-Zone Traffic Performance Measures- Sept 2012
CTRE Center for Transportation Research and Education
http://www.iowadot.gov/research/reports/Year/2013/abstracts/work-zone_perf_msrs_t2_Sept_2013.pdf

Although more focus is placed on work zone performance measures, many agencies are in early stages of selecting and implementing work zone performance measures : Survey of 7 state DOT's.

Background: The Federal Highway Administration (FHWA) 2004 Work Zone Safety and Mobility Rule applies to all state and local government agencies that receive federal-aid highway funding after October 12, 2007. This rule was an update to the former regulation (23 CFR 630 Subpart J) to address more-current issues affecting safety and mobility in work zones. In addition, Moving Ahead for Progress in the 21st Century (MAP-21) emphasizes performance monitoring and performance-based decision-

making in order to provide the most efficient investment of transportation funds. MAP-21 focuses on several areas relevant to work zones including safety, congestion reduction, and reduced project delivery delays.

Project Objectives: The main objective of this research was to identify and summarize how agencies collect, analyze, and report different work-zone traffic-performance measures, which include exposure, mobility, and safety measures. The researchers also examined communicating performance to the public.

Methodology: After conducting and documenting the results of an in-depth literature review to identify effective safety and mobility performance measures and data and reporting needs, the team conducted a survey of seven states surrounding Iowa, as well as Iowa, to provide the most up-to-date information.

These are some of the safety measures that were addressed: • Crashes (may be stratified by crash type, severity, contributing circumstance) • Speed• Work-zone inspection• Emergency management services•

Surrogate measures addressed: • Queue • Delay • Capacity • Speed • User measures • User measures involving work-zone incidents • Work-zone incidents rating

For communicating with the public, the following were examined:

• Missouri DOT TRACKER • Virginia DOT DASHBOARD • Washington State DOT Gray Notebook • Wisconsin DOT MAPSS. The team synthesized the knowledge gathered into the toolbox titled *Synthesis of Work-Zone Performance Measures* on this project.

National

MAP 21 Performance Measures FHWA
http://www.fhwa.dot.gov/tpm/about/action.pdf

The U.S. Department of Transportation (USDOT) is implementing the new MAP-21 performance requirements through a number of rulemakings released in several phases. These include planning, highway safety, congestion system and transit performance measures.

FHWA Review Guidelines- Highway Performance Monitoring System (HPMS) 2013
http://www.fhwa.dot.gov/policyinformation/hpms/documents/hpmsreviewguide.pdf

The Highway Performance Monitoring System (HPMS) was developed as a systematic measure encompassing the scope, condition, performance, use, and operating characteristics of the Nation's highways. It is a national transportation information system and is reflective of all public roads. One of the most significant and visible uses of information submitted through HPMS is for the apportionment of Federal-aid Highway Program funds to the States as currently legislated. The HPMS also serves as a primary input mechanism for the biennial Condition and Performance Reports to Congress, which supports the development and evaluation of the FHWA's legislative, program, and budget planning. In addition, the HPMS serves the needs of the States, MPOs, local agencies, and other customers in assessing highway condition, system performance, air quality trends, and future investment requirements.

Model Performance Measures for State Traffic Records Systems- NHTSA Feb 2011
http://www-nrd.nhtsa.dot.gov/Pubs/811441.pdf

The National Highway Traffic Safety Administration released this collection of 61 performance measures to help States.   The measures are designed to provide traffic records professionals with the information necessary to develop and deploy quantifiable performance measures appropriate for their *traffic record systems.* They have been grouped by performance attribute—timeliness, accuracy, completeness, uniformity, integration, and accessibility—across the six core State traffic record data systems -- crash, vehicle, driver, roadway, citation/adjudication, and emergency medical services (EMS)/injury surveillance. These common performance measures and the attendant guidance on their application are expected to help stakeholders quantify systemic improvements to their traffic records systems.

NHTSA -Traffic Safety Facts April 2009- Traffic Technology Transfer
Traffic Safety Performance Measures for States and Federal Agencies
file:///C:/Users/s115436/AppData/Local/Temp/tt374.pdf WONT OPEN

Performance measures are required for each State's traffic safety activities. Federal regulation 23 CFR 1200.10(a)(1) requires States to develop a performance plan each year that includes at least one performance measure for each goal enumerated in the plan. The list of core measures include number of fatalities, serious injuries, alcohol impaired, speeding, motorcyclist, pedestrian, seat belts, etc.

NHTSA -Traffic Safety Performance Measures for States and Federal Agencies Aug 2008
file:///C:/Users/s115436/AppData/Local/Temp/811025.pdf   DOT HS 811 025

The National Highway Traffic Safety Administration (NHTSA) and the Governors Highway Safety Association (GHSA) have agreed on *a minimum set of performance measures* to be used by States and federal agencies in the development and implementation of behavioral highway safety plans and programs. An expert panel from NHTSA, State Highway Safety Offices, academic and research organizations, and other key groups assisted in developing the measures. The initial minimum set contains 14 measures: ten core outcome measures, one core behavior measure, and three activity measures. The measures cover the major areas common to State highway safety plans and use existing data systems. States will set goals for and report progress on each of the 11 core outcomes and behavior measures annually beginning with their 2010 Highway Safety Plans and Annual Reports. States will report the activity measures annually beginning with their 2010 Highway Safety Plans and Annual Reports. States should define and use additional performance measures for their other high-priority highway safety areas as appropriate. NHTSA will use the core measures as an integral part of its reporting to the Congress, the public, and others.

NCHRP Report 618: Cost Effective Performance Measures for Travel Time, Delay, Variation and Reliability 2008
http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_618.pdf

The purpose of this guidebook is to provide transportation planners and project programmers with a framework to predict system performance using cost-effective data collection methods, analysis approaches, and applications that most effectively support transportation planning and decision making for capital and operational investments for quality-of-service monitoring and evaluation.

3. Traffic Operations Data Collection – Who's in Charge?

WEBSITE KEY WORDS: Traffic Operations, who's in charge, Traffic Operations data collection, traffic data collection and operation

SUMMARY

In other states it appears that the state highway department collects some traffic information but also rely on the local jurisdictions, such as counties or local agencies to also collect the data, and they coordinate this information with the state DOT. (Florida, Texas). Cities and counties are responsible for traffic signals on city streets and local roads. A website search basically yielded nothing on this specific topic.

There's a vast listing on the web of state counties that conduct traffic operations. No mention of budgets. Specific states would need to be queried on how they collect their traffic counts, and this type of survey would take considerable time.

COMMENT

The search did yield two ideas worth considering. First, is a concept called the "Data Sharing Toolbox Example- US DOT." States are encouraged to participate on a website. The examples on this webpage illustrate how some states and regions are collecting and sharing data. Washington State, the City of Portland and City of Salt Lake during the 2002 Winter Olympics discussed coordinating traffic information. Second, the "National Traffic Report Card- ITE" discusses a national effort to bring more attention to the need for additional investment in traffic signal operations. This may tie into the need for traffic count funding, in which traffic counts may be the basis for demonstrating a need for signalization.

COUNTIES

Pasco County, Florida
http://www.pascocountyfl.net/index.aspx?NID=197

This is a typical website that popped up with the word search. It lists what the county does for traffic operations:

Overview: The Traffic Operations Division is responsible for operation and maintenance of all traffic signals, signal systems, flashing beacons, and school flashers in Pasco County. This includes the US 19 Advanced Traffic Management System (ATMS) and Sixteen Closed Loop Signal Systems. All of US 19 is now under control of this Adaptive Traffic Signal System; this system utilizes the Sydney Coordinated Adaptive Traffic System (SCATS) software to optimize the flow of traffic on the roadway.
Our *SCATS* system is the only system of its type in the State of Florida and the fifth largest of 15 SCATS in the United States and. Expansions of the system the other roadways are planned for the future. All school flashers in the county are computer controlled though a radio pager system. The division is also responsible for roadway lighting on some arterial roadways. Construction of new traffic signals is accomplished in conjunction with the Transportation Capital Improvement Plan.
Maintenance: A technician is on call 24 hours a day, seven days a week, to respond to all emergencies. All technicians are certified by the International Municipal Signal Association at various technical levels of Traffic Signals and Roadway Lighting. All maintenance and construction is performed to strict federal and state standards by highly trained technicians.
Data Collection: The division conducts traffic counts, speed studies, crash analysis, and other data collection to support various programs along with the Engineering Services Department and Growth Management. Work orders for new signs and markings or revisions are prepared in response to citizen requests. Annual reports are posted on the Divisions Web page for Traffic Crashes and Counts. This information is used to identify hazardous locations and make recommendations for improvements.
The division also inspects all traffic control devices installed in conjunction with subdivision and roadway construction. In conjunction with the Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT), Road Safety and Pedestrian Safety Audits are conducted at high crash locations. With design and some equipment provided by the Florida Department of Transportation safety improvements are made at locations identified in the audits to reduce crashes and enhance roadway safety. These audits also identify locations were higher cost long term future improvements can be made to reduce crashes and enhance safety of the county road system.

City of Houston Traffic Operations
http://www.publicworks.houstontx.gov/traffic/index.html

Clark County, Nevada Traffic Management
http://www.clarkcountynv.gov/depts/public_works/traffic_mgmt/Pages/default.aspx

Oklahoma City Traffic Management
http://www.okc.gov/pw/trafman.html

The Traffic Management Division is responsible for coordinating with other divisions, departments, and agencies in finding solutions to all transportation related problems. They provide information as requested by the City Council, Traffic Commission, and the Planning Commission. They review Federal and State transportation projects that affect the City.

STATES

Traffic Operations State of New Jersey DOT
http://www.state.nj.us/transportation/refdata/traffic_orders/
This site contains traffic and parking regulations for roads under the jurisdiction of the State of New Jersey, from interstate highways to local municipalities. County and municipal traffic and parking regulations and ordinances are not on this site. Motor Vehicle Statutes are found under New Jersey Statutes Title 39, Manual of Uniform Traffic Control Devices.

TxDOT Texas DOT
http://ftp.dot.state.tx.us/pub/txdot-info/pio/casbrochures/pub_signals.pdf
Cities and counties are usually responsible for traffic signals on city streets and county roads. Local governments share responsibilities with TxDOT regarding state highways when a city's population exceeds 50,000. This includes the costs to develop, install and operate traffic signal lights. When roadways intersect the state highway system, TxDOT handles the installation, operation and maintenance of traffic signals. Our district employees work hard to evaluate all requests for signal lights.

Washington State DOT Traffic Signals and Coordination
http://www.wsdot.wa.gov/Operations/Traffic/signals.htm

NATIONAL

US DOT Planning for Operations- Data Collection and Sharing
http://plan4operations.dot.gov/data_coll.htm
Data sharing refers to a broad range of activities that support the full use of readily available transportation information. Many government and private organizations collect data that can inform the design and operation of transportation facilities and systems. First and foremost, data sharing implies awareness about such data sources and a fresh perspective in considering their potential value in new uses. Data sharing typically requires that organizations store data and make it available in a useable format. It also requires a forum to coordinate with other organizations about potential data exchange opportunities.
Typical Operations Systems and Associated Data: Traffic Monitoring and Detection Systems: vehicle volume, speed, travel time, classification, weight, and position trajectories
Traveler Information Systems: current traffic conditions (e.g., travel time, speed, level of congestion), traffic incidents, work zone and/or lane closures
Traffic Control Systems: time and location of traffic control actions (e.g., ramp metering, traffic signal control, lane control signals, message board content
Incident and Emergency Management Systems: location, cause, extent, and time history of roadway incident/emergency detection and clearance
Advanced Public Transit Systems: transit vehicle passenger boardings by time and location, vehicle trajectories, passenger origins and destinations

Data Sharing Toolbox Example- US DOT
http://plan4operations.dot.gov/data_coll_ex.htm
Data Collection and Sharing Examples
The examples on this page illustrate how some states and regions are collecting and sharing data. If you have an example that you'd like to share, please send an email describing what your state or region is doing to p4o@dot.gov.
Data Sharing Between Agencies in the Portland, Oregon Metropolitan Region

In the Portland Metropolitan Area, several agencies have collected transportation operations data for many years. The Oregon Department of Transportation (ODOT) uses loop detectors at ramp meters and along freeways to measure freeway volumes. The City of Portland determines traffic volumes from loop detectors placed within the City. Tri-Met, Portland's transit agency, collects extensive transit data using automatic vehicle location (AVL), global positioning systems (GPS), and other advanced technologies. Technological advances have increased data sharing and planning for future collaboration. A fiber optic cable connecting Metro (Portland region's MPO), ODOT, City of Portland, and Tri-Met facilities has enabled Metro to receive data from each agency. Tri-Met's bus movement data is being used by ODOT, the City of Portland, and Metro to detect corridor congestion. In the future, ODOT hopes to use the data to evaluate the efficiency of traffic signal timing. Metro has used the operations data in planning and programming processes to quantify the benefits of ITS and compare operations projects with traditional roadway expansion projects.

Salt Lake City's Olympics Games Leads to Continued Data Sharing
Commuter Link is a web-based traveler information system for the Salt Lake City region. The system components include closed-circuit television cameras, electronic roadway signs, a 511 travel information line, coordinated traffic signals, ramp meters, traffic speed and volume sensors, pavement sensors, and weather sensors. Transportation officials demonstrated a new willingness to devote attention to this coordinated data service in preparation for the 2002 Winter Olympics. During the Olympics, the system worked extremely well. Since the Olympics, this data sharing has continued and has proven to be useful in coordinating traffic management centers across jurisdictions.

Washington State DOT Uses Archived Data for Improved Performance Measurement
In the late 1990s, Washington State DOT engaged the University of Washington to use years of archived traffic data to explore benefits of operational improvements such as ramp metering and incident response programs. Based on these historic performance data, the University built analytical tools to demonstrate benefits from the proposed operations investments. The University now provides ongoing support for operations investments.

HSIS Highway Safety Information System
http://www.hsisinfo.org/data.cfm
Data: The Highway Safety Information System (HSIS) is a cooperative endeavor funded by the U.S. Federal Highway Administration, with data voluntarily provided to FHWA by the participating States.
HSIS is a roadway-based system that provides quality data on a large number of accident, roadway, and traffic variables. It uses data already being collected by States for managing the highway system and studying highway safety. The data are acquired annually from a select group of States, processed into a common computer format, documented, and prepared for analysis. They have information on: State Statistics, Data Elements and Guidebooks.

Highway Safety Information System Guidebook for the California State Data Files
http://www.hsisinfo.org/guidebooks/california.cfm
The California database incorporated into the HSIS system is derived from the California TASAS (Traffic Accident Surveillance and Analysis System). The system, maintained by the Traffic Operations Office (TO) of CALTRANS, is a mainframe-based system based on COBOL programming. The TO Office provides the data to HSIS in the form of two different data files. These contain: Accident data (including accident, vehicle, and occupant data) and Roadway inventory data (including intersection and interchange ramp data, and Average Daily Traffic counts).

National Traffic Report Card, Institute of National Transportation Engineers (ITE)
http://www.ite.org/selfassessment/
The 2011 Traffic Signal Operations Self Assessment was part of the 3rd National Traffic Signal Report Card, *a National effort to bring more attention to the need for additional investment in traffic signal operations.* The first and second National Traffic Signal Report Cards were released in 2005 and 2007 respectively and received extensive media attention. While the National score moved from a D- to a D, media coverage and press materials focused on the need for additional resources to support traffic signal operation. The Traffic Signal Operations Self Assessment is part of a national effort to bring more attention to the need for additional investment in traffic signal operations. Traffic signal systems are historically under- funded and are one of the first areas to be cut in tight budget times. However, investment in traffic signal operations is one of the most cost effective means to improve transportation system efficiency.

4. Traffic Count Expenditures

Key Word Search: Traffic Counts Expenditures, State DOT Expenditure Reports

SUMMARY

Most searches yielded various state's traffic counts but not expenditures. Expenditures on traffic counts may need to be found in the state's annual financial reports. When a website search was conducted for state DOT expenditure reports, most didn't list the details of costs, such as traffic counts. This would take more work to dig into actual state financial reports. It's interesting to note that Virginia DOT said that for rural counts, only 10% is spent on collecting the data and the remaining 90% is spent on office work and equipment. But perhaps that isn't surprising. The overall cost of traffic counts would include more than just collecting the data. The entire cost as well as the specific type of traffic count and equipment used should be noted.

RECOMMENDATION

A percentage of traffic counts of a total amount spent, say for the state budget or operations were not found in the search. These specifics would take many hours and require a survey of the states on their traffic count expenditures. Perhaps there is a national conference, consortium or coalition of states that share information on their traffic counts, but I'm not sure where that would be found. Caltrans Traffic Operations would be a good start. Or contacting our local FHWA office to see how they collect and report road expenditures/statistics for Caltrans. The SCOR/RAC survey of states via the state Research Division Chief may be an option or DRISI can help with facilitation of a survey of Caltrans or other states using Survey Monkey.

STATES

Evansville, IN&KY MPO Annual Performance and Expenditures 2014
http://www.evansvillempo.com/Completetion%20Report/2014%20Completion%20Report.pdf

This is an expenditure Report for this MPO which straddles two states, Indiana and Kentucky for Evansville Metropolitan Transportation Organization (MPO). On page 2 it mentioned 779 counts in 48 hours for 2014. On page 34 it mentions spending $18,250 for a 3-year contract with INDOT. There are also expenditures for each state for the traffic volumes GIS map based on AADT and HPMS: IN: $63,000   KY: $5,500. On page 37 there are tables that have different numbers, for example, on page 37 it mentions $68,500 for Traffic Counts, Capacities and HPMS.

VDOT Annual Costs and Procedures for Traffic Counts –Secondary Counts of Rural Roads   National Transportation Library 1995
http://ntl.bts.gov/DOCS/433VTRC.html

Cost estimates indicated that counting unpaved roads was approximately 17% of the secondary count program expenditure in 1993. The actual field work constituted approximately 10% of the expenditure; the remaining 90% was office work and support services.

NCDOT North Carolina DOT

http://www.ncdot.gov/about/finance/

$4.3B with a breakdown percentage of major funding sources: Fed Funds, Hwy Trust Fund and Hwy Fund.
Traffic volume maps

http://www.ncdot.gov/travel/statemapping/trafficvolumemaps/

TxDOT

http://www.txdot.gov/inside-txdot/division/finance/discos.html

TxDOT annually collects, on average 82,000 short term, traffic counts, 1,000 manual traffic counts and more than 300 long term counts. We collect data 24 hours a day, 365 days a year to support federal, state, regional and local transportation entities.

WDOT Budget and Financial Analysis

http://www.wsdot.wa.gov/finance/

Washington State Short Count Traffic Services

http://www.wsdot.wa.gov/mapsdata/pdf/ShortCountServices_2010.pdf

The Washington State Department of Transportation utilizes traffic data to support planning, analysis and roadway design functions. This data also serves as a primary input to federal apportionment calculations that return 350 million dollars to the state annually. *No dollar amount given for costs.*

FEDERAL

FHWA Office of Highway Policy Information Highway Finance Data Collection

https://www.fhwa.dot.gov/policyinformation/hss/guide/ch11.cfm

Highway Statistics 2012

https://www.fhwa.dot.gov/policyinformation/statistics.cfm

This report has a section for the states to fill out and it specifically mentions traffic control operations, but not traffic counts. It's mainly for operations and capital improvements. The Local Highway Finance Report, form FHWA-536, is a biennial report summarizing highway funding by local governments. Local governments include counties, townships, municipalities, special districts, and other general purpose authorities that are under the jurisdiction of local governments. Form FHWA-536 provides for the reporting of four basic areas of local highway finance: (1) disposition of highway-user revenues; (2) revenues used for roads and streets, identified by source and type of funds; (3) road and street expenditures identified by purpose or activity; and (4) local highway debt status.

A 50-State Review of State Legislatures and Departments of Transportation
National Conference of State Legislatures-Transportation Governance and Finance
http://www.transportation-finance.org/pdf/50_State_Review_State_Legislatures_Departments_Transportation.pdf

Overall funding for each state is listed, however, not specifically for traffic counts.
From 2010 to 2011, the National Conference of State Legislatures (NCSL) and the American Association of State Highway and Transportation Officials (AASHTO) partnered to produce an unprecedented, 50-state review of transportation governance and finance, based largely on in-depth, original survey research. The project focused on transportation finance and on the roles of, and relationships between, those state government entities that are most active in transportation issues: state legislatures and, under the authority of governors, state departments of transportation (DOTs). The report provides an overview of state transportation governance and finance as well as detailed profiles and other information for each state, the District of Columbia and Puerto Rico.

SCOR RAC Website- AASHTO
http://research.transportation.org/Pages/default.aspx

This website is intended as a resource for the American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on Research (SCOR) and its Research Advisory Committee (RAC).
The site has two main purposes: For new RAC and SCOR members, the site serves as an orientation tool, providing background information and quickly showing new members how to become full participants in committee activities.
For all members, the site is a reference tool that documents operational procedures, membership rosters, coming events, links to other sites, and current committee activities.

APPENDIX

MEETING NOTES
Traffic Counts and Performance Measures – Information Sharing Meeting by LKProvost

Location: DRISI Oct 29th 8am - 10am   DRISI 1227 "O" St. Sacramento, CA. Room 518
Attendees: Brad Mettam D1 Planning, Lee Provost & Brian Alconcel, DRISI, Traffic Ops: Joan Sollenberger, Brian Simi, Nick Compin, John Ensch, Binoy Alexander, Cindy Pribyl, &Tim Hart

Summary
Mr. Brad Mettam visited HQ from D1 and he asked Lee Provost of DRISI to call together a meeting. He asked that the attendees to share their HQ's perspective on Traffic counts, VMT's, Performance Measures (related to the new FHWA requirements), Traffic Strategic Developments (Ms. Sollenberger's office) as well as any other work that is being done currently on Traffic System Performance. He has asked Lee to perform a literature search on what other state DOT's are doing for traffic counts (continuous, frequency), performance measures, funding (how much money devoted) and operations (who's in charge). Right now he has noticed a

difference in what Districts are doing in terms of collecting traffic data, operationally, resources allocated and performance measures. Brad informed all on what he is reviewing and working on concerning value analysis of traffic volume reports on our state highway system. Each person filled in Brad on their current work related to his inquiries on traffic counts and census.

Roundtable discussions were made on data collection, current databases and how the data flows from collection to reporting, including suggestions on improvements. Rural vs. urban concerns were voiced. The importance of consistent data collection and reporting was discussed.

Brian A. is working on a VA (value analysis) project with Cindy P. and many others on how much time it takes to do a good quality count, and to develop some workload standards to justify additional resources.

Joan S. mentioned traffic safety (including Nick C and Tim H.) are working not only with the PeMS database but also with the National Performance Management Research Data set (NPMRDS), which was purchased by FHWA and given to the states, for travel time reliability, taken 1/month, by cell phone tracking. It has speed data in 5 minute increments with gps coordinates.

John E. talked on specifics of the importance of specific roadway stationing alignments for accident reporting and logical segments of roads in relationship to the Highway Logs and how the OTM relates to the TSN database, including problems with the older legacy TSN database. Binoy A. drew a dataflow diagram about how his IRD analytical software for WIM (weigh in motion) will be used so that TSN can read raw data in binary format. Rural vs. urban geometrics were also discussed. There were many more detailed discussions that have not been captured here, including AADT, VMT, SWITRS, and Table C reports linear referencing.

In conclusion, much information was shared on traffic data collected, transferred and reporting that will hopefully lead to improvements for the state. Brad M. said that he has a consultant on board in Jan 2015 to help conduct a VA (value analysis) study to gather information from each District and HQ on how they collect traffic data.

STATE COMPARISON SPREADSHEET

State DOT Comparison Traffic Counts October 2014 for Brad Mettam					
State	**Continuous Count - 24 hr/day, 365 day/year, AADT (peak hour)- Vol, Speed, Truck %,Vehicle ID**	Once every 3 Year Inventory Cycle-Fed,State, Co	Annual Count of Entire State	Inter-active Traffic Volume Map	Website link
A DOT	Yes	Unk	Yes	Yes	http://www.azdot.gov/planning/ DataandAnalysis/average-annual-daily-traffic
Caltrans	No (very few)	Yes	No	No	http://traffic-counts.dot.ca.gov/
GDOT	Yes	Unk	Yes	Yes	https://www.dot.ga.gov/inf ormationcenter/statistics/ Pages/default.aspx
Maryland SHA	Yes	Yes	No	Yes	http://www.roads.maryland.gov/ Index.aspx?PageId=251
MassDOT	Yes	Yes	No	Yes	http://www.mhd.state.ma.us/def ault.asp?pgid=content/traffic01& sid=about
MDOT	Yes	No	Yes	Yes	http://www.michigan.gov/mdot/ 0,4616,7-151-11151_11033-22141--,00.html
N DOT	Yes	No	Yes	No	https://www.nevadadot.com/rep orts_pubs/traffic_report/

NYS DOT	Yes	Yes	No	Yes	https://www.dot.ny.gov/division s/ engineering/applications/traffi c-data-viewer
O DOT					http://www.oregon.gov/odot/td/ tdata/pages/tsm/tvt.aspx
TX DOT	Yes	No	Yes	Yes	http://www.txdot.gov/inside-txdot/division/transportation-planning/maps/traffic.html
WisDOT	Yes	Yes	No	Yes	http://www.dot.wisconsin.gov/tr avel/counts/
WS DOT	Yes	Yes, 4 Yr.		Yes	http://www.wsdot.wa.gov/mapsd ata/ travel/annualtrafficreport.ht m

<p style="text-align:center">Traffic Counts Literature Website Search for Brad Mettam D1
Caltrans Division of Research, Innovation & System Information (DRISI)
By Lee Provost   November 12, 2014</p>

DRISI Internal Preliminary Investigation (PI) Request

A. Project Manager Name and Date: Oct 21, 2014   Due Date: Project Charge Code:
   Customer Name: Brad Mettam Deputy District Director, Planning & Local Assistance, D1
   (707) 445-6413

B. Will this Internal PI supplement a contracted out PI?   Y/N

C. Tie in Departmental Goal(s) No./Objective (brief please):

D. Brief Problem Statement (brief 5 lines max):
   The Department is conducting a review of how it funds, performs, and reports the traffic volumes on
   the State Highway System. Each district is responsible for determining appropriate locations,
   conducting or collecting traffic volume information (alternatively referred to as traffic census or
   traffic counts) and reporting that information to HQ, and ultimately FHWA.

E. Desired Outcome(Improvement/Implementation) of PI (brief):
   As we begin our review, we need a better understanding of the state of the practice in traffic counts
   and/or census, including information on: operations and processes; performance measures; and ways
   or identifying funding or levels of funding for these activities.

F. PI Request: Survey OR Website Search (only check one please):

Survey	Literature Review
o Survey Monkey (internal via DRISI)	o Website Search
o ListServ for AASHTO RAC (Higher level via DRISI Division Chief's direction)	o Library Search
	☒ Both

Survey requires:	Website Search Requires:
1. List of Questions	1. Key Words/Phrases
2. Complete Email Addresses (Microsoft Word)	2. Key States to Research or National Search names
3. Key States to Research or National Search names	3. Specific Sites Names

G. Please provide the needed information listed above for your Survey or Website Search
   (you may attach additional sheets) :

1. Traffic counts, traffic census, vehicle counts, vehicle classification, performance
    measures.