

Appendix 2.2.1

Performance Objectives Memo

MEMORANDUM

Date: June 15, 2015
To: Saravana Suthanthira, Alameda CTC
From: Francisco Martin and Matthew Ridgway, Fehr & Peers
Subject: **Alameda Countywide Multimodal Arterial Plan – Final Performance Measure Objectives**

OK14-0023

The Alameda Countywide Multimodal Arterial Plan's performance measures are derived from the Plan's vision and goals. The performance measures will be utilized to evaluate existing and future year multimodal transportation conditions across the County for the Plan's Study Network¹, which is a broader countywide street network that represents all arterial and collector streets throughout the County using Caltrans' California Road System (CRS) classification. Performance measures were approved by the Alameda CTC Commission on February 26, 2015.

The performance objectives, or thresholds for the performance measures, were developed as a subsequent step after performance measures were approved. The performance objectives will be applied to existing and future year conditions to identify Study Network needs and provide guidance in identifying short-term (year 2020) and long-term (year 2040) improvements to adequately address those needs. Performance measures in combination with the performance objectives will ensure that the proposed short-term and long-term improvements meet the Plan's vision and goals. This memo summarizes the Multimodal Arterial Plan's performance measure planning framework and presents the final performance objectives. The draft performance objectives were presented to ACTAC at the April 9, 2015 meeting and at each of the Planning

¹ The Study Network consists of the arterials and collectors that are part of the California Road System classification that was sent to all Alameda County jurisdictions for review and to support data collection in December 2014.



Area meetings that took place during the week of April 20, 2015. The performance objectives presented in this memo are considered final and will go for ACTAC and Commission approval in September 2015.

A brief summary of the role and utility of various Plan development components is provided in **Table 1**, additional information for each of the components is also provided in the proceeding section.

**TABLE 1
 ROLE AND UTILITY OF MULTIMODAL ARTERIAL PLAN COMPONENTS**

Plan Development Components	Utility	Approval Status
Vision and Goals	The vision lays out the strategic direction for the Plan; goals describe the desired outcome of the Plan.	Approved by Commission on February 26, 2015
Performance Measures	<p>Performance measures assess the existing and future year transportation conditions of the Study Network against the identified goals. These performance measures include three types of measures: Performance Measures; Performance Indicators; and Network Connectivity Checks.</p> <ul style="list-style-type: none"> • <i>Performance Measures</i> – Measures that directly assess the built environment and planning level operations at the facility-specific scale, and thus provide the direct assessment of a roadway facility on Study Network multimodal gaps and needs. • <i>Performance Indicators</i> –These are area-wide performance measures and are generally applied after preferred short- and long-term improvements are identified for the Arterial Network to evaluate and to ensure that the preferred improvements achieve the Plan’s vision and goals. • <i>Network Connectivity Checks</i> - Network connectivity checks are performed as a mapping exercise that evaluates the transit infrastructure, pedestrian comfort, bicycle comfort and truck route accommodation measures for consistency across the respective modal networks. 	Approved by Commission on February 26, 2015
Performance Objectives	These are thresholds identified for the performance measures that directly assess the built environment and planning level operations at the facility-specific scale. Performance objectives are applied to the performance measure assessment of existing and future year transportation conditions to determine Study Network gaps, deficiencies and needs. Performance objectives vary depending on the modal priority along a Study Network segment.	Pending Commission Approval – May/June 2015



TABLE 1
ROLE AND UTILITY OF MULTIMODAL ARTERIAL PLAN COMPONENTS

Plan Development Components	Utility	Approval Status
Typologies	Typologies classify the Study Network roads based on their transportation and access functions, and land use characteristics of the roads. They help identify the modal priorities along each Study Network segment. In addition, typologies inform the Arterial Network ¹ selection criteria.	Pending Commission Approval – June 2015

1. The Arterial Network is the subset of the Study Network representing *arterials of countywide significance*.

PERFORMANCE MEASURES AND PLANNING FRAMEWORK

The Multimodal Arterial Plan planning framework and how performance measures in combination with performance objectives will be used to identify short and long-term improvements is described below.

TASKS COMPLETED OR IN PROGRESS

1. Performance Measures are derived from the Plan’s goals, which are in turn derived from the Plan’s vision. The Plan’s vision, goals and performance measures were approved by the Commission on February 26, 2015.
2. In late 2014, the project team identified the “Study Network;” this network includes available parallel facilities of other modes (e.g. bike and truck routes). The Study Network will support data collection, assessment of existing and future conditions, and typology development.
3. In February of 2015, the ACTAC and the Commission reviewed the draft criteria to identify Arterials of Countywide Significance (Arterial Network). No changes were requested; therefore, using this set of criteria, the Arterial Network will be developed in July and presented to the ACTAC in August and to the Commission in October for approval. The Arterial Network will be used to develop the list of preferred improvements.
4. Draft roadway typologies² were developed for the Study Network. Typologies are descriptive of a roadway’s transportation function, land use context, and modal emphasis.

² The roadway typology framework is described in a separate memo titled “Alameda CTC Countywide MMAP: Draft Arterial Street Typology Framework Concepts,” and will also be presented to ACTAC and at the Planning Area meetings in April.



Modal priority for transit and trucks will be coordinated with the Countywide Transit and Goods Movement Plans that are currently underway. Modal priorities were vetted during the Planning Area meetings in April 2015 and will be brought for ACTAC and Commission approval in September 2015.

5. Modal priorities will inform the performance objectives by segment/corridor as different modal priorities can potentially result in different performance objectives. Performance objectives are described in the following section of this memo.

UPCOMING TASKS

6. The performance objectives will be applied to the performance measure assessment of existing and future year transportation conditions to determine network gaps, deficiencies and needs.
7. Recommended multi-modal transportation improvements will be identified to adequately address short (2020) and long-term (2040) Study Network multimodal needs. Network connectivity checks will be conducted for each mode at this stage to ensure that identified recommended improvements provide an adequate and supportive network for all modes; connectivity checks will be performed as a mapping exercise that evaluates the transit infrastructure, pedestrian comfort, bicycle comfort and truck route accommodation measures for consistency across the respective modal networks. For Study Network segments with multiple modal priorities, preference for recommended improvements will be given to the top identified modal priority; additional improvements will be identified for other lower priority modes wherever possible.
8. The Consultant team will meet with each Alameda County jurisdiction and transit operators individually to review the recommended set of multi-modal transportation improvements; each jurisdiction will have the opportunity to review and refine the set of recommended improvements, which will lead to identifying the preferred set of improvements for the Arterials Network. Since the Arterial Network is the subset of the Study Network, the recommended improvements identified for the Arterial Network will be considered as the preferred set of improvements for the Arterial Network.
9. After preferred improvements are identified, the project team will utilize the following area-wide performance indicators to ensure that the list of identified preferred improvements achieves these various elements of the Plan's vision and goals and the results of these indicators will revise the list of preferred improvements as necessary:
 - a. Equity: The benefit to Communities of Concern performance indicator ensures that recommended improvements are equitable throughout the County.



- b. Property value index: The property value index ensures that recommended improvements support a strong economy.
 - c. Demand for active transportation: The demand for active transportation performance indicator will identify the potential mode shift to active transportation modes.
 - d. VMT per capita and GHG per capita performance indicators: The VMT and GHG per capita indicators will help ensure that recommended improvements have a positive impact on emissions throughout the County.
10. Prioritization criteria³ will be developed in coordination with stakeholders to prioritize the list of preferred short and long-term improvements to be included in the Final Multimodal Arterial Plan.
11. The project team will develop a set of ITS, climate action, and TDM strategies that are complimentary to the list of preferred short and long-term improvements.

As described above, performance measures and objectives play a critical role in developing the Plan and identifying the preferred set of short and long-term improvements.

APPROVED PERFORMANCE MEASURES

Performance measures will be applied to assess existing and/or future year transportation conditions. These measures also include area-wide performance indicators (non-auto mode share, benefit to Communities of Concern, demand for active transportation, VMT and GHG per capita). These indicators by themselves do not evaluate existing or future conditions to identify gaps or deficiencies, but provide an evaluation of the network or facility for a comparative assessment of the proposed improvements against the Plan's vision and goals. Therefore, these area-wide indicators will be generally applied after preferred short- and long-term improvements are identified for the Arterial Network to evaluate and to ensure that the preferred improvements achieve the Plan's vision and goals. Similarly, facility-specific performance indicators such as operating cost effectiveness, implementation challenge score and property value index will be applied after short- and long-term improvements are identified.

³ Short and long-term improvement prioritization criteria will be developed and presented to stakeholders later in the Plan development process. All stakeholders will have an opportunity to review and provide feedback on the prioritization criteria before the criteria are finalized.



PROPOSED PERFORMANCE OBJECTIVES

As previously mentioned, modal priorities will inform the performance objectives as different modal priorities can potentially result in different objectives to determine if an arterial study segment is performing adequately to suit the multimodal needs. A particular objective identified for a performance measure related to a mode is the minimum threshold that needs to be met for that measure if that particular mode has the priority on that arterial segment. For example, the Bicycle Comfort Index identifies four different ratings, ranging from Level of Traffic Stress 1 (LTS1) to LTS4 (LTS1 representing "Very Good" comfort level for cyclists). If a Study Network segment is identified as having a bicycle modal priority, the performance measure objective would be to achieve an LTS1 (Very Good) or LTS2 (Good) rating. If the segment is not identified as having a bicycle modal priority, a Bicycle Comfort Index performance objective does not apply and therefore it's assumed that any rating - LTS1, LTS2, LTS3 or LTS4 - is adequate for that specific segment.

Table 2 presents the proposed performance objectives for performance measures that are facility-specific and apply to existing conditions. Performance measures for no objectives were developed are included in the next section of this memo. In order to have a comparable rating system, the scores were translated into an equivalent qualitative rating scale (e.g., very good, good, poor, etc.) for several performance measures. Performance objectives are identified for measures that directly assess the built environment and planning level operations at the facility-specific scale, and thus provide the direct assessment of a roadway facility on Study Network multimodal gaps and needs. The following are those measures, and are related to the "Multimodal" goal.

- 1.1A – Congested Speed
- 1.1B – Reliability
- 1.2A – Transit Travel Speed
- 1.2B – Transit Reliability
- 1.2C – Transit Infrastructure Index
- 1.3 – Pedestrian Comfort Index
- 1.4 – Bicycle Comfort Index
- 1.5 – Truck Route Accommodation Index

All stakeholders had an opportunity to review and refine the draft performance objectives during the April 9, 2015 ACTAC meeting and during the second set of Planning Area meetings held the week of April 20, 2015. The following performance objectives were adjusted based on comments received on the draft objectives:



- 1.1A – Congested Speed objective was adjusted to not apply to transit priority corridors since a transit speed (measure 1.2A) objective is also applied to transit priority corridors.
- 1.2A Transit Travel Speed objective was increased to be greater than 75% of the auto congested speed (measure 1.1A) based on requested changes from AC Transit.
- 1.2B Transit Reliability objective was increased to be greater than a 0.7 PM peak hour-to-non-peak hour transit speed ratio based on requested changes from AC Transit.

This memo presents the final performance objectives to be brought to the ACTAC and Commission for approval in September 2015. The basis for establishing each of the objectives is described below.



**TABLE 2
 MULTIMODAL ARTERIAL PLAN PERFORMANCE OBJECTIVES**

Performance Measure	Application	Modal Objectives ¹				
		Autos	Transit	Pedestrian	Bicycle	Trucks
1.1A – Congested Speed	Facility-Specific Measure, Existing and Future Conditions	Greater than 40% of Posted Speed Limit	*	*	*	Greater than 40% of Posted Speed Limit
1.1B – Reliability	Facility-Specific Measure, Existing and Future Conditions	Reliable	*	*	*	Reliable
1.2A – Transit Travel Speed	Facility-Specific Measure, Existing and Future Conditions	*	Greater than 75% of the Auto Congested Speed (Measure 1.1A)	*	*	*
1.2B – Transit Reliability	Facility-Specific Measure, Existing and Future Conditions	*	Greater than 0.7 (PM peak hour-to-non-peak hour transit speed ratio)	*	*	*
1.2C – Transit Infrastructure Index	Facility-Specific Measure, Existing and Future Conditions	*	Medium or High	*	*	*
1.3 – Pedestrian Comfort Index	Facility-Specific Measure, Existing and Future Conditions	**	Medium, High or Excellent	High or Excellent	*	*
1.4 – Bicycle Comfort Index	Facility-Specific Measure, Existing and Future Conditions	**	*	*	High or Excellent	*



TABLE 2
MULTIMODAL ARTERIAL PLAN PERFORMANCE OBJECTIVES

Performance Measure	Application	Modal Objectives ¹				
		Autos	Transit	Pedestrian	Bicycle	Trucks
1.5 – Truck Route Accommodation Index	Facility-Specific Measure, Existing and Future Conditions	*	*	*	*	High

Notes:

1. The asterisk (*) indicates that a performance objective is not applicable for that specific modal priority. Although a performance objective does not apply, it does not imply that the needs assessment will neglect recommended improvements that can better measure performance results and thus enhance the built environment for modes without applicable performance objectives.
2. The double asterisk (**) indicates that that a performance objective is not applicable for that specific modal priority. In addition, sidewalk width reduction or bicycle facility removal will not be considered along auto priority Study Network segments even to meet the set thresholds.

Source: Fehr & Peers, 2015.



EXCEPTIONS FOR IDENTIFYING PERFORMANCE OBJECTIVES

In addition to the facility-specific performance measures, there are a number of performance indicators that will be used later in the project to assure that project vision and goals are met. ***Performance indicators by themselves do not evaluate existing or future conditions to identify a gap or deficiency, but provide a measurement of the network or facility for a comparative assessment of the proposed improvements against the existing conditions.*** Therefore, identifying objectives for indicators are not applicable and therefore not proposed. Similarly, performance objectives are not identified for the network connectivity measures, coordinated technology or collision rates. Network connectivity measure will be conducted as a mapping exercise that evaluates the transit infrastructure, pedestrian comfort, bicycle comfort and truck route accommodation measures for consistency across the respective modal networks. The coordinated technology measure provides an inventory of available and proposed ITS infrastructure along the Study Network, coordinated technology results will be used to inform ITS improvements and strategies recommended as part of the Plan. Collision rates provide a facility-specific assessment of exiting conditions and the results will potentially be used to prioritize short and long-term improvements later in the Plan development process. The following are the indicators and measures for which identifying objectives is not applicable:

- 1.6 – Enhanced Mobility
- 1.7 – Pavement Condition Index
- 2.1 – Benefit to Communities of Concern
- 3.1 – Transit Connectivity
- 3.2 – Pedestrian Connectivity
- 3.3 – Bicycle Connectivity
- 3.4 – Network Connectivity
- 4.1 – Operating Cost Effectiveness
- 4.2 – Implementation Challenge Score
- 4.3 - Coordinated Technology
- 4.4 – Property Value Index
- 5.1 – Collision Rates
- 5.2 – Demand for Active Transportation



BASIS FOR PERFORMANCE OBJECTIVES

Jurisdictions within Alameda County generally do not have adopted performance objectives for the approved performance measures listed in **Table 2**. As a result, the consultant team based performance objectives on previous planning projects that utilized similar measures; if reference projects were not applicable the consultant team applied relevant research to identify appropriate objectives. The basis for each performance objective is described below.

1.1A – Automobile Congested Speed

Automobile congested travel speed will be estimated for Existing and Future Year PM Peak hour conditions. The *2014 Level of Service Monitoring Report* (Alameda CTC, November 2014) applies the HCM 2000 arterial LOS methodology to assess CMP-arterial segment LOS during the PM peak hour. The methodology's LOS thresholds are shown in **Table 3**. According to the methodology, an average speed that is generally greater than 40% of the typical free flow speed corresponds to LOS D or better conditions. Based on this assessment, the automobile congested speed performance objective is proposed to be greater than 40% of the posted speed limit. This objective applies to auto and truck priority corridors only.

1.1B – Automobile Reliability

The automobile reliability measure is based on the PM peak hour volume-to-capacity (V/C) assessment, which corresponds to the following measure ratings:

- Reliable (V/C between 0 – 0.8)
- Less Reliable (V/C between 0.8 – 1.0)
- Unreliable (V/C greater than 1.0)

The 1994 HCM provides V/C LOS methodology for arterials; later versions of the HCM provide arterial segment LOS methodologies based on travel speed and not V/C ratio. Based on Table 7-1 in the 1994 HCM, a V/C ratio of 0.79 or lower corresponds to LOS D or better conditions along an arterial with four or more travel lanes. Based on this assessment, the automobile reliability performance objective is proposed to be lower than a V/C ratio of 0.8, which generally corresponds to LOS D, which is identified to be of rating "Reliable". This objective applies to auto and truck priority corridors only.



**TABLE 3
 ARTERIAL LOS, HCM 2000**

Arterial Class	I	II	III	IV
Range of Free Flow Speed (mph)	55 to 45	45 to 35	35 to 30	35 to 25
Typical Free Flow Speed (mph)	50	40	35	30
Level of Service	Average Travel Speed (mph)			
A	>42	>35	>30	>25
B	>34-42	>28-35	>24-30	>19-25
C	>27-34	>22-28	>18-24	>13-19
D	>21-27	>17-22	>14-18	>9-13
E	>16-21	>13-17	>10-14	>7-9
F	≤16	≤13	≤10	≤7

Source: Exhibit 15-2, HCM 2000.

1.2A Transit Travel Speed

Transit travel speed will be estimated for Existing and Future Year PM Peak hour conditions utilizing data provided by transit agencies. The *Transit Capacity and Quality of Service Manual* (TCQSM, TRB, 3rd Edition, 2013) was reviewed for applicable performance objectives related to transit speed. No applicable performance objective was identified in the TCQSM. Instead, AC Transit provided their recommended objective based on the average transit speed data along the major corridors. According to AC Transit, a performance objective that transit travel speed is at least 75% of the auto congested speed (measure 1.1A) was assumed to be adequate. This objective applies to transit priority corridors only.

1.2B Transit Reliability

The transit reliability metric is estimated by comparing PM peak hour transit travel speed to non-peak hour speed based on data provided by transit agencies. The *Transit Capacity and Quality of Service Manual* (TCQSM, TRB, 3rd Edition) was reviewed for applicable performance objectives related to transit reliability, which for this plan is defined as the PM peak hour-to-non-peak hour



transit speed ratio. No applicable performance objective was identified in the TCQSM. Instead, AC Transit provided their recommended objective based on the average transit reliability data along the major corridors. AC Transit suggested a performance objective that transit reliability should be greater than a PM peak hour-to-non-peak hour transit speed ratio of 0.7. This objective applies to transit priority corridors only.

1.2C Transit Infrastructure Index

The transit infrastructure index score is based on the following factors: bus stop amenities, bus stop location, and bus stop design. The measure applies a 10-point scoring system that corresponds to the following rating:

- 0 – 5 points = Low
- 6 – 7 points = Medium
- 8 – 10 points = High

The proposed transit infrastructure index objective is based on previous planning projects that utilized a similar measure. For example, Fehr & Peers is currently part of the team developing the *Ashland-Cherryland Business District Specific Plan* in unincorporated Alameda County. Fehr & Peers applied a similar multi-modal performance measure for the specific plan development in which the objective was to achieve a rating of "Medium" or "High" (at least 6 out of 10 on the scoring system) along the E. 14th Street/Mission Boulevard transit corridor. The same performance objective is proposed for the Multimodal Arterial Plan development for the transit priority corridors.

1.3 Pedestrian Comfort Index

The pedestrian comfort index score is based on factors such as sidewalk width, presence of buffer between sidewalk and roadway, roadway classification, percent heavy vehicle traffic and land use context. The measure applies a 24-point scoring system that corresponds to the following rating:

- 0 – 7 points = Low
- 8 – 14 points = Medium
- 15 – 20 points = High
- 21 – 24 points = Excellent



The proposed pedestrian comfort index objective is based on previous planning projects that utilized a similar measure. As previously mentioned, Fehr & Peers is currently part of the consultant team developing the *Ashland-Cherryland Business District Specific Plan* in unincorporated Alameda County. Fehr & Peers applied a similar multi-modal performance measure for the specific plan development in which the objective was to achieve a rating of "High" or "Excellent" (at least 15 out of 24 on the scoring system) along roadways within the plan area. The same performance objective is proposed for the Multimodal Arterial Plan development and applied to pedestrian priority segments only. A performance objective of Medium, High or Excellent (at least 8 out of 24 on the scoring system) rating is also proposed for transit priority corridors to achieve a minimum pedestrian design standard for transit patrons that walk to and from bus stops.

1.4 Bicycle Comfort Index

The bicycle comfort index is based on the Level of Traffic Stress (LTS) methodology (Mineta Transportation Institute, May 2012) that examines the characteristics of streets and how various aspects can cause stress on bicyclists and affect where they are likely to ride. LTS methodology classifies roadway segments into one of four levels of traffic stress, which are termed as LTS1 through LTS4. Groups of cyclists are categorized by how much stress they will tolerate in different environments:

- LTS1: most children can tolerate and feel safe while bicycling.
- LTS2: the mainstream adult population will tolerate and feel safe while bicycling.
- LTS3: cyclists who are considered "enthused and confident" but still prefer having their own dedicated space for riding will tolerate and feel safe while bicycling.
- LTS4: a level tolerated only by those characterized as "strong and fearless", which comprises just 0.5 percent of the population. The high-stress streets that LTS4 groups will ride are those with high speed limits, multiple travel lanes, limited or non-existent bike lanes and signage, and large distances to cross at intersections.

For simplicity, the LTS results correspond to the following rating:

- LTS1 = Excellent
- LTS2 = High
- LTS3 = Medium
- LTS4 = Low



The proposed bicycle comfort index objective is based on previous planning projects that utilized a similar measure. As previously mentioned, Fehr & Peers is currently part of the consultant team developing the *Ashland-Cherryland Business District Specific Plan* in unincorporated Alameda County. Fehr & Peers applied a similar multi-modal performance measure for the specific plan development in which the objective was to achieve a rating of "High" or "Excellent" along roadways within the plan area. The "High" or "Excellent" rating corresponds to an LTS2 or LTS1 score, respectively. A "High" (LTS2) rating implies that the mainstream adult population can tolerate the design of the facility and feel safe while bicycling, a "Excellent" (LTS1) rating implies that most children can tolerate the design of the facility and feel safe while bicycling. The same performance objective is proposed for the Multimodal Arterial Plan development and applied to bicycle priority segments only.

1.5 Truck Route Accommodation Index

The truck route accommodation index score is based on curb lane width; additional consideration for on-street parking will be made only in urban contexts where many businesses are expected to load from the street. The measure applies a four-point scoring system that corresponds to the following rating scores:

- 0-1 point = Low
- 2 points = Medium
- 3 - 4 points = High

One point is assigned if curb lane width is 10 feet or less, two points are assigned if the curb lane width is 11 feet, three points are assigned if the curb lane width is 12 feet or greater. One point is assigned for roadways in urban areas that provide on-street parking; a negative point is assigned if on-street parking is not provided. For purposes of the truck route accommodation index analysis, it is assumed that all jurisdictions within the North and Central County Planning Areas are urban and all jurisdictions within the South and East County Planning Areas are suburban. On-street parking is not considered in the suburban areas since many business typically provide off-street loading facilities for trucks; urban areas generally have limited off-street loading facilities and therefore many trucks are forced to access business by utilizing on-street parking if available. Performance measures similar to the truck route accommodation index have not been applied in other similar planning studies throughout the County; therefore relevant performance objectives are not available.



According to *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011), the recommended travel lane width ranges between 10 and 12 feet (not including curb, shoulder or on-street parking) for arterials in urban environments. The narrower the lane width, the higher the probability that trucks will off-track into adjacent lane or shoulder. Based on this logic, *a curb lane width of 12 feet or greater is preferred for the majority of truck routes, which corresponds to a "High" rating applying the truck route accommodation index.* This objective applies to truck priority corridors only.

NEXT STEPS

The consultant team and Alameda CTC staff will present the performance objectives for final approval at the September 2015 ACTAC, PPLC and Commission meetings.