S A C O G

Land Use & Natural Resources Committee

Item # 16-11-6
Information

October 27, 2016

Transportation Project-Level Performance Evaluation

Issue: What approach should SACOG take to evaluate project-level performance for the next Metropolitan Transportation Plan/Sustainable Communities Strategy update (MTP/SCS) and future funding rounds?

Recommendation: None; this is an information item for discussion.

Discussion: The purpose of the staff report will be to seek Board input and direction on next steps for an agency work area focused on tools and methods to analyze transportation investments at the project-level. The process builds from SACOG's existing strengths in performance evaluation at the regional, or system-wide, level and responds to Board interest in project-level analysis for both planning and programming activities. Offering clear and transparent connections between technical analysis and policy development is the overall goal of the effort.

This item continues a discussion from Fall 2014, with a Board Workshop by Mr. Steve Heminger, Executive Director of the Metropolitan Transportation Commission, on MTC's project performance assessment process, and a subsequent Transportation Committee discussion on the topic that included a presentation by Matt Carpenter on other national best practices. At the Committee discussion, Directors expressed: 1) an interest in exploring further the options for implementing a project performance assessment process for SACOG; and 2) a preference to see sample results of test cases, to better understand the sort of information that a project performance assessment would bring forth, prior to any decision about how the information could be used in any project ranking or priority setting.

Resources to continue exploration of a project performance assessment process for SACOG are included in the agency overall work program for this fiscal year. Key activities include:

- Forming a working group of agency professional staff to assist in a review of technical methods for implementing project performance assessment at SACOG, and develop consensus on a preferred approach
- Identifying and analyzing test cases for the preferred approach

With this assistance from the working group, SACOG will document the preferred approach and results of test cases, and report back to the Committee by the fall of 2017. An independent technical consultant will be available to assist the working group in its review and evaluation of the test cases. The overall goal is to develop a methodology for project-level performance assessment which could be utilized in the 2020 MTP/SCS, and possibly in the next regional flexible funding round as well.

Background

Since the adoption of the 2008 Metropolitan Transportation Plan (MTP), the SACOG Board has steadily increased its focus on prioritizing cost-effective transportation projects with high performance benefits. The 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) emphasizes the importance of prioritizing cost-effective transportation investments in a time of funding constraints as a guiding principle, as well as through specific policies and strategies. **Attachment A** lists the 2016 MTP/SCS principles and policies that support the concept for project-level performance evaluation, while **Attachment B** lists the key performance measures from the plan.

Coinciding with the planning work for the 2016 MTP/SCS was the passage of a new federal transportation bill, *Fixing America's Surface Transportation Act* (FAST-ACT). The legislation reaffirms the new federal and state emphasis on outcome-based performance measurement that was first made in the preceding federal transportation act. The federal transportation acts have led to a series of rule-making activities and updated funding programs that elevate the importance of performance-based transportation planning. SACOG has been actively engaged in the federal act rule-making related to transportation performance management. **Attachment C** is the recent comment letter staff prepared in cooperation with our California MPO peers, while **Attachment D** is a comment letter prepared by a national organization, the Center for American Progress, on the same federal performance management rule which includes a Sacramento case study prepared by Bruce Griesenbeck.

Other markers that signal the paradigm shift towards performance-based planning include active efforts to emphasize performance in revisions to the State Transportation Improvement Program (STIP) and recent state Cap and Trade legislation that dedicates a full 35 percent of the total funding to programs that help meet the greenhouse gas performance targets of Senate Bill 375.

While significant performance benefits are expected with implementation of the 2016 MTP/SCS, there is an opportunity for the 2020 plan update to go further in addressing transportation policy challenges that remain. Among these challenges is making the most of our limited future transportation funding. Performance evaluation is a promising means to reconsider the timing or sequence of strategic system expansion opportunities at the same the region increases its commitment to maintain the system in a state of good repair.

Concept Overview

Analysis of the implementation themes in the MTP/SCS policy framework can benefit from a set of related technical efforts:

- Project Phasing & Benefit/Cost analysis
- Project Performance Outcomes analysis

These efforts will provide an opportunity to continue the agency's focus on system-wide performance outcomes, while also introducing project-scale evaluation into the MTP/SCS for the first time. Prior plans analyzed the overall transportation system, but did not analyze

performance at the project scale. There are multiple benefits from broadening SACOG's performance evaluation efforts to also consider project-scale outcomes. Key benefits include:

- optimizing the timing or sequence of investments in the MTP/SCS to address financial constraint and air quality attainment challenges
- increasing the transparency of project selection priorities for both the long-term MTP/SCS and short-range MTIP
- realizing greater consistency in the reporting of MTP/SCS implementation activity over time

Project Phasing & Benefit/Cost Analysis

The phasing analysis prepared for the 2016 MTP/SCS was an early project-level performance evaluation achievement. The purpose of this effort was to develop new information to help the Board decide whether the timing of some expansion projects in the 2016 MTP/SCS plan should be altered, i.e., moved sooner or moved later. Significant efforts were taken to get data on all transportation projects listed in the MTP/SCS into a form usable for the phasing analysis**.** The focus was on significant projects in the later years of the MTP/SCS with the most flexibility in their timing because these projects typically have limited, if any, financial commitments already made. An indicator of success from the phasing analysis of the MTP/SCS effort is a nearly $600 million reduction in spending on road and highway expansion projects from the previous plan.

Building on the phasing analysis work for the 2016 MTP/SCS, efforts have advanced to integrate this work with a benefit/cost analysis of a limited number of large and significant projects. Trial runs to test this concept are underway. The technical methodology for the proposed benefit/cost analysis are similar to the successful effort by MTC that was presented to the Board in September 2014. In this analysis, a benefit/cost ratio will result from comparing annual benefits in a horizon year with annualized life-cycle costs for the project. The benefit/cost calculation monetizes project impacts for select performance outcomes. For example, the monetary value of reducing particulate matter emissions will reflect the costs associated with the known health impacts from bad air quality. **Attachment E** offers draft considerations for the benefit/cost analysis that will be refined further through working group engagement if the trial runs are successful.

Project Performance Outcome Assessment

Project-level evaluation options for the 2020 MTP/SCS are also being explored through preparing a performance outcome assessment. The goal of this effort is to provide clear and measurable policy objectives as to what the Board hopes to achieve and help guide staff in evaluating policies and investments to help get us there.

While technical resource constraints limit the number of projects that can be evaluated by the project phasing and benefit/cost analyses, the performance outcomes assessment could provide a means to evaluate all projects in the MTP/SCS. Each project, or bundle of similar projects, would be scored against a common set of performance outcomes as to whether the investment helps, or hurts, the achievement of the outcome.

Because the performance outcomes assessment would be done for hundreds of projects, it is important to focus on a limited number of outcomes if the analysis is to be used to meaningfully inform the 2020 MTP/SCS.

SACOG's regional funding programs provide a precedent of focusing on a limited number of performance outcomes for project selection and prioritization efforts. For example, in the largest funding program, Regional-Local, there are seven outcomes related to the performance goals of the adopted MTP/SCS:

- regional reduction in VMT per capita
- regional reduction in congested VMT per capita
- increase in multi-modal travel/alternative travel/choice of transportation options
- provide long-term economic benefit within the region, recognizing the importance of sustaining both the urban and rural economies
- improve goods movement, including farm-to-mark travel, in and through the region
- significantly improve safety and security
- demonstrate "state of good repair" benefits that improve the efficiency of the existing transportation system

Regional-Local funding program applicants were asked to identify the key outcomes the project was intended to achieve, and provide evidence and relevant data which would help "make the case" for the achieving those outcomes. Staff's current thinking is to start with this set of seven outcomes from the Regional-Local funding program and consult with the working group to identify any additions or deletions to this list.

Project Performance Assessment: Level of Effort Options & Timeline

Board input through the November committee cycle is sought on the type and depth of performance evaluation it wants to see in the 2020 MTP/SCS. **Figure 1** summarizes the proposed schedule and expected level of effort for each task.

Figure 1: Project Performance Assessment Schedule

Evaluation Type	Level & Scope of Effort	History/Precedent	Timing/Delivery
Project Phasing & Benefit-Cost Analysis	***Highest Effort*** Small number of large and significant projects or corridors	Only very limited applications of BCA for MPO planning completed before	Testing of concept and methodology underway. Working group review in 2017.
Project Performance Outcome Assessment	***Medium Effort*** Individual analysis of all projects or bundles of similar projects	Only a few adopted as comprehensive assessment of a long list of projects	Draws on agency-adopted outcomes. Working group review through 2017

Evaluation Type	Level & Scope of Effort	History/Precedent	Timing/Delivery
Test Cases	***Modest Effort*** Identify test cases and apply all methods, and document results	Relatively common	Testing in spring, with report back to Committee by Sept 2017.

Approved by:

Mike McKeever
Chief Executive Officer

MM:MC:ds
Attachments

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Attachment A

2016 MTP/SCS Principles and Policies that Support a Performance Evaluation Framework that Considers both System-Wide and Project-Level Outcomes

Key MTP/SCS Guiding Principle:

Financial Stewardship: Manage resources for a transportation system that delivers cost-effective results and is feasible to construct and maintain.

Key supportive policies in the MTP/SCS:

- Educate and provide information to policymakers, local staff, and the public about the mutually supportive relationship between smart growth development, transportation, and resource conservation.

- SACOG encourages local jurisdictions in developing community activity centers well-suited for high quality transit service and complete streets.

- SACOG encourages every local jurisdiction's efforts to facilitate development of housing in all price ranges, to meet the housing needs of the local workforce and population, including low-income residents, and forestall pressure for long external trips to work and essential services.

- Implement the Rural-Urban Connection Strategy (RUCS) which ensures good rural-urban connections and promotes the economic viability of rural lands while also protecting open space resources to expand and support the implementation of the Blueprint growth strategy and the MTP/SCS.

- Support and invest in strategies to reduce vehicle emissions that can be shown as cost effective to help achieve and maintain clean air and better public health.

- Use the best information available to implement strategies and projects that lead to reduced Greenhouse Gas (GHG) emissions.

- Acknowledge and support preservation of the existing road and highway system as the top priority for local public works agencies and Caltrans, and expect to help them secure adequate funding sources for necessary work.

- Support road, transit, and bridge expansion investments that are supportive of MTP/SCS land use patterns.

Attachment B

Performance Indicators for the 2016 MTP/SCS

The following tables are designed to provide a quick reference to the range of measures used to assess the performance of the MTP/SCS.

Land Use Measures

Indicator	Specific Measures
Housing	Growth in housing units by Community Type
	Change in housing product mix, 2012 to 2035, and by Community Type
	Housing growth through reinvestment
Employment	Employment growth in different Community Types by sector
	Employment growth by Community Type
	Employment growth through reinvestment
Land Usage	Compact development: growth in population compared with acres developed
	Farmland acres developed – total and per capita
	Vernal pool acres developed
	Developed acres by Community Type
Mix of uses	Jobs-Housing balance within four-mile radius of employment centers
	Mix of use by Community Type
Transit-oriented development	Growth in dwelling units within half-mile of quality transit (in TPA) by county
	Growth in employees within half-mile of quality transit (in TPA) by county
	New housing product mix in TPAs by county
	Proximity to transit by Community Type
Urban Design	Change in street pattern in different Community Types
	Change in residential density by Community Type

Transportation Measures

Indicator	Specific Measures
Driving access	Total jobs within 30-minute drive by Community Type
Vehicles Miles Traveled (VMT)	Total weekday VMT & average annual growth rates – regionally, by county, and per capita
	Weekday VMT by source and total Commute share of household-generated VMT Weekday VMT by source per capita or per job Total VMT per capita Percent change in VMT per capita or per job compared to 2012
	Weekday household-generated VMT per capita by Community Type Weekday household-generated VMT per capita by TPA
	Household-generated commute VMT by Community Type and regional total Commute VMT per worker by Community Type and regional total
Congested Vehicle Miles Traveled (VMT)	Congested VMT total and per capita Congested VMT by source - total, per capita, per job Congested VMT for household-generated travel by Community Type
Transit Service	Increases in transit vehicle service hours per day by transit type
Transit productivity	Weekday transit vehicle service hours Weekday passenger boardings Weekday boardings per service hour Farebox revenues as percent of operating costs (farebox recovery rate)
Bicycle Infrastructure	Increases in miles of bicycle route mileage by county Bike route miles per 100,000 population
Transit, walk and bike travel	Weekday person trips by transit, walk and bike modes Transit, walk and bike trips per capita Transit, bike and walk trips per capita by Community Type Transit trips per capita by Transit Priority Area (TPA)
	Transit, bike and walk trips per capita by Community Type
	Transit trips per capita by Transit Priority Area (TPA)
Roadway Utilization/ Optimal use	Underutilized, optimally utilized, over-utilized roadways by roadway type
Commute Travel	Weekday commute tours by mode Commute mode share
Non-Commute Travel	Weekday non-commute person trips by mode Non-commute mode share
Safety	Percent reduction in accident rates

Environmental Measures

Indicator	Specific Measures
Farmland impacts	Farmland conversion Acres of impact from growth and transportation projects by type of farmland Percent of Williamson Act contract acres impacted
Habitat impacts	Percent of habitat and land cover impacted Acres of impact from growth and transportation projects by type of wildland habitat/land cover
Floodplain development	Percent of housing units expected to be constructed in 200-year floodplain
Toxic air contaminants	Percent of population within 500 feet of high-volume roadway by county, region
Greenhouse gas emissions	Greenhouse gas emissions by sector Greenhouse gas emission reductions per capita by pounds per day, percentage

Environmental Justice Measures

Indicator	Specific Measures
Land Use	Percent of EJ Area and Non-EJ Area population in Community Types Percent of EJ Area and Non-EJ Area population in TPAs by county
Housing	Housing product mix in EJ and Non-EJ Areas by Community Type
Transit service	Increases in daily transit vehicle service hours in EJ Areas
Transit accessibility	Accessibility from EJ and Non-EJ Areas within 30 minutes by transit to jobs, retail jobs, medical jobs, higher education, park acres
Mode share	EJ and Non-EJ Area transit mode share Bike and Walk mode share in EJ and Non-EJ Areas
Auto accessibility	Accessibility from EJ and Non-EJ Areas within 30 minutes by car to jobs, retail jobs, medical jobs, higher education, park acres
Comparison of transit and auto accessibility	Percent of jobs, retail jobs, medical jobs, higher education enrollments, park acres Accessible within 30 minutes by transit vs. car from EJ and Non-EJ Areas
Toxic air contaminants	Percent of population in EJ and Non-EJ areas within 500 feet of high-volume roadway by county, region

August 20, 2016 3100400

Gregory G. Nadeau
Administrator, Federal Highway Administration
U.S. Department of Transportation
1200 New Jersey Avenue S.E.
Washington, DC 20590

Dear Administrator Nadeau:

SUBJECT: National Performance Management Measures: Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program; Docket No: FHWA-2013-0020

The California Association of Councils of Government (CALCOG), in coordination with the Southern California Association of Governments (SCAG), the Metropolitan Transportation Commission (MTC), the San Diego Association of Governments (SANDAG), the Sacramento Area Council of Governments (SACOG), and the San Joaquin Council of Governments (SJCOG), appreciate the opportunity to comment on this important proposed rule. Each agency works to ensure the success of its member organizations by facilitating communication and information sharing between our members, other local officials, state and federal agencies, and the public. Our member agencies are engaged in regional planning and program implementation on a wide variety of issues, including transportation, housing, the economy, energy, and the environment.

The above mentioned agencies have worked together to compile a number of joint comments, concerns, and recommended modifications in regard to this NPRM.

Overarching Comments: Rule Implementation Timing and Data Availability

MPOs throughout the State of California currently incorporate performance based planning into their regional planning processes. Implementation of the requirements proposed by this NPRM will require extensive coordination between the MPOs and state DOTs. Such efforts would include the integration and/or assessment of the required use of the National Performance Management Research Data Set (NPMRDS) as the primary data source for target development, data compilation, analysis, and reporting. Furthermore, many states and regions have been making significant strides in implementing data collection systems that may be considered for use as equivalent data sources. While these efforts are supportive of the additional analytical and reporting requirements introduced by this NPRM, they would require an assessment of existing agency practices.

As this will be the initial implementation of the performance measurement requirements of MAP-21, we recommend USDOT allow for the maximum one-year implementation period. MAP-21, in addition to the proposed section 490.105(e)(1) recommends: *"State DOTs shall establish targets not later than 1 year of the effective date of this rule and for each performance period thereafter,*

in a manner that allows for the time needed to meet the requirements specified in this section and so that the final targets are submitted to FHWA by the due date provided in § 490.107(b)".

The proposed October 1, 2016, timeframe for developing the initial performance report does not provide state DOTs and MPOs sufficient time to determine appropriate targets and establish functional implementation processes. To minimize administrative burden and help support the advancement and implementation of this NPRM, we request that the initial performance report date be postponed one full year, to October 1, 2017, to allow states and MPOs adequate time to develop the necessary resources to ensure a successful transition to the NPRMDS. This one-year period would be dedicated to the acquisition of the requisite technologies, staff resources, and inter-agency partnerships with other California MPOs needed to maximize the efficiency of the transition to the federal transportation data resource.

The proposed timeframe for demonstrating significant progress is unrealistic considering each region has an existing pipeline of prioritized transportation projects, a significant number of which already have committed funding and are included in the Federal Transportation Improvement Program (FTIP). A more appropriate timeframe would reflect only those projects that are selected for inclusion in the FTIP well after the effective date of the rulemaking.

In addition, many of the performance metrics proposed in the NPRM rely on the availability of federal data resources. For this reason, information regarding the specific efforts being made by FHWA to assure that needed data is updated to the federal database in a timely manner should be provided. In addition, information should be provided regarding provisions for target reporting grace periods if the updated federal data is not available when needed for MPO and state analysis and reporting.

Several of our member agencies have reported that the NPMRDS is difficult to use and would require a substantial commitment of resources to facilitate functional use. FHWA could reduce the burden on MPOs and states by centralizing the computational and analytic requirements of this NPRM and simplifying the reporting requirements through the development of a user-friendly web-based analytical tool. The University of Maryland CATT lab has begun development of tools to assist state DOTs and MPOs calculate the required performance measures in this draft rule. Additional efforts like this will be necessary as implementation begins.

In California, transportation system performance monitoring relies heavily upon data obtained from the California Performance Measurement System (PeMS). PeMS data is collected from an extensive network of nearly 40,000 individual sensors embedded in freeway segments throughout the state. To leverage the analytical benefits obtained through existing data systems such as PeMS, we recommend that USDOT develop an analysis tool that would allow state DOTs and MPOs to report the required performance data without having to discard valuable existing supplemental data resources, such as PeMS. To facilitate this request, we recommend that the final rule provide more detailed guidance on the approval process for using equivalent data sources in place of, or in conjunction with, the NPRMDS. Also, for the near-term, we recommend that agencies be permitted to use their existing more detailed urban area data collection tools (i.e. PeMS) in place of the NPMRDS, or to supplement NPMRDS data, as needed.

Moving forward, the development of national guidelines for multimodal data collection would maximize economies of scale and further the goals of national multimodal performance measurement. Due to advances in technological applications that are continually evolving, the focus for data collection should be allowed to expand to other multimodal performance measures that promote the objectives of this NPRM. Federal guidance and focus also should be directed toward further support for private industry endeavors to promote national standardization for data collection, analysis methodology, and data exchange and integration practices, which would allow public agencies to focus on the functional application and use of the data rather than on what technologies to consider.

Overarching Comment: Selection of Performance Measures

Selection of specific performance metrics should be based on a comprehensive set of data developed from many sources, rather than limited to currently available data in the NPMRDS. The narrative of the NPRM clearly highlights a desire to conduct multimodal performance based planning, however, limitations of the NPMRDS data set have led the USDOT to recommend only auto-centric measures. Data supporting alternatives to the currently proposed system performance measures may be available at the local, regional, and state levels. For example, regional commute time and commute mode share data are currently available from the American Community Survey.

Overarching Comments: Measures of Congestion and Reliability

All seven of the proposed performance measures are focused solely on the National Highway System – with six of those measures emphasizing vehicle mobility. While several measures ostensibly address reliability and goods movement, they rely on the same dataset as the other congestion measures, and traditional congestion reduction techniques ultimately remain the primary actions that local agencies may use to improve performance on such measures. Given the latitude provided under MAP-21 and the FAST Act to identify measures of system performance, the USDOT should not focus so narrowly on vehicle mobility in this rulemaking.

We believe that USDOT's proposed performance measures are too auto-focused and ignore the benefits of investing in a multimodal transportation system. Under Senate Bill 375, California MPOs are making significant progress in the integration of transportation and land use planning through the development of multimodal Regional Transportation Plans/Sustainable Communities Strategies. Reducing the evaluation of transportation system performance to the results of roadway based traffic speed and vehicle delay analyses may undermine existing planning efforts. Performance measures should be multimodal, capturing system-wide benefits from a diverse set of multimodal transportation investments. Federal databases should be made available to states and MPOs to be able to monitor those multimodal metrics.

People use the transportation system to access destinations. The proposed performance measures omit an important accessibility metric. The movement of people and goods and efficient access to destinations, regardless of the mode of transportation, should be a focus. Final performance measures should support connectivity and accessibility goals through the development and measurement of a multimodal system that provides users with safe, reliable, and affordable

connections to employment, education, healthcare, and other essential services. Federal databases should be made available to states and MPOs to support the monitoring of accessibility metrics.

The NPRM's heavy focus on moving automobiles is also inconsistent with the USDOT 'Ladders of Opportunity' initiative[1]. Final performance measures should support connectivity and accessibility through the development and measurement of a multimodal system that provides travelers with safe, reliable, and affordable connectivity to employment, education, healthcare, and other essential services.

Subpart E – National Performance Management Measure to Assess Performance of the National Highway System

The NPRM requires that the state DOT and MPO agree on the desired travel time for each road segment. This would require significant time and staff resources to coordinate with state DOT district offices to concur on desired speed for each state DOT facility. FHWA will not allow MPOs to have divergent expected performance standards from state DOTs, meaning that any disagreements on desired facility performance levels would have to be elevated to management for reconciliation. The proposed approach also introduces the possibility of inconsistencies across states and regions, as some locations might set free flow as the desired travel time while others might set other benchmarks. We recommend that the approach used for the congestion reduction performance measure, 35 mph on highways and 15 mph on arterials, also be applied here as it is more consistent and appropriate. It is also critically important that the highway segment length used in performance measurement be reflective of the regional performance goals outlined in MAP-21 and the FAST Act.

It is important to note, if annual hours of excessive congestion delay per capita is to be applied, it also should reflect the complete transportation environment to which transportation improvements and transportation choices are provided to address congestion and should not be limited only to auto-centric performance outcomes. Guidance on the integration of public transit data, consideration of multimodal performance data, and the inclusion of performance measures that help advance 'Ladders of Opportunity' should be included as a cornerstone of this NPRM.

Moreover, reliance on time-based metrics may penalize development of higher density communities, and discourage active transportation and transit infrastructure investments.

Travel time/delay is experienced by people, not vehicles. The USDOT should propose travel time/delay measures that focus more on the movement of people rather than vehicles. Performance measures should recognize that improving conditions experienced by travelers, regardless of their travel mode, is the primary objective. Some of the proposed performance measures are especially problematic because they focus on the share of directional-miles that are uncongested or result in reliable travel times. Weighting based on directional-miles, as opposed to person-miles or lane-miles, will result in performance outputs that minimize the impact of

[1] The USDOT 'Ladders of Opportunity' initiative states: "The choices we make about future transportation projects, the people they touch and places they connect, will play a role in determining how widely opportunity expands throughout America."

congestion in urban and suburban areas. This is due to the fact that the bulk of roadway directional-miles in our state are located in lightly-traveled rural areas, while the vast majority of people live in metro areas utilizing a smaller number of roads more intensively (thus generating traffic congestion). Even within urban areas, it does not make sense to treat two highways as equally significant in terms of congestion, when one might have five or ten times the person-throughput.

Subpart F – National Performance Management Measure to Assess Freight and Movement on the Interstate System

The proposed freight performance metrics are too general to provide an adequate assessment of regional and statewide freight system performance. Freight system performance measures should focus on peak period congestion at the corridor level and at known freight bottlenecks rather than on 24-hour conditions. Corridor level data also could be used to accurately calculate freight reliability.

The aggregation of travel time data into five-minute intervals over an entire year for both the reliability and uncongested miles analyses will not reflect actual conditions that trucks experience. We suggest a 15-minute time interval be considered instead. This longer time interval would still provide the MPOs with appropriately detailed data while significantly simplifying the data management process. We also recommend that the proposed average truck speed threshold of greater than 50 mph be reduced to greater than 35 mph to provide the basis for a more realistic freight analysis.

As these performance measures stem from the MAP-21 legislation, we request that the NPMRDS clarify the relationships with the recently approved FAST Act and pending Interim National Multimodal Freight Network. Specifically, there are new funding programs for freight via the state apportioned funds and the discretionary FASTLANE grant program. Clarification regarding how these freight performance measures may relate to or impact FAST Act freight programs would be very useful.

Subpart G – National Performance Management Measures for Assessing the Congestion Mitigation and Air Quality Improvement Program – Traffic Congestion

Performance measures based on motor vehicle delay fail to account for alternative travel modes. A corridor that includes a large number of buses or carpools should not be treated the same as a corridor filled with single-occupancy vehicles. According to the proposed metrics, the vehicle delay for a bus carrying 50 passengers would be treated the same as a single-occupancy vehicle. Therefore, we recommend modifying the proposed performance measure to incorporate carpooling and transit data, as available, to obtain a better measure of delay accruing to travelers (as opposed to vehicles).

Subpart H – National Performance Management Measures for Assessing the Congestion Mitigation and Air Quality Improvement Program – On-Road Mobile Source Emissions

For the emissions reporting process, it is unclear how future variations in model outputs based solely on emissions model updates (MOVES or EMFAC) will be taken into account and/or reconciled. EMFAC2014 is the approved emission model for California. The EMFAC and MOVES models are periodically updated. In some past instances the new version of the model projected different emissions for the same transportation network.

The proposed CMAQ performance measure is rather narrowly defined, focusing solely on CMAQ-funded projects. The CMAQ performance measure should take into account the synergy of all projects on the transportation system. Singling out projects based on funding type without understanding the overall benefits of an integrated system will generate an unrealistic or inaccurate account of the overall air quality benefits.

The proposed approach is inconsistent with other performance measures. For example, safety performance measures reflect the benefits and dis-benefits associated with all transportation projects, regardless of funding source. Given that this is the sole performance measure proposed under the federal goal of Environmental Sustainability, we believe the measure should be expanded to reflect the impacts of non-CMAQ funded projects as well, some that improve air quality and others that might yield adverse impacts.

Greenhouse Gas Considerations

California has been a national leader in addressing the challenges of climate change – at both the statewide and regional level. When considering how to best measure greenhouse gas (GHG) emissions, we recommend that the federal government look to California as a best practice and, to the maximum extent possible, align federal performance measures with existing California initiatives. For example, MPOs across California are required to establish per-capita GHG emission reduction targets – both for the short-term (2020) and the longer-term (2035). This type of coordination has occurred in the past, as the federal government adopted California air quality requirements after the state demonstrated the clear benefits of that approach.

When considering establishing a greenhouse gas performance measure, we recommend the following key principles:

- Select a GHG efficiency metric, such as per capita or per job GHG emissions. This is critical in order to recognize that regions with growing populations and economies may find it more difficult to reduce total GHG emissions.
- Limit the metric to the measurement of on-road vehicle tailpipe emissions. While the reduction of other sources of GHG emissions is critical to tackling climate change, upstream sources and non-transportation sectors are beyond the jurisdiction of state DOTs and MPOs.
- GHG targets should not be confined to the two and four-year reporting intervals proposed for the other performance measures featured in this rulemaking. GHG targets require a longer timeframe to identify meaningful reduction trends, as strategies range from fleet improvements to new fixed-guideway transit to improved transportation-land use policy linkages. As such, target-setting should be for longer-term objectives, with reporting towards that target every 4 years.
- Future rulemaking on this topic should note the limited, but not unimportant, role that transportation planning and implementation plays in climate change mitigation. While transportation represents a significant component in the GHG emissions inventory for metro areas and states, shorter-term emissions reductions might be more easily attained from other sectors, such as energy generation. Targets should be thus set at the regional or state level in the context of a more comprehensive GHG reduction framework.

Concluding Remarks

Moving forward, we recognize that transportation system monitoring challenges will remain long after we have settled on performance measures and agreed upon targets for this NPRM. Because multiple factors impact performance of the transportation system (changing land uses, the economy, the rate of growth, etc.), the discernment of factors influencing performance, particularly in urban areas, promises to be a challenging endeavor. Still, we remain optimistic that, with the appropriate set of performance measures and carefully calibrated targets, we can meaningfully assess how the transportation system is functioning.

We recognize and appreciate the significant effort FHWA has undertaken in developing these proposed national transportation performance metrics. We sincerely thank USDOT for considering the comments, concerns, and proposed modifications contained within this letter. If you have any questions, please contact Tanisha Taylor at (916) 557-1170. CALCOG and the undersigned MPOs look forward to our continued collaboration in the finalization of this NPRM.

Sincerely,

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Attachment/Enclosure

Attachment D

National Performance Management Measures; Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and Congestion Mitigation and Air Quality Improvement Program

Docket No: FHWA-2013-0054

The U.S. surface transportation system faces two major challenges: congestion and carbon emissions. According to data by Texas A&M University, metropolitan area congestion has increased by 145 percent[1] in the last 25 years. Congestion now costs the economy $160 billion[2] in wasted fuel and lost productivity each year.[3] Over the next five decades, the U.S. will add approximately 100 million people[4] and 80 million new light duty vehicles—principally in urban areas.[5] Without balanced, multi-modal investments that provide people with safe, affordable options, the problem will grow exponentially.

Beyond congestion, transportation accounts for 31 percent or 2.1 billion metric tons of CO2 emission each year.[6] In 2009, the EPA Administrator formally determined under Section 202(a) of the Clean Air Act that CO2 and other greenhouse gases (GHGs) "threaten the public health and welfare of current and future generations."[7] In order to avoid the very worst consequences of global climate change, the federal government must push states and regions to significantly reduce greenhouse gas emissions from the mobile sector.

In 2012, Congress passed the authorization bill Moving Ahead for Progress in the 21st Century (MAP-21). The bill requires the U.S. Department of Transportation (USDOT) to develop a series of performance management measures to hold states and regions accountable for their investment decisions, including for performance of the National Highway System (NHS), traffic congestion, and on-road mobile source emissions.

Performance management is potentially a transformative change in federal policy because transparency is a powerful tool for holding elected officials and senior public administrators accountable for their decisions. But measurement is a double-edged sword. As the old saying goes: "You don't get what you want; you get what you measure." Embedded in this aphorism is an important truth. Namely, that there is a direct connection between what the federal government requires states and regions to measure and the types of projects they choose to invest in.

Unfortunately, the draft rule does not require states and regions to measure greenhouse gas emissions from on-road mobile sources. Moreover, the proposed measure for congestion focusses exclusively on vehicle speed, ignoring the significant role that public transportation plays in reducing congestion. Finally, the proposed rule includes duplicative measures for the NHS and a differential speed threshold for freight and light duty vehicles.

Taken together, these deficiencies will allow states and regions to avoid the issue of climate change and push them to prioritize highway projects that increase vehicle speed at the expense of a more balanced investment program. This comment proposes the following changes:

Traffic congestion:

- Require metropolitan regions over 1 million in population to calculate the avoided delay provided by public transportation.

Mobile source emissions:

- Require states and regions to calculate the per capita greenhouse gas emissions from on-road mobile sources.
- Require state and local agencies to adopt and publish targets for each of the forecast years for transportation improvement programs and long range plans.

National Highway System performance:

- Eliminate the conceptually flawed Percent of Interstate System Mileage Uncongested measure, which prioritizes truck speed over light duty vehicles.
- Eliminate duplicative measures of vehicle speed for Interstate and non-Interstate NHS performance

Traffic congestion

Not all roadway congestion is problematic. In fact, significant travel demand by commercial and light duty vehicles represents beneficial social and economic activity. Moreover, not all facilities serve the same function. For example, Interstate highways facilitate long-distance trips while local arterial roadways connect travelers with destinations. Stated differently, the interstate system enables mobility while signalized urban arterials provide access.

The draft congestion measure partially recognizes these diverse functions by proposing separate threshold speeds for excessive delay of 35 and 15 miles per house for limited-access and signalized arterials, respectively. Importantly, these excessive delay threshold speeds roughly coincide with the speed at which each type of arterial achieves maximum vehicle throughput.

Problem: The proposed measure fails to capture the significant congestion-reducing benefits provided by public transportation. The issue comes down size and capacity. A standard 40-foot bus takes up roughly the same amount of roadway space as two passenger cars yet can carry as many as 75 passengers.[8] On average, buses and light-duty vehicles carry 47 and 1.3 passengers, respectively.[9] Stated differently, one standard city bus carries the same number of people as 36 cars.

The efficiency of buses and rail transit is especially valuable when considering that traffic congestion is nonlinear. Research shows that a reduction of just five percent in the number of vehicles on a heavily congested roadway can translate to a 30 percent increase in vehicle speeds.[10] On a roadway carrying 2,500 vehicles per hour, a five percent reduction translates to 125 cars or just four city buses.

By focusing exclusively on vehicle speed, the proposed measure may penalize metropolitan regions that make investments in high-quality transit—especially bus service. The majority of transit trips in metropolitan regions over 1 million in population are taken on buses operating on arterial roadways. According to the American Public Transportation Association (APTA), buses have an average operating speed 12.5 miles per hour.[11] Yet, this average includes many smaller cities and suburban systems. The average for large regions covered by this rule is likely much lower. As a result, expanding traditional bus service may pull average vehicle speeds below the excessive delay threshold or exacerbate delays on roadways that already fall below the threshold.

The penalty for regions that invest in bus rapid transit may be even higher. Providing buses with a dedicated lane substantially improves service quality and reliability, but forces other vehicles into the

remaining general purpose travel lanes, which reduces travel speeds. For many congested metropolitan regions, this is worthwhile and smart tradeoff. By dedicating a travel lane to transit buses, a region can raise the overall number of people carried by a roadway lane during peak periods—effectively increasing roadway productivity.

For example, the maximum capacity of a travel lane on Wilshire Boulevard in Los Angeles, California is approximately 800 vehicles per hour.[12] Assuming an average vehicle occupancy of 1.3, a single lane on Wilshire has a maximum person throughput of 1,056 people per hour.[13] According to LA Metro, the average occupancy for the rapid and local buses that service Wilshire Boulevard is 50 passengers.[14] During peak periods, LA Metro operates 30 buses per hour through the dedicated bus-only curb lane.[15] This raises the person throughput to 1,500 people per hour—an increase of 42 percent.[16]

In the end, transportation is about moving people from origin to destination as opposed to simply increasing vehicle speed. The federal government should take considerable care to encourage and reward regions that boost the productivity and person throughput of their existing facilities. However, under the proposed congestion measure, Los Angeles and other large regions have no way to demonstrate the congestion-reducing benefits of bus service that simultaneously improve arterial roadway productivity. Instead, the congestion measure would penalize the region by only measuring the increase vehicle delay per capita.

Furthermore, this performance measure penalty will make it more likely that regions will focus on projects that expand general purpose travel lanes for single-occupant vehicles. Not only is this a failing strategy for reducing congestion, but it also runs counter to the entire design and purpose of the CMAQ program into which the measure is embedded. As 23 USC 149 clearly states: "No funds may be provided under this section [CMAQ] for a project which will result in the construction of new capacity available to single occupant vehicles."[17] Yet, this is exactly what the draft measure will reward.

Solution: USDOT should amend the measure to require regions to calculate the avoided delay provided by public transportation. In effect, an avoided delay measure would show how much worse congestion would be if transit service were to disappear and a high percentage of transit riders became drivers. Importantly, the avoided delay measure would use the same data and calculation methodology as the proposed rule with one additional step: regions would increase traffic volume data for each five-minute bin to reflect the presence of formerly transit riders now assumed to be drivers.

Under the proposed rule, regions would receive vehicle speed data in five-minute bin for each NHS roadway segment. This speed data would be combined with average hourly traffic count data that regions already collect. Hourly volume totals would be averaged out for the 12 five-minute bins in each hour. Finally, regions would multiple the amount of excessive delay for each five-minute bin (measured as a fraction of an hour) by the number of vehicles in that bin.

In order to calculate the avoided delay provided by transit, regions would simply repeat this calculation but with the added step of increasing the volume data for each five-minute bin by the number of transit riders that are assumed to have converted to become drivers. Transit agencies already have accurate ridership data. Just as with the vehicle counts, transit agencies could average their hourly ridership over the 12 five-minute bins. Regions would assume that converted transit riders experience the same delay as reported by the HERE dataset.

In order to carry out the avoided delay calculation, regions would have to assign transit riders to a particular NHS segment and five-minute bin. For buses traveling directly on a NHS facility, assignment is straightforward. Regions would assign the ridership to the NHS segments over which the bus traveled as part of its route. For rail riders traveling on a parallel route, regions would assign the ridership to the closest parallel NHS segment within one mile. Any rail travel occurring beyond one mile of an NHS segment would simply not be counted.

Finally, there is the question of what percentage of transit riders should be considered drivers in the absence of transit. Survey research by APTA reveals that 90 percent of riders also drive a car multiple times a week to meet their mobility needs.[18] For this reason, it is fair to assume a high conversion factor—defined as the share of transit riders that would become drivers. For bus service operating on an NHS facility, the conversation factor would be 90 percent. For rail riders on a parallel line within a half-mile, regions would assume a 75 percent conversion factor. And for rail riders on a parallel route beyond one-half mile but within one mile, regions would assume a 50 percent conversation rate. This approach conforms to two basic principles about transit. First, that some transit dependent riders would not become drivers. Second, that the farther away transit service is from a particular NHS facility the less the probability that someone would choose that route if forced to drive.

The rules for assigning transit trips to NHS roadway segments would be as follows:

- Transit riders must be assigned to the nearest parallel arterial segment
- Transit riders must be assigned to each roadway segment along the entire service route
- Transit riders must be assigned to the five-minute bin that corresponds to the official service schedule
- For NHS bus service, the conversation factor is 90 percent
- For parallel rail service within a half-mile, the conversion factor is 75 percent
- For service beyond one-half mile but within one mile, the conversion factor is 50 percent.

See Appendix 1 for an example of how the avoided delay calculations would work using data and analysis by the Sacramento Area Council of Governments. A portion of the Sacramento Freeway (SR 99) serves as the sample NHS segment. The avoided delay calculations include ridership from two transit services: commuter bus along SR 99 as well as the Blue Line light rail. The avoided delay provided by transit is greatest as a percentage of vehicle delay from 6:00 to 7:00 am at 7 percent.

Mobile-source emissions

Global climate change represents a grave threat to human health and welfare. The surface transportation sector is a major source of greenhouse gases. Inclusion of a greenhouse gas performance measure is essential to making progress in reducing GHGs from the mobile sector. Simply put, without a measure state and local elected officials and planners will not evaluate how their policies and investments affect emissions.

Problem: The proposed rule does not include a performance measure for greenhouse gas emissions from on-road mobile sources.

Congress established the Congestion Mitigation and Air Quality program (CMAQ) as part of the Intermodal Surface Transportation Efficiency Act of 1991. The transportation bill followed the Clean Air Act amendments of 1990 that strengthened controls on air pollution. According to USDOT, “The CMAQ

program provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act."[19]

Greenhouse gases are now formally covered by the Clean Air Act. Section 202 of the Clean Air Act amendments of 1990 (42 USC 7521) states clearly that: "The Administrator shall by regulation prescribe …standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[20] In 2009, the EPA Administrator established that CO2 along with other greenhouse gases meet the CAA standard by endangering the public health and welfare of current and future generations.

The specific language of MAP-21 is also important. Title 23, Section 150(c)(5) requires the Secretary of Transportation to establish two measures: one relating to traffic congestion and another for on-road mobile source emissions. The term "emissions" is intentionally broad. By using the term emissions, Congress clearly intended to provide USDOT with the authority to extend performance measures beyond criteria pollutants. Moreover, the term "emissions" is identical to the language used by the EPA as part of the endangerment finding:

> The Administrator also finds that the combined ***emissions*** of these greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas air pollution that endangers public health and welfare under CAA section 202(a). [emphasis added]

Importantly, Title 23, Section 150 is not the only portion of U.S. Code that directs state and local agencies to engage in performance-based planning. In fact, Title 23, Section 134 requires metropolitan planning organizations (MPOs) to "develop long-range transportation plans and transportation improvement programs through a performance-driven, outcome based approach to planning."[21] Moreover, MPOs must develop plans that "minimize transportation-related fuel consumption and air pollution."[22] Similar requirements apply to state DOTs within 23USC 135.

Solution: The final rule should include a requirement that states and metropolitan regions over 1 million in population calculate the per capita greenhouse gas emissions from on-road mobile sources as well as set a target within their transportation improvement programs and long range plans.

Calculating a greenhouse gas measure would require three essential estimates: vehicles miles of travel, vehicle emissions profiles, and fleet composition. For decades, the Federal Highway Administration, working in close coordination with states and metropolitan regions, has estimated monthly and annual vehicles miles of travel, including breakdowns by state, region and functional classification.[23]

Similarly, the Environmental Protection Agency already provides a good deal of information about GHG emissions from motor vehicles. For instance, according to the EPA, the average passenger vehicle emits 411 grams of CO2 for every mile of travel.[24] Finally, FHWA would need to provide fleet composition data at the national level as well as guidance for states and regions that wish to derive their own fleet composition estimates. Much of the data work has already been done. Taken together, these three elements would allow state and local agencies to calculate GHG emissions for a performance measure.

It should also be noted that, in the absence of a full GHG measure, requiring states to measure and set targets for reducing per capita VMT would be a strong second-best option given the tight correlation

between overall driving and GHG emissions. Furthermore, given the correlation between driving and congestion, such a measure could easily fall within either the traffic congestion measuring for CMAQ.

National Highway System performance

The proposed measures for NHS performance are problematic in two ways. First, the rule includes duplicative measures of vehicle speed for both the Interstate and non-Interstate portions of the NHS. Regardless of whether or not these measures are packaged as "reliability" or meeting "expectations" these all provide planners with the same basic fact: that congestion causes highways speeds to slow, especially during peak periods. Requiring states to measure this same fact in multiple ways is pointless. Simply stated, the final rule should eliminate duplicative measures.

Duplicative speed measures

- Percentage of the Interstate direction-miles reporting segments with a level of travel time reliability that is less than 150 percent of average. (Speed)
- Percentage of the non-Interstate NHS direction-miles reporting segments with a level of travel time reliability that is less than 150 percent of average. (Speed)
- Percentage of the Interstate direction-miles reporting segments with a level of peak hour travel time ration that is less than 150 percent of average. (Speed)
- Percentage of the non-Interstate NHS direction-miles reporting segments with a level of peak hour travel time ration that is less than 150 percent of average. (Speed)
- Percentage of the Interstate direction-miles reporting segments with a level of truck travel time reliability that is less than 150 percent of average. (Speed)
- Percentage of the Interstate direction-miles reporting segments with average truck speeds of greater than or equal to 50 miles per hour. (Speed)

Second, the proposed measure Percent of Interstate System Mileage Uncongested inherently treats the speed of freight as more important than other vehicles on the road. This is deeply conceptually flawed. There is no reason to believe that the speed of a truck delivering bread to local stores is more important than a business leader traveling in a passenger car to close a multi-million-dollar deal. Moreover, this measure does not provide analytical value for planners since freight and light duty vehicles speeds are inextricably connected. Unless the goal of this measure is to pressure states and regions to implement truck-only freight lanes, it serves no purpose.

The strongest aspect of the proposed measures for NHS performance is the use of average travel speeds as opposed to free-flow as the baseline for comparison. First, achieving free-flow speeds throughout the day in most metropolitan regions is simply not possible. Second, and more importantly, free-flow speeds should not be the goal of our highway policy. Roadways have much greater throughput and therefore productivity under moderate to heavily congested conditions. Pushing for free-flow speeds would necessitate a cost-ineffective overbuild that would tear out the heart of our metropolitan areas.

Conclusion

The proposed rule presents a unique opportunity in the history of federal surface transportation policy to establish a performance management framework that will guide policymakers for decades to come. Therefore, it is essential that these measures address congestion and carbon emissions in a manner that encourages states and regions to make truly multimodal investments that promote choice, reduce household transportation costs and reduce the environmental impact of commercial and personal mobility.

Appendix 1: Sample Avoided Delay Calculation from SACOG

Figure 1. Sample Segment—Roadway and Transit

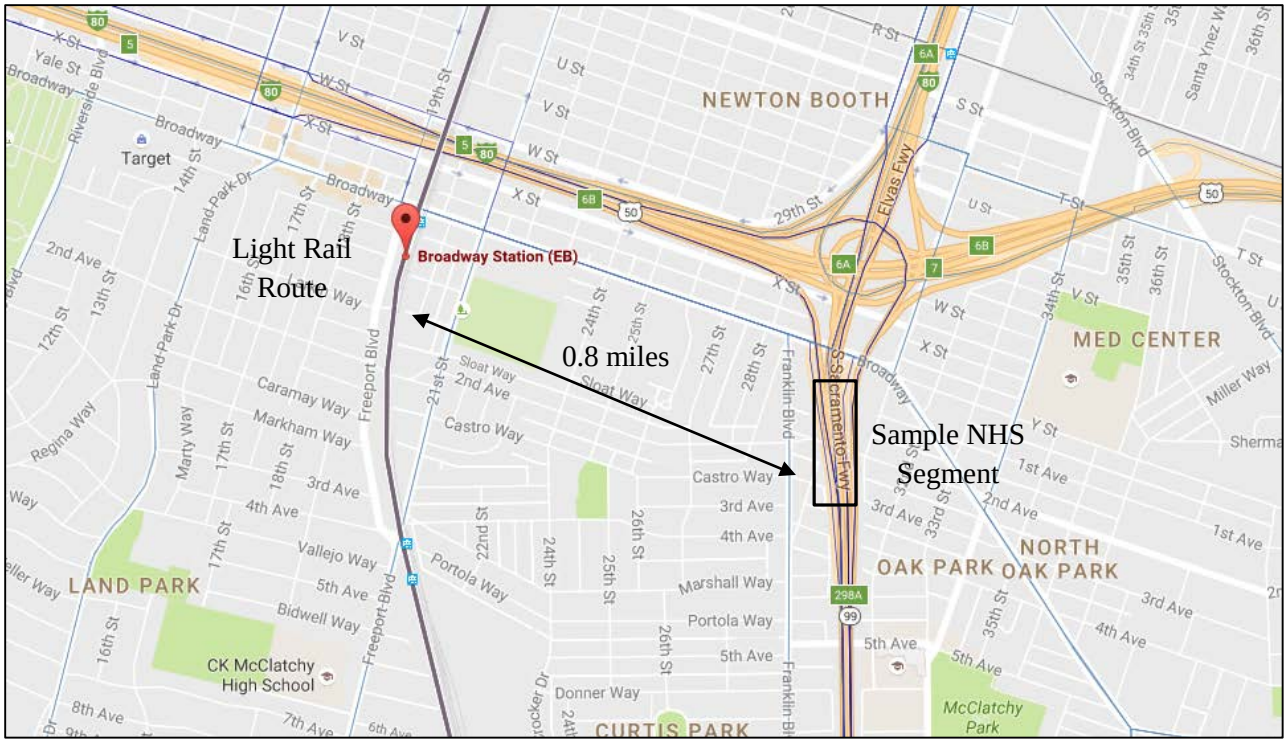

Figure 2. Excessive Delay for Sample Segment

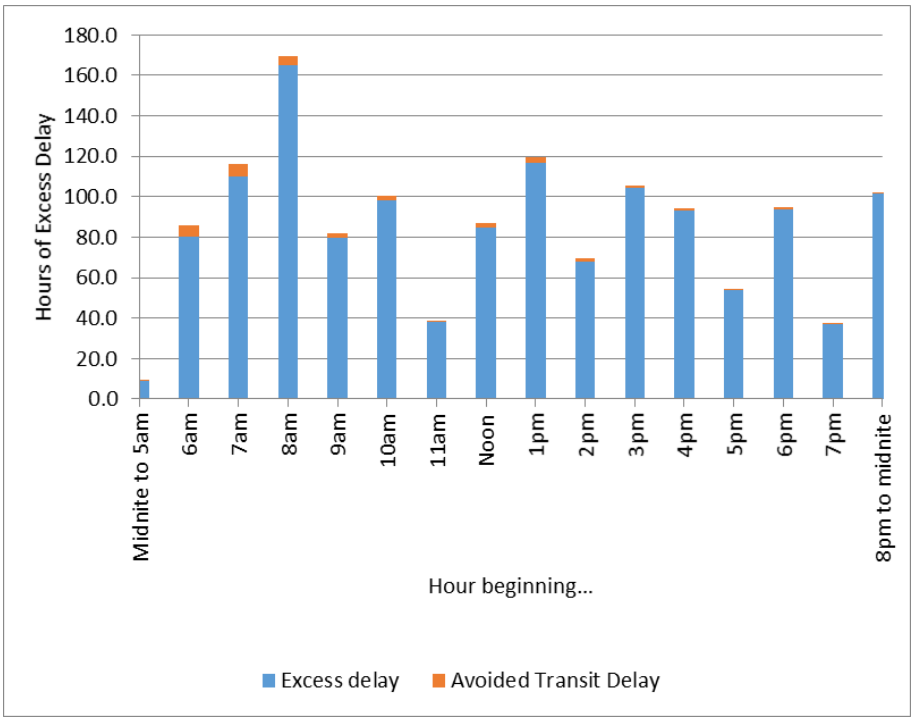

Table 1. Delay, Volume, and Transit Volume Statistics for Sample Excessive Delay Segment (see Figure)

	Hour Beginning																
Indicator	Midnight to 5am	6am	7am	8am	9am	10am	11am	Noon	1pm	2pm	3pm	4pm	5pm	6pm	7pm	8pm to midnite	Weekday Total
Traffic Count (000's) /1/	8.8	6.8	8.3	7.7	6.5	6.2	6.1	6.3	6.4	6.7	6.8	6.5	6.0	5.4	4.3	10.8	109.8
Excessive Delay per Vehicle (minutes) /2/	0.2	0.7	0.8	1.3	0.7	0.9	0.4	0.8	1.1	0.6	0.9	0.9	0.5	1.0	0.5	0.0	11.4
Total Excessive Delay (hrs) /3/	9.2	80.4	109.8	164.9	79.8	98.0	37.9	85.0	116.8	68.2	104.5	93.4	53.6	93.7	37.1	101.5	1,333.8
Wkdy. Northbound Comm. Bus Volume (passengers) /4/	82	164	164	0	0	0	0	0	0	0	0	0	0	0	0	0	409.2
% of Bus Passenger Volume on Freeway /5/	100%	100%	100%														
Wkdy. Northbound LRT Volume (passengers) /6/	149	581	607	417	307	307	307	307	307	307	129	129	129	129	129	129	4,370.3
% of LRT Passenger Volume "Creditable" to Freeway /7/	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	
Weighted Transit Passenger Volume /8/	156	454	467	208	154	154	154	154	154	154	64	64	64	64	64	64	2,594.4
Transit Avoided Excessive Delay /9/	0.40	5.35	6.15	4.47	1.88	2.43	0.95	2.07	2.80	1.56	0.99	0.92	0.58	1.11	0.56	0.01	32.2
Transit Avoided Excessive Delay as % of Vehicle Delay	4%	7%	6%	3%	2%	2%	2%	2%	2%	2%	1%	1%	1%	1%	2%	0%	2%

Notes:

/1/ 2012 weekday average, based on data downloaded from Caltrans PEMS website, and reduced to weekday hourly average by SACOG.

/2/ Based on February 2016 National Performance Management Research Data Set. Excessive delay defined as actual travel time difference from 35mph travel time, if actual travel time is greater than 35mph travel time.

/3/ Simplified calculation, based on hourly volumes and observed travel speeds (not 5 minute time breaks), and for one weekday only (not annual).

/4/ Commuter bus volumes based on weekday average boardings, assumed even directional split, and passenger volumes by hour directly related to the number of schedules per route by hour.

/5/ Since commuter buses use the “excessive delay generating” roadway segment, 100% of passenger volumes are included in the calculation (see memo for details).

/6/ LRT passenger loads calculated by SACOG based on time period ons and offs by station data for 2015 provided by Sacramento Regional Transit.

/7/ Sample calculation assumes a 50 percent conversion factor. LRT runs parallel to the excessive delay roadway segment, and 0.8 miles west of segment.

/8/ Weighted transit passenger volume is the passenger volume multiplied by the % “creditable” to the excessive delay roadway segment.

/9/ Weighted transit passenger volumes times Excessive Delay per Vehicle, and factored to hours.

Endnotes

[1] Result based on author's calculation from Texas A&M University, "Excel Spreadsheet – 101 Urban Areas," available at http://tti.tamu.edu/documents/ums/congestion-data/complete-data.xlsx (last accessed July 2016)
[2] The Texas A&M report calculates delay as the difference between free-slow travel speeds and observed travel speeds. Free-flow travel speeds are a suboptimal baseline for calculating the economic cost of congestion. For starters, this baseline implies that the goal of transportation policy should be to reduce delay to zero. In fact, heavy roadway demand corresponds to beneficial economic and social activity. Reaching zero delay would involve a massive and cost-ineffective overbuild of the roadway network. With that said, even reducing the Texas A&M estimate to reflect a more congested baseline still reveals a massive economic loss due to congestion. Moreover, regardless of the baseline speed, the change over time reveals a disturbing trend.
[3] Texas A&M University, "2015 Urban Mobility Scorecard," (August 2015), available at http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-scorecard-2015.pdf
[4] Bureau of the Census, "Table 1. Projections of the Population and Components of Change for the United States: 2015 to 2060," available at http://www.census.gov/population/projections/files/summary/NP2012-T1.xls (last accessed July 2016).
[5] Result based on author's calculation from U.S. Department of Transportation "Table 1-11: Number of U.S. Aircraft, Vehicles, Vessels, and Other Conveyances," available at http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_11.html
[6] Result based on author's calculation from Environmental Protection Agency, "Overview of Greenhouse Gases," available https://www3.epa.gov/climatechange/ghgemissions/gases/co2.html (last accessed July 2016).
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[9] Transportation Research Board, "Transit Capacity and Quality of Service Manual" available at http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_6-b.pdf.
[10] Hofstra University, "The Geography of Transport Systems: Highway Speed, Flow, and Density," available at http://people.hofstra.edu/geotrans/eng/methods/highwaysfd.html (last accessed July 2016).
[11] American Public Transportation Association, "2015 Public Transportation Fact Book," available at http://www.apta.com/resources/statistics/Documents/FactBook/2015-APTA-Fact-Book.pdf
[12] Los Angeles Metropolitan Transportation Authority, "Revised Wilshire BRT Final EIR/EA" (2011), available at https://www.metro.net/projects/wilshire/revised-wilshire-brt-final-eirea/.
[13] Ibid.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] Cornell University Legal Information Institute, "23 U.S. Code § 149 - Congestion mitigation and air quality improvement program," available at https://www.law.cornell.edu/uscode/text/23/149 (last accessed July 2016).
[18] American Public Transportation Association, "The Nation is a Multimodal Network," available at https://blog.publictransportation.org/2014/12/24/the-nation-is-a-multimodal-network/ (last accessed July 2016).
[19] U.S. Department of Transportation, "Congestion Mitigation and Air Quality (CMAQ) Program Interim Guidance," available at https://www.fhwa.dot.gov/map21/guidance/guidecmaq.cfm (last accessed July 2016).
[20] Environmental Protection Agency, "Title II – Emissions Standards for Moving Sources," available at https://www.epa.gov/clean-air-act-overview/title-ii-emission-standards-moving-sources (last accessed July 2016).
[21] Cornell University Legal Information Institute, "23 U.S. Code § 134 - Metropolitan transportation planning," available at https://www.law.cornell.edu/uscode/text/23/134 (last accessed July 2016).
[22] Ibid.

[23] Federal Highway Administration, "Traffic Volume Trends: May 2016," available at https://www.fhwa.dot.gov/policyinformation/travel_monitoring/16maytvt/16maytvt.pdf (last accessed July 2016).
[24] Environmental Protection Agency, "Greenhouse Gas Emissions from a Typical Passenger Vehicle," (May 2014), available at https://www.epa.gov/sites/production/files/2016-02/documents/420f14040a.pdf

Attachment E

Draft Benefit-Cost Analysis Approach

Staff proposes to engage a working group on establishing criteria for selecting projects projects that would be analyzed through the development of the 2020 MTP/SCS. Initial ideas for project selection criteria:

1. Committed projects and programs would not subject to project evaluation (benefit-cost or performance targets assessment). Proposed criteria for committed projects would be recommended for Board action.

2. Projects, or packages of logically connected projects in a single corridor segment, with total costs greater than $50 million (2016$) would be candidates for benefit-cost analysis. For benefit-cost analysis, it is necessary that projects' impacts could be captured in the regional travel demand model. Examples include:

    - New/enhanced transit services
    - Freeway-to-freeway interchanges
    - Freeway widenings, including HOV lanes & auxiliary lanes
    - State highway widenings and major arterial connectors/reliever route improvements
    - Local freeway interchanges in locations with wide spacing between interchanges

    A few projects that cost less than $50 million may also be selected if they have regional impacts. In some cases, multiple project phases submitted as individual projects, but part of a larger project may be grouped together for project evaluation.

3. Some large projects have extremely localized impacts or are only partially represented in the travel demand model used for the benefit-cost analysis. Examples include:

    - Arterial operations or intersection improvements
    - Freeway-to freeway interchanges that do not include significant lane widening
    - New local freeway interchanges in areas with close spacing of other interchanges
    - Transit center improvements
    - Core transit capacity improvements, which do not result in more frequent service, though they may impact carrying capacity (e.g. replacing standard buses with articulated buses on a route, without increasing frequency of the route).
    - Grade separations