

**DRAFT
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Transportation Control Source Measures

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**BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT**

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TCM A-1 – Local and Area-wide Bus Service Improvements

Brief Summary:

TCM A-1 will improve transit by sustaining and improving existing service, including new Express Bus or Bus Rapid Transit on major travel corridors, funding the replacement of older and dirtier buses, and implementing the Transit Priority Measures (TPMs) component of the Transportation Climate Action Campaign.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by sustaining and improving bus service throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

In its Transportation 2035 Plan, MTC estimates that transit operating and capital replacement costs for Bay Area transit providers are projected to total \$138 billion over the next 25 years. This includes \$98 billion in operating costs plus \$40 billion for capital replacement. Revenues available to address these needs total \$113 billion, leaving a shortfall of \$25 billion (\$8 billion for operations and \$17 billion for capital replacement). Bus and other bus capital needs total approximately \$13 billion; the Transportation 2035 Plan includes \$5 billion in committed funds and \$2 billion in discretionary funds towards these needs, leaving a remaining shortfall of \$6 billion.

In light of the transit operating and capital replacement shortfalls, the Transportation 2035 Plan also sets forth MTC's commitment to proceed with the Transit Sustainability Project. This Project aims to improve transit's core performance and financial stability as well as identify service productivity improvements that will yield more from the region's investment in transit services. Further, it may help transit operators, each of whom are responsible for their own transit operating and capital budgets, to prioritize and make more cost-effective use of limited transit funds.

Adopted as part of the 2001 Regional Transportation Plan, MTC's Resolution 3434 Regional Transit Expansion Program is an \$18 billion, long-term, and multifaceted funding strategy for directing local, regional, state and federal dollars to nearly two dozen high-priority bus, rail and ferry expansions. The bus service expansion projects included in Resolution 3434 are as follows:

- AC Transit Berkeley/Oakland/San Leandro Bus Rapid Transit
- AC Transit Enhanced Bus: Hesperian/Foothill/MacArthur corridors

- Regional Express Bus (multiple transit operators)
- SFCTA/SFMTA Van Ness Avenue Bus Rapid Transit
- VTA Downtown to East Valley Bus Rapid Transit

In 2004, voters passed Regional Measure 2 (RM 2), raising the toll on the seven State-owned toll bridges by \$1.00. This extra dollar funds various transportation projects within the region, including express buses that reduce congestion or make improvements to travel on the toll bridges, as identified in SB 916 (Chapter 715, Statutes of 2004).

Adding more service and development of new service concepts (such as enhanced bus, Bus Rapid Transit (BRT), and Regional Express Buses) to better serve existing markets and fill in regional transit gaps are determined by the individual transit operators as revenue permits. Decisions on expanding bus service must address both the needs of commuters as well as low-income, elderly, disabled and youth travelers who do not have access to other travel options. During weekday peak hours in 2006, bus transit provided over 1.3 million seat miles per hour in the Bay Area¹.

Diesel bus emissions can be reduced by acquiring new heavy-duty clean air vehicles or installing retrofit devices on existing heavy-duty diesel bus engines. MTC has provided \$14 million in Congestion Mitigation Air Quality Improvement (CMAQ) funds to retrofit 1,700 diesel buses operated by 12 transit operators; the Air District contributed the required CMAQ match (11.5%) for this project. In addition, since 2003 the Air District's Lower Emission School Bus Program has replaced 84 school buses at a cost of approximately \$11.2 million and retrofitted 204 buses with diesel particulate filters at a cost of \$1.3 million. The Air District has also spent \$7 million on retrofitting diesel transit buses and purchasing alternative fuel transit buses since 2003. The Air District's Advanced Technology Program provides funding to promote new vehicle technologies, such as hybrid heavy-duty trucks and buses.

MTC's Transportation 2035 Plan launched a new program, the Transportation Climate Action Campaign, to reduce the region's carbon footprint. The \$400 million campaign includes new funding for Transit Priority Measures. Transit Priority Measures (TPMs) are operational improvements or road-related infrastructure that preserves and improves bus speed and on-time reliability, and reduces variability in travel times and delay of buses. Case studies indicate significant ridership gains can be realized when TPMs are packaged with improvements in headways and other operations improvements (fewer bus stops, unique branding, all-door boarding and pre-paid fares) typically associated with BRT (Koonce, et al 2006). Note that as of December 2009, MTC approved \$80

¹ Seat miles are a measure of transit capacity and are calculated by multiplying the number of transit vehicle miles travelled by the number of seats in each vehicle. For more information, see Table C-3 in the T2035 Travel Forecast Data Summary (Dec. 2008) available on the MTC website.

million in the first programming cycle of the new federal transportation act for four primary climate initiatives: 1) Public Education/Outreach; 2) Safe Routes to Schools, 3) Innovative Grants; and 4) Climate Action Program Evaluation. Funding for TPMs has yet to be identified.

Implementation Actions:

Phase 1 (2012):

MTC to fund:

- The timely replacement of worn-out buses in local transit operator fleets (\$900 million)
- Operations of existing services where feasible with available funding (\$4 billion)
- Regional Measure 2 Express Bus North and Express Bus South Improvements (\$62 million)
- Transit Priority Measures component of the Transportation Climate Action Campaign (includes arterial bus lanes, transit signal priority, queue jumper lanes, and bus bulbs) (\$TBD)

BAAQMD to fund:

- Lower Emission School Bus Program (LESBP) to replace and retrofit school buses. (\$45 million)
- The Advanced Technology Program to fund hybrid buses and demonstration projects (\$1.5 million)

Phase 2 (2020):

MTC to fund:

- Sustain service of Express Buses as identified in Phase 1 and operations of existing services where feasible with available funding (\$72 million)
- The timely replacement of worn out buses in local transit operator fleets as funding becomes available (\$2.4 billion)
- Bus Rapid Transit Service on the Telegraph Avenue/International Boulevard/E. 14th Street Corridor (\$250 million)
- Bus Rapid Transit Service on the Grand-MacArthur Corridor (\$41 million)
- Enhanced Rapid Bus Service in Livermore, Dublin, and Pleasanton (includes higher frequencies, new stops and improved stop amenities) (\$14 million)
- Bus Rapid Transit project on Van Ness Avenue (includes dedicated transit lanes, signal priority and pedestrian and urban design upgrades) (\$88 million)
- Bus Rapid Transit as Phase 1 in the Santa Clara-Alum Rock Corridor with the potential to convert to light-rail in the future (Santa Clara-Alum Rock Phase 1) (\$132 million)
- Transit Priority Measures component of the Transportation Climate Action Campaign (includes arterial bus lanes, transit signal priority, queue jumper lanes, and bus bulbs) (\$TBD)

BAAQMD to continue to fund Phase 1 programs:

- Lower Emission School Bus Program (LESBP) to replace and retrofit school buses. (\$120 million)
- The Advanced Technology Program to fund hybrid buses and demonstration projects (\$4 million)

Supporting Actions by Partner Entities:

- Transit agencies and CMAs to work with MTC as appropriate to implement service improvements.
- School Districts, transit agencies and CMAs to work with BAAQMD to implement diesel emission reduction programs.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.03	0.04
NO _x	0.03	0.04
PM _{2.5}	0.001	0.001
PM ₁₀	0.005	0.01
CO ₂	22.53	71.37
CO ₂ -e	23.36	72.80

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: NH₃ (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

Implementing Express/BRT Service: This analysis uses Transportation 2035 Travel Forecasts data to estimate future ridership due to the expansion of Regional Express Buses, and it uses existing ridership projections for BRT developed by AC Transit, SFCTA, and VTA. Growth factors, based on increases in each transit operator’s ridership modeled as a part of the T2035 travel forecasts, are applied to bring the ridership estimates to analysis years 2012 and 2020. Using local data, estimated new ridership is reduced to factor in new riders that are transit dependent and those who drive to access the bus, resulting in the number of vehicle trips reduced. Additional adjustments are made to calculate vehicle miles travelled reduced based on average transit trip lengths and the average distance travelled to the bus stop by non-motorized modes.

Transit Priority Measures: While funding has not yet been identified for TPMs, this emissions analysis assumes a very limited implementation of TPMs in four corridors, specifying an assumed cost of \$5 million for two corridors in Phase 1. This analysis uses empirical findings that suggest a 4-7% increase in corridor ridership is reasonable to expect after implementation of TPMs. The average ridership among major bus corridors in the Bay Area is increased by 8-14% in 2012 (assuming TPMs will be implemented on two corridors) and 16-28% in 2020 (assuming TPMs will be implemented on an additional two corridors). Using local data, estimated new ridership is reduced to factor

in new riders that are transit dependent and those who drive to access the bus, resulting in the number of vehicle trips reduced. Additional adjustments are made to calculate vehicle miles travelled reduced based on average transit trip lengths and the average distance travelled to the bus stop by non-motorized modes.

Advanced Technology Program: Assumes an average project life of 7 years for each project. Emission reductions estimates are based on emission reductions achieved in previous funding years.

Analysis excludes: maintaining bus fleet and operating existing services, Express Bus North and South capital improvements, enhanced rapid bus in Livermore, Dublin, and Pleasanton, and Lower Emissions School Bus Program.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

Adding diesel retrofit devices to diesel engines may result in a decrease in fuel efficiency. This will thereby cause a modest increase in emissions of carbon dioxide, a greenhouse gas that contributes to climate change. For example, CARB and the EPA estimate that an urban bus with a retrofit device added to reduce emissions of PM and/or NO_x would experience a decrease in fuel efficiency of 3.5 percent on average. For an urban bus traveling 20,000 miles per year, this decrease is estimated to result in an additional 4,026 pounds per year of carbon dioxide.

Cost:

Phase 1: \$5.0 billion

Phase 2: \$3.1 billion

Co-benefits:

- Improved connectivity between transit services and destinations.
- Travel time savings from TPMs and new express/enhanced bus projects that provide faster and/or more direct service between trip origins and destinations.
- Transportation cost savings by providing new bus transit options that may allow some households to own fewer or no cars.
- Community enhancements through creation of more and higher quality transit options and services.
- Provide incentives to jump-start the heavy-duty hybrid bus market and create demonstration projects that increase knowledge about the technological feasibility of hybrid buses.

Monitoring Mechanisms:

- Track capital rehabilitation and replacement using the Regional Transit Capital Inventory (RTCI).
- Track number of diesel buses retrofitted or replaced and emissions benefits associated with these upgrades.
- Track implementation status of express bus or BRT projects.
- Track on-time performance on routes with TPMs.
- Track performance of in-service hybrid buses.

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. Due to the current economic recession, cuts in State transit funding, including funds for cleaner buses, reductions in sales tax revenue for transit, Bay Area transit operators are facing challenges to maintain and sustain their existing systems and, in light of financial constraints, are cutting their transit budgets, cutting service, increasing fares, and/or delaying or deferring capital maintenance and service expansions. Thus, maintaining the existing fleet, sustaining existing services, restoring service that has been cut, and expanding service will require new funding. New revenues may be available in the future from higher gas taxes, bridge tolls, and voter approved sales tax revenues in individual counties.

Sources:

1. MTC's Transportation 2035 Plan and Travel Forecasts Data Summary:
http://www.mtc.ca.gov/planning/2035_plan/
2. AC Transit's Strategic Vision: A World Class Transit System for the East Bay 2001-2010,
http://www.actransit.org/pdf/planning_focus/planning_focus_121.pdf?PHPSESSID=9
3. SFCTA's Van Ness Avenue Bus Rapid Transit (BRT) Feasibility Study,
<http://www.sfcta.org/content/view/425/252/>
4. VTA's Draft Environmental Impact Report (DEIR) for the Santa Clara-Alum Rock Transit Improvement Project (2008),
http://www.vta.org/projects/dtev/eir_draft.html
5. Koonce, Peter, Paul Ryus, David Zagel, Young Park, and Jamie Parks (2006). "An Evaluation of Comprehensive Transit Improvements – TriMet's Streamline Program." Journal of Public Transportation, 2006 BRT Special Edition, pp. 103-115,
<http://www.nctr.usf.edu/jpt/pdf/JPT%209-3S%20Koonce.pdf>

TCM A-2 - Local and Regional Rail Service Improvements

Brief Summary:

TCM A-2 will improve rail service by sustaining and expanding existing services and by providing funds to maintain rail-cars, stations, and other rail capital assets. Specific projects for implementation include BART extensions, Caltrain electrification, Transbay Transit Center Building and rail foundation, Capital Corridor intercity rail service, and Sonoma Marin Area Rail Transit (SMART) District commuter rail project.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by sustaining and improving rail service throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips. In addition, it would affect inter-regional travel.

Regulatory Context and Background:

In its Transportation 2035 Plan, MTC estimates that transit operating and capital replacement costs for Bay Area transit providers are projected to total \$138 billion over the next 25 years. This includes \$98 billion in operating costs plus \$40 billion for capital replacement. Revenues available to address these needs total \$113 billion, leaving a remaining shortfall of \$25 billion (\$8 billion for operations and \$17 billion for capital replacement). Rail-car and other rail capital needs total approximately \$26 billion; the Transportation 2035 Plan includes \$11 billion in committed funds and \$4 billion in discretionary funds towards these needs, leaving a remaining shortfall of \$11 billion.

The Bay Area's rail system includes light-rail (such as Muni Metro and VTA Metro), rapid rail (such as BART), and commuter rail (such as Caltrain, Capitol Corridor and ACE) services. During weekday peak hours in 2006, rail transit provided over 2 million seat miles per hour in the Bay Area².

Adopted as part of the 2001 Regional Transportation Plan, MTC's Resolution 3434 Regional Transit Expansion Program is an \$18 billion, long-term, and multifaceted funding strategy for directing local, regional, state and federal dollars to nearly two dozen high-priority bus, rail and ferry expansions. The rail service expansion projects included in Resolution 3434 are as follows:

² Seat miles are a measure of transit capacity and are calculated by multiplying the number of transit vehicle miles travelled by the number of seats in each vehicle. For more information, see Table C-3 in the T2035 Travel Forecast Data Summary (Dec. 2008) available on the MTC website.

- BART/Oakland Airport Connector
- Tri-Valley Transit Access Improvements to BART
- East Contra Costa BART Extension (eBART)
- BART: Fremont to Warm Springs and Warm Springs to San Jose/Santa Clara
- Caltrain Express: Baby Bullet (Open for service)
- Caltrain Express: Phase 2
- Caltrain Electrification
- Transbay Transit Center (Phases 1 and 2)
- Capitol Corridor Expansion and Enhancements
- MUNI Third Street Light-Rail Central Subway
- ACE Service Expansion
- Sonoma-Marin Rail (SMART)
- Dumbarton Rail
- Downtown to East Valley Light Rail

MTC, in partnership with California High-Speed Rail Authority (CHSRA), Caltrain, and BART, adopted the Regional Rail Plan in September 2007, which included an evaluation of a Bay Area to Central Valley high-speed rail alignment. CHSRA certified the Bay Area to Central Valley Program EIR/EIS in July 2008. The CHSRA is currently proceeding with detailed project-level EIR/EIS for the high-speed train from San Jose to San Francisco. In addition, the CHSRA is currently working with Bay Area and Central Valley transportation agencies (via the Altamont Corridor Partnership Working Group) to implement a joint use regional rail and high-speed rail infrastructure project in the Altamont Corridor.

In November 2008, California voters passed Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act, which includes nearly \$10 billion in general obligation rail bond proceeds to help finance construction of a high-speed rail link between San Francisco and San Diego. The Bay Area is slated to receive \$408 million for improvements to ACE, BART, Caltrain, SFMTA, and VTA light-rail. In addition, the Bay Area is well-positioned to receive a significant portion of the \$8 billion appropriation for high-speed rail included in the American Recovery and Reinvestment Act of 2009 (ARRA).

Seven of the 9 counties have adopted local sales tax measures that fund transportation improvements including rail expansion projects. Most recently, in November 2008, Santa Clara County voters approved the 1/8-cent Measure B to fund operations and maintenance of the BART to San Jose/Santa Clara extension and Sonoma and Marin county voters approved the 1/4-cent Measure Q to fully fund construction and operation of the Sonoma Marin Area Rail Transit (SMART) commuter rail.

Implementation Actions:

Phase 1 (2012)

MTC to fund:

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- The timely replacement of worn out rail-cars and other rail capital assets in local transit operator fleets as funding becomes available (\$1.8 billion)
- Operations of existing rail services where feasible with available funding (\$2 billion)

Phase 2 (2020)

MTC to fund:

- The timely replacement of worn out rail-cars and other rail capital assets in local transit operator fleets as funding becomes available (\$4.9 billion)
- Existing rail services where feasible with available funding (\$5.3 billion)
- A BART Oakland Airport Connector between Coliseum BART station and Oakland International Airport (\$459 million)
- Transit access improvements to BART in the Tri-Valley (\$168 million)
- Extension of BART/East Contra Costa Rail (eBART) eastward from the Pittsburg/Bay Point BART station into eastern Contra Costa County (\$525 million)
- Extension of BART from Fremont to Warm Springs (\$890 million)
- Electrification of Caltrain from Tamien to San Francisco (\$626 million)
- Transbay Terminal Phase 1: construct the new Transbay Transit Center Building and rail foundation (\$1.2 billion)
- Capitol Corridor intercity rail service (includes increased track capacity, rolling stock and frequency improvements (\$108 million)
- Sonoma Marin Area Rail Transit District (SMART) commuter rail project (\$1.1 billion)
- Acquisition of right-of-way for ACE rail service between Stockton and Niles Junction, complete track improvements between San Joaquin County and Alameda County, and expand Alameda County station platforms (\$150 million)
- Extension of BART from Fremont (Warm Springs) to San Jose/Santa Clara (\$7.6 billion)
- Electrification of Caltrain line from Tamien Station to Gilroy (\$140 million)
- Extension of Caltrain Express service (Phase 2): design and implement safety elements related to signal communication and positive train control; and implement system-wide level boarding program and terminal improvements (\$427 million)
- Transbay Terminal Phase 2: extend Caltrain to the new Transbay Terminal (\$3 billion)
- Capitol Corridor: Phase 2 enhancements (includes grade separations at High Street, Davis Street and Hesperian Street) (\$89 million)
- Extension of Third Street Light-Rail line from north of King Street to Clay Street in Chinatown via a new Central Subway (\$1.6 billion)
- Conversion of Bus Rapid Transit (BRT) to light-rail transit in the Santa Clara-Alum Rock corridor (Santa Clara-Alum Rock Phase 2) (\$327 million)
- Commuter rail service on the Dumbarton Bridge (\$301 million)
- High-Speed Rail: fund supporting infrastructure for ACE, BART, Caltrain, MUNI and VTA (\$408 million)

Supporting Actions by Partner Entities: Transit, CMAs, airports and other agencies to work with MTC as appropriate to implement service improvements.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG		0.15
NO _x		0.15
PM _{2.5}		0.03
PM ₁₀		0.04
Ammonia (NH ₃)		0.12
CO ₂		506.29
CO ₂ -e		516.00

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

This analysis uses existing ridership projections for rail developed by transit operators for each project. Growth factors, based on increases in each transit operator's ridership modeled as a part of the Transportation 2035 travel forecasts, are applied to bring the ridership estimates to analysis year 2020 (analysis does not assume completion of any rail projects by 2012). Using local data, estimated new ridership is reduced to factor in new riders that are transit dependent and those who drive to access rail, resulting in the number of vehicle trips reduced. Additional adjustments are made to calculate vehicle miles travelled reduced based on average transit trip lengths and the average distance travelled to the rail station by non-motorized modes.

This analysis excludes estimates of emissions reduced from maintaining existing rail services and transit access improvements to transit access improvements to BART in the Tri-Valley, Caltrain electrification, extension of Caltrain to the Transbay Terminal, and supporting infrastructure for high-speed rail.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$3.8 billion

Phase 2: \$30.1 billion

Co-benefits:

Improved connectivity between transit services and destinations

- Travel time savings from providing new rail services that provide faster and/or more direct service between trip origins and destinations.
- Transportation cost savings by providing new rail transit options that may allow some households to own fewer or no cars.
- Community enhancements through creation of more and higher quality transit options and services.

Monitoring Mechanisms:

Track implementation status of rail projects.

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. Due to the current economic recession, cuts in State transit funding, and reductions in sales tax revenue for transit, Bay Area transit operators are facing challenges to maintain and sustain their existing systems and, in light of financial constraints, are cutting their transit budgets, cutting service, increasing fares, and/or delaying or deferring capital maintenance and service expansions. Thus, maintaining the existing fleet, sustaining existing services, restoring service that has been cut, and expanding service will require new funding. New revenues may be available in the future from higher gas taxes, bridge tolls, and voter approved sales tax revenues in individual counties.

Environmental clearance, right-of-way availability and costs, funding for the capital, operating and maintenance costs and level of public support are major impediments to sustain, improve, upgrade, and expand rail services.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/

TCM B-1 - Freeway and Arterial Operations Strategies

Brief Summary:

TCM B-1 will improve the performance and efficiency of freeway and arterial systems through operational improvements. These improvements include implementing the Freeway Performance Initiative (FPI), the Bay Area Freeway Service Patrol (FSP), and the Arterial Management Program.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by improving the efficiency of existing freeways and roadways throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Caltrans manages freeway operations through a comprehensive system for surveillance (traffic detectors, CCTV cameras), communication with motorists (traffic advisory signs) and system control (ramp meters, incident management). Through its Transportation Management Center (TMC), Caltrans is able to collect and process traffic information; to detect incidents as reported by freeway cameras, loop detectors in the freeway pavement, motorist calls and other sources; and to respond to incidents.

The Freeway Performance Initiative (FPI) aims to maximize the efficiency and improve the management and reliability of the existing freeway infrastructure, while limiting traditional expansion of the system to only the most essential locations. FPI addresses both recurrent daily traffic that comes from the surge of commuters using the freeways during rush hours and nonrecurrent congestion that results from unanticipated incidents and blockages of highway lanes. In fact, half of the total congestion experienced in the Bay Area is caused by vehicle breakdowns, vehicular accidents, material spills and other incidents. In performance assessments of infrastructure packages evaluated during the development of Transportation 2035 Plan, MTC found that FPI is the most cost-effective means to deal with traffic congestion in the region.

In its Transportation 2035 Plan, MTC set-aside \$1.6 billion over the next 25 years to implement FPI. FPI includes (a) Traffic Operations Systems (TOS): full deployment of monitoring and surveillance systems and implementation of ramp metering on the region's entire freeway network to improve efficiency and maximize use of the freeway system's available capacity; (b) TOS replacement: consistent maintenance and periodic

replacement of infrastructure to ensure a fully functioning system; (c) Arterial coordination and management: coordination with and optimization of major arterials to maximize efficiency of the freeway system; and (d) Performance monitoring: monitoring to measure progress in freeway performance.

Arterial management includes traffic signals, signing and pavement marking, access management, parking management, and traffic calming. Over 3,500 of the Bay Area's 7,000+ traffic signals are part of coordinated systems. An additional 1,700 signals are close enough to be included in coordinated systems, but most local agencies cannot afford to interconnect their signals. Based on feedback from local traffic engineers, their greatest unmet needs involve resources and expertise for traffic signal timing and funding for the operation and maintenance of Smart Corridors. Most cities have not been able to meet these needs since the dot.com bust in 2001.

MTC has been investing in arterial management for over 20 years through the Traffic Engineering Technical Assistance Program (TETAP) and the Regional Signal Timing Program (RSTP). Between 2004 and 2009, over 3,500 traffic signals have been retimed, yielding 10 percent savings in travel time and fuel consumption, 7 percent reductions in mobile source emissions, and a benefit: cost ratio of 34:1. Similarly, since its inception in 1993, TETAP has funded over 250 operations and safety studies.

The Bay Area FSP is a joint project of the Metropolitan Transportation Commission Service Authority for Freeways and Expressways (MTC SAFE), the California Highway Patrol (CHP) and Caltrans. The service is provided by private tow truck companies, and during the hours of operation, the vehicles and drivers are exclusively dedicated to patrolling their freeway beat. Currently, a fleet of 83 trucks patrols some 550 miles of the Bay Area's freeways. Patrol routes are selected based on several factors, including a high rate of traffic and congestion, frequent accidents or stalls, and lack of shoulder space for disabled vehicles. The program is intended to augment the MTC SAFE network of motorist-aid call boxes in the nine Bay Area counties.

Implementation Actions:

Phase 1 (2012)

MTC to implement the following actions (\$155 million):

- Through FPI, fill gaps in TOS infrastructure.
- Through FPI, install ramp meters at entrance ramps.
- Through the RSTP, coordinate traffic signals and continue to update timing plans. Arterial management strategies will consider and prioritize transit needs.
- Maintain the current level of FSP service which involves patrolling 540 miles of the Bay Area freeways. By 2012, FSP anticipates a reduction of up to ten trucks from the FSP fleet. Note that the FSP service levels are subject to change though the freeway miles covered are unlikely to be significantly affected.

Phase 2 (2020)

MTC to implement the following actions (\$TBD):

- Through FPI, conduct routine replacement of TOS infrastructure at the end of its useful life
- Through FPI, install additional TOS infrastructure.
- Through FPI, install additional ramp meters at entrance ramps and monitor and adjust meter timing as appropriate.
- Through the RSTP, coordinate additional traffic signals and continue to update timing plans.
- Expand FSP on I-280 from SR 92 to SR 85 in San Mateo and Santa Clara counties.

Supporting Actions by Partner Entities: Local governments, Caltrans, CMAAs and transit agencies to work with MTC as appropriate to implement service improvements.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.99	1.06
NO _x	3.25	3.83
PM _{2.5}	0.12	0.16
PM ₁₀	0.18	0.24
Ammonia (NH ₃)	0.07	0.09
Benzene	0.02	0.02
Formaldehyde	0.01	0.01
Acetaldehyde	0.01	0.01
CO ₂	2,403.08	3,303.24
CO ₂ -e	2,451.00	3,369.30

Emission Reduction Methodology:

This analysis includes emissions reductions associated with implementation of the Freeway Performance Initiative (FPI), the Freeway Service Patrol (FSP), and the Regional Signal Timing Program (RSTP). These three components are calculated separately. The Freeway Performance Initiative uses model output from the Transportation 2035 Vision Analysis which compared four different investment scenarios on a range of performance objectives: 1) Baseline, 2) Freeway Performance (Freeway Operational Improvement) 3), High-Occupancy/Toll (HOT) Lanes Network And Express + Local Bus, and 4) Regional Rail and Water Transit. The net difference between air quality emissions associated with the Baseline and the Freeway Performance scenarios are used to determine emissions reductions associated with the project. Emissions reductions are estimated for year 2012 and 2020 based on 2035 model output. The Freeway Service Patrol uses a benefit-cost model developed by Caltrans with the cooperation of the 13 local agencies that operate the FSP programs around the state. Emission reductions were last calculated for the 2004-05 fiscal year. Similarly, estimates for the regional signal timing program use a benefit-cost model in which the general methodology, fuel consumption factors, and health costs of motor vehicle emissions are based on Caltrans' California Life-Cycle

Benefit/Cost Analysis Model; estimates are calculated using the average benefits from 64 projects involving 1975 retimed traffic signals. For both FSP and RSTP, the 2004-05 emissions reductions are used to estimate 2012 and 2020 emissions reductions.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Trade-offs:

ARB's motor vehicle emissions factors indicate that tailpipe emission rates for ROG, NOx, PM, and CO2 are lowest when vehicles travel in the 30-50 mph speed range. The estimated emission reduction benefits for this measure are based on the anticipated improvement in average vehicle speed due to expected reduction in congestion in the affected corridors. While the regional travel model estimates transportation emissions due to temporal, spatial and mode shifts resulting from increased roadway capacity, the potential emission reduction benefits of this measure may be eroded if reduced travel time in these corridors encourages additional vehicle travel or changes in land uses that would result in longer vehicle trips. To address this issue, the Air District will perform an independent analysis to evaluate the long-term impacts of this measure on vehicle travel and emissions.

Cost:

Phase 1: \$ 155 million

Phase 2: \$ TBD million

Co-benefits:

- Health and economic savings for both businesses and travelers from reduced congestion.
- Improved travel times, reduced fuel consumption and fewer collisions from retiming signals.
- Reductions in fuel usage, improved safety for stranded motorists, reductions in secondary accidents and improved motorist travel times from FSP services.

Monitoring Mechanisms:

- Track mobility (how well the corridor moves people and freight), reliability (the predictability of travel times), and safety as part of the comprehensive FPI corridor studies.
- Track savings in travel time, fuel consumption, and air emissions on a project-by-project and on an annual basis for Arterial Management Program.
- Collect detailed assist data and motorist experience information for Freeway Service Patrol services. The assist data is used by Caltrans to calculate benefit-cost ratios, fuel-savings, and pollutant reductions.

Issues/Impediments:

By making more efficient use of existing capacity, the FPI should help to improve air quality by reducing peak period congestion, as well as incident-related delay, on the Bay Area's freeways. However, ramp-metering may provide a greater travel time savings for vehicles making longer trips. Levinson and Zhang (2006) found that: "Ramp meters are particularly helpful for long trips relative to short trips... trips longer than three exits in length benefit, while many trips 3 exits or less are hurt by ramp meters." Reducing travel time for long distance commuters could, at least in theory, encourage longer commutes from residential locations in the periphery of the region. If this were to occur, it could erode the air quality benefits of this measure over time.

Local jurisdictions may be concerned that ramp meters will spill over onto local streets and disrupt their arterial operations (although these impacts are most often mitigated prior to the operation of the ramp meters through protocols for the ramp metering timing or local street improvements to accommodate the ramp queues).

Where arterial signal coordination requires cooperation of multiple jurisdictions, the negotiations can take time to resolve both technical and policy issues.

Installation and replacement of TOS infrastructure, retiming traffic signals, and expansion of FSP is constrained by the availability of funding.

Sources:

1. MTC's Transportation 2035 Plan and Travel Forecasts Data Summary: http://www.mtc.ca.gov/planning/2035_plan/
2. MTC's Arterial Management Program: http://www.mtc.ca.gov/services/arterial_operations/
3. MTC's Transportation 2035 Vision Analysis: http://www.mtc.ca.gov/planning/2035_plan/tech_data_summary_report.pdf
4. SAFE's Freeway Service Patrol Program: <http://www.mtc.ca.gov/services/fsp/>
5. Levinson, David and Lei Zhang (2006). "Ramp Meters on Trial: Evidence from the Twin Cities Metering Holiday" *Transportation Research Part A: Policy and Practice*, Volume 40, Issue 10, pp. 810-828.
6. Levinson, David and Lei Zhang (2003). "Relationships between Ramp Metering and Sprawl" Draft working paper available through the University of Minnesota <Http://nexus.umn.edu/Papers/RampMetersSprawl.pdf>.

TCM B-2 - Transit Efficiency and Use Strategies

Brief Summary:

This measure will improve transit efficiency and make transit more convenient for riders, through continued operation of 511 Transit, and full implementation of TransLink fare payment system and the Transit Hub Signage Program.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by improving transit efficiency and use through financial incentives, improved real-time transit service information, coordinated fare payment and collection, and improved transit connectivity. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect intraregional travel on transit, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Public transit services in the Bay Area are operated by 26 agencies, each with its own budget, policies, procedures, service plan and operating practices tailored to its immediate service area. The agencies do not always coordinate effectively with neighboring service areas for purposes of facilitating seamless regional travel and customer service.

Since 2002, the Bay Area's telephone and Web-based 511 traveler information service provides up-to-the-minute, on-demand transportation-related information that supports transit riders throughout the nine-county region. On the phone, 511 provides direct transfers to over two dozen transit agencies and various paratransit providers as well as real-time transit departure predictions for SF Muni and BART. It will expand to cover other agencies that develop real-time capabilities. On the web, 511 offers a transit trip planner which allows users to create itineraries for their trips, including trips requiring transfers between transit agencies. The project also has a call center interface used by transit agencies to provide trip-planning information to customers over the phone. The 511 web service also provides schedules, route maps, information on fares and passes, and service announcements. In the near future, a personalized MY 511 service on the phone and the web will allow users to save trips for real-time departure predictions. The Bay Area system has received nearly 25 million calls since 2002, and averages 100,000 transit-related calls and over 1.3 million transit itinerary requests each month. In light of a planned 50 percent decrease in 511 Transit project funding starting in FY 2014, as well as potential project impacts due to recent State Transit Assistance budget reductions, the project will assess possible approaches to reduce ongoing

operational costs such as further automating data transfer/processing from the region's over two dozen transit agencies and/or scaling back project functionality/features provided to the public.

TransLink[®] offers transit riders a convenient and secure way to pay fares on multiple transit systems. The TransLink[®] system reduces the hassle associated with paying transit fares using exact change, multiple tickets and paper transfers. The reloadable TransLink[®] card stores value in the form of electronic cash (e-cash), which is accepted by all participating agencies, and transit passes. TransLink[®] has been available on all AC Transit and Dumbarton Express buses and on all Golden Gate Transit and Ferry routes since November 2006. TransLink[®] is currently operating on all San Francisco Muni routes, but Muni is encouraging only limited use of the system by the public in order to closely monitor the system's performance and customer response. Furthermore, TransLink[®] is fully installed on the Caltrain system, and Caltrain will begin encouraging the public to use the system once an employee testing phase is complete. TransLink[®] use by BART customers began in August 2009, and use by Santa Clara VTA and SamTrans customers will begin in 2010. TransLink[®] will also be available for use at a limited number of San Francisco Municipal Transportation Agency (SFMTA) parking garages on a pilot basis in 2010. When fully implemented, TransLink[®] will serve more than 600,000 transit riders every day.

A number of programs provide services to Bay Area employers to facilitate use of pre-tax purchases of transit tickets and other transit benefits. (See discussion re: transit benefit ordinances in TCM C-1.) Transit riders can apply their transit benefits directly to their TransLink[®] card. The TransLink[®] program is also working with AC Transit and a number of housing developers to offer transit benefits to residents of new transit-oriented housing developments.

MTC prepared the Transit Connectivity Plan to improve passenger transfers between connecting transit systems. Aside from reinforcing the importance of 511 Transit and TransLink[®] to improve transit system-wide, several key issues emerged, including (a) lack of wayfinding signage to guide transit riders between systems and to their final destinations; (b) lack of information about connecting services such as schedules, fares and routes; (c) lack of real-time transit departure information; (d) disconnects in schedule coordination; (e) lack of "last mile" services for riders to get to/from mainline transit service such as shuttles, pedestrian access, bicycle parking or taxis; and (f) few hub amenities such as weather protection, restrooms and security measures. MTC, in partnership with transit operators, will implement the Hub Signage Program to address wayfinding signage, transit information and real-time transit information recommendations at 21 transit hubs and 3 airports. Transit operators will lead implementation of other Plan recommendations over time (no cost assumption in TCM).

Implementation Actions:

Phase 1 (2012)

MTC to:

- Operate and maintain 511 Transit (\$10 million)
- Deploy, operate and maintain TransLink® on Bay Area transit agencies (\$59 million)
- Provide pre-tax and other transit benefits through TransLink® (\$5 million)
- Implement, operate and maintain Transit Hub Signage Program (\$3 million)

Phase 2 (2020)

MTC to:

- Operate and maintain 511 Transit (\$18 million)
- Operate and maintain TransLink® on Bay Area transit agencies (\$117 million)
- Provide pre-tax and other transit benefits through TransLink® (assume cost is absorbed in TransLink® budget)
- Operate and maintain Transit Hub Signage Program (\$10 million)

Supporting Actions by Partner Entities:

- Local governments and transit agencies to work with MTC on the Transit Hub Signage Program.
- Local governments, CMAs, transit agencies and other agencies to work with MTC to deploy, operate and maintain TransLink® and 511 Transit.
- Local governments are encouraged to implement programs that offer residents, students and employees free or discounted transit passes, such as Santa Clara’s Ecopass program, and other innovations to encourage transit use.

Pollutants (tons per day)	2012	2020
ROG	0.004	0.006
NO _x	0.005	0.007
PM _{2.5}	0.00	0.00
PM ₁₀	0.00	0.00
CO ₂	6.01	10.01
CO ₂ -e	6.12	10.21

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: PM_{2.5}, PM₁₀, NH₃ (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emissions Reduction Methodology:

This analysis uses a “transit efficiency” elasticity of 0.651; that is, every 1% increase in “transit efficiency” will result in a 0.651% increase in ridership. This elasticity was selected based on an analysis of output from the Transportation 2035 travel forecasts that examined change in mode share given a reduction of in-vehicle travel time by transit and wait time for transit, both by 20%. Reductions of this magnitude were selected based on review of empirical studies that examined how information improvements affect passengers’ perceived and actual wait time and travel time (Litman 2008). This elasticity was then applied to a share of the entire transit market (ranging

from 2.7% to 3.4% in Phase 1 and 3.4% to 5.4% in Phase 2), which was estimated based on the current share of transit riders that use the 511 Transit Trip Planner 3.4%; and scaling by 100-125% in Phase 1 and by 125% to 200% in Phase 2 to assume additional impact from the other elements of the TCM beyond the 511 transit trip planner. Using local data, estimated new ridership is reduced to factor in new riders that are transit dependent and those who drive to access the bus, resulting in the number of vehicle trips reduced. Additional adjustments are made to calculate vehicle miles travelled reduced based on average transit trip lengths and the average distance travelled to the bus stop by non-motorized modes. Note: this analysis excludes impact and costs associated with TransLink[®] as there is insufficient empirical research regarding the travel impacts associated with implementation of universal fare card payment systems.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Trade-offs:

None identified.

Cost:

Phase 1: \$77 million

Phase 2: \$145 million

Co-benefits:

- Improved transit customer experience
- Travel time savings

Monitoring Mechanisms:

- Monitor customer use of 511 web and phone features to obtain transit schedule, route and fare information as well as real-time transit departure times. Monitor use of 511 Transit data by third party Information Service Providers
- Monitor customer use of TransLink[®] card and TransLink[®] market penetration
- Track number of people receiving transit benefits through TransLink[®]
- Track completion of sign installation (wayfinding, transit information displays, real-time transit) at each of 21 hubs and 3 airports

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. In addition, technological issues, institutional support, and market penetration are factors that may impede full implementation of 511, TransLink[®] and other transit connectivity improvements.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/

2. Litman, Todd (2008). "Valuing Transit Service Quality Improvements." *Journal of Public Transportation*, Vol. 11, No. 2, pp. 43-63.
<http://www.nctr.usf.edu/jpt/pdf/JPT11-2Litman.pdf>.

TCM B-3 - Bay Area Express Lane Network

Brief Summary:

TCM B-3 will seek to price travel demand on Bay Area highways by developing and implementing a seamless, regionally-managed Express Lane Network throughout the Bay Area and improving regional transit service. This system will offer free-flowing conditions for carpools, buses and toll payers by adjusting tolls based upon the level of congestion.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx, by improving the efficiency of and managing congestion on existing freeways throughout the Bay Area through the use of express lanes, and by generating revenues to make corridor improvements such as improved regional transit. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Bay Area highway congestion is the second-worst in the nation; regional travel is slow and unreliable. The carpool lane system, which has been under construction for over 30 years, is fragmented by gaps. If we rely on traditional funding sources, these gaps will not be fully closed for many decades due to the lack of funds, making carpools and transit less effective.

Currently, the Bay Area is authorized to develop and implement only a handful of express lane projects in Alameda and Santa Clara counties. The first such projects, on Interstates 580 and 680, are now under construction and are scheduled to open in 2010/2011.

MTC is seeking legislation via AB 744 (Torrico) in the 2009 and 2010 legislative sessions to authorize the Bay Area Toll Authority (BATA) to finance, develop and operate a complete, seamless, regionally managed Express Lane Network. Key features will include:

- A management and operations structure involving the BATA, the county Congestion Management Agencies, Caltrans, and the California Highway Patrol.
- Conversion of 500 miles of existing or fully funded HOV lanes to express lanes.
- Construction of 300 miles of new express lanes, including 200 miles of gap closure and 100 miles of outward expansion. The outward expansion segments are:
 - I-80 SOL: I-505 to Yolo County Line – 28 miles

- I-80 SOL: Air Base to I-505 – 18 miles
- I-580 ALA: Greenville to San Joaquin County Line – 17 miles
- US 101 SCL: Cochrane to SR 25 – 30 miles
- Qualifying carpools and public transit use network free of charge; non-carpoolers pay toll (collected electronically).
- Free-flowing traffic for carpools, buses and toll payers maintained by adjusting tolls as congestion rises and falls.
- Toll revenue pays for construction, operation, maintenance and enforcement of the Express Lane Network, with remaining net revenue available for additional transportation improvements, including public transit, in network corridors.

The Express Lane Network will be built in phases; the first phase will likely include primarily HOV conversions, followed by gap closures, with the last segments being the outward extensions.

MTC expects that the express lanes will be operated on a full-time (24/7) basis when tolling is introduced in a corridor, subject to further evaluation.

Implementation Actions:

Phase 1 (2012)

MTC will implement the following express lane projects (\$2.7 billion)³:

- Existing Express Lane projects under development on I-680 (Sunol), I-580, SR 85 and US 101, including the SR 237/I-880 direct connector
- I-680 corridor from the I-680/SR 24 interchange south
- I-880 corridor in Alameda and Santa Clara counties
- I-80 in Alameda and Contra Costa
- Portions of US 101 in Marin and Sonoma County
- SR 87 in Santa Clara County
- I-280 in Santa Clara County
- Bridge approaches (SR 84, SR 92, and on I-680 and I-80)
- SR 237 in Santa Clara
- I-80 between Air Base and I-680
- I-80 between I-680 and the Carquinez Bridge

As proposed in recent amendments to AB 744, at least 95% of net revenues from the express lane network will be allocated to fund corridor improvements determined by Corridor Working Groups in Corridor Investment Plans, with priority given to public transit improvements.

Phase 2 (2020)

³ Assumes project implementation during Phase 1/Phase 2 time horizons. The actual implementation year is subject to change based on the Bay Area Express Lane implementation plan.

The outward expansion projects (see list in Regulatory Context and Background section above) identified in Phase 2 are included subject to additional air quality analysis to determine if they will be beneficial for air quality.

MTC to implement the following express lane projects (\$1 billion):

- SR 4 in Contra Costa County
- US 101 North (Novato Narrows) in Marin and Sonoma counties
- US 101 SM: Millbrae to Whipple – 22 miles
- I-80 SOL: I-505 to Yolo County Line – 28 miles
- I-80 SOL: Air Base to I-505 – 18 miles
- I-580 ALA: Greenville to San Joaquin County Line – 17 miles
- US 101 SCL: Cochrane to SR 25 – 30 miles
- I-680 in Solano County
- I-580 between 238 and I-680

As proposed in recent amendments to AB 744 at least 95% of net revenues from the express lane network will be allocated to fund corridor improvements determined by Corridor Working Groups (CWGs) in Corridor Investment Plans, with priority given to public transit improvements.

Supporting Actions by Partner Entities: Local governments, transit agencies, Caltrans, and CMAAs to work with MTC as appropriate to implement express lane projects while implementing or maintaining express bus service and land uses supportive of transit.

Pollutants (tons per day)	2012	2020
ROG	0.86	0.82
NO _x	1.34	1.11
PM _{2.5}	0.28	0.37
PM ₁₀	0.66	0.9
Ammonia (NH ₃)	0.11	
Benzene	0.02	
Formaldehyde	0.01	
Acetaldehyde	0.01	
CO ₂	1855.00	2551.50
CO ₂ -e	1892	2602.53

Emission Reduction Methodology:

This analysis uses model output from the Transportation 2035 Vision Analysis which compared four different investment scenarios on a range of performance objectives: 1) Baseline, 2) Freeway Performance (Freeway Operational Improvement 3), High-Occupancy/Toll (HOT) Lanes Network And Express + Local Bus, and 4) Regional Rail and Water Transit. The net difference between air quality emissions associated with the Baseline and the High-Occupancy/Toll and Express/Local Bus scenarios are used to determine emissions reductions associated with the project. Emissions reductions are reduced to factor out the emissions reductions associated with expanded transit service

(which is modeled in TCMs A-1 and A-2). The estimated emissions reductions are interpolated for year 2012 and 2020 from 2006 and 2015 estimates.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

Implementing the express lane network and providing express bus service in these corridors should reduce freeway congestion and decrease motor vehicle emissions in the near term. ARB's motor vehicle emissions factors indicate that tailpipe emission rates for ROG, NOx, PM, and CO2 are lowest when vehicles travel in the 30-50 mph speed range. The estimated emission reduction benefits for this measure are based on the anticipated improvement in average vehicle speed due to expected reduction in congestion in the affected corridors. However, this measure will also increase vehicle capacity on segments within some of these corridors. While the regional travel model estimates transportation emissions due to temporal, spatial and mode shifts resulting from increased roadway capacity, the potential emission reduction benefits of this measure may be eroded if the increased capacity in these corridors encourages additional vehicle travel or changes in land uses that would result in longer vehicle trips. To address this issue, the Air District will perform an independent analysis to evaluate the long-term impacts of this measure on vehicle travel and emissions.

Cost:

Phase 1: \$2.7 billion

Phase 2: \$1 billion

Co-benefits:

- Travel time savings.
- Generation of net toll revenue for corridor improvements.

Monitoring Mechanisms:

- Track miles of express lanes implemented.
- Track average vehicle speeds in both express lanes and general travel lanes (changes in congestion).
- Track changes in Vehicle Hours of Delay.

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. In addition, legislation is required to give BATA the authority to finance, develop and operate the Bay Area Express Lane Network. AB 744 (Torrico) is currently being considered by the State Legislature.

The network includes a variety of design challenges due to both environmental, geographic, and development constraints.

There is mixed public opinion regarding value pricing, with concerns about the impact on existing carpoolers, potential environmental impacts, the use of network net revenues, and charging for the use of the highway.

The program calls for rapid implementation of a large network of managed lanes, which will require significant resources and institutional support from a number of agencies.

Sources:

1. MTC's Transportation 2035 Plan and Travel Forecasts Data Summary:
http://www.mtc.ca.gov/planning/2035_plan/
2. MTC's Bay Area Express Lane page: <http://mtc.ca.gov/planning/hov/>
3. MTC's Transportation 2035 Vision Analysis:
http://www.mtc.ca.gov/planning/2035_plan/tech_data_summary_report.pdf

TCM B-4 - Goods Movement Improvements and Emission Reduction Strategies

Brief Summary:

Goods movement is a critical component of the Bay Area's economic and transportation system, and a significant contributor to air quality issues. Exposure to diesel pollution from goods movement greatly impacts the health of residents near ports, rail yards, distribution centers, and roads with high truck volumes. Investing in the Bay Area's trade corridors and continuing to offer incentives for diesel engine owners to reduce emissions will address existing air quality issues as well as help the region to prepare for continued growth in this important sector of our economy.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx, and diesel particulate matter associated with goods movement by investing in the Bay Area's trade corridors and by providing incentive funding for diesel equipment owners to purchase cleaner-than-required vehicles and equipment. In addition, some projects implemented through this measure will reduce emissions of greenhouse gases. The District will endeavor to meet the California Air Resources Board (ARB) 2007 Goods Movement Action Plan goal to reduce goods movement emissions to the greatest extent possible and at least back to 2001 levels by year 2010.

Travel Market Affected:

This measure would affect all goods movement activity within the region.

Regulatory Context and Background:

Goods movement is a critical component of the Bay Area's economic and transportation system. Whether it is delivering construction materials or consumer goods to the growing population, or exporting electronics and food throughout the world, a robust goods movement system is essential for both business and residents to function and thrive in the Bay Area.

Exposure to diesel pollution from goods movement operations greatly impacts the health of community residents near ports, rail yards, distribution centers, and roads with high truck volumes. Analysis by the District has found that emissions of diesel particulate matter (PM) account for 80 percent of the risk from toxic air contaminants (TACs) in the Bay Area. Twenty-two percent of the total California population living in close proximity to goods movement corridors is located in the Bay Area. This population is exposed to approximately 20 percent or 5.6 tons per day of the total PM and 20 percent of 124 tons per day of the total NOx emission from goods statewide.

Nearly 40 percent of the region's economic output is in manufacturing, freight transportation, and the warehouse and distribution businesses. For example, the Port of Oakland is one of the nation's busiest container ports, and although cargo volumes are

currently down due to the economic recession, projections show cargo volumes at the Port and throughout the region and state will grow significantly over the next 20 years. The Port of Oakland plays a particularly important role in supporting the state's agricultural sector, providing the primary means of transporting produce from the Central Valley to the Pacific Rim. Goods movement businesses create over 10 percent of regional employment. More than 80 percent of the goods movement in the Bay Area involves trucking in several major corridors: Interstates 80, 580, and 880 and U.S. Highway 101.

In November 2006, California voters approved Proposition 1B, a \$19.9 billion transportation infrastructure bond. Proposition 1B included a \$2 billion Trade Corridors Improvement Fund (TCIF) to improve goods movement infrastructure statewide. In 2008 the state augmented the program to nearly \$2.5 billion and programmed just over \$3 billion for high-priority goods movement projects. A coalition of regional agencies in Northern California, representing 23 counties and the three major ports, was able to secure \$825 million for 14 Northern California transportation projects that are to be in construction by 2013. Nearly \$585 million of this total will fund seven key Bay Area goods movement projects.

Proposition 1B also included \$1 billion for a Goods Movement Emissions Reduction program. The BAAQMD is responsible for developing various programs for the bond, including a diesel truck replacement program.

In addition, the California Air Resources Board (ARB) 2007 Goods Movement Action Plan seeks to meet five specific goals for addressing the air pollution associated with goods movement, including reducing "total statewide international and domestic goods movement emissions to the greatest extent possible and at least back to 2001 levels by year 2010."

In the Transportation 2035 Plan, MTC allocated \$45 million toward the District's Goods Movement Emission Reduction Program, which aims to reduce particulate matter emissions and health risks by replacing and/or retrofitting up to 800 port and general regional goods movement trucks currently operating along the Bay Area's priority trade corridors.

Since 2003, the District has spent approximately \$55.6 million on projects through the Carl Moyer Program. These funds purchased cleaner-than-required on-road, off-road, marine, rail, and agricultural equipment.

In addition, since 2003, the District has spent approximately \$18 million on projects through the Transportation Fund for Clean Air (TFCA) that reduce pollution from on-road trucks that move goods, including port trucks, garbage and street sweepers, and construction dump trucks. Beginning in 2009, the District will set aside \$1.5 million in

TFCA funds a year. These dollars will fund the Advanced Technology Program, which will provide grants for heavy-duty hybrid trucks and demonstration projects.

The California Air Resources Board (CARB) has adopted rules that require owners of diesel trucks and equipment, including those associated with goods movement, such as on-road trucks and harbor craft, to limit emissions from their fleets. The federal government has also taken action to limit emissions from locomotive engines. Although these regulations will require that equipment meets stringent standards, anticipated growth in goods movement over the next 20 years may offset much of the benefits that these regulations will achieve. Thus, incentive programs offered through the District are designed to provide emission reductions that go beyond reductions required by CARB. For example, regulations require upgrades to equipment in future years; the District incentive programs offer funds for engine owners to upgrade equipment in advance of these regulations, thereby funding emission reductions that are not yet mandated. Incentive programs can also offer funds for reduction of pollutants that are not required, for example, NO_x and ROG reductions, when only PM reductions are required. In sum, although CARB (and federal) requirements will result in substantial emission reductions from the goods movement sector, incentive funding can be used to speed up these reductions or generate additional emission reductions that would otherwise not occur.

Implementation Actions:

Phase 1 (2012)

BAAQMD to implement:

- State-funded diesel emission reduction incentive programs, including the Carl Moyer Program and Proposition 1B Goods Movement program (\$144 million)
- Replacement or retrofit of port and general goods movement trucks operating in the region via Goods Movement Emission Reduction Program, (subject to availability of funding)
- The TFCA-funded Advanced Technology Program to fund hybrid heavy-duty trucks and demonstration projects (\$1.5 million a year).

Phase 2 (2020)

MTC to implement the following seven Proposition 1B Trade Corridors Improvement Fund (TCIF) projects (\$585 million):

- 7th Street Grade Separation
- I-80 Eastbound Cordelia Truck Scales Relocation
- Martinez Subdivision Rail Corridor Improvements
- San Francisco Bay to Port of Stockton Channel Dredging
- I-580 Eastbound Truck Climbing Lane
- I-880 Improvements at 23rd and 29th Avenues
- Outer Harbor Intermodal Terminals

BAAQMD to continue implementation of:

- Goods Movement Emissions Reduction Program to replace or retrofit up to 800 port and general goods movement trucks operating in the region (\$45 million)
- State-funded diesel emission reduction incentive programs (\$384 million)

Supporting Actions by Partner Entities:

- Local governments, Ports, goods movement businesses and other agencies to work with the District to implement grant programs that fund diesel emission reduction programs.
- Local government, Ports, Caltrans and other agencies to work with MTC as appropriate to implement TCIF projects.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG		0.59
NO _x		4.81
PM _{2.5}		0.06
PM ₁₀		0.28
Diesel PM		0.12
Benzene		0.01
Formaldehyde		0.05
Acetaldehyde		0.09
CO ₂		3966.08
CO ₂ -e		4045.00

Emission Reduction Methodology:

Diesel emission reduction program emission reduction estimates are based on emission reductions achieved in past funding years.

Proposition 1B TCIF Projects: Emissions reductions were estimated as a part of the project application for TCIF funds. Growth factors were applied to emissions reduction estimates to bring them to analysis year 2020.

Exposure Reduction:

The District and California Air Resources Board (CARB) studies show that 80% of the risk from toxic air contaminants in the Bay Area comes from diesel particulate emissions. This measure addresses this air quality problem by reducing emissions from vehicles and equipment used in goods movement. This measure directly addresses air quality in impacted communities.

Emission Reduction Trade-offs:

Adding diesel retrofit devices to diesel engines may result in a decrease in fuel efficiency, thereby increasing emissions of carbon dioxide. For example, CARB and the EPA estimate that a heavy-heavy duty (HHD) diesel truck with a retrofit device added

would experience a decrease in fuel efficiency of 3.5 percent on average. By District staff computations, for a HHD truck traveling 30,000 miles per year, this decrease is estimated to result in an additional 4,382 pounds per year of carbon dioxide.

Cost:

Phase 1: \$146 million

Phase 2: \$1 billion

Co-benefits:

- Energy/fuel cost savings from more efficient and reliable engines.
- Economic benefits from faster, more efficient goods movement.

Monitoring Mechanisms:

- Completion of major project milestones for TCIF projects.
- Changes in Vehicle Hours of Delay (VHD) on TCIF corridors.
- Number of goods movement trucks retrofitted or replaced through the Goods Movement Emission Reduction program, and amount of emissions reduced through these retrofits/replacements.
- Number of grants and amount of money awarded through Carl Moyer Program and the Alternative Technology Program, emissions reduced through these grants.

Issues/Impediments:

High costs to reduce emissions from aging goods movement equipment and infrastructure (such as large diesel trucks that tend to stay on the road much longer, replace at a very slow rate, and operate on the smallest margin of profits) may be cost-prohibitive for the private sector.

Funding availability may constrain the implementation of goods movement emission reduction programs.

Technological issues may be a limiting factor in retrofitting and replacing on- and off-road mobile sources due to technical capabilities, availability and rate of deployment.

Incentive funding can only be made available for projects that reduce emissions that are surplus and not required by existing regulation. As CARB regulations that require owners of diesel engines to replace or retrofit these engines are phased in over the next several years, the number of engines that are eligible for incentive funding will decrease.

It will be difficult to achieve the same amount of emission reductions through the existing incentive programs. However, since diesel engine owners will be required to reduce emissions by CARB regulations, the Bay Area will still benefit from cleaner diesel operations.

The uncertain state of the economy may limit the number of diesel equipment owners willing to enter into contracts to receive incentive funding because it commits them to monitoring and use requirements.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. MTC's Goods Movement Initiatives 2009 Update:
http://www.mtc.ca.gov/planning/2035_plan/Supplementary/T2035_Goods_movement_update.pdf
3. ARB's Goods Movement Emission Reduction Program:
<http://www.arb.ca.gov/bonds/gmbond/gmbond.htm>
4. BAAQMD's Strategic Initiatives: <http://www.baaqmd.gov/Divisions/Strategic-Incentives.aspx>
5. ARB's Carl Moyer Memorial Air Quality Standards Attainment Program:
<http://www.baaqmd.gov/Divisions/Strategic-Incentives/Carl-Moyer-Program.aspx>

TCM C-1 - Voluntary Employer-Based Trip Reduction Programs

Brief Summary:

This measure will support voluntary efforts by Bay Area employers to encourage their employees to use alternative commute modes, such as transit, ridesharing, bicycling, walking, telecommuting, etc.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by reducing commute trips, vehicle miles traveled, and vehicle emissions. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would primarily affect commute trips, which were 23% of total weekday person-trips and about 40% of weekday vehicle miles traveled for personal (non-commercial) travel in 2006 in the Bay Area.

Regulatory Context and Background:

While commute trips make up only about one-quarter of person trips they tend to be longer distance trips and they make up most peak hour trips when traffic congestion is worse. For these reasons, reducing commute vehicle trips can have a significant impact on reducing congestion and improving air quality.

Employees may choose to drive to work for a variety of reasons:

- Workplaces that are not near transit.
- Barriers to ridesharing (see TCM C-3).
- Lack of pedestrian or bicycle connectivity to transit.
- Lack of “first mile” or “last mile” connectivity at origin or destination.
- Lack of bicycling amenities such as bicycle racks/lockers or showers at transit stations or workplaces.
- Lack of information regarding other travel options.
- Availability of free (or underpriced) vehicle parking.

Since 1996, Senate Bill 437 has prohibited mandatory employer trip reduction programs. However, many employers participate in these types of program on a voluntary basis.

511 Rideshare is one component of 511, MTC’s regional transportation information program, which provides a suite of services to facilitate carpooling, vanpooling, taking transit and bicycling. These programs are designed to remove some barriers identified above. 511 Rideshare and congestion management agencies (CMAs) conduct outreach to employers, providing information and encouragement to implement programs that will influence employees to use alternate modes of transportation. 511 Rideshare services and tools include: consultations, marketing and outreach, work site events,

employee surveys, density maps, relocation assistance, online ridematching, vanpool formation and support, commute incentives, and employer referrals. (For additional elements of 511 Rideshare, see TCM C-3).

MTC, through 511 Rideshare, provides funds to each of the 9 county CMAAs to conduct outreach to employers in their county. Employer outreach focuses on describing and marketing each of the rideshare services and tools provided by 511 (described above), encouraging implementation of trip reduction programs, as well as informing employers of county-level incentives (see TCM C-3).

BAAQMD administers the Spare the Air program, encouraging individuals to take actions to improve air quality on days when air quality is forecasted to be unhealthy. On summer days with unhealthy levels of ground-level ozone forecast, individuals are encouraged to take transit, carpool, and/or curb driving. As a part of this program, employers participating in the Spare the Air Employer Network designate coordinators to inform their workforce of impending Spare the Air days, educate employees about the ways individuals can improve air quality, and motivate them to take action. BAAQMD provides educational information, incentives and support to participating employers.

Since 2003, BAAQMD's Transportation Fund for Clean Air (TFCA) program has allocated \$117 million for local projects that reduce motor vehicle emissions in the Bay Area. TFCA is funded by a surcharge on motor vehicle registration fees paid within BAAQMD's jurisdiction. The surcharge revenues are to be used to implement specific transportation control measures that are developed and adopted in BAAQMD's Clean Air Plans and are pursuant to the requirements of the 1988 California Clean Air Act. Programs funded by TFCA include regional and local rideshare programs, vanpool/buspool programs, bicycle lockers, rack and parking stations, bicycle paths and lanes.

The Bay Area Clean Air Partnership (BayCAP) ran a shuttles project from 2001 - 2006. The major employer and business organizations involved in BayCAP saw untapped potential for shuttle expansions in the Bay Area. Private sector entities saw the project as an opportunity for a public/private partnership to improve air quality. The shuttles project was funded by BAAQMD with the goals of increasing the Bay Area shuttle ridership, improving partnerships among public agencies, providing technical support and networking information, and improving policy-maker understanding of Bay Area shuttle programs. As Bay Area population grows and public transportation agencies expand service, we will need new shuttles to serve new stations and handle increased overall passenger loads.

Federal law and IRS regulations allow employers to provide transit passes to their employees on a pre-tax basis up to \$230 per month; this substantially reduces the out-of-pocket cost of transit to employees. Many employers already make this benefit available to their employees, either by providing free or subsidized passes to their

employees, or by allowing the employee to purchase a transit pass with pre-tax dollars. The employer also benefits by not having to pay payroll taxes on the cost of the transit pass. In fall 2008 the City of San Francisco adopted a Commute Benefits Ordinance which requires employers with 20 or more employees to offer employees the opportunity to purchase transit passes with pre-tax dollars. By expanding the number of employers who offer transit benefits, the ordinance should help to retain and increase transit use for commute trips. This is especially important in the current economic environment in which transit agencies have been forced to impose significant fare increases to compensate for cuts in public funding and reduced farebox revenues.

Implementation Actions:

Phase 1 (2012)

- MTC to continue to implement employer elements of 511 Rideshare (\$2 million).

BAAQMD to:

- Continue to implement employer elements of the Spare the Air program, evaluate program effectiveness, and implement new ideas to expand the scope and improve the effectiveness of the program at workplaces (\$6 million). Note that the costs associated with this program are accounted for under TCM C-3.
- Continue to provide TFCA funding for shuttle/feeder buses (\$9 million).
- Support legislation to maintain and expand incentives for employer programs, such as tax deductions and credits.
- Encourage local cities to adopt transit benefit ordinances, similar to the ordinances that have been adopted by the cities of San Francisco, Richmond, and Berkeley.
- Support legislation to empower air districts and/or local governments to adopt employer-based trip reduction requirements. (This item is also addressed in the CAP Leadership Platform.)
- Encourage employers and other entities to utilize webcasting and related technologies to reduce travel for business meetings.
- Consider implementing a program similar to the (2001-2006) BayCAP shuttle program. The new program could include any or all of the following elements:
 - Encourage coordination between the private and public sector.
 - Study and implement a consistent regional shuttle program.
 - Encourage the integration of shuttles in regional rail plans and in the planning process.
 - Encourage the expansion of current shuttle operations.
 - Promote the benefits of shuttles to employers, employees, transit operators, and regional agencies.
 - Study alternative access modes to regional transportation stations/hubs, specifically frequent shuttle/feeder buses, from under used parking lots.
 - Study and promote the concept of rapid shuttles using park and ride parking capacity to meet the same need as transit hub parking structures.
 - Work with large housing developments to provide guidance and implement rapid shuttles as an alternative to driving.

Phase 2 (2020)

- MTC to sustain employer elements of 511 Rideshare and CMA programs (\$17 million).
- BAAQMD to sustain other Phase 1 actions (\$40 million).

Supporting Actions by Partner Entities:

- Congestion Management Agencies will continue to implement employer element of CMA programs.
- Local governments are encouraged to require mitigation of vehicle travel as part of new development approval, adopt transit benefits ordinances in order to reduce out-of-pocket transit costs to employees, and develop innovative ways to encourage rideshare, transit, cycling and walking for work trips.
- Transit agencies and shuttle providers should continue to implement and expand shuttle and feeder bus service to complement fixed routes transit service and reduce the demand for parking at transit stations.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG	0.08	0.07
NO _x	0.10	0.07
PM _{2.5}	0.00	0.00
PM ₁₀	0.03	0.04
Ammonia (NH ₃)	0.01	0.01
CO ₂	94.73	103.82
CO ₂ -e	97.00	105.90

In addition to the pollutants shown above, this measure will reduce emissions of the following air toxics by less than 0.01 tons per day: benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

Employer elements of 511 Rideshare: This analysis uses a calculation of vehicle trips and vehicle miles travelled reduced through outreach to employers as a part of a previous analysis conducted by 511 Rideshare staff to estimate the combined impacts of travel demand management programs, both for those implemented by MTC and by local partners such as CMAs without double counting any impacts at both the county and regional level. The ratio of trips reduced to total employment in FY 2006-07 (the year the analysis was carried out) is then applied to projected employment levels in 2012 and 2020.

This measure also includes emission reductions based on TFCA funding for shuttle buses. The estimate from this program is based on emission reductions from previous years of the program.

Note that the emission reductions associated with the Spare the Air program are accounted for under TCM C-3.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$ 17 million

Phase 2: \$ 57 million

Co-benefits:

- Reduced travel costs for employees.
- Reduced costs in provision of parking for employers.

Monitoring Mechanism:

- Track number of employers contacting 511 Rideshare for employer services offered.
- Track number of employees served by BayCAP and regional shuttle programs and emission reduced.
- Number of grants and amount of money awarded through TFCA Program and emissions reduced through grants.
- Track municipalities implementing commute benefit ordinances.

Issues/Impediments:

BAAQMD's lack of regulatory authority to mandate employer-based trip reduction programs limits the ability to expand employer participation.

Implementation of this TCM requires that funding is available for this program. Potential lack of funding would preclude MTC, CMAs, county transportation authorities, cities, etc., from delivering this TCM as scoped.

The current economic downturn and cost of implementing trip reduction programs may limit employer's willingness to participate. However, future legislation may repeal SB 437 or provide new incentives for employer-based trip reduction programs.

The BayCAP Shuttles Project identified key barriers that must be addressed if the region is to expand its shuttle system and increase transit ridership, including:

- No consistent regional shuttle program.
- Shuttles are not yet seen as an integral part of the regional rail network.

- Lack of on-going regional funding (TFCA funding is only regional funding available for shuttles).
- Most shuttles are at the work-end; very little experimentation with home end shuttles.
- With certain notable exceptions such as Caltrain/SamTrans/VTA, shuttles are not high priority and shuttles programs are not institutionalized at most transit agencies.
- Some transit agencies see shuttles as competition for fixed route services.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. [South Hayward BART Development, Design and Access](http://www.bart.gov/docs/planning/SouthHaywardDevelopDesignAccessPlanpartA.pdf) Plan:
<http://www.bart.gov/docs/planning/SouthHaywardDevelopDesignAccessPlanpartA.pdf>
3. Bay Area 2005 Ozone Strategy: <http://www.baagmd.gov/Divisions/Planning-and-Research/Plans/Bay-Area-Ozone-Strategy/2005-Bay-Area-Ozone-Strategy.aspx>
4. San Francisco County Transportation Authority. Draft Strategic Analysis Report: "The Role of Shuttle Services in San Francisco's Transportation System." November 17, 2009.
http://www.sfcta.org/images/stories/Planning/Shuttles/ShuttleSAR_Draft_PnP111709.pdf.

TCM C-2 - Safe Routes to Schools and Safe Routes to Transit Programs

Brief Summary:

This measure will facilitate safe routes to schools and transit by providing funds and working with transportation agencies, local governments, schools, and communities to implement safe access for pedestrians and cyclists. Likely projects will include implementation of bicycle facilities, such as lanes, routes, paths, and parking, and improvements to pedestrian facilities, such as sidewalks/paths, benches, reduced street width, reduced intersection turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes and streets trees.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by improving bicycle and pedestrian access to schools and transit throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

The Safe Routes to School component of this measure would affect school trips, which were 6% of total person trips in 2006, and trips to transit stops. The Safe Routes to Transit component of this measure would affect transit trips, which were 5.2% of total person trips in 2006.

Regulatory Context and Background:

Safe Routes to School is a state, regional and local program that encourages children to walk or bicycle to school by removing barriers such as lack of infrastructure, unsafe facilities that result in uninviting walking and bicycling conditions, and lack of education and enforcement programs aimed at children, parents and the community at large. In 2006, home-based grade school trips in the Bay Area accounted for nearly 1.3 million trips/day, or 6 percent of total personal trips. Safe Routes to School reduces vehicle trips to school and parents' vehicle trips to work, who may be able to switch to another mode if they do not need to drop their children off at school.

The State of California's Safe Routes to School program was established in 1999 by Assembly Bill 1475, and in 2007, legislation was passed (Assembly Bill 57) to extend the program indefinitely. Project funding has been issued for 7 two-year funding cycles, the selection of Cycle 8 projects for FY 2008-09 and FY 2009-10 is underway, and the program will continue to issue calls for projects on a bi-annual basis. Examples of Bay Area projects funded in Cycle 7 include:

- New traffic signals with countdown pedestrian heads, crosswalks, radar speed feedback signs and education activities near Ocean View Elementary School in Alameda County;

- Construction of a segment of the Lions Creek Trail for bicyclists and pedestrians, outreach and education activities near Antonio Del Buono Elementary School in Santa Clara County; and
- Installation of in-pavement lighted crosswalk, curb ramps, safety lighting, signing and striping near Windsor High School in Sonoma County.

SAFETEA established a federal Safe Routes to School program between 2005 and 2009. The federal program advises Safe Routes to School projects to include five components, “the Five Es” – engineering, education, enforcement, encouragement and evaluation. Two cycles of federal funding were issued. Examples of Bay Area projected funded include:

- Installation traffic calming features by extending curbs, narrowing an intersection, and installing a pedestrian crossing signal near Mill Valley Middle School in Marin County; and
- Funding to conduct walkability audits/workshops, focus groups, meetings with teacher and parent groups, assemblies, outreach, on-site technical assistance with local bicycle/pedestrian champions, and pedestrian educational presentations at schools in Western Contra Costa County.

In 2004, voters passed Regional Measure 2, raising the toll on the seven State-owned toll bridges by \$1.00. This extra dollar funds various transportation projects within the region, including the Safe Routes to Transit program.

Safe Routes to Transit is a program that funds bicycle and pedestrian planning and capital projects that facilitate walking and bicycling to regional transit, thereby reducing vehicle trips to transit. While removing vehicle trips to transit may have only small impacts on reducing vehicle miles travelled, these reductions have more significant impacts in reducing vehicle engine starts, which are a significant source of total vehicle emissions. The Safe Routes to Transit program is funded by MTC and administered by TransForm and the East Bay Bicycle Coalition. To date nearly \$8 million has been awarded to over 20 capital and planning projects. Example projects funded include:

- Planning for Balboa Park Ocean Avenue pedestrian/bicycle connections in San Francisco;
- Capital improvements to provide safe pedestrian/bicycle routes to Ed Roberts Campus/Ashby Bart in Berkeley; and
- Capital funds to provide electronic bicycle lockers at BART stations.

MTC’s Transportation 2035 Plan launched a new program, the Transportation Climate Action Campaign, to reduce the region’s carbon footprint. The \$400 million campaign includes new funding for Safe Routes to School and Safe Routes to Transit. These funds will supplement the available federal, state, regional and local sources committed to these sources, which are currently oversubscribed, to meet the high demand for funding for these types of projects. Note that as of December 2009, MTC approved \$80 million in the first programming cycle from the new federal transportation act for four primary climate initiatives: 1) Public Education/Outreach; 2) Safe Routes to Schools, 3)

Innovative Grants; and 4) Climate Action Program Evaluation. Of the \$80 million, the Safe Routes to Schools program received \$17 million in funding. Funding has not yet been identified for the Safe Routes to Transit program.

Implementation Actions:

Phase 1 (2012)

MTC to:

- Continue to award Regional Measure 2-funded Safe Routes to Transit Program funds (\$23 million)
- Implement the Safe Routes to Schools Program component of the Transportation Climate Action Campaign (\$17 million)

Phase 2 (2020)

- MTC to pursue additional funding for Safe Routes to School and Safe Routes to Transit (\$ TBD)

Supporting Actions by Partner Entities: CMAs, transit agencies, local governments, schools, and communities to work with MTC to implement safe access for pedestrians and cyclists to schools and transit.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.01	0.01
NO _x	0.01	0.01
PM _{2.5}	0.00	0.00
PM ₁₀	0.00	0.00
CO ₂	8.02	17.51
CO ₂ -e	8.18	17.86

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: PM10, PM2.5, NH3 (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

Safe Routes to School: This analysis assumes increases in home-based grade school walk trips by 25-35% and increases in home-based grade school bicycle trips by 60-70%, ranges based on previous analyses of Safe Routes to School travel outcomes from the State of California's Safe Routes to School programs. Because the amount of funding expected to be available for Safe Routes to School programs will not be sufficient to fund programs at all the elementary and middle schools in the Bay Area, the 25-35% increase in walk trips and the 60-70% increase in bike trips are only applied to 2.7% of grade school trips in 2012 and 5.3% of grade school trips in 2020. VMT reduced is then calculated based on an assumed average walk-to-school distance of 0.5 miles and an assumed bike-to-school distance of 2 miles.

Safe Routes to Transit: Because there is very little empirical research estimating the impacts of Safe Routes to Transit-type improvements on travel outcomes, this analysis is grounded in findings of one empirical study (Cervero 2001) that presents "walk-to-transit" elasticities ranging from .161-.230 for increases in sidewalk miles; that is, a 1% increase in the ratio of sidewalk miles to road miles results in a .16% to .23% increase in the probability of walking to transit. This analysis assumes a 0.5% increase in this ratio in 2012 and a 1% increase in this ratio in 2020. It also assumes a comparable increase in bicycle infrastructure and anticipated increase in the probability of bicycling to transit; although the relationship documented in the study is only for walk trips, the analysis extends the relationship to bicycle trips as results from any more suitable studies were not found. These changes in walk-to-transit and bicycle-to-transit trips are then multiplied by a 2 mile bicycle access/egress distance and a 0.7 mile walk access/egress distance to calculate vehicle miles reduced.

This analysis assumes \$17 million in SRTS and \$10 million SR2T funds available in Phase 1 (though no funding has yet been identified for SR2T), and an additional \$10 million for each program in Phase 2.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$ 40 million

Phase 2: \$ TBD

Co-benefits:

- Improved safety/reduced pedestrian-motor vehicle and bicycle-motor vehicle accidents.
- Improved public health/reduced obesity.
- Reduced travel costs.

Monitoring Mechanisms:

- Track the number of new Safe Routes to School programs and the change in number of bicycle and walk trips to school at schools with Safe Routes to School programs
- Track the number of new Safe Routes to Transit Projects

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. The Safe Routes to School and Safe Routes to Transit programs receive a high volume of grant applications and have only limited amount of funds to award to projects. While funding for these programs have been identified in the short-term, many of these sources will sunset in the future. However, the new federal transportation bill could include additional funding for Safe Routes to School and Transit. New funds may also be available from higher gas taxes, bridge tolls, and voter approved sales tax measures in individual counties.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. Safe Routes to School Safety & Mobility Analysis: Report to the California Legislature:
http://www.saferoutespartnership.org/media/file/SR2S_Final_Report_3_1_07.pdf
3. Cervero, Robert (2001). "Walk-and-Ride: Factors Influencing Pedestrian Access to Transit." *Journal of Public Transportation*, Vol. 3, No. 4, pp. 1-23.

TCM C-3 - Ridesharing Services and Incentives

Brief Summary:

This measure will promote ridesharing services and incentives through the implementation of the 511 Regional Rideshare Program, as well as local rideshare programs implemented by Congestion Management Agencies. These activities will include marketing rideshare services, operating the rideshare information call center and website, and providing vanpool support services. In addition, this measure includes provisions for encouraging car-sharing programs where appropriate.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by reducing single occupancy vehicle trips through the promotion of rideshare services and incentives throughout the Bay Area, and car sharing programs where feasible. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

The ridesharing component of this measure would primarily affect commute trips, which were 23% of total weekday person-trips and approximately 40% of weekday vehicle miles traveled for personal travel in 2006 in the Bay Area. Car-sharing programs are more likely to affect discretionary trips for shopping, errands, business and recreational purposes.

Regulatory Context and Background:

Ridesharing

While commute trips make up only about one-quarter of person trips, they tend to be longer distance trips and they make up most peak hour trips when traffic congestion is worse. For these reasons, reducing vehicle trips to workplaces can have a significant impact on reducing congestion and improving air quality.

Barriers to ridesharing include:

- Difficulty for individuals in identifying others who both live and work proximate to them.
- Difficulty in setting up the logistics of a vanpool (such as establishing driver(s), shared payment for gas and other costs, identifying parking places, etc.).
- Needing to factor in travel time to pick-up other carpoolers.
- Needing flexibility to change travel schedule due to emergencies.

511 Rideshare is MTC's regional rideshare program, providing a suite of services to facilitate carpooling and vanpooling online (511.org) and by telephone (511). These

programs help remove some barriers to ridesharing identified above, provide additional incentives for ridesharing, and include:

- A regional ridematching system which connects commuters who live and work near one another (for employer elements of 511 Rideshare see TCM C-1).
- Information and incentives for carpools and vanpools, including gas cards for carpoolers, seat subsidies for vanpoolers, and prizes for both types of ridesharing.
- CMAs, county transportation authorities, cities and counties provide a range of different incentives to encourage non-single occupant vehicle commute trips. Eligibility requirements and types of incentives available vary and include (or will include) the following⁴:
 - Alameda County: guaranteed ride home in emergencies.
 - ACE Rail: guaranteed ride home in emergencies for those who hold monthly ACE Rail passes
 - 511 Contra Costa: guaranteed ride home in emergencies, discounted vanpool fare for new vanpoolers, cash incentives for vanpool drivers who sustain a vanpool for one year, gift card incentives for carpool participants, complimentary transit tickets for commuters who currently drive alone.
 - Marin County: incentives for new vanpools and guaranteed ride home.
 - Napa County: guaranteed ride home in emergencies, gas cards for new back-up vanpool drivers, gas cards for new vanpools.
 - San Francisco County: preferential vanpool parking, guaranteed ride home in emergencies, carpool parking permits.
 - San Mateo County: guaranteed ride home in emergencies, gas cards for carpool participants, discounted vanpool fare for new vanpoolers, discounted purchase and installation costs for employers to provide bike racks/lockers, free transit coupons for new riders, free lunchtime taxi service.
 - Santa Clara County: EcoPass Transit annual transit pass on South Bay transit systems (for participating employers), preferential parking for 4+ carpools.
 - Solano County: guaranteed ride home in emergencies, gas cards for new back-up vanpool drivers, gas cards for new vanpools, discounted bicycle purchase.
 - Sonoma: guaranteed ride home in emergencies, free 2+ carpool parking in downtown garages, reduce cost transit passes.

Car-Sharing

Carsharing allows people to forgo or reduce the number of cars in their household and rely on other modes for most of their trips, but still have convenient access to a car when needed for occasion use. There are currently two car-sharing organizations in the Bay Area: City Carshare is a nonprofit organization and Zipcar, (which merged with Flexcar in 2007) is a for profit corporation. Members join for a monthly fee, pay an hourly use fee that includes gasoline, and can schedule use of a car over the internet. Car-sharing has been available in the Bay Area since 2001, but has a longer history in

⁴ See 511 Rideshare's Commute Rewards and Incentives: County Incentives webpage at http://rideshare.511.org/rideshare_rewards/county.asp.

Europe. Members can pick up cars at locations around San Francisco and the east bay, including Oakland, Alameda, Berkeley, Albany, El Cerrito, and in Palo Alto at Stanford University. The advantages to car-sharing include:

- Fixed costs are lower than owning a car. Zipcar members report an average savings of approximately \$500 a month when they join Zipcar compared to owning their own car. These fixed costs include car payments, licensing, garage fees, insurance, and maintenance.
- Regardless of how often an owner uses a car, there are high fixed costs to owning a car and lower marginal costs, such as fuel and parking charges. Because of the ratio of fixed costs to marginal costs, car owners tend to use their private auto for trips that could be served by other less polluting transportation modes, including transit, walking and biking. In contrast, car sharing has lower fixed costs and higher marginal costs. This encourages members to use other transportation modes when available and convenient. Overall, car-sharing encourages members to reduce their total number of vehicle trips by taking advantage of other modes of travel.
- For low income people, car-sharing can augment transit, walking and bicycle trips to make occasional trips carrying cargo or outside the transit system's service area.
- Car-sharing service is also available to businesses. This can help Bay Area businesses save money otherwise spent on maintaining, insuring and garaging a fleet of cars.

Implementation Actions:

Phase 1 (2012)

MTC to implement the following actions (\$17 million):

- Continue to provide 511 RideMatch service and implement website enhancements including a trip-tracking tool, functionality for administration of employer-based and local agency-based incentives, a quick search matching tool, and improved interface functionality for employers.
- Continue to provide rideshare support services, including call center services, program marketing and materials and vanpool support services.
- Continue administration of 511 Rideshare Rewards annual campaign and provision of incentives for carpools and vanpools.
- Implement incentive programs sponsored by congestion management agencies, county transportation authorities, cities and counties, and transit agencies.
- Encourage the expansion of car-sharing services.

BAAQMD will encourage car-sharing, as appropriate, as a potential CEQA and ISR mitigation measure.

Phase 2 (2020)

Sustain Phase 1 programs (\$47 million)

Supporting Actions by Partner Entities:

- Local governments, CMAs, and employers to encourage ridesharing and create incentives to promote ridesharing.
- CMAs that support existing local rideshare programs to continue to fund these programs.
- Caltrans to identify and develop new Park and Ride sites as needed.
- Explore the option to encourage or require new projects to include dedicated car-sharing parking spaces and car-sharing services in-lieu of required parking spaces.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.09	0.06
NO _x	0.10	0.05
PM _{2.5}	0.01	0.01
PM ₁₀	0.01	0.02
Ammonia (NH ₃)	0.03	0.03
CO ₂	150.03	170.03
CO ₂ -e	153.00	173.43

In addition to the pollutants shown above, this measure will reduce emissions of the following air toxics by less than 0.01 tons per day: benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

This analysis uses a calculation of vehicle trips and vehicle miles travelled reduced through rideshare services and incentives as a part of a previous analysis conducted by 511 Rideshare staff to estimate the combined impacts of travel demand management programs, both for those implemented by MTC and by local partners such as CMAs without double counting any impacts at both the county and regional level. The ratio of trips reduced to total employment in FY 2006-07 is then applied to projected employment levels in 2012 and 2020.

The estimated emission reductions do not include any reductions from car-sharing programs.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$17 million

Phase 2: \$47 million

Co-benefits:

- Reduced travel costs for employees through ridesharing and for Bay Area residents, businesses and visitors through car-sharing.
- Reduced costs in provision of parking for employers.
- Support additional options for residents who seek to reduce their dependence on private vehicles for environmental and financial reasons.

Monitoring Mechanisms:

- Track number of carpools and vanpools matched through the 511 RideMatch service
- Track number of carpools and vanpools participating in 511 Rideshare Rewards program

Issues/Impediments:

Ridesharing

Surveys and focus groups indicate that many commuters need flexibility in their daily trips to conduct errands, or pick-up and drop-off children. This reduces the market for carpooling and vanpooling as traditional participation requires fixed schedules among participants. Incentive programs such as guaranteed ride home programs, which are available to most Bay Area employees, and/or encouraging participants to try carpooling once or more a week can alleviate this impediment.

Potential lack of funding would preclude MTC, CMAs, county transportation authorities, cities, etc., from delivering this TCM as scoped.

Employer support of ridesharing programs, which complement the regional services and incentives, are limited by the economic downturn.

Car-Sharing

Car-sharing works best in dense urban areas; it may not be viable in all parts of the Bay Area.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. <http://www.citycarshare.org/>
3. <http://www.zipcar.com/>

TCM C-4 - Conduct Public Outreach & Education

Brief Summary:

This measure will encourage Bay Area residents to make choices that benefit air quality by educating the public about the health effects of air pollution and the air quality benefits of choosing transportation modes that reduce motor vehicle use, such as carpooling, vanpooling, taking public transit, biking, walking, and telecommuting. BAAQMD will implement this measure through the Spare the Air (STA) Every Day campaign and the Spare the Air episodic program (“STA Alerts”). In addition, MTC and BAAQMD in partnership will implement the outreach component of the Transportation Climate Action Campaign. Implementation actions include marketing and incentive programs to alert the public to the connection between air pollution and motor vehicle usage, and promoting the benefits of reducing single-occupant motor vehicle use every day, and in particular on poor air quality days when BAAQMD issues a STA Alert.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NO_x, by educating the public about air quality in the Bay Area and encourage residents, employers and local governments to make choices that have a positive effect on air quality, particularly regarding transportation and consumer activities. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would target all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips. The Spare the Air program emphasizes reduction in morning commute trips. In addition, this measure may help to reduce emissions from the use of consumer products, lawn and garden equipment, recreational watercraft, etc.

Regulatory Context and Background:

Public education and outreach are an important part of the overall strategy to reduce motor vehicle travel and emissions. The BAAQMD administers several public education programs, including Spare the Air (STA) Every Day and the Spare the Air Alert programs. The BAAQMD encourages voluntary actions that reduce air pollution throughout the year.

The STA Every Day Program is the backbone of the BAAQMD’s efforts to encourage the public to take direct action to reduce emissions and improve air quality. Since motor vehicles are the leading source of ozone forming emissions in the Bay Area, efforts to reduce vehicle travel, particularly on days with Spare the Air Alerts, can help avoid exceedances of federal and state standards. STA Every Day includes the following components:

- Outreach Program

- STA Alert notifications via media channels, alert notification sign up lists, and the employer program.
- Advertising campaign through print, billboards, TV ads and website ads.
- Media outreach through news programs and community based outreach channels, such newsletters.
- Outreach at community events, such as county fairs.
- Coordination with MTC/511.
- Employer Program (see TCM C-1)
- Community Resource Teams
 - Local civic groups, agencies, businesses and environmental organizations meet regularly and work collaboratively to implement projects that promote cleaner air. Team members, with BAAQMD support, are responsible for developing and carrying out local projects.
 - Currently there are nine STA Resource Teams meeting and working together within the Bay Area's nine counties.
- Youth Programs
 - Protect Your Climate Curriculum which includes 16 lessons for 4th and 5th grade students that focus on air pollution, energy, waste reduction and transportation.
 - Clean Air Challenge Curriculum, a science-based curriculum which includes experiments that help students understand air pollution and climate change.
 - Cool the Earth, a greenhouse gas reduction program for K-8th grade students and their parents.
 - As the World Warms, a classroom supplement including news stories and puzzles on climate change for elementary aged student.
 - Development of the eCO2 Commute Challenge Project Manual, a tool to help high schools students become a part of the solution to climate change by taking action in their schools to reduce greenhouse gas emissions from student commutes by promoting walking, biking, riding the bus and carpooling.
 - Air District staff make presentations in the classroom as requested by teachers.

MTC's Transportation 2035 Plan launched a new program, the Transportation Climate Action Campaign (TCAC), to reduce the region's carbon footprint. The campaign, which will be implemented by MTC and the BAAQMD in partnership, includes funding for outreach activities to educate Bay Area residents about how they can reduce emissions of greenhouse gases (and criteria air pollutants) on an everyday basis. The outreach campaign will feature multiple outreach messages directly linked to action programs, incentives, projects, policies and advocacy focused on two complementary themes: 1) Smart Driving/Vehicles: actions to reduce emissions of greenhouse gases on a per-mile basis via driving behaviors and vehicle improvements as discussed above, and 2) Smart Traveling: actions to reduce emissions of greenhouse gases by promoting alternatives to driving: e.g., transit, biking, walking, carpooling and telecommute. Note that as of December 2009, MTC approved \$80 million in the first programming cycle of the new federal transportation act for four primary climate initiatives: 1) Public Education/Outreach; 2) Safe Routes to Schools, 3) Innovative Grants; and 4) Climate

Action Program Evaluation. Of the \$80 million, the public education/outreach element received \$10 million in funding.

Implementation Actions:

Phase 1 (2012)

- MTC and BAAQMD to implement outreach component of Transportation Climate Action Campaign (\$10 million).
- BAAQMD to implement Spare the Air Every Day Campaign including STA Alerts, employer program, community resources team, and youth programs (\$6 million).

Phase 2 (2020)

- MTC and BAAQMD to continue implementing outreach component of Transportation Climate Action Campaign (\$TBD).
- BAAQMD to continue implementing Spare the Air Every Day Campaign including STA Alerts, employer program, community resources team, and youth programs (\$16 million).

Supporting Actions by Partner Entities: Local governments, transit agencies, CMAs, schools, media outlets, and businesses are encouraged to participate in the campaign.

Emission Reductions:

The STA Every Day and TCAC programs will result in the following emission reductions, expressed in tons per day.

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.02	0.01
NO _x	0.02	0.01
PM _{2.5}	0.00	0.00
PM ₁₀	0.00	0.00
CO ₂	38.99	46.96
CO ₂ -e	40.42	47.90

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: NH₃ (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

Emission reductions estimates are based on aggregated survey information collected after STA Alerts. The STA Alert data shows that 5 percent of the surveyed population changed travel behavior due to the alert. These individuals were more likely to forgo discretionary (non-work) vehicle trips than work trips. This travel behavior data was then applied to STA Every Day and TCAC programs based on the assumption that the STA Every Day program would result in a behavior change at one-tenth the rate (0.5%)

of the episodic Spare the Air program. This is a conservative assumption: the program may provide greater emission reductions.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$13 million

Phase 2: \$16 million

Note that 3 million of the funds available for the TCAC Program are accounted for under TCM C-5.

Co-benefits:

This measure raises the awareness of the public about the causes of and solutions to the air pollution problem. People who choose to change their travel or other behaviors in response to a voluntary request for a STA Alert may reduce vehicle use or change other polluting activity on a regular basis, as advocated in the STA Every Day and TCAC programs.

Monitoring Mechanisms:

BAAQMD will continue to conduct surveys of travel behavior in response to STA Alerts, possibly expanding this activity to include STA Every Day and the TCAC programs.

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. In addition, because the Spare the Air program is voluntary in nature, its effectiveness depends on the cooperation of the general public.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan
2. BAAQMD's Spare the Air Program: <http://www.sparetheair.org/>

TCM C-5 - Smart Driving

Brief Summary:

Pollutant emissions rates vary based on the speed a vehicle is traveling. The emission/speed relationship varies for each pollutant, but emission rates generally are lowest in the 30-45 mile per hour mph range. Vehicles traveling on Bay Area freeways at speeds above 65 mph emit significantly more ROG, NOx and greenhouse gases (GHGs) than cars and trucks traveling at speeds between 35 and 55 mph. This measure focuses on public education to encourage drivers to observe posted speed limits and adopt other fuel efficient driving practices, supplemented by more rigorous enforcement of speed limits, especially to reduce high-speed driving on freeways.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx, by reducing high speed driving. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips. In addition, this measure would primarily address freeway travel within the Bay Area.

Regulatory Context and Background:

Further Study Measure 3 in the Bay Area 2001 Ozone Attainment Plan provides a foundation for this control measure. In response to FSM 3, MTC conducted an analysis on emissions created by vehicles traveling over 65 mph on freeways. This analysis shows that by limiting passenger car travel to 65 mph, there is a potential to reduce VOC by 1 to 2.8 tons per day and NOx by 0.9 to 1.9 tons per day, if applied throughout the Bay Area. Approximately 60% of Bay Area driving (VMT) takes place on the freeway system and, based on Caltrans speed monitoring data, 34% of freeway driving occurs at speeds over 65 mph. Therefore, by addressing over-the-limit freeway driving, this measure could achieve a significant amount of emission reductions. A vehicle driven at 75 mph consumes approximately 40% more fuel and emits 35% more emissions than one driven at 60 mph.

There are a variety of techniques known as “smart driving”, “green driving”, or “eco-driving” that increase the fuel efficiency of auto travel, thereby reducing emissions and saving money; these include:

- Avoiding quick starts and aggressive driving
- Reducing highway speeds (55 mph is the most efficient speed for fuel consumption)
- Using overdrive and cruise control
- Avoiding driving in rush hour

- Using air conditioning sparingly
- Reducing idling
- Reducing drag by removing roof racks, tow-hook carriers, and other items that cause wind resistance
- Removing heavy unneeded items from cars (e.g. golf clubs)
- Properly maintaining vehicles including maintaining optimal tire pressure

Outreach to encourage these types of smart driving behaviors are included in the outreach component of the Transportation Climate Action Campaign (see TCM C-4).

In Europe there have been several measures that address the relationship between travel speed and traffic safety, climate effects and air quality. Some of the measures that have been undertaken addressed speed reduction, improved speed enforcement, speed alerts, and driver education. A program to promote “ecodriving” has been implemented by several European countries. Program details vary among countries, but generally the focus is on driving school curriculums, fuel saving devices in vehicles, purchasing behavior, and vehicle maintenance. Evaluation of this program has shown positive benefits in traffic safety, GHG reductions and improved air quality.

Implementation Actions:

Phase 1 (2012)

- BAAQMD and MTC to encourage smart driving as a part of the outreach component of the Transportation Climate Action Campaign (see TCM C-4).

As resources permit, BAAQMD will:

- Coordinate and implement programs with business (e.g., tire companies, insurance companies, driving schools, and vehicle manufacturers) and public agencies.
- Implement and coordinate curriculum with High Schools (Driver’s Ed) and driving schools.
- Promote/implement a voluntary certification program with fleet operators that could be used as a marketing tool, utilizing the Sustainable Earth Initiative’s Green Fleets Toolkit, which was produced with a grant from the BAAQMD.
- Evaluate and potentially promote and implement a program to purchase and install fuel consumption feedback devices in vehicles for a nominal price. Devices are available now for various vehicle models and allow drivers to get real-time information about fuel consumption. Access to this information may influence drivers to practice fuel-saving behavior, such as driving the speed limit, maintaining a steady speed, and avoiding unnecessary acceleration and braking.
- Explore and potentially establish with CHP and others agencies such as MTC and/or ARB a partnership to 1) enhance enforcement of freeway speed limits on an on-going daily basis and 2) emphasize the importance of complying with posted speed limits on Spare The Air days, including use of variable message boards on roadways and public outreach messaging.

Phase 2 (2020)

- MTC and BAAQMD to continue Phase 1 activities

Supporting Actions by Partner Entities:

Local governments, transit agencies, CMAs, school districts, other agencies, media outlets and businesses will be encouraged to join BAAQMD and other partners to create an innovative campaign to connect smart driving with climate protection.

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020*</u>
ROG	0.08	
NO _x	0.17	
PM _{2.5}	0.01	
PM ₁₀	0.01	
CO ₂	176.00	
CO ₂ -e	180.00	

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: NH₃ (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

* 2020 emission reductions are not available at this time.

Emission Reduction Methodology:

The emissions reduction estimate for this measure is based on the following assumptions:

- 35% of freeway travel occurs at speeds over 65 mph
- Of the 65 mph + driving, 50% occurs at 70 mph and 50% at 75 mph
- Speed would be reduced to 65 mph
- The actions described in this measure would reduce five percent of over-the-limit speeding (65 mph for light vehicles and 55 mph for heavy-duty vehicles).

The appropriate emission/speed factors were applied to the above assumptions to calculate the emissions reductions.

It should be pointed out that these assumptions are very conservative. The portion of high-speed driving on freeways may well exceed 35% and many drivers may exceed 75 mph. Using the same assumptions described above, if we assume that all freeway driving in excess of 65 mph were reduced to the 65 mph limit, the reductions would be on the order of 1.6 tpd of ROG, 3.3 tpd of NO_x, and 3500 tpd of CO₂.

Exposure Reduction:

To the extent that freeway corridors are a major source of emissions in many impacted communities, reducing high speed driving should help to reduce emissions of ROG, NOx, PM, and CO2 in these corridors and throughout the Bay Area.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$ 3 million (\$1 million per year)

Phase 2: \$ TBD

Implementation of this measure will be funded as part of the public outreach campaign described in TCM C-4. It is not yet known how much of this funding will be used to promote speed moderation. However, for purposes of estimating the cost-effectiveness of this measure, we estimate \$1 million per year.

Co-benefits:

- Economic benefits from fuel savings to individual drivers and to the Bay Area economy as whole. If all high-speed freeway driving were eliminated, based on the conservative assumptions described above, this would save approximately 360,000 gallons of gasoline and diesel per day in the Bay Area, yielding a cost savings greater than \$1 million per day.
- Reduced/less frequent servicing, maintenance and repair costs that result from reduced wear and tear of various vehicle components (i.e. tires, clutch, and engine).
- Economic savings from reduced costs associated with automobile crashes. According to the National Highway Traffic Safety Administration (NHTSA) speeding is a significant contributing factor to traffic crashes. Based on 2007 data, the NHTSA estimates that nationally speeding related crashes have a \$40.4 billion cost to society. In a 2008 Bay Area study, the American Automobile Association estimated that the total cost of car crashes (fatalities and injuries) is \$2.7 billion.

Monitoring Mechanisms:

- While monitoring changes in behavior can be difficult, voluntary programs may be monitored by participation rates.

Issues/Impediments:

Implementation of this TCM requires that funding is available for this program. In addition, this program requires collaboration between multiple agencies. Finally, at present the public is accepting of high-speed driving. This TCM requires that the public begin to recognize the consequences of high-speed driving.

Sources:

1. American Automobile Association. Crashes vs. Congestion:
<http://www.aaaexchange.com/Assets/Files/2008107142430.CrashesVs.Congestionl.pdf>
2. BAAQMD. 2001 Ozone Attainment Plan:
<http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Ozone-Attainment-Plans/2001-Ozone-Attainment-Plan.aspx>
3. [European Transport Conference 2007](#): The effects of speed measures on air pollution and traffic safety: <http://www.etcproceedings.org/paper/the-effects-of-speed-measures-on-air-pollution-and-traffic-safety>.
4. Dijkema, et al. 2008. Air Quality Effects of an urban highway speed limit reduction: <http://www.sciencedirect.com>.
5. Gauderman, et al. 2007. Effect of exposure to traffic on lung development from 10 to 18 years of age. www.thelancet.com.
6. <http://www.ecodrive.org/>. Ecodriven Campaign Catalogue for European Ecodriving & Traffic Safety Campaigns.
7. UK Safe and Efficient Driving. <http://www.safed.org.uk/About.htm>

TCM D-1 - Bicycle Access and Facilities Improvements

Brief Summary:

TCM D-1 will expand bicycle facilities serving employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers. Typical improvements include bike lanes, routes, paths, and bicycle parking facilities. This TCM also includes improving bicycle access to transit and supporting the annual Bike to Work event.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by sustaining and improving bicycle access and facilities throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to the airport; and school trips.

Regulatory Context and Background:

Bicycles are an inexpensive and widely available type of zero emissions vehicle. Bicycles are well-suited to a wide range of trips in urban settings. In urban contexts, bicycles compete well with cars and transit in terms of door-to-door travel time. Bikes can be combined with public transit for longer trips and trans-bay trips. Cities such as Palo Alto, Davis, Seattle, and Portland have demonstrated that bicycle use can be integrated into local transportation networks.

Improved bicycling facilities increase perceived and actual safety of travel by bicycle as well as its overall attractiveness, encouraging more travel by this mode. The average trip length for all personal trips in the Bay Area is just under 3 miles, a distance short enough for travel by bicycle. In addition, improved bicycle facilities can encourage park-and-ride users to shift modes to bike-and-ride. Bicycle improvements encourage mode shift for shorter trips, which are a majority of total personal trips. The average weekday trip length for all personal travel in the Bay Area in 2006 was 2.95 miles. Of total personal trips in 2006, 21% of trips were less than one mile, 18% were between 1 and 2 miles, 12% were between 2 and 3 miles, and 8% were between 3 and 4 miles.

Many barriers exist that prevent more bicycle trips. In particular, parts of the Bay Area lack bicycling routes that include features such as lower speed limits, bicycle lanes or other facilities, loop detectors that detect bicyclists waiting at red lights, and other complete street features.

MTC's Regional Bicycle Plan for the San Francisco Bay Area, 2009 Update was created to focus regional bicycle-related funding on high-priority bicycle facilities that serve regional trips. The Plan defines a Regional Bicycle Network made up of key routes in each county. The Plan was updated in 2009 and was adopted as a part of MTC's Transportation 2035 Plan. MTC created the Regional Bicycle Working Group to implement the Regional Bicycle Plan. The Working Group's activities include data collection and analysis; collaboration with transit operators to provide bike parking at stations; and marketing and outreach.

In July 2006, MTC adopted Resolution 3765 to encourage the routine accommodation of bicyclists and pedestrians in projects that are funded by MTC regional discretionary funds. To implement the resolution, MTC developed a Routine Accommodation Checklist Policy, requiring project sponsors to consider the needs of bicyclists and pedestrians in project design.

In its Transportation 2035 Plan, MTC committed \$1 billion in funding over the next 25 years for the Regional Bicycle Program.

The Bicycle Facility Program (BFP) is a component of BAAQMD's Transportation Fund for Clean Air (TFCA) grant program that provides funding to reduce motor vehicle emissions through the implementation of new bicycle facilities in the San Francisco Bay Area. Since 2003, BAAQMD has awarded approximately \$14.6 million towards bicycle facility projects in the Bay Area.

MTC has created the Safety Toolbox, a website that provides tools for preventing collisions, injuries and fatalities, and encouraging walking and bicycling through partnerships between multiple disciplines, multiple jurisdictions, and the public. The site includes information on engineering and maintenance (e.g. design standards and review), law enforcement (e.g. police stings or photo enforcement to identify motorists who violate pedestrian right-of-way crossing streets), planning (e.g. pedestrian- and bicycle-friendly local policies), community involvement (e.g. local jurisdiction pedestrian and bicycle advisory committees), school districts (e.g. Safe Routes to School), and public health (e.g. health promotion).

The Transportation Development Act (TDA) is a quarter-cent sales tax that is imposed statewide in California for transportation purposes. A share of this money, TDA Article 3, goes to fund pedestrian and bicycle projects. To obtain TDA funding from MTC, local jurisdictions must have Bicycle Advisory Committee to plan and prioritize funding for bike projects.

A special issue in the bicycle community is the provision of bike lanes on the Bay bridges. Bay bridges with bicycle lanes currently include the Golden Gate, Carquinez, Antioch, and Dumbarton Bridges. The New East Span of the San Francisco-Oakland Bay Bridge and the new Benicia Bridge will also have bicycle lanes. Caltrans completed a

feasibility study to install bicycle lanes on the west span of the Bay Bridge in 2001 and Bridge and Toll Authority (BATA) is currently preparing a Project Study Report (PSR) to update this analysis. In particular, it will identify a new cost estimate and update the engineering and design for the touchdown points on Yerba Buena Island and on Rincon Hill in San Francisco.

Bicycle projects are also funded as a part of MTC's Transportation for Livable Communities (TLC) program (see TCM D-3).

The regional FOCUS program (described in TCM D-3) also seeks to create communities that meet the day-to-day needs of residents in a bicycle-friendly environment.

The State of California also funds bicycle projects through its Bicycle Transportation Account (BTA) which is expected to allocate \$7.2 million statewide in FY 2009-10.

Many Bay Area counties also fund bicycle projects through their local option sales tax expenditure plans. These counties include:

- Alameda: 5% of revenues, measure sunsets in 2022
- Contra Costa: 1.5% of revenues, measure sunsets in 2025
- Marin: 3.5%, measure sunsets in 2025
- San Mateo: 3%, measure sunsets in 2033
- Sonoma: 4%, measure sunsets in 2025

Implementation of bike sharing programs is on the rise around the globe. A number of cities, such as Paris and Montreal, have successfully implemented bike sharing programs.

Implementation Actions:

Phase 1 (2012)

To improve bicycle access and facilities, MTC will:

- Fund bicycle improvements through the Regional Bicycle Program that are a part of the Regional Bikeway Network (\$19.5 million – Note: As of December 2009, MTC approved \$19.5 million in the first programming cycle of the new federal transportation act for the Regional Bicycle Program).
- Apply the Routine Accommodations Checklist Policy to projects funded by regional discretionary sources.
- Continue to fund bicycle projects with TDA Article 3 funds (\$0.4 million).
- Continue to fund and promote annual Bike to Work event (\$0.5 million).
- Continue to provide bicycle education and information dissemination via 511 Bicycle website, including the BikeMapper tool (\$0.3 million).

BAAQMD will:

- Continue to fund bicycle projects with TFCA funds through the Bicycle Facilities Program (BFP) (\$1.8 million).

ABAG will:

- Continue to work with local jurisdictions and special districts to advocate for the completion of the 500-mile Bay Trail, a planned recreational and commute corridor that, when complete, will encircle San Francisco and San Pablo Bays with a continuous network of bicycling and hiking trails. The Bay Trail provides easily accessible recreational opportunities, as well as key transportation linkages.

Phase 2 (2020)

MTC will:

- Pursue additional funding for the Regional Bikeway Network (\$TBD million).
- Continue to fund bicycle projects with TDA Article 3 funds (\$1.4 million).
- Continue to fund and promote annual Bike To Work event (\$1.2 million).
- Continue to provide bicycle education and information dissemination via 511 Bicycle website, including the BikeMapper tool. (\$0.9 million).

BAAQMD will:

- Continue to fund bicycle projects with TFCA funds through the Bicycle Facilities Program (BFP) (\$4.8 million).
- BAAQMD will encourage MTC to meet its T2035 commitment to provide \$1 billion in funding for the Regional Bicycle Program.
- MTC, BAAQMD and ABAG will sustain other Phase 1 programs.

Supporting Actions by Partner Entities:

- Cities and counties should implement their bicycle plans, provide a comprehensive network of bicycle lanes, routes, and pathways, and provide secure bicycle parking.
- Local governments, including park districts and other special districts, should continue to build, operate, and maintain bicycle facilities.
- Local governments are encouraged to require bicycle access and amenities as a condition of approval of new development projects, and to require secure bicycle parking in existing public and private parking lots and office buildings.
- Local governments should consider using a broader approach to measure roadway performance that considers cyclists and pedestrians as well as motor vehicles, rather than relying on Level of Service (LOS) that is solely based on motor vehicle throughput.
- Caltrans, Congestion Management Agencies and local governments should implement “complete streets” policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads.
- Transit agencies should implement policies and maintain and expand facilities to accommodate bicycles on rail transit, buses and ferries.
- Local governments should consider implementing bicycle-sharing programs.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG	0.00	0.01
NO _x	0.00	0.00
PM _{2.5}	0.00	0.00
PM ₁₀	0.00	0.00
CO ₂	4.36	9.93
CO ₂ -e	4.44	10.13

This measure will also reduce emissions of the following pollutants by less than 0.01 tons per day: ROG, NOX, PM2.5, PM10, NH3 (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

This analysis uses a methodology developed using data collected around cycling facilities in the cities of Minneapolis and Saint Paul, Minnesota, to estimate use of a new cycling facility, as well as to estimate how much use is generated by the new facility versus how much is generated by existing cyclists changing routes (see Krizek et al 2006). Because the funds expected to be available to fund the RBN will not be sufficient to build the whole network, this analysis assumes 3% of the unbuilt network will be built by 2012 and 6% will be built by 2020. Using the estimated number of employed residents within ¼ mile, ½ mile, and 1 mile buffers around the unbuilt portion of the RBN and the regional bicycle commute share, the existing number of cycling commuters is estimated. The number of new commuter cyclists is then estimated based on multipliers applied to the number of existing bicycle commuters in each buffer. New cycling trips for non-work purposes are estimated based on the ratio of bike commute trips to bike non-work trips. Vehicle trips reduced is then estimated by assuming 63% of all new cycling trips will replace car trips, and vehicle miles travelled reduced is estimated by assuming a 4.54 mile average bicycle commute distance and a 2 mile average bicycle non-work trip distance. This analysis excludes emissions reductions associated with funding via TFCA, TDA Article 3, Bike to Work Day, and the provision of bicycling information via 511.org.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

2012: \$22.5 million

2020: \$8 million

Co-benefits:

- Improved safety/reduced bicycle-motor vehicle accidents.
- Improved public health/reduced obesity.
- Reduced travel costs.

Monitoring Mechanisms:

- Track new miles of the Regional Bikeway Network constructed and projects funded through the BFP.

Issues/Impediments:

Bicycle use is limited by factors such as physical ability, terrain, weather, and the need to carry cargo. Personal safety concerns may also prevent some people from switching modes to bicycle. Improving bicycle facilities and public education for bicyclists and drivers can increase perceived and actual safety.

Implementation of this TCM requires that funding is available for these programs. At present, funds for bicycle improvements are limited and funds to implement the bridge portion of the Regional Bikeway Network have not been identified.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. MTC's Regional Bicycle Plan for the San Francisco Bay Area 2009 Update: http://www.mtc.ca.gov/planning/bicyclespedestrians/MTC_Regional_Bicycle_Plan_Update_FINAL.pdf
3. MTC's Safety Toolbox at <http://mtc.ca.gov/planning/bicyclespedestrians/>
4. Krizek, Kevin, et al 2006. *NCHRP Report 552: Guidelines for Analysis of Investments in Bicycle Facilities*. Washington D.C.: Transportation Research Board.: http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_rpt_552.pdf.
5. League of American Bicyclists report on the City of Davis Bicycle Plan: http://www.bikeleague.org/programs/bicyclefriendlyamerica/communities/bfc_davis.php
6. League of American Bicyclists report on the City of Portland Bicycle Plan: http://www.bikeleague.org/programs/bicyclefriendlyamerica/communities/bfc_portland.php.

TCM D-2 - Pedestrian Access and Facilities Improvements

Brief Summary:

TCM D-2 will improve pedestrian facilities and encourage walking by funding projects that improve pedestrian access to transit, employment and major activity centers. Improvements may include sidewalks/paths, benches, reduced street width, reduced intersection turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes, and street trees.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by encouraging walking throughout the Bay Area. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; and school trips.

Regulatory Context and Background:

Improved pedestrian facilities increase perceived and actual safety of walking on trips as well as the overall attractiveness of walking, encouraging more travel by this mode. About one-fifth of all personal trips are less than a mile, a short enough distance to walk. In addition, improved pedestrian facilities can encourage park-and-ride users to shift modes to walk-and-ride.

Many barriers exist that prevent people from taking more walk trips. In particular, low levels of pedestrian travel can be attributed to low density, single-use land use patterns and development of streets, roads and development projects that lack adequate attention to the pedestrian environment.

Pedestrian improvements encourage mode shift for shorter trips, especially those less than a mile. In 2006, 21% of total weekday personal trips were less than one mile. In addition, for longer trips pedestrian improvements encourage transit users who access transit by car to switch to accessing transit by walking.

These types of barriers can be overcome through a variety of techniques, including:

- Ensuring the design and placement of buildings in new developments provide amenities such as sidewalks/paths, benches, and landscaping; minimize setbacks from street; and provide entrances near sidewalks and transit stops (as well as retrofitting existing developments/streets to include these features).
- Providing an integrated street network with direct routes for pedestrians and ensuring easy pedestrian access between neighboring developments, as well as downtowns, commercial areas and community centers.

- Locating and designing parking so pedestrians have direct, attractive access (see TCM E-2)
- Promoting pedestrian-friendly land uses (see TCM D-3).
- Using street design standards that enhance pedestrian safety and comfort through measures such as reduced street width, reduced turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes, streets trees, etc.

MTC's Regional Pedestrian Committee was created in 2001. The Pedestrian Program works at the regional and community level to make walking a safe, convenient, and healthy activity by using the best engineering, public education, and law enforcement practices to minimize pedestrian injuries and fatalities.

MTC has created the Safety Toolbox, a website that provides tools for preventing collisions, injuries and fatalities, and encouraging walking and bicycling through partnerships between multiple disciplines, multiple jurisdictions, and the public. The site includes information on engineering and maintenance (e.g. design standards and review), law enforcement (e.g. police stings or photo enforcement to identify motorists who violate pedestrian right-of-way crossing streets), planning (e.g. pedestrian- and bicycle-friendly local policies), community involvement (e.g. local jurisdiction pedestrian and bicycle advisory committees), school districts (e.g. Safe Routes to School), and public health (e.g. health promotion).

Pedestrian projects are funded as a part of MTC's Transportation for Livable Communities (TLC) program (see TCM D-3).

The Transportation Development Act (TDA) is a quarter-cent sales tax that is imposed statewide in California for transportation purposes. A share of this money, TDA Article 3, goes to fund pedestrian and bicycle projects.

Since 2003, BAAQMD has awarded smart growth projects that improve conditions for pedestrians with approximately \$6 million in funds (see TCM D-3).

In 2006, MTC prepared the Bay Area Pedestrian Districts Study to encourage and improve pedestrian planning in the Bay Area. The Pedestrian Districts Study advances the use of pedestrian districts as a concept for creating better pedestrian environments in the Bay Area. Through the development of the pedestrian district typologies and real-life case studies, the study identifies the types and costs of pedestrian facilities that have the greatest impact on improving the pedestrian environment. This study is one tool that cities and counties can use in planning for pedestrian improvements.

Pedestrian projects are also subject to MTC's Routine Accommodation Checklist Policy (see TCM D-1).

The regional FOCUS program (described in TCM D-3) also seeks to create communities that meet the day-to-day needs of residents in a pedestrian-friendly environment.

Implementation Actions:

Phase 1 (2012)

MTC to:

- Continue to fund pedestrian safety and facility improvements with TLC funds (see TCM D-3) and through Safe Routes to School and Safe Routes to Transit (see TCM C-2).
- Continue to fund pedestrian projects with TDA Article 3 funds (\$0.6 million).

BAAQMD to:

- Continue to fund projects that enhance pedestrian facilities through TFCA funds (referred to as Smart Growth and traffic calming in TFCA guidelines, see TCM D-3).

ABAG to:

- Continue to work with local jurisdictions and special districts to advocate for the completion of the 500-mile Bay Trail, a planned recreational and commute corridor that, when complete, will encircle San Francisco and San Pablo Bays with a continuous network of bicycling and hiking trails. The Bay Trail provides easily accessible recreational opportunities, as well as key transportation linkages.

Phase 2 (2020)

- MTC to continue to fund pedestrian projects with TDA Article 3 funds (\$1.8 million).
- BAAQMD to continue to fund projects that enhance pedestrian facilities through TFCA funds (referred to as Smart Growth and traffic calming in TFCA guidelines, see TCM D-3).

Supporting Actions by Partner Entities:

- Cities and counties should provide a comprehensive network of facilities, including sidewalks, pathways and provide for pedestrian access in their development plans.
- Local governments are encouraged to require pedestrian access and amenities as a condition of approval of new development projects, such as street trees, furniture, lighting, shelter for transit patrons and inviting environments for walking.
- Local governments should consider using a broader approach to measure roadway performance that considers cyclists and pedestrians as well as motor vehicles, rather than relying on Level of Service (LOS) that is solely based on motor vehicle throughput.
- Local governments should adopt land use policies that support more compact, infill development to make neighborhoods more walkable.
- Caltrans, Congestion Management Agencies and local governments should implement “complete streets” (aka “routine accommodation”) policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.00	0.01
NO _x	0.00	0.00
PM _{2.5}	0.00	0.00
PM ₁₀	0.00	0.00
CO ₂	1.72	4.26
CO ₂ -e	1.79	4.35

This measure will also reduce emissions of the following pollutants by less than 0.01 tons per day: ROG, NOX, PM2.5, PM10, NH3 (ammonia), benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

By providing safer and more connected walking routes, funding new pedestrian infrastructure will encourage additional walk trips which would previously have been made by car. Because the location and type of pedestrian improvements that will be made with anticipated future TDA Article 3 and TFCA funds are undefined, the expected travel outcome impact is difficult to quantify. This analysis uses outputs from the more defined RBN investment and anticipated outcomes as a proxy to estimate changes in pedestrian travel. The ratio of the amount of money invested in the RBN relative to the percentage increase in cycling trips expected is applied to the amount of funds anticipated to be spent on pedestrian infrastructure to estimate the percent increase in pedestrian trips. An average walk distance of 0.7 miles is applied to determine the number of vehicle miles reduced.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$0.6 million

Phase 2: \$1.8 million

Co-benefits

- Improved safety/reduced pedestrian-motor vehicle accidents.
- Improved public health/reduced obesity.
- Reduced travel costs.

Monitoring Mechanisms:

- Track number of pedestrian projects funded through TLC and TDA.

Issues/Impediments:

Implementation of this TCM requires that funding is available for these programs. In addition, long distances, inclement weather, and concerns with safety may all reduce the desirability of pedestrian travel.

Sources:

1. MTC's Transportation 2035 Plan: http://www.mtc.ca.gov/planning/2035_plan/
2. MTC's Safety Toolbox: <http://www.mtc.ca.gov/planning/bicyclespedestrians/safety/policies.htm>

TCM D-3 - Local Land Use Strategies

Brief Summary:

TCM D-3 will support and promote land use patterns, policies, and infrastructure investments that support higher density mixed-use, residential and employment development near transit in order to facilitate walking, bicycling and transit use.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by promoting land use patterns, policies, and infrastructure investments that support higher densities and job creation near transit that facilitate walking, bicycling and transit use. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

A significant body of research has demonstrated the relationship between land use and travel behavior. People who live in areas with higher densities; a mix of residential, retail and office uses; with well-designed pedestrian, bicycle and transit infrastructure; and that are proximate to transit service have distinctly different travel behavior. They take more transit, bicycle, and walk trips and drive shorter distances, resulting in reduced vehicle miles travelled per household. For example, key findings from MTC's Station Area Residents Survey (STARS) Report include the following:

- People who live within ½ mile of a rail or ferry station are four times as likely to use transit as people living farther than ½ mile from a rail/ferry stop.
- Individuals living and working within ½ mile of a rail/ferry stop use transit for 42% of their work commute trips, whereas those who neither live nor work within ½ mile of a station use transit for only 4% of their work commute trips.
- Households within ½ mile of rail stations/ferry generate about half of the vehicle miles travelled of their suburban and rural counterparts.
- People who live within ½ mile of rail or ferry walk about half the time for all short trips (less than one mile), whereas residents who live greater than ½ mile away walk for only about one quarter of short trips.

The National Research Council concludes that “the most reliable studies estimate that doubling residential density across a metropolitan area might lower household VMT by 5 to 12 percent, and perhaps by as much as 25 percent, if coupled with higher employment concentrations, significant public transit improvements, mixed uses, and other supportive demand management measures.”

Land use is directly regulated at the local level by local governments. Cities and counties adopt local general plans, specific plans and zoning ordinances. As local governments support focused growth, these documents will be updated to promote land use patterns with increased densities and mixed land uses, focus development around transit stops, strengthen downtowns and community centers, and promote infill development and reuse/redevelopment of underutilized land.

Since 2003, BAAQMD has awarded smart growth and arterial management projects with approximately \$17.5 million in funds.

Local parking policies also impact travel behavior and offer an opportunity to encourage non-auto trips (see TCM E-2).

In July 2005, MTC adopted a landmark Transit-Oriented Development (TOD) Policy. The TOD Policy ties regional discretionary funds for new transit extension projects (funded via Resolution 3434) to supportive land uses. This policy establishes targets for new housing units in each transit corridor and calls for station area plans and corridor working groups to help achieve the housing targets. Station area plans to meet the housing targets must be adopted by local municipalities prior to receiving MTC discretionary funding for construction of Resolution 3434 funds. MTC has provided over \$10 million in funding to date to Station Area Planning grant recipients.

ABAG, MTC, BAAQMD and BCDC administer FOCUS, a voluntary, local jurisdiction-led effort to identify future locations for infill development and for the preservation of critical habitat and open space. Through this process over 60 local government entities have identified well over 100 Priority Development Areas (PDAs). PDAs are areas near transit with a mix of housing, jobs, services, and stores to meet the day-to-day needs of residents in a pedestrian- and bicycle-friendly environment. The adopted PDAs offer the chance to house over 50% of the region's 25-year housing needs on 3% of the land within the existing built environment. In addition, 98 Priority Conservation Areas have been designated as areas for protection and preservation.

Furthermore, regional agencies are committed to securing financial incentives and providing technical assistance to designated PDAs and PCAs. A few examples of funding opportunities made available to PDAs to date are the Transportation for Livable Communities Program (described below), \$229 million in Proposition 1C funds award by the Department of Housing and Community Development to 21 Bay Area communities (20 of the 21 communities are PDAs), \$7.5 million in Station Area Planning grants were awarded to PDAs, and \$100,000 from an Environmental Justice grant was awarded to PDAs seeking to engage community members on the topic of displacement due to development in their community. In addition, the BAAQMD's grant program, Transportation Fund for Clean Air, offers additional points to proposed projects that are located in PDAs and Potential PDAs.

MTC's Transportation for Livable Communities (TLC) program offers capital grants to cities, counties, and transit agencies to construct projects that support compact development near transit. Since the inception of the TLC program in 1998, MTC has funded 67 planning projects totaling \$2.5 million and 84 capital projects totaling \$85 million.

In its Transportation 2035 Plan, MTC allocated \$2.2 billion to TLC over the next 25 years. MTC has developed new TLC program guidelines that direct funding to PDAs and allow a broader set of eligible expenditures that are focused on providing the best possible incentives for TOD. As of December 2009, MTC approved \$85 million in the first programming cycle of the new federal transportation act for the Transportation for Livable Communities Program.

Senate Bill 375, signed into law in September 2008, requires the Air Resources Board (ARB) to adopt by September 30, 2010, regional greenhouse gas (GHG) reduction targets for emissions associated with the automobile and light truck sector. Metropolitan planning organizations are required to develop a Sustainable Communities Strategy (SCS) element in their long-range transportation plans to reach the GHG reduction targets. The SCS adds three new elements to the plan: 1) a land-use component that identifies areas within the region to house all of the population in the region; 2) a resource and farmland protection component; and 3) a demonstration of how the development pattern and the transportation network can work together to reduce GHG emissions. In the Bay Area, the provisions of Senate Bill 375 will apply to the successor plan to Transportation 2035, scheduled for adoption in 2013. MTC and ABAG will need to work closely with local and regional agency partners to begin implementation of SB 375.

MTC distributes funds to each of the 9 county congestion management agencies (CMAs) for transportation planning, programming and transportation/land use coordination. The interagency funding agreements for FY 2010-12 will include language that encourages county planning activities to support climate protection and reduce VMT.

Implementation Actions:

Phase 1 (2012)

MTC to:

- Award funds through new TLC program to support transit-supportive land uses in FOCUS PDAs (\$85 million).
- Implement the TOD Policy for Resolution 3434 Regional Transit Expansion Program.
- Award Station Area Planning Grants to fund city-sponsored planning efforts for areas around future stations of Resolution 3434 projects and for other transit projects in PDAs.

BAAQMD to:

- Continue to fund smart growth projects through TFCA program (\$3 million).
- Issue updated CEQA guidelines; the guidelines will establish thresholds of significance for GHGs (see LUM 2 - Updated CEQA Guidelines and Enhanced CEQA Review).
- Issue guidance for local general plan updates, as well as guidelines to help local jurisdictions address air quality and population exposure issues related to infill development.

Regional agencies to :

- Continue to collaborate with local agencies to implement the FOCUS program and Priority Development Areas under the leadership of the Joint Policy Committee and ABAG.
- Begin developing the SCS pursuant to the requirements of SB 375.

Phase 2 (2020)

Sustain Phase 1 programs (\$TBD)

Supporting Actions by Partner Entities:

- Local governments are encouraged to update general plans and area plans to encourage infill and support land use that allows residents and workers to walk, bicycle, and take transit to reach destinations, instead of relying on private automobiles.
- Local governments are encouraged to revise parking standards required for new development and update parking policies. (See TCM E-2)
- Transit agencies are encouraged to work with local governments and developers to create mixed-use transit-oriented developments in proximity to transit stations and key bus routes.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.26	0.60
NO _x	0.31	0.72
PM _{2.5}	0.15	0.35
PM ₁₀	0.58	1.35
Ammonia (NH ₃)	0.16	0.00
Benzene	0.01	0.00
CO ₂	856.50	1998.94
CO ₂ -e	873.63	2038.92

Emission Reduction Methodology:

As a part of the Transportation 2035 travel forecast process, MTC evaluated the impact that pricing and land use policies would have on achieving regional performance objectives, including improving air quality. In order to evaluate the impact that a more

compact development pattern would have on regional travel, MTC used an alternative growth scenario developed by ABAG that goes beyond the Projections 2007 demographic forecast to balance jobs and housing and target growth in existing communities near transit. This land use alternative reflects considerable shifts in regional growth to existing employment and housing centers, areas projected to have either household or employment growth, and areas with existing and/or planned transit. The alternative scenario also assumes fewer in-commuters from neighboring regions by accommodating approximately 37,000 more households within the Bay Area. The emissions reductions estimated as a part of the travel forecasts are interpolated for year 2012 from 2010 and 2015 estimates. ABAG's alternative growth forecast is a good proxy to examine transportation impacts from land use changes; however, the provisions described in this TCM are not expected to result in the precise population/employment distribution used for this analysis. Because the alternative forecast houses an additional 37,000 households within the Bay Area, additional air quality benefits are anticipated from households that would otherwise have located in the Central Valley, but work in the Bay Area. However, because these forecasts are at a regional level, the additional benefits associated with housing this portion of the population regionally are not taken into account in this emissions reduction estimate.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$ 88 million

Phase 2: \$ TBD

Co-benefits:

- Reduced travel costs.
- Reduced greenhouse gases, particulate matter, and toxic air containments.
- Community enhancements through revitalized downtowns, transit centers, and other major activity nodes.
- Closer integration of transportation and land use.
- Increased access to jobs, services, and stores.
- Improved public health by reduced driving and increased walking and biking.

Monitoring Mechanisms:

- Track funds awarded to and completion of station area plans, TLC projects, projects within PDAs, and TFCA and other grant dollars spent to support and promote land use patterns, policies, and infrastructure investments that support higher density mixed-use, residential and employment development near transit.

Issues/Impediments:

Land use changes and new development occur slowly and are directly regulated by local jurisdictions, not regional agencies. In addition, higher density development can raise neighborhood concern over impacts on traffic, parking, localized air pollution, and other impacts. However, FOCUS, TLC, and MTC's TOD Policy all provide incentives that help overcome some of these challenges. In addition, as Senate Bill 375 implementation begins, CEQA-relief incentives for projects consistent with the region's land use strategy to reduce greenhouse gas reductions may also reduce both the time and costs associated with this type of development.

Sources:

1. MTC's Transportation 2035 Plan and Travel Forecasts Data Summary:
http://www.mtc.ca.gov/planning/2035_plan/
2. FOCUS: <http://www.bayareavision.org/>
3. Station Area Residents Survey (STARS) Report (September 2006)
http://www.mtc.ca.gov/planning/smart_growth/stars/index.htm.
4. National Research Council. "Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions," (August 2009).

TCM E-1 - Value Pricing Strategies

Brief Summary:

TCM E-1 will pursue implementation of value pricing strategies such as tolling on trans-bay bridges and cordon pricing recommendations from San Francisco County's Mobility, Access, and Pricing Study.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx, by managing travel demand during congested conditions and improving regional bus service through value pricing on the Bay bridges and in San Francisco. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Value pricing (which is also known as congestion pricing) refers to varying road tolls wherein higher prices are set at congested times and locations and lower prices are set at less congested times and locations for purposes of reducing peak-period traffic volumes to optimal levels. Tolls can vary based on a fixed schedule, or they can be dynamic, meaning that rates change depending on the level of congestion that exists at a particular time. Value pricing serves as a demand management strategy on existing roadways to avoid the need to add capacity. In addition, value pricing can raise needed revenues for a wide-range of transportation improvements, including public transit.

The Federal Highway Administration's (FHWA) Value Pricing Pilot (VPP) program, which was initially authorized in the Intermodal Surface Transportation Efficiency Act (ISTEA) and most recently renewed under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), encourages implementation and evaluation of value pricing pilot projects to manage congestion on highways through tolling and other pricing mechanisms. Three Bay Area transportation agencies have received VPP funding to study value pricing, including area road charging and parking pricing in San Francisco, express lanes on I-580 and I-680 in Alameda County, and pricing strategies in Santa Clara County.

The San Francisco County Transportation Authority (SFCTA) is currently conducting a Mobility, Access, and Pricing Study (MAPS) to examine the feasibility of value pricing in San Francisco, following receipt of a \$1 million VPP study grant from the FHWA. Refined pricing scenarios under evaluation include combining fees on gateway crossings with additional fees on downtown cordon and fees on crossings in the northeast corner of

San Francisco. The SFCTA expects to present the final study recommendations in winter 2010.

MTC is pursuing legislation in the 2009 and 2010 state sessions via AB 744 (Torrico) to authorize a Bay Area Express Lane Network to deliver congestion relief and public transit funding. Because of this, the HOV (high occupancy vehicle) occupancy requirements on Bay Area bridges must be made consistent with HOV occupancy requirements on adjacent freeways so that the region's bridges and express lane network form a unified system (see TCM B-3).

In January 2010, the Bay Area Toll Authority (BATA) increased the toll on the seven state-owned toll bridges in the Bay Area to pay for the completion of the Toll Bridge Seismic Retrofit Program. This toll increase included value pricing on the Bay Bridge, where motorists would pay \$6 toll during peak hours, \$4 toll during non-peak hours, and \$5 toll on weekends. The toll increases will go into effect on July 1, 2010. BATA staff will evaluate the value pricing on the Bay Bridge and provide a report to the BATA Oversight Committee on an annual basis after value pricing is implemented.

Implementation Actions:

Phase 1 (2012)

- MTC will assist SFCTA in implementing recommendations of the Mobility, Access, and Pricing Study in San Francisco (if applicable and feasible).

Phase 2 (2020)

- MTC will consider time-of-day pricing on trans-Bay bridges as a part of future bridge toll increases. If the value pricing on the Bay Bridge is successful, value pricing may be considered for application to other bridges in the region, if feasible.
- MTC will continue to assist SFCTA in implementing recommendations of the Mobility, Access, and Pricing Study in San Francisco (if applicable and feasible).

Supporting Actions by Partner Entities:

- Local governments, CMAs and transit agencies are encouraged to partner with MTC to implement value pricing.
- SFCTA will implement recommendations of the Mobility, Access, and Pricing Study in San Francisco (if applicable and feasible).

Emission Reduction:

<u>Pollutants (tons per day)</u>	<u>2012</u>
NO _x	0.02
CO ₂	9.68
CO ₂ -e	9.87

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: PM10, PM2.5 and NH3 (ammonia).

Emission reduction estimates for year 2020 will be determined at a later date, depending upon whether value pricing is extended to include other trans-Bay bridges.

Emission Reduction Methodology:

The emissions reduction methodology is based on the 2009 study, “San Francisco-Oakland Bay Bridge Congestion Pricing – Phase 1” prepared for the Bay Area Toll Authority. This analysis examines the effect of congestion pricing on traffic demand, mode shift and time-of-day shift.

The study determines that the most likely scenario is a 4.7% mode shift from single occupancy travel to other modes, during both the AM and PM peak periods, resulting in the emission reductions reported above.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$26 million per year

Phase 2: TBD.

The cost of \$26 million per year is based on the estimated number of vehicles that will pay the additional \$2 per vehicle congestion surcharge during AM & PM peak periods on weekdays.

Co-benefits:

- Generation of new funds for multi-modal transportation improvements.
- Travel time savings.

Monitoring Mechanisms:

- Track whether new legislative authority is granted SFCTA to implement its MAPS strategies.
- Track implementation status of SFCTA’s MAPS strategies.

Issues/Impediments:

There is mixed public opinion regarding value pricing, with concerns about the impact on existing carpoolers, potential environmental impacts, the use of net revenues, and charging for the use of the highway and bridges.

Sources:

1. FHWA’s Value Pricing Program,
http://ops.fhwa.dot.gov/tolling_pricing/value_pricing/index.htm

2. San Francisco County Transportation Authority: www.sfmobility.org
3. BATA:
http://apps.mtc.ca.gov/meeting_packet_documents/agenda_1433/5a_tollincreaser_ecommendationmemo.pdf
4. Cambridge Systematics. "San Francisco-Oakland Bay Bridge Congestion Pricing – Phase 1 Final Report." October 7, 2009.

TCM E-2 - Promote Parking Policies to Reduce Motor Vehicle Travel

Brief Summary:

Parking policies and practices have a profound impact on vehicle travel and mode choice, as well as land use patterns and the quality of the built environment. Parking policies are also an important tool in implementing focused growth strategies. This control measure outlines how the Air District, in cooperation with its regional agency partners, will 1) take actions at the regional level to implement parking policies that will benefit air quality, and 2) encourage and support local agency parking policies to reduce motor vehicle travel and promote focused growth.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NO_x by implementing parking policies that support in-fill and transit-oriented development and reduce vehicles miles traveled and vehicle emissions through increased transit use, walking and bicycling. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Local governments have traditionally implemented parking policies that provide plentiful parking. Although “free” parking is often provided, there are both direct and indirect costs associated with all parking. Parking policies and zoning codes that promote an oversupply of parking contribute to sprawl-like growth and undermine infill and transit-oriented development.

Promoting parking policy reform will require political leadership in combination with technical assistance, resources, and incentives and disincentives. Cities and counties have direct authority over parking policies. However, regional agencies can assist local governments by providing technical resources, recommending best practices, and leading by example in adopting internal and external policies.

Many cities base their minimum parking requirements on guidelines in the *Parking Generation* manual published by the Institute of Transportation Engineers with little consideration to the location of the land use. The recommended parking ratios in the guidelines are geared toward meeting peak demand for parking in single-use suburban locations with little transit access. Applying these same parking guidelines to more dense, mixed-use areas well served by transit leads to an oversupply of parking, which in turn serves as a disincentive for people to choose other transportation modes over

private vehicles.

An oversupply of parking and ineffective parking management policies creates a number of adverse impacts. For example, parking in dense areas requires using high-value land for parking lots and structures. The high cost of land and construction to build parking drives up development costs. Construction costs for structured parking can range from \$30,000 to \$60,000 per parking spot. These costs are typically hidden in purchase prices and rents. This exacerbates the shortfall of affordable housing in the Bay Area, creates obstacles to transit-oriented development, and reduces the land available for other uses.

Second, parking supply and the quality of design both influence streetscapes and walkability. For example, the pedestrian friendliness of a commercial main street compared to a strip mall depends in part on parking design. In a typical big box strip mall, large stores are surrounded by sprawling parking lots and people tend to drive and re-park from store to store rather than walk. In contrast, a commercial main street with street parking, or parking behind stores, creates a more pedestrian-friendly environment where people are more likely to park once and walk from store to store. Areas where stores are oriented to the street and parking does not dominate the streetscape are also more accessible to bicyclists, and helps reduce motor vehicle travel.

Paved parking areas also contribute to local urban heat island effects, which raises local temperatures. Higher temperatures lead to higher levels of ozone and particulate matter, increase energy use for cooling, and can create health risks for sensitive populations. Paved, impermeable parking surfaces also add to water quality problems including storm water pollution run-off, flooding vulnerability, and reduced groundwater recharge.

Effective parking management can encourage alternative transportation modes, support carpooling and car-sharing, and improve vehicle travel efficiency, thus reducing vehicle miles traveled and emissions. Best practice parking policies and strategies include:

- Coordinated parking policies within jurisdictions and on a regional scale
- Coordinated parking pricing that encourages shorter-term curbside parking and longer-term off-street parking
- Parking design guidelines to promote walkability
- Unbundled parking from residential and commercial rents
- Parking cash-out by employers
- Parking technologies such as real-time parking information and parking payment devices
- Parking financing such as a parking tax or fee and incentives or rebates
- Parking assessment districts
- Reduced parking requirements in coordination with requirements for transit passes and other transportation demand management strategies (TDMs), such as shuttles, for new developments and/or implementation of parking maximums

- Shared parking between land uses with different patterns of demand

Donald Shoup's book, *The High Cost of Free Parking* describes the consequences of non-market rate parking pricing and strategies to reform parking policy in much greater detail.

Examples of effective parking policies can be found in Bay Area cities. The San Francisco Metropolitan Transportation Agency (SFMTA) is implementing SFPark, a variable rate parking pricing strategy to effectively manage curbside, lot, and structured parking spaces. The variable rate will be determined by location, time of day, and day of week. This project is funded through a U.S. Department of Transportation program grant. Prices will be adjusted to direct short-term parking to street parking and longer-term parking to lots and garages.

The City of Redwood City adopted a downtown parking plan and a parking ordinance to allow for periodic adjustment of downtown meter rates. Rates are based on achieving a parking utilization rate of 85 percent.

A number of local governments have reduced parking requirements for new development in conjunction with TDMs, including the cities of San Jose, Berkeley, and San Mateo.

MTC has provided technical information on parking to local agencies. In 2007, MTC conducted a parking policy study with the purpose of developing best practices and modeling tools. The study resulted in several key products including:

- Toolbox/handbook for parking best practices and strategies that support transit oriented development for local governments.
- Parking demand model that can be customized for local conditions.
- Detailed case studies of parking policies for 10 Bay Area cities.
- Parking training seminar for local governments hosted by MTC.

The Joint Policy Committee (JPC) has identified regional parking policies as a priority area in its climate action strategy. MTC, in leading this effort, is preparing a report, "Regional Parking Strategies for Climate Protection," to outline a set of regional parking reform strategies and actions to reduce greenhouse gas emissions. The JPC is in the process of developing regional parking policies. Strategies may include: leading by example, incorporating parking policies into current and conditions for forthcoming regional grants to local jurisdictions (e.g. TLC, Climate Change, Station Area Plans) with regional monitoring, engaging congestion management agencies as partners for climate protection, using or extending existing regulations to parking, conditioning distribution of regional discretionary transportation funding to local jurisdictions on implementation of specified parking management policies/practices, funding parking programs with a regional gas tax, and advocating for elimination of federal tax subsidy for employee parking.

Implementation Actions:

Phase 1 (2012)

- Regional agencies will participate in the Joint Policy Committee (JPC) consideration and adoption of regional parking strategies.
- Regional parking strategies will consider using parking fees to improve transit and other alternative modes of travel, such as biking and walking.

MTC will:

- Provide technical assistance to local jurisdictions such as consultant assistance for individual cities through the TOD Technical Assistance Program (TOD TAP) and offering best practices workshops
- Develop Transportation 2035 Climate Change guidelines regarding capital support for innovative parking strategies.
- Incorporate parking issues into the broader public outreach program for climate action.
- Continue support for State and Federal bills to reduce subsidies for parking.
- Support other BAAQMD efforts described below as relevant and feasible.

BAAQMD will:

- Work with partners to explore ways to provide financial incentives to cities and counties to implement parking policies.
- Work with partners to consider the air quality impacts associated with free parking as part of the District's Indirect Source Review (ISR) Rule development. The District is currently developing an ISR and anticipates rule adoption in 2011. Parking supply and policies may be considered as performance standards in the ISR development.
- Identify appropriate grant opportunities that can be applied to implementing parking policies.
- Make implementation of such policies a condition for receiving certain funds that are awarded at the regional agencies' discretion.
- Integrate parking best practices into the update of its guidelines for evaluating air quality impacts in CEQA analyses. The District's CEQA Guidelines are currently being updated and are scheduled to be adopted in 2010. Parking best practices will be included in the guidance document as recommended mitigation measures. In addition, in providing comment on CEQA analyses to lead agencies, the Air District recommends for cities to include parking best practices as a condition of project approval.
- Highlight parking best practices in its best practices web portal. The District has partnered with the Institute for Local Government to develop a best practices web portal to serve as an information clearinghouse for Bay Area local governments seeking to implement climate protection actions.
- Working with partners, will consider funding a parking technology demonstration projects. Demonstration projects may include providing real-time parking information, pay-by-phone parking, a parking hotline program where people call in

advance for automated information on available parking, or related car-sharing or bike-sharing technology project. The goal would be to better understand the potential for these projects to create mode shifts and therefore reduce emissions.

- With its partners promote implementation of parking cash-out programs and advocate for legislation to strengthen and expand the reach of the California parking cash-out law enacted in 1992, including advocating appropriate legislative actions to improve the parking cash-out program, such as identifying potential financial incentives for parking cash-out programs, and recommending that parking cash-out programs be required as a condition of approval in environmental review processes.

ABAG will:

- Integrating parking best practices into its FOCUS program, through technical assistance and other resources provided to local governments.
- ABAG and MTC to administer Station Area Planning grants to FOCUS Priority Development Areas and Resolution 3434 stations that encourage adoption of TOD-oriented parking management strategies in final area plans.

Phase 2 (2020)

- MTC, BAAQMD, and ABAG will continue Phase 1 actions.

Supporting Actions by Partner Entities:

- SFMTA will implement SFpark.
- Local agencies are encouraged to adopt innovative parking strategies, including:
 - Eliminate or reduce minimum parking requirements.
 - Limit the supply of off-street parking in transit-oriented areas.
 - Encourage developers and property owners to unbundle the price of parking spaces from rents and purchase prices.
 - Promote shared parking by different users.
 - Implement market-rate pricing for off-street parking and consider residential permit programs to alleviate spillover concerns.
 - Implement performance-based pricing for curb parking in high-use areas.
 - Implement parking assessment districts that use revenue from street parking to fund pedestrian and streetscape improvements.
 - Adopt design guidelines and policies to minimize surface area for parking.
 - Implement car-sharing and bike-sharing programs in appropriate locations in exchange for reduced parking requirements, and provide as a benefit to renters.
 - Encourage a coordinated parking policy approach among jurisdictions to minimize spillover to other jurisdictions and fears of unfair competition.

Employer-Based Actions:

- Employers, in partnership with regional agencies and in particular BAAQMD, can work to reduce motor vehicle travel by promoting and implementing parking cash-out programs.
- Business groups can work with regional partners to encourage employers to

voluntarily implement parking cash out programs, and/or develop other parking best practices.

Emission Reduction:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.18	0.16
NO _x	0.19	0.16
PM _{2.5}	0.02	0.03
PM ₁₀	0.02	0.05
Ammonia (NH ₃)	0.05	0.15
CO ₂	288.00	553.00
CO ₂ -e	294.00	564.06

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

This measure encompasses a wide range of potential actions by various regional and local agencies, to promote parking policies to reduce motor vehicle travel. The specific combination of strategies and actions that will be implemented has not yet been determined, so the potential emission reductions for this measure cannot be predicted with any degree of confidence as yet. For purposes of estimating potential emission reductions from parking measures we have analyzed the potential emission reductions that might be achieved if parking fees were to be imposed at Bay Area worksites. However, it should be emphasized that employer parking fees are not proposed as part of this measure. Rather, this is used as an example for purposes of estimating potential emission reductions, because analysis of employer parking fees was previously performed and therefore available.

The employee parking fee emission reduction methodology uses empirical findings that support a relationship between employee parking prices and vehicle work trip rates for the Bay Area (Harvey and Deakin, 1997). This data suggests that a \$3.18 employee parking fee will result in a 1.65% decline in vehicle work trips. Based on Transportation 2035 Travel Forecast data, BAAQMD estimated that this charge has the potential to eliminate approximately 62,400 vehicle trips in 2012, and approximately 120,600 vehicle trips in 2020.

This analysis does not take into account that funds raised by parking pricing can be re-invested into the transportation system to improve access to transit and other alternative modes of travel, such as bicycle and pedestrian travel to further promote transit use.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$1.4 billion/year. If a fee as described above were imposed on all employer-provided parking in the region, this would result in costs of approximately \$1.4 billion to employees who continue to park in employer-provided lots. However, as noted above, such a fee is not proposed as part of this measure.

Phase 2: \$1.4 billion/year

Co-benefits:

- Generation of parking revenues.
- Improved housing affordability.
- Conservation of energy.
- Improved water quality / reduced storm water run-off.
- Promotion of more efficient use of land.
- Increased transit ridership, walking, and cycling.
- Enhanced community design and quality of life.
- Cost savings to those providing parking cash-out program.
- Reduced cruising and associated congestion and vehicle emissions.
- Reduced health risks from vehicle emissions and enhanced walkability.
- Potential to use any revenue generated by parking fees to fund improvements to transit and other alternative modes of travel.

Monitoring Mechanisms:

- A panel of academic researchers, including Donald Shoup, will conduct a program evaluation of SFpark.
- MTC will track legislative actions related to parking policies.

Issues/Impediments:

Local government parking reform can be impeded by limited resources and technical expertise, especially in small municipalities. These jurisdictions can seek technical assistance from MTC. Technical assistance may include: training seminars, sharing of best practices across municipalities, and development of outreach and education materials for developers and the public.

Parking policies are a highly political issue on the local level. Local governments may be reluctant to adopt parking reforms due to lack of political will; fear that businesses will protest; fear that their city will be at a disadvantage with competitors in neighboring cities without similar parking reforms; and concern that the process will be stalled due

to protests from businesses and residents. Since parking costs are often hidden in rents and purchases, residents may not understand the basis or need for parking reform.

Local governments develop local parking policies based upon local needs and priorities. Willingness to implement policies consistent with regional parking policies will vary among these entities.

Sources:

1. MTC Parking Study including presentations and resource documents:
http://www.mtc.ca.gov/planning/smart_growth/parking_study.htm
2. MTC Regional Parking Strategies for Climate Protection by Nelson\Nygaard Consulting Associates, May 2009
3. SFMTA's SFpark program: <http://www.sfmta.com/cms/psfpark/sfparkindx.htm>
4. Shoup, Donald. *The High Cost of Free Parking*. Washington D.C.: APA Planners Press, 2005.

TCM E-3 - Implement Transportation Pricing Reform

Brief Summary:

Motor vehicle travel imposes a variety of costs on society, including air pollution, that are not fully reflected in the price that drivers currently pay to own and operate a vehicle. Transportation pricing strategies can provide a powerful mechanism to reduce motor vehicle travel, traffic congestion, and tailpipe emissions of criteria pollutants and greenhouse gases. This control measure proposes that the Air District and its regional agency partners collaborate to develop and implement a regional transportation pricing policy strategy.

Purpose:

This measure will reduce emissions of the key ozone precursors, ROG and NOx by implementing transportation pricing policies in the Bay Area through establishment of a regional pricing task force to evaluate transportation pricing policy options and coordinated implementation of a regional transportation pricing strategy. In addition, the measure will reduce emissions of particulate matter, air toxics and greenhouse gases.

Travel Market Affected:

This measure would affect all intraregional travel, including commute travel; shopping, personal business, social and recreational travel; passenger and commute trips to airports; and school trips.

Regulatory Context and Background:

Transportation pricing, if well conceived and implemented, can help to achieve some or all of the following objectives:

- Reduce total vehicle trips and VMT.
- Reduce traffic congestion.
- Reduce emissions of criteria pollutants and greenhouse gases.
- Generate revenues that can be used for a variety of purposes, including support for public transit and alternative modes of transportation.
- Increase use of alternative transportation modes, such as transit, rideshare, walking and biking.

In its Transportation 2035 (T2035) Plan adopted in April 2009, MTC highlighted the importance of transportation pricing to help achieve the performance objectives defined in the Plan.

Transportation pricing mechanisms that may be available at the regional or local level include:

- High-occupancy toll (HOT) lanes – see TCM B-3.
- Value pricing, including variable bridge tolls, congestion pricing of roadways, or zone

- pricing (e.g. downtown tolls) – see TCM E-1.
- Parking pricing – see TCM E-2.
 - Gas tax or fee: This could include imposing a gasoline tax or fee at the regional level (MTC has existing authority to place a regional gas tax measure on the ballot in Bay Area), and/or helping to build support for higher gas taxes at the state and federal levels.
 - Diesel tax or fee: Revenues from higher diesel fuel taxes could be used to reduce NOx and particulate matter emissions from older heavy duty diesel trucks, which may stay on the road for many years due to the durability of their engines. Funds could go to help offset the cost of purchasing new vehicles, repowering existing vehicles with cleaner engines, or retrofitting trucks with aftermarket devices that significantly reduce NOx and particulate matter.
 - VMT fee: As an alternative to gas or diesel taxes, a fee could be levied based on vehicles miles traveled, i.e., the annual miles that a vehicle is driven.
 - Pay-as-you-drive vehicle insurance: Pay-as-you-drive insurance premiums would be more sensitive to the number of miles an individual drives, thereby offering vehicle owners an incentive to cut back on miles driven.
 - Emission-based vehicle registration fees: Vehicle registration fees could be used to influence the purchase choices of new vehicles. Annual fees would be based on vehicle emission characteristics and the amount of annual driving that is conducted (which would be assessed at the time the vehicle undergoes a Smog Check). The fees would be used in turn to pay for various air quality programs, such as Voluntary Accelerated Vehicle Retirement programs (VAVR), fixing emission controls on mid-aged vehicles, incentives to tune up vehicles prior to the next smog season, financial assistance to low income families that would face hardships with costly tune-ups, and other programs.
 - Feebates: Feebates, incentives for purchasing fuel efficient vehicles, could be offered to consumers for choosing fuel efficient vehicles over other vehicles. Funding from feebates could come from the emission-based vehicle registration fee noted above.

Implementing transportation pricing policies will require political leadership, public support, and coordination among the Bay Area’s regional agencies and local jurisdictions. Although the potential benefits of transportation pricing are significant, there are major obstacles as well. The technical means are available to implement several value pricing strategies; the constraints are primarily political. The universe of potential pricing mechanisms is well defined, and pricing measures have been included in Bay Area air quality plans since 1991. The real challenge is how to develop and execute a clear strategy to implement transportation pricing in the Bay Area.

Transportation pricing policies must identify and address equity concerns, specifically those that disproportionately affect low-income drivers and impacted communities. These concerns should be addressed early in the development process. Effective pricing modeling, measures to minimize disproportionate impacts, public outreach, and

monitoring of pricing policies equity issues should be incorporated into pricing strategies.

Implementation Actions:

The Air District and MTC will collaborate with their regional agency partners under the auspices of the Joint Policy Committee to establish a regional transportation pricing task force. The task force will be charged with:

- Developing a public engagement and input process, and coordinating with key stakeholders.
- Defining goals and outcomes.
- Developing evaluation criteria based upon those goals.
- Analyzing the various pricing options based upon the criteria.
- Identifying and advocating for any necessary enabling legislation.
- Recommending a regional transportation pricing strategy and an action plan to implement the strategy, including policies regarding reinvesting transportation fees to improve transit service and other alternative modes, such as biking and walking.

A regional transportation pricing strategy can help to feed into and inform the Sustainable Communities Strategy that will be developed as part of the next update of the Regional Transportation Plan in 2013.

Supporting Actions by Partner Entities:

Local governments, businesses, insurance providers, and other public and private entities are encouraged to develop and implement policies to ensure that user costs to own and operate motor vehicles reflect the full environmental and social costs related to vehicle use. This can be pursued via value pricing of the roadway network (see TCM E-1), parking policies (see TCM E-2), and other pricing measures, such as those described in the “Background” section above.

Emission Reductions:

<u>Pollutants (tons per day)</u>	<u>2012</u>	<u>2020</u>
ROG	0.12	0.06
NO _x	0.12	0.06
PM _{2.5}	0.01	0.01
PM ₁₀	0.02	0.02
Ammonia (NH ₃)	0.07	0.07
CO ₂	184.00	200.00
CO ₂ -e	188.00	204.00

In addition to the pollutants shown above, this measure will reduce emissions of the following pollutants by less than 0.01 tons per day: benzene, 1,3 butadiene, formaldehyde, and acetaldehyde.

Emission Reduction Methodology:

This measure describes a variety of potential pricing policies and strategies to reduce motor vehicle emissions. The specific combination of strategies and actions that will be endorsed by the proposed regional transportation pricing task force cannot be predicted with any degree of confidence at this time. For purposes of estimating potential emission reductions from this measure, we have analyzed the potential emission reductions that might be achieved by means of a regional gas tax increase, as described below. We use the regional gas tax as an example because studies have been performed that demonstrate the relationship between higher gas fees and a reduction in vehicle trips and therefore vehicle miles traveled. However, it should be emphasized that such a fee is only one pricing option that may be evaluated by a regional task force and is not explicitly being proposed as part of this measure; rather, it is provided here as an example to illustrate the potential impact of pricing measures in reducing motor vehicle travel and emissions.

The regional gas tax emission reduction methodology uses empirical findings that support a relationship between a gasoline tax increase and decreased trip rates (US EPA). This data suggests that a 1% increase in tax would result in a 0.9% decrease in vehicle trips. At a cost of \$3.01 a gallon, an increase of \$0.30 per gallon was assumed. This is a 10% increase in tax.

Based on Transportation 2035 Travel Forecast data, we estimate that this charge has the potential to eliminate approximately 127,100 vehicle trips in 2012, and approximately 138,300 vehicle trips in 2020. The vehicle trips eliminated include work and non-work trips and it is assumed that 25% percent would be work trips, and 75% percent would be non-work trips. Based on these assumptions, the number of miles and emissions reduced was then estimated.

This analysis does not take into account that funds raised by a gasoline tax can be re-invested into the transportation system to improve access to transit and other alternative modes of travel, such as bicycle and pedestrian travel.

Exposure Reduction:

This measure will reduce region-wide population exposure to air pollutants based on the estimated reduction in emissions.

Emission Reduction Trade-offs:

None identified.

Cost:

Phase 1: \$470 million/year. If gas taxes were increased by \$0.30 per gallon as described above, this would result in costs of approximately \$470 million per year to Bay Area residents, based on current gasoline consumption data. However, as noted above, such a fee is not proposed as part of this measure.

Phase 2: \$500 million/year

Co-benefits:

- Generate revenues that could be invested in supporting transit, other alternative modes of travel, and transit-oriented development.
- Increase transit ridership, walking, and cycling.
- Reduce health risks from vehicle emissions and enhanced walk-ability.

Monitoring Mechanisms:

Progress will be monitored by tracking the progress and outcomes of the Regional Pricing Task Force. An initial work product of the Task Force will be to identify milestones and schedule for their process.

Issues/Impediments:

Transportation pricing reform may be controversial. Any proposal will need to consider equity impacts.

Sources:

1. ICLEI, January 2006. Changing the Pricing Signal. <http://www.iclei.org/>
2. Victoria Transport Policy Institute, <http://www.vtppi.org/>
3. Rand Corporation, 2009. "Equity and Congestion Pricing." http://www.rand.org/pubs/technical_reports/TR680/.
4. U.S. Environmental Protection Agency, "Technical Methods for Analyzing Pricing Measures to Reduce Transportation Emissions," Table 2.2. August 1998. <http://www.epa.gov/OMS/stateresources/policy/transp/tcms/anpricng.pdf>