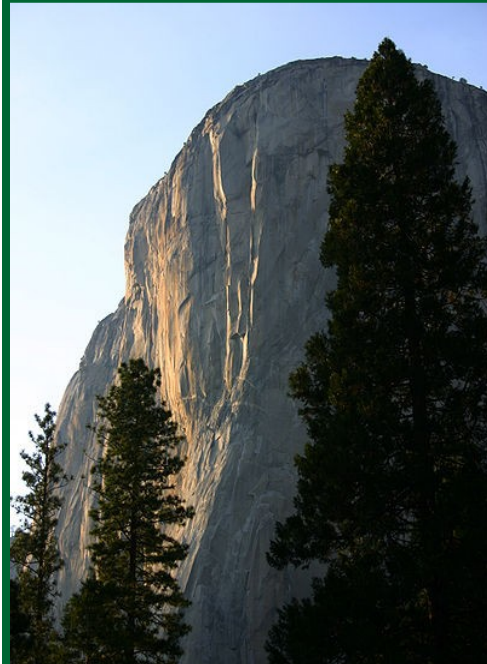




Quantifying Greenhouse Gas Mitigation Measures

A Resource for Local Government
to Assess Emission Reductions from
Greenhouse Gas Mitigation Measures

August, 2010



Quantifying Greenhouse Gas Mitigation Measures

**A Resource for Local Government to Assess
Emission Reductions from Greenhouse Gas
Mitigation Measures**

August, 2010

California Air Pollution Control Officers
Association

with

Northeast States for
Coordinated Air Use Management

National Association of
Clean Air Agencies

Environ

Fehr & Peers

Section	Category	Page #	Measure #
3.0	Transportation	155	
3.1	Land Use/Location	155	
3.1.1	Increase Density	155	LUT-1
3.1.2	Increase Location Efficiency	159	LUT-2
3.1.3	Increase Diversity of Urban and Suburban Developments (Mixed Use)	162	LUT-3
3.1.4	Increase Destination Accessibility	167	LUT-4
3.1.5	Increase Transit Accessibility	171	LUT-5
3.1.6	Integrate Affordable and Below Market Rate Housing	176	LUT-6
3.1.7	Orient Project Toward Non-Auto Corridor	179	LUT-7
3.1.8	Locate Project near Bike Path/Bike Lane	181	LUT-8
3.1.9	Improve Design of Development	182	LUT-9
3.2	Neighborhood/Site Enhancements	186	
3.2.1	Provide Pedestrian Network Improvements	186	SDT-1
3.2.2	Provide Traffic Calming Measures	190	SDT-2
3.2.3	Implement a Neighborhood Electric Vehicle (NEV) Network	194	SDT-3
3.2.4	Create Urban Non-Motorized Zones	198	SDT-4
3.2.5	Incorporate Bike Lane Street Design (on-site)	200	SDT-5
3.2.6	Provide Bike Parking in Non-Residential Projects	202	SDT-6
3.2.7	Provide Bike Parking with Multi-Unit Residential Projects	204	SDT-7
3.2.8	Provide Electric Vehicle Parking	205	SDT-8
3.2.9	Dedicate Land for Bike Trails	206	SDT-9
3.3	Parking Policy/Pricing	207	
3.3.1	Limit Parking Supply	207	PDT-1
3.3.2	Unbundle Parking Costs from Property Cost	210	PDT-2
3.3.3	Implement Market Price Public Parking (On-Street)	213	PDT-3
3.3.4	Require Residential Area Parking Permits	217	PDT-4
3.4	Commute Trip Reduction Programs	218	
3.4.1	Implement Commute Trip Reduction Program - Voluntary	218	TRT-1
3.4.2	Implement Commute Trip Reduction Program – Required Implementation/Monitoring	223	TRT-2
3.4.3	Provide Ride-Sharing Programs	227	TRT-3
3.4.4	Implement Subsidized or Discounted Transit Program	230	TRT-4
3.4.5	Provide End of Trip Facilities	234	TRT-5
3.4.6	Encourage Telecommuting and Alternative Work Schedules	236	TRT-6
3.4.7	Implement Commute Trip Reduction Marketing	240	TRT-7
3.4.8	Implement Preferential Parking Permit Program	244	TRT-8
3.4.9	Implement Car-Sharing Program	245	TRT-9
3.4.10	Implement a School Pool Program	250	TRT-10
3.4.11	Provide Employer-Sponsored Vanpool/Shuttle	253	TRT-11
3.4.12	Implement Bike-Sharing Programs	256	TRT-12
3.4.13	Implement School Bus Program	258	TRT-13
3.4.14	Price Workplace Parking	261	TRT-14
3.4.15	Implement Employee Parking “Cash-Out”	266	TRT-15

Section	Category	Page #	Measure #
3.5	Transit System Improvements	270	
3.5.1	Provide a Bus Rapid Transit System	270	TST-1
3.5.2	Implement Transit Access Improvements	275	TST-2
3.5.3	Expand Transit Network	276	TST-3
3.5.4	Increase Transit Service Frequency/Speed	280	TST-4
3.5.5	Provide Bike Parking Near Transit	285	TST-5
3.5.6	Provide Local Shuttles	286	TST-6
3.6	Road Pricing/Management	287	
3.6.1	Implement Area or Cordon Pricing	287	RPT-1
3.6.2	Improve Traffic Flow	291	RPT-2
3.6.3	Required Project Contributions to Transportation Infrastructure Improvement Projects	297	RPT-3
3.6.4	Install Park-and-Ride Lots	298	RPT-4
3.7	Vehicles	300	
3.7.1	Electrify Loading Docks and/or Require Idling-Reduction Systems	300	VT-1
3.7.2	Utilize Alternative Fueled Vehicles	304	VT-2
3.7.3	Utilize Electric or Hybrid Vehicles	309	VT-3

Transportation

MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

3.3 Parking Policy/Pricing

3.3.1 Limit Parking Supply

Range of Effectiveness: 5 – 12.5% vehicle miles travelled (VMT) reduction and therefore 5 – 12.5% reduction in GHG emissions.

Measure Description:

The project will change parking requirements and types of supply within the project site to encourage “smart growth” development and alternative transportation choices by project residents and employees. This will be accomplished in a multi-faceted strategy:

- Elimination (or reduction) of minimum parking requirements⁵²
- Creation of maximum parking requirements
- Provision of shared parking

Measure Applicability:

- Urban and suburban context
- Negligible in a rural context
- Appropriate for residential, retail, office, industrial and mixed-use projects
- Reduction can be counted only if spillover parking is controlled (via residential permits and on-street market rate parking) [See PPT-5 and PPT-7]

Baseline Method:

See introduction to transportation section for a discussion of how to estimate trip rates and VMT. The CO₂ emissions are calculated from VMT as follows:

$$\text{CO}_2 = \text{VMT} \times \text{EF}_{\text{running}}$$

Where:

VMT = vehicle miles traveled

EF_{running} = emission factor for running emissions

Inputs:

The following information needs to be provided by the Project Applicant:

- ITE parking generation rate for project site
- Actual parking provision rate for project site

⁵² This may require changes to local ordinances and regulations.

Transportation

MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

Mitigation Method:

$$\% \text{ VMT Reduction} = \frac{\text{Actual parking provision} - \text{ITE parking generation rate}}{\text{ITE parking generation rate}} \times 0.5$$

Assumptions:

Data based upon the following references:

- [1] Nelson\Nygaard, 2005. Crediting Low-Traffic Developments (p. 16)
<http://www.montgomeryplanning.org/transportation/documents/TripGenerationAnalysisUsingURBEMIS.pdf>

All trips affected are assumed average trip lengths to convert from percentage vehicle trip reduction to VMT reduction (% vehicle trips = %VMT).

Emission Reduction Ranges and Variables:

Pollutant	Category Emissions Reductions ⁵³
CO ₂ e	5 – 12.5% of running
PM	5 – 12.5% of running
CO	5 – 12.5% of running
NO _x	5 – 12.5% of running
SO ₂	5 – 12.5% of running
ROG	3 – 7.5% of total

Discussion:

The literature suggests that a 50% reduction in conventional parking provision rates (per ITE rates) should serve as a typical ceiling for the reduction calculation. The upper range of VMT reduction will vary based on the size of the development (total number of spaces provided). ITE rates are used as baseline conditions to measure the effectiveness of this strategy.

Though not specifically documented in the literature, the degree of effectiveness of this measure will vary based on the level of urbanization of the project and surrounding areas, level of existing transit service, level of existing pedestrian and bicycle networks and other factors which would complement the shift away from single-occupant vehicle travel.

⁵³ The percentage reduction reflects emission reductions from running emissions. The actual value will be less than this when starting and evaporative emissions are factored into the analysis.

Transportation

MP# LU-1.7 & LU-2.1.1.4

PDT-1

Parking Policy / Pricing

Example:

If the ITE parking generation rate for the project is 100 spaces, for a low range a 5% reduction in spaces is assumed. For a high range a 25% reduction in spaces is assumed.

- Low range % VMT Reduction = $[(100 - 95)/100] * 0.5 = 2.5\%$
- High range % VMT Reduction = $[(100 - 75)/100] * 0.5 = 12.5\%$

Preferred Literature:

To develop this model, Nelson\Nygaard [1] used the Institute of Transportation Engineers' *Parking Generation* handbook as the baseline figure for parking supply. This is assumed to be unconstrained demand. Trip reduction should only be credited if measures are implemented to control for spillover parking in and around the project, such as residential parking permits, metered parking, or time-limited parking.

Alternative Literature:

- 100% increase in transit ridership
- 100% increase in transit mode share

According to *TCRP Report 95, Chapter 18* [2], the central business district of Portland, Oregon implemented a maximum parking ratio of 1 space per 1,000 square feet of new buildings and implemented surface lot restrictions which limited conditions where buildings could be razed for parking. A "before and after" study was not conducted specifically for the maximum parking requirements and data comes from various surveys and published reports. Based on rough estimates the approximate parking ratio of 3.4 per 1,000 square feet in 1973 (for entire downtown) had been reduce to 1.5 by 1990. Transit mode share increased from 20% to 40%. The increases in transit ridership and mode share are not solely from maximum parking requirements. Other companion strategies, such as market parking pricing and high fuel costs, were in place.

Alternative Literature Sources:

[1] TCRP Report 95, Chapter 18: Parking Management and Supply: Traveler Response to *Transportation System Changes*. (p. 18-6)

http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_95c18.pdf

Other Literature Reviewed:

None