FEHR PEERS

MEMORANDUM

Date: June 17, 2019

To: Brian Lasagna, BCAG

From: Mike Wallace, Jimmy Fong & Albee Wei, Fehr & Peers

Subject: VMT and GHG Emissions Reduction Strategies Assessment Memo

RS18-3710

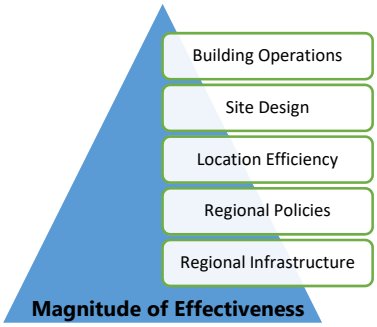
This memorandum contains an assessment of strategies related to reducing Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions, including transportation demand management (TDM), transportation system management (TSM), intelligent transportation system (ITS), pricing, and alternative fuel vehicle fleet. The purpose of this work was to compile a list of strategies that are applicable in Butte County and evaluate their effectiveness. This information can be used to determine potentially feasible VMT mitigation measures for individual land use projects, or provide information for regional and local policy implementation.

Transportation Demand Management

TDM refers to various strategies that change travel behavior in order to increase transport system efficiency and achieve specific planning objectives. This section identifies TDM strategies, including strategies identified in the CAPCOA 2010 report *Quantifying Greenhouse Gas Mitigation Measures* and a compilation of new research that has been published in research papers and agency reports since the release of the CAPCOA document, that are suited to Butte County given the rural and suburban land use context.

An important consideration for the mitigation effectiveness is the scale for TDM strategy implementation. The biggest effects of TDM strategies on VMT (and resultant emissions) derive from regional policies related to land use location efficiency and infrastructure investments that support transit, walking, and bicycling. While there are many measures that can influence VMT and emissions that relate to site design and building operations, they have smaller effects that are often dependent on final building tenants. **Figure 1** presents a conceptual illustration of the relative importance of scale.

Figure 1: Transportation-Related GHG Reduction Measure Effectiveness



Of the 50 transportation measures presented in the CAPCOA 2010 report *Quantifying Greenhouse Gas Mitigation Measures*, 41 are applicable at building and site level. The remaining nine are functions of, or depend on, site location and/or actions by local and regional agencies or funders. **Table 1** summarizes the strategies according to the scope of implementation and the agents who would implement them.

TABLE 1: SUMMARY OF TRANSPORTATION-RELATED CAPCOA MEASURES

Scope	**Agents**	**CAPCOA Strategies (see full CAPCOA list below)**
Building Operations	Employer, Manager	**26 total** from five CAPCOA strategy groups: • **3** from 3.2 Site Enhancements group • **3** from 3.3 Parking Pricing Availability group • **15** from 3.4 Commute Trip Reduction group • **2** from 3.5 Transit Access group • **3** from 3.7 Vehicle Operations group
Site Design	Owner, Architect	**15 total** from three strategy groups: • **6** from 3.1 Land Use group • **6** from 3.2 Site Enhancements group • **1** from 3.3 Parking group • **2** from 3.6 Road Access group
Location Efficiency	Developer, Local Agency	**3 shared** with Regional and Local Policies
Alignment with Regional and Local Policies	Regional and local agencies	**3 shared** with Location Efficiency
Regional Infrastructure and Services	Regional and local agencies	**6 total**

Of the 50 transportation measures presented in the CAPCOA 2010 report, only a few are likely to be effective in a setting such as Butte County. To help winnow the list, we reviewed how land use context could influence each strategy's effectiveness and identified the following below as the most applicable. A complete assessment for the identified strategies is contained in **Table 2** (appended at the end of this memorandum) including updated research information through 2018. Please note that disruptive trends, including but not limited to, transportation network companies (TNCs, such as Uber and Lyft), autonomous vehicles (AVs), internet shopping, and micro-transit may affect the future effectiveness of these strategies.

1. Increase density of land uses – This strategy focuses on placing land uses in closer proximity to minimize the distance of trips and to make walking and bicycling more viable.

2. Increase diversity of land uses – This strategy focuses on inclusion of mixed uses within projects or in consideration of the surrounding area to minimize vehicle travel in terms of both the number of vehicle trips and the length of those trips.

3. Increase accessibility to transit – This strategy facilitates transit use by providing frequent transit service, expanded service area, and support infrastructure such as safe pedestrian and bicycle access near transit stops.

4. Orient projects toward non-auto corridor – This strategy focuses on placing developments near existing transit, bicycle, or pedestrian corridor to encourage transit and active mode use. Note that this strategy is most effective when applied in combination with strategies that encourage shift to non-auto modes, including neighborhood design, density and diversity of development, transit accessibility, and pedestrian and bicycle network improvements.

5. Provide pedestrian network improvements – This strategy focuses on creating a pedestrian network within the project and connecting to nearby destinations. Implementation on local or regional level could occur through an impact fee program or benefit/assessment district based on local or regional plans such as active transportation plans.

6. Provide traffic calming measures and low-stress bicycle network improvements – This strategy combines the CAPCOA research focused on traffic calming with new research on providing a low-stress bicycle network. Traffic calming creates networks with low vehicle speeds and volumes that are more conducive to walking and bicycling. Building a low-stress bicycle network produces a similar outcome. Implementation options are similar to strategy 2 above. One potential change in this strategy over time is that electric/electric-assist bikes and scooters (i.e. e-bikes and e-scooters) could extend the effective range of travel on the bicycle network, which could enhance the effectiveness of this strategy.

7. Provide a regional bike trail system – This strategy focuses on dedicating land for a bike trail network that links jurisdictions in Butte County to facilitate long distance travel by bicycles and e-bikes. Note that this strategy should be applied in combination with other strategies that

improve bicycle access and connectivity at local- or project-scale. Implementation could occur through an impact fee program or benefit assessment district based on local or regional plans such as active transportation plans. Sources of impact fee may include new development fees, business improvement district fees, or parking revenue. Benefit assessment district is based on the concept of assessing only those properties that directly benefit from the bike trail system. However, defining the boundaries of the benefit district may be difficult since the bikeways will have citywide or regional benefit.

8. Increase transit service frequency and speed – This strategy focuses on improving transit service convenience and travel time competitiveness with driving. Transit speeds could be improved through higher priority treatment for transit vehicles on the roadway network through dedicated lanes (during peak periods) and intersection treatments (i.e., queue jumps). This strategy may be applied to local and regional commute routes to reduce passenger vehicle travel. In a rural land use context, new forms of demand-responsive service could be provided as subsidized trips by contracting to private TNCs or Taxi companies. Alternatively, a public transit operator could provide the subsidized service but would need to improve on traditional cost effectiveness by relying on TNC ride-hailing technology, using smaller vehicles sized to demand, and flexible driver employment terms where drivers are paid by trip versus by hour. Note that implementation of this strategy would require regional or local agency implementation, substantial changes to current transit practices, and would not likely be applicable for individual development projects.

9. Implement car-sharing program – This strategy reduces the need to own a vehicle or reduces the number of vehicles owned by a household by making it convenient to access a shared vehicle for those trips where vehicle use is essential. Note that implementation of this strategy would require regional or local agency implementation and coordination and would not likely be applicable for individual development projects.

10. Provide ride-sharing programs – This strategy focuses on encouraging carpooling and vanpooling by project site/building tenants and has similar limitations as strategy 8 above.

11. Encourage telecommuting and alternative work schedules – This strategy relies on effective internet access and speeds to individual project sites/buildings to provide the opportunity for telecommuting. The effectiveness of the strategy depends on the ultimate building tenants and this should be a factor in considering the potential VMT reduction.

12. Provide park-and-ride lots – This strategy facilitates shift to transit and carpooling by installing park-and-ride facilities near transit stops. Note that this strategy is most effective when applied in combination of strategies that improve transit frequency or facilitate ride-sharing.

13. Unbundle parking costs from property cost – This strategy focuses on reducing vehicle ownership through the pricing signal of parking costs. Vehicle owners or drivers are required to purchase parking spaces at an additional cost from the property cost, while those who do not utilize a

parking space enjoy increased property affordability. This strategy may be applied for residential or office uses. For this strategy to be effective, the cost of parking should be passed through to the vehicle owners or drivers.

14. Implement market price public parking – This strategy focuses encouraging a shift to non-auto modes through the pricing signal of parking costs. Market rate parking fees can be implemented for on-street parking in central business districts, employment centers, or retail centers. For this strategy to be effective, residential area parking permits should be implemented in nearby areas to prevent spillover parking.

15. Require residential area parking permits – This strategy facilitates other parking pricing strategies in reducing VMT and vehicle ownership by requiring the purchase of residential parking permits for on-street parking in residential areas. This strategy applies to residential areas adjacent to commercial areas, transit stations, or other locations where parking may be limited and/or priced.

16. Implement work place parking fee – This strategy facilitates shift to non-auto modes for commute trips through the price signal (i.e. parking fees). Strategies include explicitly charging for parking, implementing above market rate pricing, or parking cash-out for those who do not drive to work. Effectiveness of this strategy depends on availability of alternative modes. Parking revenue may be used to improve non-auto mode infrastructure such as bike paths, sidewalks, trails, and intersection crossings.

17. Implement commute trip reduction marketing – This strategy focuses on marketing and information sharing that complement strategies related to commute trip reduction to increase their effectiveness.

18. Implement bike-sharing program – This strategy focuses on providing bicycles that can replace short-distance passenger vehicle trips and facilitate first-mile/last-mile connections for transit trips. Note that this strategy is most effective when applied in combination of strategies that improve bicycle and transit access. Implementation of this strategy would require regional or local agency implementation and coordination and would not likely be applicable for individual development projects.

19. Provide bike parking near transit – This strategy facilitates shift to transit and bicycling by installing short-term and long-term bicycle parking near transit stops.

Pricing

Pricing strategies, including road pricing, parking pricing, distance-based fees, fuel tax increase and commuter financial benefits, provide market signals that can increase transport system efficiency and achieve specific planning objectives. In addition to parking pricing strategies identified in the CAPCOA 2010 report, state and local agencies may consider the following pricing strategies that relate directly to VMT and GHG emissions:

1. Gas tax – Federal and state gas tax implemented as a form of user fee that measures driving through fuel consumption. Similar to parking and VMT-based fees, fuel price acts as a price signal that encourages the shift away from auto travel. Overtime, however, the effect of gas tax has diminished due to rising fuel economy and increased marked share of alternative-fuel vehicles.

2. California Road Charge Pilot Program – This program explores the possibility of replacing the gas tax with a VMT-based road user fee. The 9-month pilot program was concluded in 2016, although no determination has been made regarding the long-term implementation of the program. Similar to gas tax, the VMT-based fee acts as a price signal that encourages the shift away from auto travel. Compared to gas tax, the VMT-based fee offers a more stable source of revenue and greater flexibility (e.g. variable fee by time of day, type of road, or type of vehicle).

Transportation System Management and Intelligent Transportation System

TSM and ITS refers to a set of techniques used to increase the capacity of transportation infrastructure (usually roadways) without increasing its physical size. These techniques include minor changes to road geometry, traffic signal improvements and coordination, ramp metering, vehicle navigation, variable speed limit, and real-time travel information (e.g. travel time, road condition, ride share match). Strategies within the TSM and ITS toolbox can be applied for freeway corridors, local roadway network, or at specific locations to relieve congestion and reduce vehicle emissions. However, a caveat to TSM and ITS is that with improved traffic flow, vehicles that were previously deterred by the congestion may now choose to travel on the route where improvements occurred, resulting in increased vehicle travel and a new wave of congestion.

Alternative Fuel Vehicle Fleet

The Butte Plug-In Electric Vehicle (PEV) Readiness Plan, adopted in 2018, was developed to ensure local agencies in Butte County are prepared to provide infrastructural support for PEVs. The plan envisions that an increase of PEVs in the county's overall vehicle fleet would lead to reduction in vehicle tailpipe GHG emissions and help achieve GHG reduction goals in the BCAG region.

Next Steps

Once we have completed the base model calibration and first round of validation, we will prepare a follow-up memorandum identifying how the model will address each strategy and the type of test we will perform within the model to evaluate sensitivity. The expected method of implementation within the travel model is included in Table 2. If the model cannot be calibrated to be sensitive to a TDM measure, we will propose off-model adjustments.