

Bay Area 2005 Ozone Strategy



Volume II

DRAFT
September 2005



METROPOLITAN
TRANSPORTATION
COMMISSION



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT



Association
of Bay Area
Governments

BAY AREA
2005 OZONE STRATEGY

**APPENDIX C - STATIONARY AND MOBILE
SOURCE MEASURE DESCRIPTIONS**

DRAFT

SEPTEMBER 2005



**BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT**

939 Ellis Street
San Francisco, CA 94109
(415) 771.6000
www.baaqmd.gov

APPENDIX C - STATIONARY AND MOBILE SOURCE CONTROL MEASURE DESCRIPTIONS

TABLE OF CONTENTS

Stationary Source Control Measures

Control Measure SS 1: AUTO REFINISHING.....	C - 3
Control Measure SS 2: GRAPHIC ARTS OPERATIONS	C - 6
Control Measure SS 3: HIGH EMITTING SPRAY BOOTHS	C - 9
Control Measure SS 4: POLYESTER RESIN OPERATIONS.....	C-12
Control Measure SS 5: WOOD PRODUCTS COATING.....	C-14
Control Measure SS 6: FLARES.....	C-17
Control Measure SS 7: GASOLINE BULK TERMINALS AND PLANTS.....	C-20
Control Measure SS 8: MARINE LOADING OPERATIONS	C-23
Control Measure SS 9: ORGANIC LIQUID STORAGE TANKS	C-26
Control Measure SS 10: PRESSURE RELIEF DEVICES AND BLOWDOWN SYSTEMS.....	C-29
Control Measure SS 11: WASTEWATER SYSTEMS.....	C-32
Control Measure SS 12: INDUSTRIAL, INSTITUTIONAL AND COMMERCIAL BOILERS	C-34
Control Measure SS 13: LARGE WATER HEATERS AND SMALL BOILERS.....	C-38
Control Measure SS 14: STATIONARY GAS TURBINES	C-42
Control Measure SS 15: PROMOTE ENERGY CONSERVATION.....	C-45

Mobile Source Control Measures

Control Measure MS 1: DIESEL EQUIPMENT IDLING ORDINANCE	C-48
Control Measure MS 2: GREEN CONTRACTING	C-51
Control Measure MS 3: LOW-EMISSION VEHICLE INCENTIVES	C-53
Control Measure MS 4: VEHICLE BUY BACK PROGRAM	C-56

CONTROL MEASURE SS 1: AUTO REFINISHING

Control Measure Description

This control measure would reduce ROG emissions from automobile refinishing facilities through lower VOC limits for some categories of coatings based on the comparable South Coast Rule 1151.

Background and Regulatory History

The Air District regulates ROG emissions from auto refinish operations by setting volatile organic compound (VOC) limits on various types of paints and surface preparation solvents used in auto refinishing. In addition, the amount of some high-VOC coating is limited by a volume relationship with other coatings. This prevents “gaming” by using high-VOC coatings for general, rather than specialized purposes. Also, the rule requires the use of spray technology that is transfer efficient, to minimize the amount of paint that misses or bounces off the intended surface.

Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations, which includes auto refinishing and new and used mobile equipment coating, was adopted in 1989. Auto refinish facilities were previously subject to the less stringent standards in Regulation 8, Rule 4: General Solvent and Surface Coating Operations, which limits facility emissions but not the VOC content of paints. The rule was also amended several times, most significantly in 1994. The emissions from auto refinishing operations (both coating and solvent) have been reduced from over 11 tons per day prior to the implementation of Rule 45 to approximately 3.3 tons per day today.

Emissions Subject to Control

The emissions from auto refinishing are included in the emission inventory as point sources. Any coating operation that uses 30 gallons of coating and solvent per year is required to have an Air District operating permit, and must submit usage information annually from which emissions are calculated. Auto refinish coating emissions are *Category 274* in the emissions inventory. *Category 275* is solvent used for surface preparation and clean up in auto refinishing and mobile coating operations.

Year	<i>Emissions Subject to Control (TPD, Summer)</i>	
	<i>Cat. 274</i>	<i>Cat. 275</i>
2003	2.12	1.21
2006	2.21	1.26

Proposed Method of Control

This proposal draws from two sources, South Coast Rule 1151: Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations, and a draft suggested control measure currently being developed by CARB staff that recommends 1) combining separate categories for automobiles and mobile equipment, 2) elimination of the averaging provision for compliance with VOC limits for multistage topcoats, 3)

combining other coating categories, 4) replacing the specialty coatings category with specific coatings with appropriate VOC limits, and 5) reducing VOC coating limits in a number of coating categories. In addition, the suggested control measure proposes a 25 g/l VOC limit on solvent surface preparation and cleaning operations, based on the South Coast rule.

Adoption of the South Coast limits was proposed for the 2000 Clean Air Plan and evaluated in the 2001 Ozone Plan for the One Hour Federal Standard RACM Analysis. At that time, an analysis of the lower South Coast limit for clear coatings showed a cost effectiveness of \$35,000 per ton. However, as costs have come down since that analysis, the potential to reduce emissions at a reasonable cost should be re-examined.

Automobiles (motor vehicles) and mobile equipment (public transit buses, trains, bulldozers, golf carts, street cleaners, etc.) are subject to different sets of VOC limits, the more stringent for mobile equipment. Based on the suggested control measure, these would be combined and given VOC limits that would, overall, be more stringent. For multistage topcoats, the individual coatings consist of base coat (or color coat), and clear coat. Although there are often a number of base coats of varying translucency, the base coat/clear coat application form a coating system. Currently, Bay Area Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations, allows averaging of VOC contents of the coatings in the system based on specified formulae for the number of layers of coating used. The VOC limit would be replaced by VOC limits for each type (or layer) of coating. Other coating categories, specifically in the primer stage, would be eliminated. Rule 45 currently has separate VOC limits for pretreatment wash primer, primer, precoat, and primer-sealer. The category specialty coating is proposed to be eliminated. Specialty coating is a catch-all category for typically minor use coating that does not fit within the iterated categories. It would be eliminated and replaced with two categories of coating, antiglare (safety) coating, and uniform finish coating. Both of these categories would have VOC limits significantly lower than the existing limit for specialty coatings, 840 g/l, but the existing rule constrains use of these coatings on a volume basis whereas the draft suggested rule does not. Also, some coatings would have a lower VOC limit. These, primarily topcoat and clearcoat, would make up the bulk of the emissions reduction. Finally, Rule 45 currently has an VOC limit for surface preparation solvent of 72 g/l, except for plastic parts. The proposal would set a VOC limit for all surface preparation and clean-up of 25 g/l.

Currently, staff of the Stationary Source Division of CARB have developed a draft suggested control measure in the form of a rule and have discussed it at public workshops on June 28, 2005 and June 30, 2005. CARB staff is waiting for more information from industry on a variety of topics related to the draft. CARB staff expects to present a proposal to their Board in Fall 2005. Because the auto refinish industry varies little between districts, coordination of statewide efforts is desirable.

Emission Reductions Expected

The emission reduction estimates consider only the implementation of a requirement to use high solids, low VOC clear topcoat. Additional reductions may be possible from the elimination of coating categories, however, they cannot be quantified at this time. Furthermore, a reduction in the emissions from associated solvent surface preparation and clean up should be considered. The emissions from implementation of a low-VOC clear coat standard would result in emissions reductions of 33%, or 0.7 tons per day.

Costs of Control

The control costs are based on the cost to the finisher of a high solids low-VOC clear coat, resulting in a reduction in the basecoat/clearcoat coating system or a reduction in the VOC attainable in individual coating categories. Currently, the Bay Area rule allows most coating companies to sell clear coat that has about 420 grams/liter VOC content (3.5 lbs/gal). There is also clear coat available at 250 – 265 g/l VOC content, used sometimes with higher VOC base coats to comply with the average VOC standard for basecoat/clearcoat systems. Due to increased production of low VOC clear coats because of South Coast Rule 1151 that mandates their use, the cost has come down since the 2000 investigation. High solids low-VOC clear coats are now available at lower cost than the conventional material used to meet Bay Area regulations, and the reducer or thinner used is also less expensive. Based on the clear coat alone, on which the emissions reductions are based, adoption of lower VOC standards could now save money. Some other elements of the rule could negate that cost savings, but the rule would still likely be cost effective.

Other Impacts

No significant adverse environmental impacts are expected as a result of the adoption of this control measure. The affected industry is already regulated and proposed changes in paint formulations will not be implemented in a way that will add to waste streams or impact other media.

References

South Coast Rule 1151: Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations, and staff report dated 12/11/98
2001 Ozone Plan for the One Hour Federal Standard RACM Analysis
Bay Area Regulation 8, Rule 45: Motor Vehicle and Mobile Equipment Coating Operations
CAPCOA Enforcement Managers' Automotive Coatings Model Rule, Final Draft, 7/19/02
e-mail communication with Barb Fry, ARB Stationary Source Division, 5/20/03
CARB workshop announcement, suggested control measure and summary, June, 2005

CONTROL MEASURE SS 2: GRAPHIC ARTS OPERATIONS

Control Measure Description

This control measure would reduce ROG emissions from printing operations by reducing the allowable VOC limit for flexographic ink used on porous substrates and by limiting the VOC content of clean up solvent used on flexographic presses.

Background and Regulatory History

The Air District regulates ROG emissions from graphic arts operations by setting volatile organic compound (VOC) limits on various types of inks and coating used in printing press operations. Also, fountain solutions used to wet image plates and solvents used to clean presses are limited by vapor pressure and/or VOC content. Regulation 8, Rule 20: Graphic Arts Printing and Coating Operations was first adopted in 1980. The initial rule was based on an EPA Control Techniques Guideline for rotogravure and flexographic presses. Amendments in 1984 established standards for both letterpress and lithographic printing, and subsequent amendments made the limits applicable to smaller facilities, lowered allowable VOC limits and implemented the Bay Area Stratospheric Ozone Policy. Approximately 1600 graphic art establishments operate in the Bay Area, ranging from small local printing operations to large newspaper, magazine, and packaging operations.

Emissions Subject to Control

The emissions from printing operations are included in the emission inventory. Any printing operation that uses 30 gallons of coating or ink and solvent per year is required to have an Air District operating permit, unless the materials have less than 1% VOC by weight. This exemption has been a driving force in the development of soy based lithographic printing inks that have less than 1% VOC. The emissions inventory lists categories for gravure printing, flexographic printing, letterpress printing, lithographic printing, silk screening and small in-house printing. The emissions that are the subject of this control measure are in category # 109 in the emissions inventory, which are all point sources.

Year	<i>Emissions Subject to Control (TPD, Summer)</i>	
	<i>Cat. 109 ink</i>	<i>Cat. 109 cleanup</i>
2003	0.36	0.06
2005	0.36	0.06

Proposed Method of Control

The CAPCOA All Feasible Measures review found the Sacramento Metropolitan Air Quality Management District (AQMD) and South Coast AQMD graphic arts rules to be the most stringent rules considered feasible. In the South Coast, graphic arts (printing) operations are controlled by Rule 1130: Graphic Arts. In Sacramento, graphic arts operations are controlled by Rule 410: Graphic Arts Operations. Bay Area graphic arts

operations are controlled by Regulation 8, Rule 20: Graphic Arts Printing and Coating Operations.

South Coast Rule 1130: Graphic Arts has one ink VOC limit that is more stringent than the Bay Area limit. Flexographic ink used on porous substrates are subject to a VOC limit of 225 grams/liter. All flexographic inks used in the Bay Area are subject to a VOC limit of 300 grams/liter.

Sacramento Rule 410: Graphic Arts, has no VOC limits for inks, coatings or adhesives that are more stringent than the VOC limits in Bay Area Rule 20. In fact, several ink VOC limits for screen printing are less stringent than Bay Area limits. However, the Sacramento rule does have a more stringent clean up limit for solvent used to clean flexographic presses. The clean up solvents limits in both rules are expressed in terms of VOC content or vapor pressure or both, depending on the type of printing press or press component being cleaned. The Sacramento limit for flexographic press clean up solvent is 100 grams VOC/liter and 3 mm Hg vapor pressure. The Bay Area limit is 810 grams VOC/liter and 21 mm Hg vapor pressure. However, the South Coast has even more stringent VOC limits for graphic arts equipment clean up. The South Coast has adopted stringent VOC limits that become effective on 7/1/2005 and has no limits on the vapor pressure of solvents. The South Coast limits for clean up do not go into effect unless a technology review in 2004 finds them feasible. Among the South Coast VOC limits for clean up solvents, a 25 grams VOC/liter limit is in effect (SCAQMD Rule 1171) currently for clean up solvent used on flexographic presses, more stringent than the Sacramento limit.

The CAPCOA All Feasible Measures review process does not consider future effective VOC limits that require a technology review to be feasible. The feasibility, however, changes as the limits become effective and technology becomes available. Consequently, this control measure only analyzes the potential emissions reductions from the 25 gram per liter VOC limit for flexographic clean up solvent and 225 gram per liter VOC limit for flexographic ink, although additional emission reduction opportunities from the source category may be discovered during the rule development process.

Emission Reductions Expected

The Bay Area inventory for flexographic printing shows 0.36 tons per day organic emissions from printing and 0.06 tons per day organic emissions from solvent clean-up operations. A reduction in the allowable VOC content of flexographic ink could yield a 25% reduction [$0.36 * (1 - 225/300) = 0.09$ tons per day]. A reduction in the allowable VOC content of the flexographic clean up solvent would yield 0.058 tons per day [$0.06 * (1 - 25/810)$]. Combined emissions reductions are 0.15 tons per day. The emission reductions may be less, however, as the South Coast clean up solvent limit only affects flexographic printing on porous substrates. Under Rule 1130, non-porous substrates, such as food packaging film, are allowed to use ink of 300 grams VOC/liter, which is the same as the Bay Area standard.

The potential emission reductions from this control measure appear to be greater than de minimis. In addition, the South Coast technical evaluation of lower VOC lithographic press clean up solvent, scheduled for 2004, may add to the potential emission reductions. The emissions from clean up solvent from litho presses in the Bay Area is currently 0.75 tons per day.

Costs of Control

Lower VOC flexographic ink is priced comparably with 300 g/l ink. Costs for lower VOC clean up solvent have yet to be determined.

Other Impacts

No significant adverse environmental impacts are expected as a result of the adoption of this control measure. The affected industry is already regulated and proposed changes in ink or cleaning solvent formulations will not be implemented in a way that will add to waste streams or impact other media.

References

Sacramento Metropolitan AQMD Rule 410: Graphic Arts
South Coast AQMD Rule 1130: Graphic Arts Operations, and staff report dated Sept., 1999
South Coast AQMD Rule 1171: Solvent Cleaning Operations
Telephone conversation, Gerald Boneto, California Printing Industries Council, 2/25/2004
Telephone conversation, Duke Nickoley, Flint Ink, 3/1/2004

CONTROL MEASURE SS 3: HIGH EMITTING SPRAY BOOTHS

Control Measure Description

This control measure would reduce ROG emissions from coating operations that emit in excess of 20 tons of emissions per year. It would require a reduction beyond the use of coatings that comply with existing Air District rules. Spray booths or enclosed coating operations could be abated to meet a standard based on a percent reduction requirement, or alternative lower emitting coating technology could be sought.

Background and Regulatory History

The Air District regulates industrial and commercial coating through industry or substrate specific rules. Due to the vast number of coating applications, fifteen of the fifty Air District organic compound rules affect these types of coating applications. Each rule sets specific volatile organic compound (VOC) content limits on various types of inks, coatings or adhesives, although the option exists in each rule to meet the VOC limits by the use of add on control technology. In addition, Regulation 2, Rule 2: New Source Review, requires the use of Best Available Control Technology (BACT) for new or modified sources that emit more than 10 pounds of organic compounds per day. For larger coating sources, BACT has required installation of abatement technology. Consequently, some of the sources that would be subject to this control measure would already meet the mandates for additional control. The South Coast has already implemented this control measure. Rule 1132: Further Control of VOC Emissions from High Emitting Spray Booth Facilities, is derived from the South Coast's 1999 AQMP, control measure CTS-09. Rule 1132 requires coating facilities that emit 20 tons of VOC per year from spray booths to reduce emissions by 65% from a 2001 baseline, primarily through the installation of abatement equipment, although alternative compliance options exist.

Emissions Subject to Control

There are 12 facilities in the Bay Area that do surface coating that emit 20 tons VOC per year. Of these, 47% of the total emissions are from 2 facilities, New United Motors Manufacturing in Fremont and Ball Metal Beverage Container in Richmond. Five of the facilities, including New United Motors and Ball Metal, are already abated, with emissions are controlled to at least the extent required by the South Coast rule. Of the remaining seven facilities, one is a mobile equipment manufacturer, one is a can manufacturer, one a wood furniture company, two are metal parts manufacturers, and two are foundries that have significant coating emissions.

Because this rule is source specific rather than source category or industry specific, the emissions are found in several source categories in the emission inventory. It is more appropriate to look at specific facilities that would be subject to the rule. The following table shows emissions on a facility by facility basis. Emissions Subject to Control consists of the emissions from specific sources at Bay Area facilities that emit 20 tons or organic compounds per year in each of the source surface coating source categories from the emissions inventory.

<i>Facility</i>	<i>Emissions Subject to Control</i>	<i>Potential Reduction at 65%</i>
US Pipe and Foundry	297 lb/day	193 lb/day
McGuire Furniture	128 lb/day	83 lb/day
Gillig Corp.	198 lb/day	129 lb/day
Enclosures Engineering	185 lb/day	120 lb/day
Container Mgmt Serv.	140 lb/day	91 lb/day
Rexam Beverage Can	170 lb/day	110 lb/day
American Brass and Iron	436 lb/day	283 lb/day

The emissions total 0.78 tons per day and the reduction, assuming 65% control could be achieved on all operations, is approximately 0.5 tons/day.

Proposed Method of Control

The Bay Area, like the South Coast, has numerous rules that affect commercial and industrial coating operations. Some, such as Wood Products Coating and Automotive Refinish Coating, have already been identified for emission reductions (see Wood Products Coating and Auto Refinishing Control Measure Descriptions, respectively). Others, such as aerospace coating, have very small inventories or, such as can and coil coating, already have emissions largely controlled by abatement technology. For coating categories for which there is sufficient inventory and technical evidence that emissions can be further reduced, staff will continue to pursue emission reduction opportunities. However, this control measure is directed at various source categories at the highest emitting facilities. If emissions are sufficient, it is considered to be cost effective to abate emissions instead of reduce solvent content in coating materials. A 65% reduction requirement would also allow alternative coating technology such as ultraviolet cured coatings or very low VOC water based technology.

Several air pollution control devices are available to reduce VOC emissions from spray booths. They include commonly used control technologies such as carbon or zeolite adsorption, and thermal or catalytic oxidation, and newer technologies such as biofiltration, cryogenic condensation, ultraviolet oxidation, and hybrid concentrator/oxidation systems. A 65% reduction, as specified by the South Coast rule, could be achieved by any of these technologies.

Emission Reductions Expected

The South Coast rule only applies to emissions from spray booth operations, and exempts booths with air flows that have a low VOC concentration because control of these booths is much less cost effective. The South Coast staff report estimates that, due to this exemption, emission reductions are about 15% less than they would have been had all sources had to reduce emissions by 65%. Based on the seven currently unabated Bay Area facilities with coating emissions of 20 tons per year, and assuming a 15% of the emissions would be exempted from the requirement due to cost or technical problems, an emissions reduction of approximately 0.43 tons per day could be achieved.

Costs of Control

The South Coast estimates that the cost effectiveness for control of spray coating operations subject to the rule is about \$5484 per ton of emission reduction. The 20 ton per year threshold may be adjusted to improve rule effectiveness and cost-effectiveness. The emissions from two of the facilities included, Rexam Beverage Can and American Brass and Iron, are from coating operations, but not from spray booths as specified in the South Coast rule. The emissions from Rexam Beverage Can are from tab lube applicators and the emissions from American Brass and Iron are from a dip tank. An examination of each of these facilities must be conducted to determine whether control would be cost effective for these operations.

Other Impacts

No significant adverse environmental impacts are expected as a result of the adoption of this control measure. The affected coating operations are part of existing industrial operations, so that an addition of emissions control equipment will not cause additional impacts. The proposed control option, however, will add emissions of NO_x to the atmosphere if incineration is the preferred technology to comply with the proposal.

References

CST-10: Miscellaneous Industrial Coatings and Solvent Operations, South Coast 2003 Air Quality Management Plan, SCAQMD
Rule 1132: Further Control of VOC Emissions from High Emitting Spray Booth Facilities, and staff report, SCAQMD, 1/2001

CONTROL MEASURE SS 4: POLYESTER RESIN OPERATIONS

Control Measure Description

This control measure would reduce ROG emissions from polyester resin operations (fiberglass product manufacturing) by lowering some limits in Regulation 8, Rule 50: Polyester Resin Operations.

Background and Regulatory History

The Air District regulates ROG emissions from polyester resin operations by setting volatile organic compound (VOC) limits and monomer content limits. Monomers are relatively low molecular weight compounds that combine chemically to become a cured resin. Approximately 5% of resin monomers do not react, and are emitted. A reduction in allowable monomer content reduces ROG emissions. Also, for polyester resin spray-up applications, the rule requires the use of certain spray technologies that are relatively transfer efficient to minimize the amount of resin that misses or bounces off the intended surface. Regulation 8, Rule 50: Polyester Resin Operations, was adopted in 1990. Only minor amendments to the rule have been adopted since 1990.

Emissions Subject to Control

The emissions from polyester resin operations are included in the emission inventory as point sources. The emissions from this source category include organic emissions from mixing, pouring, impregnating, injecting, forming, spraying and curing with polyester resins. Any polyester resin operation is required to have an Air District operating permit, and must submit usage information annually. Emissions are calculated from the submitted information. Polyester resin operations are found in Category 45: Fiberglass Products Manufacturing in the emissions inventory. Clean-up solvent used in polyester resin operations is almost all acetone, a negligibly photochemically reactive solvent.

	<i>Emissions Subject to Control (TPD, Summer)</i>
<i>Year</i>	<i>Category 45</i>
2003	0.66
2006	0.69

Proposed Method of Control

South Coast Rule 1162: Polyester Resin Operations, amended in November 2001, sets monomer content standards for polyester resins used in a variety of applications. Currently, the Bay Area rule allows a monomer content of 35%, or 50% for materials used for corrosion-resistant or fire-retardant service. The South Coast rule allows from 10% to 35% for specified types of general purpose resins, 48% for resins used for corrosion-resistant service, 38% for fire-retardant service, and 40% for high strength service. The South Coast rule also sets monomer content standards for gel coats and requires the use of non-atomizing spray application equipment, which is stated to reduce emissions by 40%.

Emission Reductions Expected

The Bay Area emissions inventory shows that polyester resin (fiberglass) products manufacturing operations emit 0.66 tons organic compounds per day. The South Coast rule development staff report states that the amendments adopted in November 2001 reduce emissions by 68%. In the Bay Area, this would achieve a reduction of approximately 0.45 tons organic compounds per day, although the previous South Coast rule had some provisions slightly more permissive than the existing Bay Area rule. At this time, the South Coast has delayed the non-atomizing spray provisions for gel coats from July 2003 until July 2005.

Costs of Control

The staff report for the 2001 amendments to South Coast Rule 1162 estimates the cost effectiveness of this measure at approximately \$800 per ton ROG emissions reduced. Typically, improvements in transfer efficiency can save operators money because less material is used.

Other Impacts

No significant adverse environmental impacts are expected as a result of the adoption of this control measure. Styrene, a toxic air contaminant, is the predominant organic compound emitted from polyester resin operations. A reduction in ROG emissions would also reduce exposure to styrene.

References

South Coast AQMD Rule 1162: Polyester Resin Operations, and staff report, SCAQMD, November, 2001
ARB-CAPCOA Suggested Control Measure For Polyester Resin Operations, CAPCOA Technical Review Group and CARB, September, 1990.

CONTROL MEASURE SS 5: WOOD PRODUCTS COATING

Control Measure Description

This control measure would reduce ROG emissions from wood coating facilities by lowering some VOC limits in Regulation 8, Rule 32: Wood Products Coating.

Background and Regulatory History

The Air District regulates ROG emissions from wood coating facilities by setting volatile organic compound (VOC) limits on various types of coatings used on wood, clear and pigmented topcoats, sanding sealers, penetrating sealers (wash coats), fillers and stains. Also, the rule requires the use of spray technology that is transfer efficient to minimize that the amount of paint that misses or bounces off the intended surface.

Rule 32 regulates coatings used in the manufacturing of furniture, kitchen cabinets, outdoor speakers, picture frames, bathroom vanities and other wood products. Rule 32 was adopted in 1983 and amended several times. The most significant amendments were in 1991 and 1995. The rule exempts certain types of products and operations for which low VOC technology is not appropriate, such as musical instruments, antique refinishing and foundry patterns. Emissions from wood product coating have been reduced by 50% through the implementation of VOC limits in the rule. A reduction in the number of facilities operating in the Bay Area has also reduced emissions from this source category.

Emissions Subject to Control

The emissions from wood coating operations are included in the emission inventory as point sources. Any coating operation that uses 30 gallons of coating and solvent per year is required to have an Air District operating permit, and must submit usage information annually from which emissions are calculated. Wood product coating emissions are found in Category 256 in the emissions inventory. Category 257 is surface preparation and clean up solvents used in wood finishing operations.

Year	<i>Emissions Subject to Control (TPD, Summer)</i>	
	<i>Cat. 256</i>	<i>Cat. 257</i>
2003	2.74	0.44
2006	2.78	0.46

Proposed Method of Control

Several other California districts have adopted VOC limits that are more stringent than the Bay Area's. Generally, the difference between rules is marginal currently, but the other rules become more stringent in July, 2005. The following table illustrates the major differences in the rules in four districts, expressed in allowable VOC content in grams/liter.

Coating	Bay Area current	South Coast ⁽²⁾ effective 7/05	Sacramento ⁽²⁾ effective 7/05	San Joaquin ⁽²⁾ effective 7/05
Clear topcoat	275/550 ⁽¹⁾	275	275/550 ⁽³⁾	275
Sanding sealer	550	275	275	275
Color topcoat	275/550 ⁽¹⁾	275	275	275
High solid stain	700	350	350	240
Low solid stain	480	120	120	120
Filler	500	275	275	275
Wash coat	480	120	120	120

Notes:

(1) The lower limits are for general wood products, the higher are for furniture.

(2) Other coating limits apply.

(3) The higher limit is for conversion varnish, a type of clear or colored topcoat.

The current Bay Area limits in Rule 32 are higher than the future limits in the other rules, 550 g/l for clear and colored topcoats and sealers, except for the Sacramento limit for conversion varnish, 700 g/l for high solids stains, and 480 g/l for low solids stains and washcoats. Based on the other districts adopted future limits, the following VOC limits are suggested for consideration, at a minimum:

High solids stain	350 g/l
Sealers	275 g/l
Filler	275 g/l
Low solids stains	120 g/l
Wash coats	120 g/l

Emission Reductions Expected

A 1998 study conducted by UC Davis under ARB contract 93-343 found that high solids stains were 15% of the volume of coatings used, sealers were 23%, fillers were 3% and low solids stains and washcoats were 6%. The following table illustrates potential emission reductions from the above suggested limits, assuming that the volume percentage coating used is equivalent to a percentage of emissions and that there was no reduction in volumes used due to a higher solids content of lower VOC materials.

Coating	Current VOC (g/l)	Suggested VOC (g/l)	Calculation	Reduction tons/day
High solid stain	700	350	$2.74 \times 0.15 \times (700 - 350) / 700$	0.21 t/dy
Sealers	550	275	$2.74 \times 0.23 \times (550 - 275) / 550$	0.31 t/dy
Fillers	500	275	$2.74 \times 0.03 \times (500 - 275) / 500$	0.04 t/dy
Low solid stain	480	120	$2.74 \times 0.06 \times (480 - 120) / 480$	0.12 t/dy
Wash coat	480	120	Included with low solid stains	

Together, the potential emission reduction is 0.68 tons per day. This does not include potential reductions from clear topcoats, which represent 48% of the volume of coating

used. Because of the potential based on volume, and the lower limits in other rules, lower VOC limits should be investigated.

Costs of Control

In the staff report for the proposed amendments to South Coast Rule 1136, the cost effectiveness was estimated to range from \$1900 to \$2900 per ton for waterborne systems, and for acetone reformulated coatings to be slightly less, about \$1600 per ton. At an inflation rate of 3%, this equates to a range of \$2406 per ton to \$3674 for waterborne coatings and \$2026 per ton for acetone coatings. This is within the range of cost effectiveness of other surface coating control measures.

Other Impacts

During the course of rule development in 1990 and 1995 for Bay Area Regulation 8, Rule 32: Wood Products Coating, it was found that the Bay Area is home to a unique set of custom furniture and millwork manufacturers and antique refinishers, for which coatings designed for large factory environment applications would not be able to be employed. Consequently, coating technology that meets the requirements of wood product manufacturers in other districts may not be applicable to the Bay Area.

When the South Coast rule requirements came into effect, they found an increase in the use of an ozone depleting compound, 1,1,1 trichloroethane, of about 1 ton per day. Since that time, however, the Montreal Protocol and 1990 Clean Air Act amendments have phased out the production of this compound.

Many California districts have VOC limits on strippers. Most commercial furniture refinishers use methylene chloride for wood stripping. Methylene chloride is a toxic compound and has been declared negligibly photochemically reactive by EPA. It is exempt from controls as a VOC in those rules outside of the Bay Area that have stripper limits. In Bay Area Rule 32, methylene chloride is a VOC. Consequently, a reduction in the allowable VOC content for strippers in the Bay Area may be technically infeasible. Methylene chloride emissions from stripping operations, however, may be limited either through the existing Bay Area risk reduction program or through the development of a statewide Air Toxic Control Measure.

Other than the minor impacts discussed above, no potential adverse environmental impacts are expected as a result of the adoption of this control measure.

References

Industrial Surface Coatings-Wood Furniture & Fixtures Emission Inventory Development, Robert P. Anex, et al, U.C. Davis Civil Engineering Department, June 1998, Air Resources Board Contract 93-343
Staff report, Proposed Amendments to Rule 1136 - Wood Products Coating, South Coast AQMD, May 10, 1996

CONTROL MEASURE SS 6: FLARES

Control Measure Description

This control measure would reduce ROG emissions from flares in petroleum refineries and chemical plants. Regulation 12, Rule 12: Flares at Petroleum Refineries, was adopted by the Board of Directors on July 20, 2005.

Background and Regulatory History

Flares in refineries provide for the safe disposal of liquid and gaseous hydrocarbons that are either automatically vented from process units through pressure safety valves, control valves or manually drawn from units. Blowdown systems gather hydrocarbon flow, separate liquid from gases, recover condensable oil and water, and discharge the gases to be combusted at the flare.

The 2001 Ozone Attainment Plan contained two measures related to flaring operations at petroleum refineries. Control measure SS-15 included a commitment to adopt a regulation requiring monitoring of flows to flares and calculation of emissions from flares. On May 21, 2003, the Bay Area adopted new Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries. Further study measure FS-8 in the 2001 Ozone Plan committed the Air District to assess the viability of controlling flare emissions at petroleum refineries. In December, 2002 a draft technical assessment document was completed that recommended that routine flaring could be minimized by equipment control strategies or by pollution prevention strategies.

Emissions Subject to Control

Emissions from flares at petroleum refineries are reported in Category 15 in the emissions inventory, Flares and Blowdown Systems. The emissions inventory for this category is derived from the calculated emissions based on data analyzed during the development of the 2001 Ozone Plan and incorporated into the emissions inventory. The base year for these data is 1999.

<i>Emissions Subject to Control (TPD, Summer)</i>	
<i>Year</i>	<i>Cat. 15 Flares and Blowdown Systems</i>
2003	7.78
2006*	0.68

Current data based on the monitoring requirements of Reg 12-11 shows that the volume of flare gas sent to flares has been reduced by over 50% from 2001 and 2002. This reduction can be attributed to two factors: 1) the installation at one refinery of new compressors with sufficient capacity to provide recovery of gases to be used as fuel gas at that refinery, and 2) greater attention to operating practices at refineries that have minimized the need for flaring. Also, improvements in flow monitors and better gas composition information are helping to replace engineering assumptions made for the 2001 Ozone Plan with refined data and better emission estimates. Data collected since

the monitoring requirements in Reg 12-11 became effective in December, 2003 indicate that emissions from refinery flares in this time period have averaged about 0.68 tons reactive organic gases/day on average.

Proposed Method of Control

Flaring in refineries can be roughly categorized as being one of three types, routine flaring as part of petroleum product manufacturing, flaring during startups and shutdowns of process units, and flaring during process upsets and emergencies. The reductions already achieved in flaring are primarily the result of reduced routine flaring. Flares exist as emissions controls and safety devices that function during upsets, unanticipated breakdowns of pressurized equipment, or unforeseen events such as power outages. Either by carefully controlling processes, including startup and shutdown, or by equipment modifications, some flaring may be able to be eliminated.

Regulation 12, Rule 12 will reduce emissions from flares at petroleum refineries by minimizing the frequency and magnitude of flaring. The proposal includes a standard that prohibits the use of a refinery flare unless the use is consistent with an approved flare minimization plan ("FMP" or "Plan"). The rule is structured to capture reductions realized by the refineries, and to require refiners to identify and implement feasible prevention measures to further minimize flaring. In addition to the requirement to develop and implement plans, the rule will: 1) require annual updates to the FMPs; 2) require timely notification to the District when flaring occurs; 3) require refineries to conduct a causal analysis when flaring occurs; and require monitoring and recording of the pressure and water levels in the flare water seals. The flare minimization plans will be made available to the public for review and comment. A plan will only be approved if the APCO determines that all feasible flaring prevention measures have been identified, considered, incorporated and scheduled for expeditious implementation. Flaring will only be allowed in accordance with an approved FMP or for emergencies where necessary to prevent accident, hazard or release of flare vent gas into the atmosphere, based on a causal analysis. The proposed Regulation 12, Rule 12 will result in a continuous improvement process in refineries to reduce flaring.

Emission Reductions Expected

Emissions from flares fluctuate on a daily, monthly and yearly basis. The emission inventory estimates developed for the 2001 Ozone Plan are not expected to be consistent with present or future estimates. Overall, emissions are expected to continue their downward trend.

Costs of Control

Equipment control strategy costs can vary greatly depending on the specifics of each refinery. Flare gas compressors cost between one and eight million dollars depending on the size of the compressor. Also, additional gas storage capacity or equipment to process the gas may need to be installed. Costs for operational controls or process changes that could minimize flaring may have economic benefits. The rule is structured to allow refiners to investigate and choose cost effective options for control.

Other Impacts

Flares act to burn gases released from process units to avoid fires or explosions. As long as safety considerations are not compromised, significant adverse environmental impacts are not expected as a result of adding equipment to process flare gas or making changes to minimize flaring. Large flaring events are of particular concern to communities around refineries. Implementation of this measure may reduce public exposure to emissions from these events. The affected flare systems are part of existing refinery operations, so that additional equipment added to these systems will not cause additional impacts. However, to the extent that additional control equipment is required, there may be an increase in incineration technology used to abate emissions. Incineration and flares both generate NOx emissions.

* Because flare emissions are variable and not predictable based on anticipated refinery production or material throughputs, 2004 average emission data from the flare monitoring has been used for the 2006 emissions estimate.

References

Technical Assessment Document, Further Study Measure 8, Flares, BAAQMD, Dec. 2002

CONTROL MEASURE SS 7: GASOLINE BULK TERMINALS AND PLANTS

Control Measure Description

This control measure would reduce ROG emissions from gasoline bulk terminals and bulk plants by requiring backpressure monitors and controls to shut down loading when backpressure exceeds a set standard, setting more stringent liquid and vapor leak standards, increasing enforceability, and setting a more stringent emission standard.

Background and Regulatory History

The Air District regulates ROG emissions from gasoline terminals and bulk plants under Regulation 8, Rule 33, and Rule 39, respectively. Both rules also set standards for gasoline delivery vehicles. Gasoline terminals receive gasoline products by pipeline or barge and load it into trucks for delivery to gasoline dispensing facilities. Gasoline bulk plants receive gasoline products by truck and also load it into trucks for shipment to gasoline dispensing facilities. The principal difference is that bulk plants have the ability to balance or return gasoline vapors to the point of origin via truck, whereas gasoline bulk terminals must process them on site.

Rule 33 for bulk terminals was adopted in 1983 and Rule 39 for bulk plants was adopted in 1987. Rule 33 sets an emission standard of 9.6 grams per cubic meter gasoline loaded (0.08 lb/1000 gal loaded). Rule 39 sets an emission standard of 60 grams per cubic meter gasoline loaded (0.5 lb/1000 gal loaded). Both rules also require equipment maintenance, set liquid leak standards and set standards for gasoline delivery vehicles consistent with the requirements of the California Health and Safety Code. Section 41962 requires the ARB to set standards for gasoline delivery vehicles and pre-empts districts' authority to set standards or to certify vehicles.

Emissions Subject to Control

Gasoline bulk terminals and plants are considered point sources and emissions are calculated for each facility. Category 64 is for gasoline truck loading at gasoline bulk plants. Category 898 is for gasoline loading at bulk terminals. The evaporative emissions from trucks during transport and from storage tanks at bulk plants and terminals are not part of this source category and are not part of this control measure.

Year	<i>Emissions Subject to Control</i> <i>Category, tons/day</i>	
	<i>Category 64</i>	<i>Category 898</i>
2003	0.28	0.97
2006	0.28	0.97

Proposed Method of Control

This control measure, which targets gasoline bulk plants and terminals subject to Bay Area Regulation 8, Rule 33: Gasoline Bulk Terminals and Gasoline Delivery Vehicles,

and Regulation 8, Rule 39: Gasoline Bulk Plant and Gasoline Delivery Vehicles, has six specific elements:

- 1) A requirement to install backpressure monitors on loading racks during gasoline cargo tank loading at terminals and automatic shutoffs if backpressure exceeds 18" H₂O, which prevents popping the cargo tank's pressure/vacuum (P/V) valve.
- 2) A requirement for new vapor recovery piping at loading racks to have a backpressure shutoff at 12" H₂O.
- 3) More stringent leak standards for liquid leaks than the current 3 drops/minute and disconnect leaks than the current 10 ml per disconnect, averaged over 3 disconnects. More stringent standards for vapor leaks than the current 100% LEL measured one inch from the leak source.
- 4) Incorporation of California Air Resources Board standards for bulk plant certification to increase the enforceability of the standards.
- 5) A prohibition on loading unless the cargo tank and terminal are compatible.
- 6) A reduction in the allowable emission standard for bulk terminals.

A requirement for a 12" backpressure at the loading racks shutoff would affect only new equipment installation. California standards and an incompatibility loading prohibition incorporate existing law to make the rules clearer and enforcement easier. Leak standards and disconnect standards would require increased maintenance and operator monitoring but would involve no new equipment installation.

Emission Reductions Expected

Emission estimates are derived from a reduction in the allowable emission rate from 0.08 lbs organic emissions per 1000 gallons loaded to 0.04 lbs/1000 gallons loaded. This is a 50% reduction, or 0.48 tons/day, although existing control equipment at some bulk terminals may already comply with this standard. Further reductions from backpressure monitors on vapor piping and automatic shutoffs, and more stringent leak standards are expected, but cannot be quantified at this time.

Costs of Control

Installation of a pressure monitoring and automatic shutoff system at the bulk terminal loading racks would eliminate excess emissions during loading. Estimated costs for a pressure monitoring and automatic shutoff system are between \$20,000 and \$35,000 initial costs, with ongoing maintenance costs after installation. The cost will vary depending on the number of lanes at the terminal. There are 14 bulk terminals currently operating in the Bay Area. The cost effectiveness of this proposal will be determined, along with an estimate of the potential emissions reductions from prevention of backpressure popping the cargo tank's P/V valves. Vapor processing equipment that meets current BACT standards is expected to comply with a more stringent emission limitation without additional equipment installation.

Other Impacts

Any new equipment would be installed within existing gasoline bulk terminals. No adverse environmental impacts are expected.

References

Ken Kunaniec, personal conversations, 3/24/03, 5/1/03, 6/16/03

Bay Area Regulation 8, Rule 33: Gasoline Bulk Terminals and Gasoline Delivery Vehicles

Memo, Ken Kunaniec, BAAQMD, 10/06/03

CONTROL MEASURE SS 8: MARINE LOADING OPERATIONS

Control Measure Description

This control measure would further reduce ROG emissions from marine loading operations by controlling currently unregulated cargoes, requiring more stringent emission limitations, and/or controlling housekeeping operations such as tank washing, tank venting or gas freeing aboard marine vessels that result in ROG emissions.

Background and Regulatory History

Regulation 8, Rule 44: Marine Vessel Loading Terminals and Regulation 8, Rule 46: Marine Tank Vessel to Marine Tank Vessel Loading were both adopted in 1989. Reg 8-44 limits precursor organic emissions (ROG) from the loading of specified organic liquids at marine terminals or emitted from the loading of tank vessels that previously contained these organic liquids. Reg 8-44 affects mostly petroleum refineries, chemical plants, bulk terminal distribution facilities, and shipping companies. Reg 8-46 applies to marine vessel loading operations, termed lightering. Reg 8-44 and 46 currently require control of specified organic liquids: gasoline, gasoline blending stocks, aviation gas, JP-4 aviation fuel, and crude oil. The existing emission standard in these rules for loading operations is 2 pounds of precursor organic compound emissions per thousand barrels of organic liquid loaded, or a 95% reduction in emissions.

In the 2001 Ozone Attainment Plan for the San Francisco Bay Area, the Air District committed to study the viability of further controls on marine vessel loading and marine tank vessel activities in Further Study Measure 11. A draft technical assessment document was completed in December, 2002. The document recommends several changes to Bay Area Reg 8-44 and 46 and concludes that there are viable strategies to further control emissions from these operations. In addition, the technical assessment document recommends changes to the emissions inventory to better account for emissions from unregulated cargo.

Emissions Subject to Control

Emissions from marine vessels are divided into several categories in the emissions inventory. Categories 86 and 87 are ship and barge lightering, respectively. Categories 88, 89, and 90 are the emissions from vessel ballasting, the loading of water into a tank that contains organic vapors from crude oil, gasoline and other organic liquids, respectively. Category 91 is for cleaning and gas freeing of vessels. Categories 795 through 798 are the emissions at marine terminals at the refineries from the loading and unloading of crude oil and gasoline (including other products) in tankers and barges. Categories 799 through 802 are the emissions from the loading and unloading of crude oil and gasoline in tankers and barges at locations other than the petroleum refineries.

ROG Emissions Subject to Control (TPD, Summer) Categories

<i>Year</i>	<i>86, 87</i>	<i>88, 89, 90</i>	<i>91</i>	<i>795, 796, 797, 798</i>	<i>799, 800, 801, 802</i>
2003	0.07	1.40	0.56	0.25	0.36
2006	0.07	1.52	0.60	0.25	0.39

The reactive organic (ROG) emissions from these activities total 2.64 tons per day in 2003 and 2.83 tons per day in 2006.

The technical assessment document prepared in December, 2002 includes the results of source tests conducted on unregulated cargo. The results of these tests are not yet incorporated into the inventory data shown above.

Proposed Method of Control

Further study measure FS-11 from the 2001 Ozone Attainment Plan looks at the potential to control currently unregulated cargo, or further limit emissions from marine loading activities. Marine loading and ballasting are already limited by the standards in Bay Area Regulation 8, Rule 44 and 46. In December, 2002, Bay Area staff released a draft technical assessment document (TAD). Source tests conducted in development of the TAD found a number of cargoes that are currently not subject to the rule that had significant emissions that resulted from loading.

The technical assessment document contains three recommendations: 1) a requirement that cargoes be controlled based on emissions rather than type of cargo as in the current rule, and the development of methodology to easily determine applicability of the standards to any given load; 2) a reduction in the fugitive emission standards (measured as a concentration of organic compounds in ppm) based on the current South Coast standard of 1000 ppm; and 3) a requirement to control emissions from ballasting into non-segregated tanks where a regulated cargo was previously stored. Staff are currently examining these options, and others. Comments have been received as to the cost effectiveness and feasibility of this measure. Staff is examining these issues and data related to source tests conducted on unregulated cargo during loading. Also, the viability of controls on barge traffic are being examined.

Emission Reductions Expected

A preliminary assessment of the potential reductions estimates that ROG reductions from 0.2 to 0.5 tons per day could be achieved from control of additional cargo and/or control to a more stringent level. In addition, unregulated housekeeping emissions are estimated to be able to be reduced by 0.5 tons per day or more.

Costs of Control

The technical assessment document estimates costs of control for these additional emissions reductions. At least one facility may need to modify its control system. Estimates of the cost to control unregulated cargo are from \$9000 to \$15,000 per load. At 50,000 barrels per load and 6,400,000 barrels loaded yearly of currently unregulated cargo, 90% of which would need control, costs range from \$1,036,800 to \$1,728,000 yearly. Given the emission reduction estimates of 0.22 to 0.5 tons per year, the cost effectiveness for the control of currently unregulated cargo ranges from \$5680 to \$21,600 per ton of ROG reduced.

Control of housekeeping emissions is expected to be cost effective, because tank cleaning done under vapor recovery may speed up the process, resulting in fewer demurrage fees for shipping operators. A demurrage fee is a charge for detaining a ship

beyond that necessary for loading or unloading cargo. Based on the costs of technology necessary to control housekeeping emissions, a full analysis of the cost effectiveness of this control suggestion will be part of the rule development effort.

Other Impacts

Marine loading operations are part of existing industrial complexes, both part of and apart from refinery operations. The addition of control equipment and associated piping and hardware is not expected to result in adverse environmental impacts. However, to the extent that additional control equipment is required, there may be an increase in incineration technology used to abate emissions. Incineration generates NO_x emissions.

References

Technical Assessment Document, Further Study Measure 11, Regulation 8, Rules 44 and 46, Marine Loading Operations, BAAQMD, Dec. 2002
Draft Staff Report, Proposed Revision and Consolidation of Regulation 8, Rule 44 and Rule 46: Marine Loading Operations, BAAQMD, Oct. 2003

CONTROL MEASURE SS 9: ORGANIC LIQUID STORAGE TANKS

Control Measure Description

This control measure would reduce ROG emissions from organic liquid storage tanks by supplementing existing requirements in Regulation 8, Rule 5: Storage of Organic Liquids.

Background and Regulatory History

Regulation 8, Rule 5: Storage of Organic Liquids, was adopted in 1978. The rule mandates equipment standards for large organic liquid storage tanks. The rule applies to tanks storing liquids with a vapor pressure of at least 0.5 psia. Larger tanks and tanks storing highly volatile liquids are required to meet more stringent standards. This control measure applies primarily to large, floating roof tanks that are typically found at petroleum refineries and chemical plants, and gasoline bulk plants and terminals.

The 2001 Ozone Attainment Plan included two commitments regarding organic liquid storage tanks. Control Measure SS-12 focused on inspection requirements and was implemented through an amendment to Regulation 8, Rule 5 in November 2002. Further Study Measure FS-10 focuses on enhanced control requirements for tanks. A draft technical assessment document (TAD) was released in January 2004. The TAD investigated the feasibility of requiring controls on lower vapor pressure liquids than Reg 8-5 currently requires, retrofitting external floating roof tanks with domes to reduce evaporation from air movement across the tank, imposing more stringent tank cleaning standards, requiring external floating roof tanks to be retrofitted with vapor recovery, a provision to allow minor maintenance and encourage more frequent self-inspections, and phasing out riveted tanks currently in service.

Emissions Subject to Control

Emissions from storage tanks are included in the emissions inventory in Petroleum Refinery Evaporation, Storage Tanks. Categories 55, 56, 57, and 58 address cone roof tanks, external floating roof tanks, internal floating roof tanks, and other tanks, respectively. Category 940 addresses tank cleaning in petroleum refineries. Fuels Distribution contains the emission inventory categories for gasoline tanks in bulk terminals and bulk plants (Categories 62 and 63). Other organic liquid storage tanks are found in Categories 84 and 85, which address cone roof tanks and other types of tanks, respectively, in both point and area sources. This control measure focuses on point (permitted) sources.

Emissions are derived from AP-42 correlation equations. The technical assessment document recommends that several elements in the calculations change, because the equations currently in use do not account for evaporative losses through deck fittings and do not account for “zero-gap” seals that are required on many tanks. Potential changes to the calculations are the subject of ongoing discussions with refinery representatives.

Emissions Subject to Control (TPD, Summer)

Categories

	55	56	57	58	940	62 - 63	84	85
2003	2.10	1.31	.08	.05	.05	.56	.78	.15
2006	2.19	1.36	.08	.05	.05	.56	.82	.15

The ROG emissions subject to control total 5.08 tons per day in 2003 and 5.26 tons per day in 2006.

Proposed Method of Control

The draft technical assessment document (TAD) has several recommendations to reduce emissions from organic liquid storage tanks: 1) a requirement for domes to reduce wind speed over floating roof tanks that store liquids with at least 3.0 psia vapor pressure, 2) improved standards for degassing and cleaning tanks and for storing and transporting removed sludges, and 3) implement an inspection and maintenance program that provides an incentive for more frequent tank inspections. Since the TAD was released, staff has received more information on tank seal criteria on external floating roof tanks in refineries. A more detailed review of the emissions and cost effectiveness of these tanks indicates that the proposal to require domes on external floating roof tanks does not appear to be cost effective.

The TAD did not recommend that three items be pursued as controls: 1) lowering the applicability of the rule to lower vapor pressure material, 2) requiring external floating roof tanks to be retrofitted to internal floating roofs or fixed roofs with vapor recovery, and 3) phasing out of riveted tanks.

Emission Reductions Expected

The emission inventory for tank cleaning is very small, although as tanks are cleaned infrequently, the emissions may be significant on days when tank cleaning occurs. Further work will quantify potential emission reductions from sludge handling. Also, emissions reductions for an inspection and maintenance program have not been determined.

Costs of Control

Cost effectiveness for the proposed amendments will be determined. Costs are expected to be reasonable. Standards for controlling degassing of tanks and handling sludges are already in effect in other air districts. Implementing an inspection and maintenance program is expected to be a cost benefit because such a program will enable tank owners to avoid District enforcement action while reducing emissions.

Other Impacts

Refinery and non-refinery tanks exist in industrial areas. Additional requirements related to tank cleaning or maintenance programs are not expected to have any adverse environmental impacts. No significant adverse environmental impacts are expected as a result of the adoption of this control measure.

References

Proposed Rule 1178: Further Reductions of VOC Emissions From Storage Tanks At Petroleum Facilities, Staff Report, South Coast AQMD, December 11, 2001
Technical Assessment Document, Further Study Measure 10, Organic Liquid Storage Tanks, BAAQMD, January, 2004
Conversation, Julian Elliot, February 26, 2004
e-mail and data submission, Ferry, Rob, The TGB Partnership, October 22, 2004
Conference call, WSPA and Rob Ferry, The TGB Partnership, November 15, 2004

CONTROL MEASURE SS 10: PRESSURE RELIEF DEVICES AND BLOWDOWN SYSTEMS

Control Measure Description

This control measure would further reduce ROG emissions from pressure relief devices in petroleum refineries and chemical plants.

Background and Regulatory History

Pressure relief valves (PRVs) or pressure relief devices (PRDs) are safety devices installed in refinery and chemical plant process units on pressure vessels and tanks. They function to release overpressures that could threaten the integrity of the process vessel or tank. These devices are typically vented either directly to atmosphere through a PRV or PRD, or to atmosphere through a blowdown system. Some blowdown systems vent to atmosphere with limited controls, most are vented to a flare.

Episodic releases of ROG emissions from pressure relief devices are regulated in Regulation 8, Rule 28: Pressure Relief Devices at Petroleum Refineries and Chemical Plants. Reg. 8-28 was first adopted in 1980 and significantly amended on December 17, 1997. The amendments require refineries to conduct PRD monitoring, reporting, and release prevention planning. The rule also requires controls for new PRDs and for PRDs that have repeat releases. In the 2001 Ozone Attainment Plan for the San Francisco Bay Area, the Air District committed to study the viability of further controls on PRDs and blowdown systems in Further Study Measure 8. A draft technical assessment document was completed in December, 2002. The document recommends several changes to Bay Area Regulation 8, Rule 28 and identifies two strategies to further control emissions from these devices. No comments have been received in response to the technical assessment.

Blowdown systems that vent to atmosphere are only found in one Bay Area refinery. These blowdown systems are not able to be controlled directly, however, due to the variable flow from them. Although emissions can be estimated by engineering calculation, attempts to directly measure the emissions have largely failed. Many of the inputs are controlled by pressure relief valves, these are subject to the provisions of Reg.8-28. Many of the other inputs are excess steam or water. Some inputs, however, may have the potential for significant ROG emissions, these inputs may be able to be controlled.

Emissions Subject to Control

Emissions from pressure relief devices are reported in Category 19 in the emissions inventory, *Pressure Relief Valves*. Emissions from blowdown systems are reported in Category 14, *Flares and Blowdown Systems*. Emissions from the inventory for Category 19 are shown here. Additional data is being gathered to more accurately estimate emissions from blowdown systems. The emissions inventory for these categories is derived from the annual updates submitted by the affected industries. The emission inventory for pressure relief devices since 1980 shows significant differences year to year, because of the episodic nature of the releases. For example, 2000 data shows ROG emissions of 0.6 tons per day. 2002 data, the most recent year for which plant

submissions are available, shows ROG emissions of 0.18 tons per day. 2003 and future year emissions are calculated from 2002 data.

	<i>Emissions Subject to Control (TPD, Summer)</i>
<i>Year</i>	<i>Cat. 19 Pressure Relief Valves</i>
2003	0.19
2006	0.19

Regulation 8, Rule 28 also requires that emissions be calculated for releases and submitted to the Air District. The highest calculated emission release from a single event during the study period used for the technical assessment document was 32,000 pounds (16 tons) organic compounds. This occurred during one day. The lowest calculated emission from a release event in the study was 6 pounds and the median calculated emission was between 3600 and 3700 pounds. The annual average emissions for the time period since the 1998 amendments is about 13 tons/year. The annual average emissions for the last five years is 10.3 tons/year.

Proposed Method of Control

The technical assessment document for Further Study Measure 8 from the 2001 Ozone Plan suggests further controls on pressure relief devices and recommends several changes to Bay Area Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants. The standards in Reg 8-28 for existing PRDs that require prevention measures, hazards analyses and controls do not become effective until the first scheduled turnaround for repair or maintenance of the process unit that contains the PRD. The recommendations are: 1) to require facilities to demonstrate the ability to detect and quantify Release Events (10 pounds of pollutants), 2) to require data recording and recordkeeping requirements for venting and emissions verification, 3) to add a definition for a term in lieu of "source" to ensure the rule applies to individual process components and related PRDs, and 4) to require "tell-tale indicators" or the equivalent for all atmospheric PRDs, and add a definition of "tell-tale indicator." Staff has also evaluated requiring all PRD's to be vented to vapor recovery systems or to disposal systems such as flares. Such control requirements are not expected to be cost effective.

Staff is undertaking an evaluation of the atmospheric blowdown systems and the potential to control inputs where appropriate.

Emission Reductions Expected

Based on estimates by EPA and others, increased monitoring requirements can be expected to reduce emissions by about 20%. However, because Reg. 8-28 already requires monitoring and prevention measures, staff believes that emissions reductions would be only 5%. This would result in ROG emissions reductions of 0.5 tons per year (0.0014 tons per day). These potential emission reductions do not account for any emissions inventory adjustments based on data reported pursuant to the requirements of Reg. 8-28. The emissions reductions would be from preventing releases due to increased monitoring requirements.

The emissions on an annualized basis (tons per day annualized) are not sufficient to suggest development of a control measure. However, this control measure is recommended for inclusion in an ozone strategy because of the potential to reduce a large amount of organic emissions during release events curtailed because of increased monitoring. Since July, 1998 (the effective date of the Reg. 8-28 requirements, there have been 15 releases of between 0.5 tons and 5 tons ROG, and 7 between 5 and 50 tons ROG.

Costs of Control

The costs of implementing enhanced monitoring procedures are expected to be cost effective. It is estimated that the proposed amendments are expected to cost between \$165,000 and \$300,000 District-wide. Cost effectiveness of the proposed amendments expected to be poor, from \$32,000/ton to \$58,000/ton ROG annualized over 10 years. Costs of venting all PRD's to vapor recovery or disposal systems is expected to cost from \$1.4 million/ton to \$2.8 million/ton annualized over 20 years.

Other Impacts

Any rule development effort directed at pressure relief devices needs to recognize that the purpose of these devices is safety. PRVs and PRDs prevent overpressurization of vessels to avoid fires or explosions. As long as safety considerations are not compromised, significant adverse environmental impacts are not expected as a result of either adding to the existing rule or requiring more control of emissions from these devices. When these devices release, there is the potential for a large amount of toxic compounds to be released in fairly close proximity to communities. Consequently, there may be a large reduction in potential acute exposure to those compounds from implementation of this control measure. To the extent that additional control equipment is required, there may be an increase in incineration technology used to abate emissions. Incineration generates NOx emissions. Except as noted above, no significant adverse environmental impacts are expected as a result of the adoption of this control measure.

References

Technical Assessment Document, Further Study Measure 8, Pressure Relief Devices, BAAQMD, Dec. 2002

Draft staff report: Proposed Amendments to Regulation 8, Rule 28: Episodic Releases from Pressure Relief Devices at Petroleum Refineries and Chemical Plants.

CONTROL MEASURE SS 11: WASTEWATER SYSTEMS

Control Measure Description

This control measure would reduce ROG emissions from refinery wastewater systems by requiring control, covers or water traps at various emission points such as open drains, sumps, junction boxes and manholes.

Background and Regulatory History

The Air District regulates ROG emissions from wastewater systems by setting equipment standards which require minimum gaps in seals around oil-water separators, gauging and sampling wells, dissolved air flotation units, slop oil vessels, separator effluent channels and junction boxes. A 1000 ppm concentration limit for large oil-water separators is a regulatory option. Sludge de-watering units are required to have vapor recovery with a 95 % destruction efficiency standard. The rule also allows vapor recovery as an option for oil-water separators, slop oil vessels and dissolved air flotation units. Regulation 8, Rule 8 was first adopted in 1979, significantly amended in 1989 and amended to address EPA policy issues in 1993 and 1994.

Emissions Subject to Control

In December, 2002, the staff of the California Air Resources Board and Air District produced a technical assessment document (TAD) that characterized the emissions from refinery wastewater systems. Emissions as shown in the Air District's emission inventory are reported as point sources. Categories exist for refinery oil-water separators (Category 11), which includes fugitive emissions from process drains, and refinery wastewater treatment (Category 12), which includes the biological and/or chemical treatment, settling and clarification that occurs after the oil-water separator to meet water discharge standards. The emissions inventory is shown below

Year	<i>Emissions Subject to Control</i> <i>(TPD, Summer)</i>	
	<i>Cat. 11 separators</i>	<i>Cat. 12 treatment</i>
2003	3.63	0.13
2006	3.80	0.14

Category 11 consists of oil-water separators and process drains, as well as some other sources such as dissolved air flotation units. Process drains constitute most of the emissions, 2.43 tons/day in 2003 and 2.55 tons in 2006. The TAD estimated emissions by a combination of wastewater sampling to determine organic content, and industry and EPA emissions models to calculate emissions from refinery wastewater drains, junction boxes and manholes. These models estimate emissions to be at least 3.31 tons/day from the combination of these emission points.

Proposed Method of Control

A variety of methods can provide controls for open process drains, junction boxes and manholes, such as installation of vapor recovery on emission points accompanied by a

control device, seals or traps on drains and open points in junction boxes and manhole covers, and the installation of solid piping where openings to the atmosphere exist. The most cost effective option is to require the installation of water seals on these emission points and to promulgate an emission standard to verify their effectiveness along with a program to assure that the water seals are maintained. The national New Source Performance Standard for refinery wastewater systems requires that emissions from drains meet a 500 ppm hydrocarbon concentration standard. An option not to install water seals could be added as long as emissions from drains do not exceed the ppm standard.

Emission Reductions Expected

Based on established emission reduction factors for water seals, emissions from drains, junction boxes and manholes could be reduced by 65%. Based on the emissions in the inventory, a reduction of 65% would reduce emissions by 1.6 tons per day. Based on the TAD estimates, the emission reduction that could be achieved is 1.8 tons per day, accounting for drains already controlled. The emission estimates do not account for the fraction of diesel oil in the wastewater. This could increase the estimates of emissions, and would also increase the amount of emissions reductions.

Costs of Control

Staff estimated costs for controls on drains, junction boxes and manholes. The cost of controlling drains is from \$1100 to \$3000 per ton reduced, the cost for junction boxes is from \$3300 to \$4400 per ton reduced, and the cost for manhole covers is from \$3100 - \$8800 per ton reduced. The overall cost effectiveness for this proposed measure is from \$1900 to \$4200 per ton emissions reduced.

Other Impacts

No significant adverse environmental impacts are expected as a result of the adoption of this control measure. The affected wastewater systems are part of existing refinery operations, so that additional equipment added to these systems will not cause additional impacts. The proposed control option will not add to other atmospheric pollutants because additional incineration or adsorption of hydrocarbon vapors is not anticipated. In addition, the existing water treatment systems are designed to handle much greater influent than exists in normal flows. Consequently, additional hydrocarbons going into the treatment system will not result in exceedances of the refineries water discharge permits.

References

Draft Technical Assessment Document: Potential Control Strategies to Reduce Emissions from Refinery Wastewater Collection and Treatment Systems, CARB, and BAAQMD, Jan. 2003
SJVUAPCD Rule 4625: Wastewater Separators
South Coast AQMD Rule 1176: VOC Emissions from Wastewater Systems

CONTROL MEASURE SS 12: INDUSTRIAL, INSTITUTIONAL AND COMMERCIAL BOILERS

Control Measure Description

This control measure would reduce emissions of nitrogen oxides (NO_x) from boilers by extending controls to boilers smaller than those currently regulated by Bay Area Regulation 9, Rule 7 and evaluating lower NO_x limits consistent with those adopted by the San Joaquin Valley Unified APCD.

Background and Regulatory History

The Air District regulates NO_x emissions from boilers under three separate rules, all of which were adopted pursuant to California Air Resources Board (CARB) pollution transport regulations (California Code of Regulations beginning at section 70600). Each BAAQMD boiler rule regulates a different category of boilers. BAAQMD Regulation 9, Rule 7 imposes a 30 ppm NO_x limit on industrial, institutional, and commercial boilers with a rated heat input of 10 million BTU/hr or more. Regulation 9, Rule 10 imposes a slightly more stringent NO_x limit equivalent to 28 ppm on refinery boilers with a rated heat input of 10 million BTU/hr or more. Regulation 9, Rule 11 applies to extremely large boilers used to generate electricity and imposes a NO_x limit equivalent to 15 ppm on boilers with a rated heat input of 250 million BTU/hr or more.

This control measure applies to boilers currently subject to Air District Reg 9-7: Nitrogen Oxides and Carbon Monoxide From Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters and those exempt by rated heat input. Smaller boilers exempt from Reg 9-7, with a rated heat of 10 million BTU/hr or less, are generally sold as “package boilers” that are equipped and shipped complete with burners, automatic controls and accessories, and mechanical draft equipment. They are generally used in high-rise office buildings, large hotels, and some industrial facilities to supply heat, steam, or hot water. A small number of boiler manufacturers – Ajax, Bryan, Cleaver-Brooks, Kewanee, Teledyne Laars, Parker, Peerless, Rite, and Thermo Pak – manufactured most of the boilers of this size installed in San Francisco.

Emissions Subject to Control

Boiler emissions are included in the BAAQMD inventory in several different categories. Emissions from boilers at power plants are found in the category called fuels combustion – power plants. Emissions from boilers at refineries are found in the category called fuels combustion – oil refineries external combustion.

The emissions from other boilers, including smaller boilers not already subject to the existing BAAQMD rules, are included in the emission inventory source category called *fuels combustion – other external combustion*. This category includes external combustion sources such as boilers, furnaces, space heaters, and ovens. Boilers subject to Regulation 9, Rule 7 (those fired on natural gas or LPG of at least 10 MM BTU/hr and those fired on other fuels of at least 1 MM BTU/hr) have air quality permits, and emissions from these boilers are included in the point source portion of this category. Most emissions from the smaller boilers are included in the area source portion of this inventory category (the exception would be small boilers located at facilities required to have a permit for other reasons). These area source emissions are

estimated by subtracting fuel usage by the point sources from total fuel usage as obtained from fuel consumption data. Emissions from both area and point sources are estimated to be 9.05 tons of NOx per day for 2003.

To determine more precisely the emissions within the other external combustion inventory category that are attributable to Bay Area boilers in the 5 to 10 million BTU/hr size range, data from a boiler database developed by the San Francisco Department of Building Inspection (DBI) was used. Although San Francisco's population represents about one-tenth of the Bay Area total population, it represents about one-fourth of the population in heavily urbanized areas. This is important because boilers are not generally found in suburban areas except at laundries, some light industrial locations, and some schools. The San Francisco boiler population was therefore multiplied by 5 and rounded to arrive at boiler population estimates for the entire Bay Area.

Based on the DBI database, there are an estimated 420 boilers with a capacity greater than 5 million BTU/hr and less than or equal to 10 million BTU/hr in the Bay Area. Total estimated NOx emissions from these boilers are set forth below. Future-year emissions in this small boiler sub-category have been derived using the same growth factors used in the broader *fuels combustion – other external combustion* inventory category. Emissions from boilers smaller than 5 million BTU/hr are calculated from the area source portion of the inventory minus the 1.9 tons/day (2003) for 5-10 million BTU/hr boilers.

<u>Emissions Subject to Control, TPD, Summer</u>			
<u>Year</u>	<u><5 MM BTU/hr</u>	<u>5–10 MM BTU/hr</u>	<u>>10 MM BTU/hr</u>
2003	3.07	1.90	4.08
2006	3.22	1.99	4.08

Note that these emission estimates are likely to change during rule development as better population and emissions information becomes available. For example, Bay Area boiler service companies have indicated that estimates based on the DBI database may significantly understate the numbers of boilers for this particular size range.

Proposed Method of Control

This measure would consider the limits adopted by the San Joaquin Valley Unified APCD in Rule 4306 to boilers already controlled by District Reg 9-7, extend these limits to smaller boilers in the 5 to 10 million BTU/hr range, and consider regulation of boilers in the 2 to 5 million BTU/hr range. Control would generally be achieved by installation of low-NOx burners. On smaller boilers, it may only be cost effective to implement controls on new boilers. Low-NOx burners are available on new boilers manufactured by most of the major boiler manufacturers. Low-NOx burners are available as retrofits for some models, and virtually all of these retrofits are claimed to achieve NOx levels of 30 ppm or less. For some models, however, low-NOx retrofits may be unavailable.

Emission Reductions Expected

Most of the reduction (11 tons/day of a total of 12.7 tons/day) attributable to Rule 4306 comes from large numbers of process heaters at crude oil production facilities and boilers at food processing facilities through retrofits with ultra low-NOx burners. This

indicates that the reduction in point source emissions (those boilers already subject to Reg 9-7) may be modest.

The estimated NO_x emission reduction that could be achieved in the 5 to 10 million BTU/hr size range, assuming the population could be completely retrofitted, would be 1.44 tons per day. Actual emission reductions are likely to be significantly lower because many of the boilers in this size range are used for space heating. Annual usage of boilers used for space heating is relatively low, and installation of controls is not likely to be cost effective. For this reason, most boiler rules, including BAAQMD Regulation 9, Rule 7, exempt boilers with low annual usage (less than 90,000 therms). Up to 80% of boilers in this size range may be exempt, based on data developed by the Sacramento Metropolitan AQMD. Emission reductions could be higher if the number of boilers is found to be higher than currently estimated or if the standards imposed by the San Joaquin Air District are able to be implemented for a wide range of units. Any emission reductions could probably be achieved in a cost-effective manner only over a period of at least 5 years, given the likelihood that low-NO_x burner retrofits will be unavailable for many existing boilers. Most air districts have allowed boiler operators at least 5 years to achieve similar emission limits.

Costs of Control

Installation of low-NO_x burners is expected to have a cost effectiveness of \$5000 per ton or better based on cost data developed by the South Coast AQMD during development of its Rule 1146.1 and by the Ventura County APCD during development of its Rule 74.15.1. For boilers with low annual usage, controls would be much less cost effective than \$5000 per ton.

Other Impacts

Bay Area NO_x reductions may reduce ambient levels of fine particulate pollution, because some fraction of the NO_x emissions is ultimately converted to nitrate particles in the atmosphere. However, these reactions are not currently well understood and are difficult to quantify.

Minor adverse environmental impacts may occur as a result of this control measure. Photochemical modeling from the 1980's and 1990's and recent ambient measurements indicate that Bay Area NO_x reductions are likely to cause an increase in localized Bay Area ozone levels. In addition, ambient measurements suggest an emerging "ozone weekend effect" in the Sacramento area that may mean Bay Area NO_x reductions are counterproductive in reducing downwind ozone. Further information on the benefits and disbenefits of Bay Area NO_x reductions may come from photochemical modeling associated with the Central California Ozone Study.

Some NO_x technologies may adversely affect boiler turndown, capacity, CO levels, or efficiency. Rule provisions should be designed to avoid, for example, efficiency decreases and resulting increases in fuel use that might come from widespread use of boiler derating, water or steam injection, or burners modified to reduce flame temperatures.

Other than the minor impacts discussed above, no potential adverse environmental impacts are expected as a result of the adoption of this control measure. BAAQMD air

quality permits are not currently required for boilers with an input capacity smaller than 10 million BTU/hr unless they also fire liquid fuels. To implement this control measure, amendments to BAAQMD Regulation 2, Rule 1 to require permits for small boilers would probably be necessary. If boilers in the 5 to 10 million BTU/hr range are as numerous as boiler service companies suggest, the administrative burden for the Air District could be significant.

References

- Blanchard, C., Tanenbaum, S. "Characterization of CCOS Intensive Operating Periods: Task 4c. Supplemental Analyses: Corroborative Analysis" (paper prepared by Envair for the Central Coast Ozone Study/ARB, 2001)
- Marr, L.C., Harley, R.A. 2002. "Spectral analysis of weekday-weekend differences in ambient ozone, nitrogen oxide, and non-methane hydrocarbon time series in California." *Atmospheric Environment* 36, 2327-2335.
- San Francisco Department of Building Inspection. 2003. Personal communication from DBI forwarding boiler data extracted from DBI database into Excel spreadsheet.
- San Joaquin Unified APCD. 2003. "Final Draft Staff Report: Proposed Amendments to Rule 4305 (Boilers, Steam Generators, and Process Heaters - Phase 2) and Rule 4351 (Boilers, Steam Generators, and Process Heaters - Phase 1); New Rule 4306 (Boilers, Steam Generators, and Process Heaters - Phase 3)"
- San Joaquin Unified APCD. Rules 4305, 4351, and 4306.
- South Coast AQMD. 2001. "Potential Backstop Rule for Regulation XX - Regional Clean Air Incentive Market (RECLAIM)." Report to SCAQMD Board, November 9, 2001.
- South Coast AQMD. 2000. "Staff Report: Proposed Amended Rule 1146 - Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters."
- South Coast AQMD. 1997. "Final Staff Report for: Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers."
- South Coast AQMD. Rules 1121, 1146, 1146.1, and 1146.2.
- Texas Council on Environmental Quality. 1999. Rule Log. No. 1999-055I-117-AI, available at www.tnrcc.state.tx.us/oprd/rul-lib/pa99055i.pdf.
- Texas Administrative Code, Title 30, Chapter 117 - Control of Pollution from Nitrogen Compounds.
- TIAX LLC. 2004. "Control Measure Number: D-16 Bay Area: Boilers, Steam Generators, and Process Heaters/Space Heaters" Control measure suggested for the Bay Area by Sacramento Metropolitan AQMD/TIAX based on control measure D-16 developed by TIAX for the Sacramento region.
- U.S. EPA. 1994. "Alternative Control Techniques Document - NO_x Emissions from Industrial, Commercial, Institutional (ICI) Boilers." EPA document no. EPA-453/R-94-022.

CONTROL MEASURE SS 13: LARGE WATER HEATERS AND SMALL BOILERS

Control Measure Description

This control measure would reduce emissions of nitrogen oxides (NO_x) from water heaters larger than those currently regulated by BAAQMD rules and boilers smaller than those currently regulated by BAAQMD rules. NO_x limits would be imposed on units with a rated heat input capacity greater than 75,000 BTU/hr and less than or equal to 2 million BTU/hr.

Background and Regulatory History

The Air District regulates NO_x emissions from water heaters under Regulation 9, Rule 6, which imposes a NO_x limit of 40 nanograms NO_x per joule of heat output on water heaters with a rated heat input capacity of 75,000 BTU/hr or less. The regulated water heaters are conventional tank water heaters typically found in single-family residences.

Boilers are regulated under three separate rules. Two rules apply to large industrial boilers at refineries and power plants (Regulation 9, Rules 10 and 11, respectively). The third rule, Regulation 9, Rule 7, imposes a 30 ppm NO_x limit on industrial, institutional, and commercial boilers with a rated heat input of 10 million BTU/hr or more. Control measure SS-12 proposes to extend the Regulation 9, Rule 7 limits to smaller boilers with a capacity of less than 10 million BTU/hr.

The water heaters to which this measure applies are tank type water heaters similar in appearance, design, and construction to the smaller water heaters subject to Regulation 9, Rule 6. These large water heaters range in size between 75,000 and 400,000 BTU/hr and are used in small hotels, apartment buildings, office buildings, and industrial and commercial facilities to supply hot water.

Units larger than 400,000 BTU/hr are typically small boilers and are different in appearance, design, and construction from water heaters. The small boilers to which this measure applies are generally sold as “package boilers” that are equipped and shipped complete with burners and controls. Boilers in this size range generally rely on natural draft rather than mechanical draft equipment. They are used in office buildings, hotels, schools, and industrial facilities to supply heat, steam, or hot water.

Emissions Subject to Control

Emissions from these units along with emissions from many other types of combustion equipment are included in the BAAQMD inventory in two different categories. Some emissions from water heaters are included in the emission inventory source category called fuels combustion – domestic. Combined emissions from all types of equipment in this category are estimated to be 8.33 tons of NO_x per day for 2003. Emissions from non-residential water heaters and boilers are included in the source category called fuels combustion – other external combustion, which includes external combustion sources such as boilers, furnaces, space heaters, and ovens. Emissions in this category are estimated to be 15.78 tons of NO_x per day for 2003.

To determine more precisely the emissions attributable to Bay Area water heaters and boilers in the size range subject to this measure, data from a boiler database developed

by the San Francisco Department of Building Inspection (DBI) was used. Although San Francisco's population represents about one-tenth of the Bay Area total population, it represents about one-fourth of the population in heavily urbanized areas. This is important because large water heaters and boilers are not generally found in suburban areas except at laundries, some light industrial locations, and some schools. The San Francisco boiler population was therefore multiplied by 5 and rounded to arrive at water heater and boiler population estimates for the entire Bay Area.

Based on the DBI database, there are an estimated 12,300 water heaters with a capacity from 75,000 to 400,000 Btu/hr in the Bay Area. The number of boilers with a capacity over 400,000 BTU/hr and up to 2 million BTU/hr is estimated at 10,500. Total estimated NOx emissions from these water heaters and boilers are set forth below. Future-year emissions for these units have been derived using the same growth factors used in the fuels combustion – other external combustion inventory category.

<u>Year</u>	<u>Emissions Subject to Control (TPD, Summer)</u>
2003	5.30
2006	5.54

Note that these emission estimates are likely to change during rule development as better population and emissions information becomes available.

Proposed Method of Control

This measure would impose a NOx limit of 40 nanograms per joule of heat output as found in Regulation 9, Rule 6 on large water heaters with a capacity greater than 75,000 BTU/hr and less than or equal to 400,000 BTU/hr. For boilers larger than 400,000 BTU/hr and less than or equal to 2 million BTU/hr, the measure would impose the NOx limit of 30 ppm found in Regulation 9, Rule 7. All limits would apply to new units only. These limits would be identical to limits for new units adopted by the Santa Barbara County APCD (SBCAPCD Rule 360). Water heaters and boilers with burners capable of meeting these NOx limits are widely available from numerous manufacturers.

Rather than impose the limits only on new units, the South Coast AQMD adopted retrofit requirements (in Rule 1146.2) for units with a capacity between 400,000 BTU/hr and 2 million BTU/hr. However, because operators of the units were given approximately 10 years to comply, the requirements are similar in effect to those adopted by the Santa Barbara APCD. In addition, South Coast AQMD staff have reported a non-compliance rate of 80% with rule limits for units subject to RECLAIM. In addition, it appears that retrofits are unavailable for most of these smaller units.

Emission Reductions Expected

The total estimated NOx emission reduction that could be achieved, assuming a 10 year life expectancy for these units and replacement of all units with complying units by the end of the 10-year period, would be 3.9 tons NOx per day. This emission reduction would be achieved year-by-year over the 10-year period as new units replace existing units.

Costs of Control

Based on cost data developed by the South Coast AQMD during development of its Rule 1146.1, cost effectiveness is expected to range from a net cost savings (due to higher efficiency of low-NOx units) to approximately \$3,000 per ton of NOx reduced.

Other Impacts

Bay Area NOx reductions may reduce ambient levels of fine particulate pollution, because some fraction of NOx emissions is ultimately converted to nitrate particles in the atmosphere. However, these reactions are not currently well understood and are difficult to quantify.

Burners used to comply with the control measure may reduce energy usage. Low-NOx burners have higher thermal efficiencies than conventional units. Energy savings from use of low-NOx units may be as high as 20%.

Minor adverse environmental impacts may occur as a result of this control measure. Photochemical modeling from the 1980's and 1990's and recent ambient measurements indicate that Bay Area NOx reductions are likely to cause a localized increase in Bay Area ozone levels. In addition, ambient measurements suggest an emerging "ozone weekend effect" in the Sacramento area that may mean Bay Area NOx reductions are counterproductive in reducing downwind ozone. Further information on the benefits and disbenefits of Bay Area NOx reductions may come from photochemical modeling associated with the Central California Ozone Study.

Some NOx technologies may adversely affect boiler turndown, capacity, CO levels, or efficiency. Rule provisions should be designed to avoid, for example, efficiency decreases and resulting increases in fuel use that might come from widespread use of boiler derating, water or steam injection, or burners modified to reduce flame temperatures.

Except as noted above, no significant adverse environmental impacts are expected as a result of the adoption of this control measure. BAAQMD air quality permits are not currently required for these water heaters and boilers and would not be required for implementation of this measure. NOx limits for these units would be enforced through a sales and installation prohibition. The Air District would enforce the sales ban at the distributor level, and local building departments would prohibit installation of heaters that do not comply with rule requirements. Implementation of the measure is not expected to impose a significant administrative burden for the Air District.

References

Blanchard, C., Tanenbaum, S. "Characterization of CCOS Intensive Operating Periods: Task 4c. Supplemental Analyses: Corroborative Analysis" (paper prepared by Envair for the Central Coast Ozone Study/ARB, 2001)

Marr, L.C., Harley, R.A. 2002. "Spectral analysis of weekday-weekend differences in ambient ozone, nitrogen oxide, and non-methane hydrocarbon time series in California." *Atmospheric Environment* 36, 2327-2335.

San Francisco Department of Building Inspection. 2003. Personal communication from DBI forwarding boiler data extracted from DBI database into Excel spreadsheet.

Santa Barbara County APCD. Rule 360.

South Coast AQMD. 2001. "Potential Backstop Rule for Regulation XX - Regional Clean Air Incentive Market (RECLAIM)." Report to SCAQMD Board, November 9, 2001.

South Coast AQMD. 1997. "Final Staff Report for: Proposed Amended Rule 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers."

South Coast AQMD. Rule 1146.2.

CONTROL MEASURE SS 14: STATIONARY GAS TURBINES

Background

This control measure would reduce emissions of nitrogen oxides (NOx) from stationary gas turbines through the revision of existing limits to reflect current best available retrofit control technology (BARCT).

Regulatory History

The Air District regulates NOx emissions from stationary gas turbines under Regulation 9, Rule 9. The rule was adopted in 1993 pursuant to California Air Resources Board (CARB) pollution transport regulations (California Code of Regulations beginning at section 70600). The CARB regulations required the BAAQMD to adopt by 1994 best available retrofit control technology (BARCT) for source categories that collectively amounted to 75% of the 1987 nitrogen oxides emission inventory. The BAAQMD standards for existing turbines are 9 to 42 ppm depending upon turbine size, with small turbines subject to less stringent limits.

The CARB transport regulations were amended in 2003 and now require adoption of “all feasible measures” to reduce ozone precursor emissions.

In 2002, the San Joaquin Valley Unified APCD adopted amendments to its gas turbine rule (Rule 4703) that impose turbine NOx standards more stringent than the standards found in the rules of most other air districts. The most significant of the SJVUAPCD amendments require larger turbines (greater than 10 megawatts) to meet standards of either 3 or 5 ppm, depending upon the installation date of NOx controls.

Emissions Subject to Control

Turbine emissions are included in the BAAQMD inventory in the category called fuels combustion – turbines. Estimated emissions for the category are set forth below.

<u>Year</u>	<u>Emissions Subject to Control (TPD, Summer)</u>
2003	1.77
2006	1.83

Staff investigating this proposal has determined that emissions from permitted stationary gas turbines from reported throughput data for 2004 is about 2.9 tons/day. The discrepancy may be due to increases in usage.

Proposed Method of Control

Most emission reductions would come from the installation of selective catalytic reduction (SCR) on large turbines (>10 MW) that do not currently use SCR to control NOx emissions.

There are 43 stationary turbines operating in the BAAQMD. Eleven of the turbines already meet 5 ppm limits, and the measure would not reduce emissions for those turbines. Another 20 large turbines currently meet 5 - 10 ppm limits using SCR. Emission reductions from requiring these turbines to meet a 5 ppm limit are likely to be minor, and cost effectiveness for controls is likely to be poor unless the limit can be achieved through catalyst resizing. Twelve large turbines are currently subject to a 15 ppm or higher limit, and adoption of the SJVUAPCD limits would require that they meet a 5 ppm limit. These turbines are all larger than 10 MW and do not use SCR for NOx control. Installation of SCR may not be feasible for all 12 turbines because of site-specific constraints.

Some very minor emission reductions might come from the installation of dry low-NOx combustors (DLN) on small turbines (<10 MW) currently subject to 42 ppm limits. The San Joaquin limits are 35 ppm limit if DLN is not available and 25 ppm if DLN is available. DLN appears to be available for less than half of the 13 Bay Area turbines in this size range. Emission reductions would be minor.

Emission Reductions Expected

Requiring turbines larger than 10 MW to meet a 5 ppm standard would reduce emissions by approximately 1.2 tons per day, assuming SCR installation is feasible and cost effective for all turbines in this category. Additional minor emission reductions may be achievable for some smaller turbines through the installation of DLN. Greater precision in the emission reduction estimate cannot be achieved without detailed investigation for each turbine.

Costs of Control

The SJVUAPCD found that cost effectiveness for the installation of SCR on turbines larger than 10 MW ranged from approximately \$5,000 per ton to approximately \$10,000 per ton. Cost effectiveness for the installation of DLN on smaller turbines was in this same range. The cost estimates used by SJVUAPCD for new SCR's appear to be three times higher than similar estimates from the EPA. Assuming these costs are valid, cost effectiveness of new SCR's for NOx reduction is at the high end of traditional cost effectiveness for District rules. Staff is working to refine cost estimates.

Other Impacts

Bay Area NOx reductions may reduce ambient levels of particulate pollution, because some fraction of the NOx emissions is ultimately converted to nitrate particles in the atmosphere. However, these reactions are not currently well understood and are difficult to quantify.

Minor adverse environmental impacts may occur as a result of this control measure. Photochemical modeling from the 1980's and 1990's and recent ambient measurements indicate that Bay Area NOx reductions are likely to cause localized increases in Bay Area ozone levels. In addition, ambient measurements suggest an emerging "ozone weekend effect" in the Sacramento area that may mean Bay Area NOx reductions are counterproductive in reducing downwind ozone. Further information on the benefits and disbenefits of Bay Area NOx reductions may come from photochemical modeling

associated with the Central California Ozone Study. The current assessment is that a reduction of 1.2 tons/day of NO_x is below the sensitivity of the model.

Additional use of SCR would increase ammonia emissions and the hazards associated with the transportation and use of ammonia, since the SCR system relies on ammonia injection to reduce NO_x.

Other than the minor impacts discussed above, no potential adverse environmental impacts are expected as a result of the adoption of this control measure.

References

- Blanchard, C., Tanenbaum, S. "Characterization of CCOS Intensive Operating Periods: Task 4c. Supplemental Analyses: Corroborative Analysis" (paper prepared by Envair for the Central Coast Ozone Study/ARB, 2001)
- Gallenstein, C., California Air Resources Board. 2003. Personal communication.
- Marr, L.C., Harley, R.A. 2002. "Spectral analysis of weekday-weekend differences in ambient ozone, nitrogen oxide, and non-methane hydrocarbon time series in California." *Atmospheric Environment* 36, 2327-2335.
- San Joaquin Valley Unified APCD. 2002. "Final Staff Report: Amendments to Rule 4703 (Stationary Gas Turbines)" and Appendices.
- U.S. Environmental Protection Agency. 2000. "Compilation of Emission Factors, AP-42 , 5th Ed., Chapter 3.1: Stationary Gas Turbines, Supplement F" and supporting materials including Background Document and turbine database.

CONTROL MEASURE SS 15: PROMOTE ENERGY CONSERVATION

Control Measure Description

The purpose of this measure is to educate public and private entities about the link between air quality, greenhouse gas emissions and energy conservation. This measure would encourage local governments, businesses and the public to make choices that have a positive effect on energy conservation and air quality. Reduced combustion of fossil fuels through increased energy efficiency will reduce emissions of ozone precursors and other criteria pollutants, as well as reduce emissions of carbon dioxide and other pollutants contributing to global warming. This control measure would reduce emissions of criteria pollutants and greenhouse gas emissions through the voluntary adoption and enforcement of a model ordinance by local government agencies to reduce energy consumption. This measure may also include development of new Air District programs to increase energy conservation and strengthen existing Air District programs and measures already achieving some measure of energy conservation. Air District energy conservation programs may include education campaigns targeting the general public, businesses and industry through outreach programs and workshops. The Air District may also partner with local government agencies and other public agencies to encourage energy conservation.

Background and Regulatory History

Energy produced from the combustion of fossil fuels, such as gasoline or natural gas, results in air emissions of criteria air pollutants, such as those that form ozone, and greenhouse gases. According to the California Energy Commission (CEC), fossil fuel combustion provides Californians with 86 percent of the energy consumed in the State and results in the emissions of nitrogen oxides, an ozone precursor, and carbon dioxide, a greenhouse gas. Potentially large potential emission reductions from energy conservation exist in all sectors of the economy. The CEC, created in 1974, is the State's primary energy policy and planning agency, promoting energy efficiency through appliance and building standards, public education, and other programs. The CEC also is involved with developing energy technologies and supporting renewable energy programs.

The Air Resources Board, in response to AB 1493 (Pavley), has drafted a regulation to reduce greenhouse gas emissions from light-duty motor vehicles that will primarily be accomplished through increased vehicle efficiency. The draft regulation would increase the light-duty fleet fuel efficiency by approximately 30 percent, would be inexpensive to implement, could be easily achieved with current technology, and would result in a cost savings to the consumer. TCMs and mobile source measures proposed in the Ozone Strategy also achieve some measure of energy efficiency by encouraging people to drive less, use alternative and more energy efficient means of transportation, or operate vehicles more efficiently.

The Air District is currently funding a pilot project to inventory the greenhouse gas emissions in Sonoma County, make recommendations to reduce these emissions, and highlight the link between greenhouse gas emission reductions and Air District air quality programs. The pilot project will also provide valuable information on developing a model greenhouse gas emission reduction ordinance that links these emission reductions with Air District efforts to reduce emissions of other air pollutants. Many of the Air District's

efforts to reduce emissions of criteria air pollutants, such as ozone precursors, have the additional benefit of reducing carbon dioxide, the primary greenhouse gas that contributes to global warming. This measure will more strongly link energy conservation measures with carbon dioxide and ozone precursor reductions.

Market Affected

This measure would affect all sectors of the Bay Area economy including building energy and industrial/manufacturing processes, transportation and land use planning. Design and construction of residential, retail, office, commercial and industrial buildings would be affected. Building envelopes (i.e. exteriors) that reduce heating and cooling loads would be promoted, as well as more energy efficient building systems that consume less energy for heating, cooling, lighting and water heating. More energy efficient industrial and manufacturing processes would be encouraged. Land use planning that promotes alternatives to the automobile would be encouraged (see TCM 15). Transportation sectors affected would include private and public fleets and would promote more energy efficient and alternate means of transportation.

Proposed Method of Control

This measure would be implemented through a combination of efforts. The Air District will develop a model Energy Efficiency Ordinance and encourage voluntary adoption by local government agencies. Agencies may adopt the Air District's model ordinance or modify the ordinance prior to adoption. The Air District will encourage agencies adopting the Energy Efficiency Ordinance to promote the ordinance throughout the agency's jurisdiction. In addition, the Air District may conduct a public education program promoting energy efficiency that links energy efficiency with combating air pollution and global warming. The Air District may also explore potential incentives that could be provided to promote projects and programs that in addition to reducing air pollution are energy efficient and reduce global warming gases. The Air District may also promote measures to reduce temperatures in urban areas through tree planting and the use of building and paving materials with high reflectivity. These measures would reduce urban ambient temperatures, and thus reduce energy demand for building cooling as well as contribute to reduced photochemical production of ozone.

Emissions Reductions Expected

Quantification of emission reductions from this measure is very difficult and would depend on the breadth of implementation and the available funding for implementation. Based on the growing concern over global warming, adoption and implementation of Energy Efficiency Ordinances (or similar climate change or greenhouse gas ordinances) by local government agencies may accelerate and thereby increase the effectiveness of this measure. The emission reductions achieved through enhancing the effectiveness of TCMs and mobile source measures from activities such as mode shifts to less polluting forms of transportation and reduced equipment idling are addressed in those measures.

Costs of Control

The annual costs of this measure cannot be determined at this time. Air District costs would include staff time for developing and implementing a model Energy Efficiency Ordinance. Costs may also include staff time for developing a public education program,

including the printing and distribution of materials and media and advertising costs, as well as providing incentives for the implementation of energy conservation measures. Many energy efficiency measures promoted through existing local, State and national programs incorporate cost effective measures that provide a financial benefit to the participant (i.e. there is a savings). For example, walking, bicycling or taking transit, instead of owning or driving a car, can save an individual \$5,000 -\$6,000 a year in the Bay Area.

Other Impacts

This measure would also reduce:

- Peak energy demands at utilities thereby reducing the need for construction of power plants to meet peak demands,
- Emissions of carbon dioxide, a global warming gas, and
- Consumer utility bills and fuel costs,
- Exploration, extraction, transportation and use of fossil fuels that damage water and land resources (e.g. oil spills that destroy plant and animal life and leave waterways and their surrounding shores uninhabitable).

CONTROL MEASURE MS 1: DIESEL EQUIPMENT IDLING ORDINANCE

Background

This control measure would reduce emissions from the idling of diesel equipment through the voluntary adoption and enforcement of a model ordinance by local government agencies. Reducing diesel equipment idling will primarily reduce emissions of NO_x, particulate matter and toxic air contaminants. The measure would limit the amount of time operators of diesel equipment, including heavy-duty trucks, buses and construction equipment, idle their engines. This measure would reduce emissions from heavy-duty trucks at warehouse/distribution centers, port terminals, truck stops and rest areas. This measure would also reduce emissions from idling diesel buses and heavy-duty diesel construction equipment. Diesel equipment idling for extended periods of time can produce localized high concentrations of emissions that affect the health of the operators and the neighboring communities.

Regulatory History

Anti-idling legislation has been enacted in at least 18 states across the country with some legislation targeting specific urban areas and others with statewide restrictions. The majority of the restrictions limit idling to 5 minutes. In December 2002, the ARB adopted its first anti-idling, airborne toxic control measure (ATCM) that would limit school bus idling at or near schools. That ATCM requires a driver of a school bus, urban bus, or other commercial motor vehicle to manually turn off the bus or vehicle engine upon arriving at a school and to restart it no more than 30 seconds before departing. Sections 40720 and 40720.5 of the California Health and Safety Code require coastal port authorities to limit truck idling at certain marine terminals to no longer than 30 minutes. The Air District has responsibility of enforcing this requirement at ports in the Bay Area. ARB has voluntary incentive and demonstration programs to reduce idling, such as the Carl Moyer Program, that promotes the introduction of auxiliary power units as an idle reduction device for heavy-duty vehicles. Placer County APCD has adopted regulations limiting idling to 5 minutes for diesel-powered trucks with a gross vehicle weight (GVW) of 26,000 lbs or greater and off-road diesel-powered equipment rated at 75 horsepower or greater. In July 2004, the California Air Resources Board adopted a heavy-duty vehicle idling emission reduction requirement.

Emissions Subject to Control

This control measure would potentially apply to all diesel-fueled medium and heavy heavy-duty trucks, heavy-duty urban buses and construction equipment rated at 75 horsepower or greater operating within the boundaries of the Air District. Preliminary estimates of the projected baseline ROG, NO_x and PM emissions for vehicles and equipment subject to control are provided in the table below.

Emissions Subject to Control (Tons/Day) - Preliminary¹

	ROG		NOx		PM	
	2005	2010	2005	2010	2005	2010
Medium Heavy Duty Diesel Trucks	0.04	0.04	1.36	1.03	0.04	0.04
Heavy Heavy Duty Diesel Trucks	0.18	0.14	3.90	2.85	0.09	0.07
Heavy Duty Diesel Urban Buses	0.04	0.04	0.79	0.81	0.02	0.02
School Buses	0.01	0.01	0.13	0.15	0.00	0.01
Off-Road Construction Equipment	0.40	0.28	3.61	2.78	0.25	0.20
Total	0.67	0.51	9.79	7.62	0.40	0.32

Proposed Method of Control

The Air District would develop a model diesel equipment idling ordinance and would encourage cities and counties to adopt it locally. Local governments choosing to adopt the ordinance would be responsible for enforcement. This measure would allow the use of alternative idle reduction devices such as automatic stop-start systems. Operators of diesel equipment without idle reduction devices would need to manually turn off their equipment. Diesel engine operators would not be subject to idling limitations under specified conditions in which idling would be necessary to accomplish the work for which the vehicle/equipment is designed. Compliance with this measure generally would be carried out by peace officers. General idling would be limited to 5 minutes per location for all applicable diesel equipment. Trucks with sleeper berths would be allowed to idle for more than 5 minutes only if an alternative means of providing power and heating or cooling to the berth were not available and the sleeping berth is in use. Devices such as fuel-fired heaters, auxiliary power units, and power inverter/chargers for use with batteries and grid-supplied electricity could be used to provide heating and air conditioning at truck stops for truck cab comfort. Outreach efforts to inform truck and bus operators could be carried out with signage at commercial fueling stations, Department of Motor Vehicles offices, transit stations, depots, truck stops and gateways to the Air District. Compliance by construction contractors could be promoted through informational materials provided by local governments, license renewals and/or mailings.

Emission Reductions Expected

The use of alternative idle reduction devices/strategies, in lieu of operating the heavy-duty diesel engine at idle, will result in significant NOx reductions. Reductions in ROG, PM, carbon monoxide and carbon dioxide are also expected, but to a lesser extent. The fleet average cost-effectiveness of this proposal is less than \$500 per ton of NOx plus ROG reduced. Estimated emission reductions from this measure are presented in the following table.

¹ Emissions are from ARB database and are an annual average of grown and controlled emissions.

Emissions Reductions Expected (Tons/Day) - Preliminary²

	ROG		NOx		PM	
	2005	2010	2005	2010	2005	2010
Medium Heavy Duty Diesel Trucks	0.01	0.01	0.27	0.21	0.01	0.01
Heavy Heavy Duty Diesel Trucks	0.04	0.03	0.78	0.57	0.02	0.01
Heavy Duty Diesel Urban Buses	0.01	0.01	0.16	0.16	0.00	0.00
School Buses	0.00	0.00	0.03	0.03	0.00	0.00
Off-Road Construction Equipment	0.08	0.06	0.72	0.56	0.05	0.04
Total	0.13	0.10	1.96	1.52	0.08	0.06

Cost of Controls

This measure could save up to \$1,600 in fuel costs and \$2,000 in maintenance costs annually per heavy-duty truck. Idle shutdown systems are a standard feature on current electronically controlled on-road heavy-duty engines, but would need to be reprogrammed to shut the engine down after 5 minutes. Either engine manufacturers or vehicle owners would need to reset the idle shutdown time. The cost incurred to reset the idle shutdown time is not significant. There would be no cost to operators of vehicles or equipment that do not have idle shutdown systems and would therefore need to manually turn off their equipment.

Other Impacts

This measure would also reduce:

- Emissions of diesel particulate matter, which the California Air Resources Board has identified as a toxic air contaminant;
- Consumption of diesel fuel;
- Emissions of carbon dioxide, a global warming gas; and
- Noise and odor impacts to sensitive receptors near warehouses and distribution centers.

No significant adverse environmental impacts are expected as a result of the implementation of this control measure.

² Emission reductions are based on ARB's Staff Report: Initial Statement of Reasons, Public Hearing to Consider Adoption of Heavy-Duty Vehicle Idling Emission Reduction Requirement, December 5, 2003, that estimates 5% of emissions are from idling. Emission reductions in this table assume 1% emission reductions due to the voluntary nature of this measure and enforceability.

CONTROL MEASURE MS 2: GREEN CONTRACTING

Background

This measure would entail development and promotion of a model ordinance for local government agencies to use in amending local codes that govern public agency contracting. Public agencies can play an important role in improving air quality by encouraging contractors to operate low-emission vehicles, purchase clean fuels, promote ridesharing programs and curtail polluting activities on Spare the Air days. By adopting and implementing Green Contracting Ordinances, public agencies can encourage contractors to operate their businesses in ways that benefit air quality.

Regulatory History

The Air District does not have regulatory authority to require local government agencies to adopt Green Contracting Ordinances. Under this measure, adoption of Green Contracting Ordinances by public agencies in the Bay Area would be strictly voluntary. The Sacramento Metropolitan Air Quality Management District and the Yolo-Solano and Placer County Air Pollution Control Districts have developed a Model Green Contracting Ordinance for use by local agencies in their jurisdictions.

Emissions Subject to Control

This measure achieves emission reductions by encouraging contractors that do business with public agencies to increase the use of low-emission vehicles and equipment or implement other measures that reduce emissions, such as use of clean fuels or business practices supporting employee trip reduction. Emissions subject to control would include on road mobile sources and off road equipment operated by contractors that do business with public agencies, emissions from the employee commutes for these contractors, and emissions from activities discouraged on Spare the Air days, such as vehicle refueling, use of gasoline-powered lawn and garden equipment, and use of paints and solvents.

Proposed Method of Control

The Air District will develop a model Green Contracting Ordinance and encourage adoption by local government agencies. Agencies may adopt the Air District's model ordinance or modify the ordinance prior to adoption. The Air District will encourage agencies adopting a Green Contracting Ordinance to promote the ordinance with businesses that may contract with the agency. In implementing the ordinance, the agency would give preferential consideration in awarding contracts to contractors that procure and operate low-emission vehicles, purchase clean fuels, and achieve low-emission fleet status for off-road equipment and heavy-duty on-road fleets. Participating government agencies will also provide preferential consideration in awarding contracts to contractors that promote ridesharing programs and participate in the Spare the Air program. An agency would include contract bid language implementing the following contracting program requirements on contracts within the Air District:

- Contractor would submit to the local government agency a clean air plan for reducing air emissions. The plan may contain but would not be limited to emission reductions from on-going activities, such as low-emission fleet

operations and ridesharing programs, and/or intermittent emission reductions, such as participation in the Spare the Air program. This plan would be submitted to and approved by the contracting agency prior to the final execution of the contract. This plan would detail the types of actions the contractor would take to reduce air quality impacts while working within the jurisdiction.

- A contractor may submit their low-emission fleet status as a qualifying plan. Low-emission fleet status might be achieved by subcontracting to a registered low-emission fleet for the contracted work or using approved alternative fuels or devices on non-compliant equipment.
- Bidders that provide ridesharing program components could include those elements in their submitted plan. These components may include membership in a transportation management association, having a designated employee transportation coordinator, or some other type of effective employee alternative commute program.
- The contractor submits an acceptable plan to curtail emission-producing activities on Spare the Air days.
- The contractor meets with local agency staff and discusses suitable emission reduction strategies and future plans.

Emission Reductions Expected

Emission reductions expected from this measure are very difficult to quantify. Reductions would be achieved by the ability of contractors that meet Green Contracting requirements to win contracts with local government agencies. The volume of work, emission characteristics of the low emission fleet, volume of clean fuel used, level of participation of employee commute programs and number of Spare the Air days would all be factors affecting the level of emission reductions achieved by this measure.

Cost of Controls

Contractors may incur costs by purchasing, maintaining and/or operating a low emission fleet, providing employees with alternative commute benefits, purchasing clean fuels or curtailing activities on Spare the Air days. However, if local agencies favor contractors with such programs, they could improve the competitiveness of contractors in winning contract awards. Local government agencies may have higher costs if they award contracts to contractors that have higher costs but are selected because they meet Green Contracting requirements.

Other Impacts

Increased use of fuel efficient vehicles and equipment, reduced vehicle trips, and other energy saving measures implemented based on green contracting provisions would reduce emissions of pollutants that contribute to global warming. No significant adverse environmental impacts are expected as a result of the implementation of this control measure.

CONTROL MEASURE MS 3: LOW-EMISSION VEHICLE INCENTIVES

Background

The purpose of this measure is to encourage the purchase of new low-emission vehicles and to reduce emissions from existing vehicles. Low-emission vehicles can be defined as vehicles that emit significantly less pollution than the standards established for vehicles of similar make and model year. Low-emission vehicles typically have cleaner burning engines, fuels and/or exhaust treatment devices. The Air District currently funds low-emission vehicle projects through the Transportation Fund for Clean Air (TFCA), Carl Moyer Program and other funding sources. TFCA enabling legislation identifies “low-emission and zero-emission vehicle programs” as one of the project categories eligible for TFCA funding. The legislation further requires that to be eligible for funding, control measures such as low-emission vehicle programs must also be included in the plans for attainment of state or federal ambient air quality standards, such as this Ozone Strategy. This measure clarifies the types of low-emission vehicle projects that would be eligible for TFCA funds and other Air District grant programs.

Regulatory History

The Air District provides financial incentives to increase the use of low-emission vehicles. The Air District currently provides incentives to reduce mobile source emissions through the TFCA and Carl Moyer Programs. Section 44220 of the California Health and Safety Code allows the Air District to collect funds through a motor vehicle registration surcharge to carry out “low-emission and zero-emission” projects that are also contained in a State ambient air quality attainment plan, such as this Ozone Strategy. Chapter 9 of the California Health and Safety Code contains the enabling legislation for the Carl Moyer Program. Under the Carl Moyer Program, the California Air Resources Board (CARB) provides funding to local air districts, which award grants to reduce emissions from on-road and off-road engines and equipment in public and private fleets. In fall 2004, legislation was enacted which 1) significantly increases funding for the Carl Moyer Program, and provides a stable funding source through the year 2014, and 2) authorizes local air districts to impose an additional \$2 per vehicle surcharge on motor vehicle registrations, to be used for projects to reduce emissions from heavy-duty vehicles, scrappage or repair of existing in-use vehicles, and agricultural sources. The new legislation will greatly increase the available funding to implement low-emission vehicle projects, especially projects to reduce emissions of NO_x and particulate matter from heavy-duty diesel engines. The Air District’s Low Emission School Bus Program provides funds for the conversion of school buses to clean fuels or the installation of particulate matter retrofit devices on school buses.

Emissions Subject to Control

This control measure would achieve emission reductions from low-emission vehicle programs that include all vehicle weights (i.e., light, medium and heavy-duty) and on-road and off-road sources. This control measure would allow TFCA funding of low-emission vehicles, engine repowers and retrofits, exhaust treatments, clean fuels or additives, and the infrastructure to supply alternative fuels. The projected ROG and NO_x emissions subject to control are provided below.

Emissions Subject to Control

<u>Year</u>	<u>ROG (TPD)</u>	<u>NO_x (TPD)</u>
2003	163	305
2006	137	263
2009	115	223

Proposed Method of Control

This control measure is intended to increase the share of low-emission vehicles in on-road and off-road fleets. TFCA funds and other Air District grant programs would be used to provide an incentive to:

- Purchase low- or zero-emission vehicles or engines;
- Engine repowers, retrofits and replacements;
- Exhaust treatments and add-on equipment;
- Clean fuels or additives; and
- Infrastructure to supply alternative fuels.

Emission Reductions Expected

Estimated emission reductions are shown in the table below. Emission reductions would be limited by available TFCA and other Air District grant program funds, availability of vehicles and infrastructure, and the ability of projects to compete for the funds. With the increase in funding due to the legislation enacted in fall 2004, it is expected that the Air District will be able to distribute \$15 million per year or more for low-emission vehicle projects beginning in 2005.

<u>Year</u>	Emission Reductions	
	<u>ROG (TPD, Summer)</u>	<u>NO_x (TPD, Summer)</u>
2003	0.03	0.6
2006	0.03	1.6
2009	0.03	4.6

Cost of Controls

For the incremental cost of light-duty and medium-duty low-emission vehicles, the District typically provides between \$1,000 and \$4,000 per vehicle. For the incremental cost of new heavy-duty vehicles, the District typically provides between \$15,000 - \$50,000 per vehicle. Grants for repowers and retrofits of existing heavy-duty diesel engines typically range from \$5,000 to \$20,000 per vehicle. Projects funded by the Air District via the Carl Moyer Program typically achieve a cost-effectiveness of less than \$5,000 per ton of NO_x reduced. The cost-effectiveness of low-emission vehicle projects funded through the TFCA program can range from \$5,000 to \$90,000 per ton, with an average cost-effectiveness in the range of \$30,000 to \$40,000 per ton.

Other Impacts

It would be necessary to minimize leaks and losses of natural gas during handling, as methane is 30 times more potent than CO₂ as a greenhouse gas. Increased use of natural gas and electric vehicles would reduce U.S. dependency on imported petroleum. Other than the minor impacts discussed above, no potential adverse environmental impacts are expected as a result of the implementation of this control measure.

CONTROL MEASURE MS 4: VEHICLE BUY BACK PROGRAM

Background

This control measure would accelerate the retirement of older, high emitting vehicles from the region's roadways by providing incentives to scrap them. The first vehicle scrapping program in the country was implemented in the South Coast Air Basin by UNOCAL in 1990. The BAAQMD has administered a voluntary vehicle scrapping program since 1996. Other California air districts that have conducted publicly funded buy back programs include the South Coast AQMD, Santa Barbara APCD, San Diego APCD, and San Joaquin Unified APCD.

Regulatory History

The federal 1990 Clean Air Act amendments required the EPA to issue guidance on a control measure that would “encourage the voluntary removal from use and the market place of pre-1980 model year light duty vehicles”. Following the UNOCAL pilot project, numerous air districts throughout the state implemented vehicle buy back programs. The South Coast Air Quality Management District (SCAQMD) was the first to implement a vehicle buy-back program with their adoption of Regulation 1610 in 1993.

The Air District began its Vehicle Buy Back (VBB) Program in June 1996. The Air District's VBB Program purchases and scraps older vehicles that lack modern emission control systems and therefore produce more air pollution than newer cars. Since its inception in June 1996 through April 2004, the VBB Program has purchased and scrapped nearly 20,000 vehicles. The Air District funds the VBB Program through its Transportation Fund for Clean Air (TFCA). Section 44220 of the California Health and Safety Code allows the Bay Area Air District to collect funds through a motor vehicle registration surcharge to carry out specified clean air projects, including a vehicle scrapping program. The section further requires “an automobile buy-back scrapping program operated by a governmental agency” also be contained in a State ambient air quality attainment plan in order to be funded with TFCA funds. The Air District's VBB Program adheres to the California Air Resources Board's Voluntary Accelerated Light-duty Vehicle Retirement (VAVR) regulation.

Emissions Subject to Control

This control measure reduces emissions of reactive hydrocarbons, oxides of nitrogen and particulates from older model year light-duty motor vehicles. Currently, vehicles eligible for the VBB Program are light duty vehicles model year 1981 or older. There are approximately 265,600 model year 1981 and older vehicles in the Bay Area.³ The projected ROG and NOx emissions subject to control for vehicles that are model year 1981 and older are provided below.

³ Number of 1981 and older vehicles is from DMV database provided to District through VBB contractor as of October 2003

Emissions Subject to Control (Tons/Day)

<u>Year</u>	<u>ROG</u>	<u>NOx</u>
2003	23.5	11.6
2006	21.2	10.5
2009	15.4	7.6

Proposed Method of Control

The VBB Program is a voluntary program that provides a financial incentive to owners of eligible vehicles to scrap their vehicles. The Air District implements the VBB Program by contracting with vehicle dismantlers to screen, purchase, and destroy eligible vehicles. The purchase of vehicles to be scrapped adheres to the VAVR vehicle eligibility requirements, which include the registration status of the vehicle, ability of the vehicle to pass a functional test, and an equipment inspection test. VAVR eligibility requirements are established to provide assurance that a vehicle would remain on the road and continue to produce emissions if it were not scrapped. Marketing of the program by the Air District and its contractors informs potentially eligible vehicle owners about the program through annual direct mailings, newspaper and radio advertisements, fliers and on-site advertisements at scrapping sites. The VBB Program was expanded in October 2004, increasing the eligibility of model years from 1981 to 1985 and increasing the incentive from \$500 to \$650. The Air District will continue to monitor the VBB Program and consider further revisions to the program, as necessary, to maximize the emission reductions and cost effectiveness.

Emission Reduction Expected

The emission reductions from this program depend upon the amount of funding available, the vehicle purchase price, vehicle eligibility requirements, the effectiveness of the marketing program, and the actual buy back rate. Increasing the purchase price, reducing the stringency of the vehicle eligibility requirements, and/or more intensive marketing increases the rate at which vehicles are purchased. Prior to October 2004, the Air District VBB Program offered \$500 to eligible vehicle owners. At this funding level, the program purchased approximately 280 vehicles per month, or 3,360 vehicles per year. Scrapping 3,360 vehicles annually resulted in ROG reductions of 0.30 tons/day and NOx reductions of 0.15 tons/day, and a cost effectiveness of approximately \$6,400/ton of ROG and NOx reduced. The expansion of the program in October 2004, to allow up through 1985 model years and increasing the incentive to \$650, increased the rate at which vehicles are purchased and the emission reductions achieved by the program. Under the expanded VBB Program, approximately 600 vehicles per month are purchased. Emission reductions under the expanded program are approximately 0.48 tons/day of ROG and 0.31 tons/day of NOx.

Cost of Controls

The average cost of scrapping a vehicle under the expanded program is \$890, which includes the \$650 paid to the vehicle donor and \$240 in program overhead costs. Program overhead consists of the cost of contractors to market the program, purchase and scrap the vehicles and Air District staff time. In FY 2003/04, the Air District spent approximately \$3.7 million to purchase and scrap 4,573 vehicles. In FY 2004/05, the Air District's allocation remained unchanged. In FY 2005/06, the VBB Program budget was

increased to \$7.2 million to fund the expanded program. Cost effectiveness for the expanded program is approximately \$8,600/ton.

Other Impacts

Scrapping older vehicles may potentially reduce the supply of affordable vehicles for the economically disadvantaged. This measure would also increase the amount of solid waste generated by scrapped vehicles, although some materials from scrapped vehicles is recycled. Except as noted above, no significant adverse environmental impacts are expected as a result of the implementation of this control measure.

BAY AREA
2005 OZONE STRATEGY

**APPENDIX D - TRANSPORTATION CONTROL
MEASURE DESCRIPTIONS**

DRAFT

SEPTEMBER 2005



**BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT**

939 Ellis Street
San Francisco, CA 94109
(415) 771.6000
www.baaqmd.gov

APPENDIX D - TRANSPORTATION CONTROL MEASURE DESCRIPTIONS

TABLE OF CONTENTS

TCM 1: SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAM.....	D - 3
TCM 2: EMPLOYER BASED TRIP REDUCTION.....	D - 7
TCM 3: IMPROVE LOCAL AND AREAWIDE BUS SERVICE	D - 8
TCM 4: UPGRADE AND EXPAND LOCAL AND REGIONAL RAIL SERVICE.....	D-12
TCM 5: IMPROVE ACCESS TO RAIL AND FERRIES	D-15
TCM 6: IMPROVE INTERREGIONAL RAIL SERVICE	D-19
TCM 7: IMPROVE FERRY SERVICE	D-21
TCM 8: CONSTRUCT CARPOOL / EXPRESS BUS LANES ON FREEWAYS.....	D-24
TCM 9: IMPROVE BICYCLE ACCESS AND FACILITIES	D-27
TCM 10: YOUTH TRANSPORTATION.....	D-31
TCM 11: INSTALL FREEWAY TRAFFIC MANAGEMENT SYSTEMS	D-33
TCM 12: ARTERIAL MANAGEMENT MEASURES	D-36
TCM 13: TRANSIT USE INCENTIVES	D-39
TCM 14: CARPOOL AND VANPOOL SERVICES AND INCENTIVES.....	D-42
TCM 15: LOCAL LAND USE PLANNING AND DEVELOPMENT STRATEGIES	D-45
TCM 16: PUBLIC EDUCATION/INTERMITTENT CONTROL MEASURES	D-51
TCM 17: CONDUCT DEMONSTRATION PROJECTS.....	D-56
TCM 18: IMPLEMENT TRANSPORTATION PRICING REFORM.....	D-59
TCM 19: IMPROVE PEDESTRIAN ACCESS AND FACILITIES	D-64
TCM 20: PROMOTE TRAFFIC CALMING MEASURES.....	D-67

The transportation control measures (TCMs) in this appendix for the 2005 Ozone Strategy were designed to reduce emissions from motor vehicles by reducing vehicle trips and vehicle miles traveled. TCMs may also reduce vehicle use, vehicle idling or traffic congestion. These TCMs address State ozone planning requirements for the Bay Area. Some of the TCMs are included in local, regional and state transportation programs. We expect to see those measures implemented, and achieve the emissions reductions we have projected. Other measures have little or no funding, and may require legislative authorization and voter approval prior to implementation. One example is TCM 18, Implement Transportation Pricing Reform. While the Air District would also like to see the most effective TCMs implemented, we acknowledge that there are significant obstacles that first must be overcome. Public education efforts must be undertaken in order to gain acceptance of these often-controversial measures.

TCM 1: SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAM

Purpose

TCM 1 will support and encourage voluntary efforts by Bay Area employers to promote the use of commute alternatives by their employees.

Background

The political and economic climate for employer-based trip reduction has changed since the early 1990's, when employer-based trip reduction programs received greater emphasis in Bay Area air quality plans. Major developments include 1) the enactment of SB 437, which prohibited mandatory employer trip reduction programs as of January 1, 1996, and 2) the reduction in public sector funding for transportation demand management programs.

Despite these developments, the need for trip reduction programs remains strong. Without continued trip reduction programs, increased traffic volumes in general could increase motor vehicle emissions, and congestion in particular increases auto emissions due to stop and go traffic and lower average speeds. Employment growth in the Bay Area has been especially robust in suburban areas, which due to land use patterns and limited transit infrastructure, tend to have the highest drive alone rates. In the near term, carpool and vanpool programs are especially suited for many suburban locations.

Commute trips, which comprise 25 percent of daily trips, are still logical targets for employer-based trip reduction efforts due to: a) their key role in contributing to peak period traffic congestion and ozone formation, b) the long average distance of commute trips compared to other trip types, c) the repetitive nature of commute trips that occur on the same route and schedule each day, d) the pool of potential candidates for ridesharing at larger work sites, and e) the ability of employers to influence employee commute mode choice by means of the facilities, services, and incentives that they provide.

While the need for employer programs is undiminished, TCM 1 will focus on assessing employer needs and maintaining core support services to employers. Generally, most of this effort will be accomplished through the regional ridesharing program administered by MTC and through discussions between the Air District and employers involved in the Spare the Air program, the Bay Area Clean Air Partnership (BayCAP), and other outreach efforts.

Description

TCM 1 includes the following:

Phase 1 (2004-2006)

Generally maintain current efforts:

- Provide core support for employer programs, based on an assessment of employer needs and the level of employer interest. Potential support includes

assistance in developing or enhancing employer programs, information and referrals, employer networks, and programs to recognize outstanding employer programs.

- Support legislation to maintain and expand incentives for employer programs, such as tax deductions and/or tax credits for employer efforts to promote ridesharing, transit, and other commute alternatives. (MTC, Air District, Congestion Management Agencies.)
- Implement employer elements of the *Spare the Air* program (see TCM 16).
- Provide information and assistance to employers in organizing transportation fairs and other marketing events at Bay Area work sites.
- Work with employers to implement regional promotions such as Rideshare Week, Bike to Work Day, etc.
- Work with employers to implement provisions of the State parking cash-out law, where certain employers who lease parking and provide subsidized parking to employees must offer their employees the choice of the subsidized parking or the equivalent value of the parking space as a cash payment to use for commute alternatives such as carpooling, transit, bicycling and walking, or to retain as additional income (see TCM 15).
- Promote *Commuter Check* transit subsidy program to employers (see TCM 13).
- Implement sub-regional or local programs to promote employer-based trip reduction in those cities and counties that choose to allocate local resources to such efforts. (Congestion Management Agencies, county transportation authorities, cities and counties).
- Work with cities, counties and other public agencies who are also employers to develop commute alternatives, including telecommuting, compressed work week schedules, guaranteed ride home programs, etc. (MTC and the Air District can make special efforts to work with governmental agencies to encourage their support for these types of programs and explore new funding opportunities).
- Continue to work with employers to support and encourage shuttle programs including the Bay Area Clean Air Partnership (BayCAP) comprehensive shuttles campaign to inventory existing programs, provide coordination and assistance, and promote “best practices” among shuttle operators. Support other efforts to coordinate shuttles with transit operators, improve shuttle marketing and provide additional shuttle funding opportunities.

Phase 2 (Beyond 2006)

- Continue programs listed above.

- Seek legislation to create incentives for stronger voluntary programs for all employers or to require certain minimum elements of a basic commute alternatives program for public employers.

Travel Market Affected

This TCM targets commute travel, which accounts for approximately 25 percent of trips and 33 percent of VMT on a typical weekday.

Effectiveness

Empirical results show that employer trip reduction programs can decrease vehicle trips to a typical worksite by as much as 5-10 percent. Results from a 1996 BayCAP survey showed that work sites with voluntary trip reduction programs reduced commute trips by about 8 percent compared to the average for large work sites in 1994-95 before implementation of mandatory employer-based trip reduction.

Maintenance of current efforts (and enhancements where feasible) is critical to assuring that voluntary trip reduction programs continue to reduce drive alone commute trips and emissions. Continued implementation of these voluntary programs is expected assumed to reduce work trips by 1% and yield the following emissions reductions:

	<u>ROG</u>	<u>NOx</u>
2006	0.53 tpd	0.57 tpd
2015	0.23 tpd	0.22 tpd

Cost

The costs of this TCM include the public sector costs to provide services to promote voluntary employer efforts as well as the costs to employers that choose to implement such programs. Much of the public sector costs are included in the cost of funding the regional rideshare program (see TCM 14).

Employer costs depend upon the number of employers that implement voluntary programs and the specific services and incentives that they offer to their employees. Data from studies of mandatory trip reduction programs indicate that employer costs typically ranged from \$25 to \$100 per employee per year. It is expected that employer costs for voluntary programs are lower, perhaps a maximum of \$40-\$50 per employee per year on average. Employer costs are offset to some extent by indirect gains such as increased productivity of employees due to less stressful commutes and improved recruitment and employee retention.

Impediments

The primary impediment is the reduced employer interest in trip reduction efforts given the cost of implementing these types of programs in a weakened economy and the lack of authority for the Air District to require these programs.

Other Impacts

In addition to reducing emissions, this TCM reduces auto trips in congested corridors and reduces fuel consumption and greenhouse gas emissions (CO₂). Employees will benefit from reduced commute costs, such as vehicle operating and maintenance costs.

TCM 2: EMPLOYER BASED TRIP REDUCTION

(A summary description of this deleted TCM is provided below for reference only.)

The purpose of TCM 2 was to decrease motor vehicle emissions by reducing the use of single occupant vehicles for commuting to work sites and employment centers in the Bay Area. TCM 2 differs from TCM 1 in that it was a District-wide regulation through which employers were required to implement programs to reduce employee vehicle trips. TCM 1 consists of entirely voluntary efforts by Bay Area employers to promote the use of commute alternatives by their employees

During the mid-1980's, the Air Resources Board determined that employer-based trip reduction rules were a reasonably available transportation control measure in accordance with the California Clean Air Act (CCAA). In response to this CCAA mandate, the Air District adopted Regulation 13, Rule 1, Trip Reduction Requirements for Large Employers in December 1992.

Regulation 13, Rule 1 applied to all employers at work sites with 100 or more employees. The rule divided the region into four geographic zones and established annual performance objectives for each zone. A failure to achieve the performance objectives was not considered a violation of the rule; however, it did trigger the requirement to submit an Employer Trip Reduction Plan or an Alternative Emission Reduction Program. The conventional Plan included trip reduction measures to reduce the number of employees commuting to the work site in single occupant vehicles. An Alternative Emission Reduction Program achieved emission reductions through other means, such as a vehicle buy-back or scrappage program.

In addition to directly administering the rule, TCM 2 was also implemented by the Air District through multiple efforts to reduce commute trips to smaller work sites and employment centers that were not subject to Regulation 13, Rule 1. The Air District pursued this through informational and outreach efforts directed toward smaller employers and employment centers (i.e. multi-tenant facilities). The Air District also allocated Transportation Fund for Clean Air grants, as appropriate, to projects and programs that benefited trip reduction efforts at smaller work sites.

However, TCM 2 was suspended in 1995 by Senate Bill 437 (Lewis). SB 437 prohibited air districts from requiring mandatory employer-based trip reduction programs.

TCM 3: IMPROVE LOCAL AND AREAWIDE BUS SERVICE

Purpose

This TCM will help to reduce motor vehicle trips, vehicle miles traveled, and mobile source emissions by maintaining and improving the Bay Area's extensive bus system, and by funding replacement of diesel buses with clean fuel buses and retrofits of diesel buses with emission control devices.

Background

TCM 3 will increase the attractiveness of local and regional bus service by ensuring the system is well maintained, adding more service as revenues permit, and developing new service concepts (such as enhanced bus, Bus Rapid Transit and Regional Express buses) to better serve existing markets and fill in regional transit gaps. There are 26 transit operators in the Bay Area that provide local and regional bus service. Each operator must tailor its service to local conditions. Cumulatively, these operators provided about 94 million revenue miles of bus service in FY 2002-2003. Fixed route bus service accounts for approximately 66 percent of all transit riders in the Bay Area. Certain elements of this TCM – e.g., express bus, enhanced bus, clean fuel buses – will reduce motor vehicle emissions; elements regarding maintenance of the current system seek to assure that existing emission benefits continue.

MTC's long range Regional Transportation Plan (RTP) dedicates significant funding to maintaining existing bus facilities and vehicles, but capital and operating shortfalls will still remain to meet future needs. Also, transit operators will be hard pressed to expand service without new revenues. Recent financial conditions have caused many operators to curtail service and/or raise fares. Therefore, the RTP does not anticipate significant improvements to local bus routes at this time, other than some of the improvements discussed below.

Two examples of recent service improvements which would be continued and expanded under this TCM are the enhanced bus/BRT concepts being developed by AC Transit, Muni, and Santa Clara VTA and the Regional Express Bus Program funded with State transportation dollars.

Mobile source emissions are controlled through fuel and engine regulations. Recent amendments to the diesel fuel standards require that sulfur content of diesel fuel be reduced from the current 500 ppm to 15 ppm beginning in June 2006. In June 2004, ARB adopted modifications to the fleet rule for transit agencies to allow for the purchase of diesel hybrid electric buses by diesel-path transit agencies. Please refer to Section 2 of the main Ozone Strategy document for more information on state and national mobile source programs that impact transit buses.

The Air District funds replacement of diesel buses with clean fuel buses through the Transportation Fund for Clean Air. Clean fuel buses meet specified emission standards and do not use diesel as their primary fuel. The Air District also funds retrofits of diesel buses to reduce emissions from existing diesel bus engines.

Description

Improvements in local bus service are determined by the individual transit operator boards, based on revenues available. Decisions on expanding local service must address both the needs of commuters as well as low-income travelers who do not have access to a car. As part of the 2001 Regional Transportation Plan, MTC defined a Lifeline Transportation Network which addresses some of these needs.

The Regional Express Bus program was funded with \$40 million in State transportation funds which were used to purchase about 90 buses serving 12 new regional express bus routes. Participating transit operators included: AC Transit, CCCTA, Fairfield/Suisun, Golden Gate Transit, LAVTA, Samtrans, Tri-Delta, Vallejo, and West Cat. These buses serve generally longer distance routes that fill in key transit gaps, and use freeway HOV lanes where possible to improve travel times and service reliability.

Several transit operators are considering or have implemented enhanced bus service on major arterials, most notably AC Transit's Route 72 along San Pablo Avenue. Enhanced bus service is a concept that can include a variety of improvements, including more frequent service, relocated bus stops and signal priority treatment for better schedule adherence, real time bus arrival information, improved signage, proof-of-payment fare system, multiple-door boarding, and other passenger amenities. San Francisco Muni has also developed a long range Vision Plan that would provide similar types of services along certain Muni routes. Bus Rapid Transit (BRT) includes most of the features of enhanced bus, and involves even more ambitious enhancements to bus service and would typically include dedicated lanes for bus operations as well.

Phase 1 (2004-2006)

- Continue to fund the timely replacement of worn out buses in local transit operator bus fleets; while providing flexibility to some operators to use federal funds for preventive maintenance (operating expenses) on a case-by-case basis.
- Sustain the existing Regional Express Bus Program (12 routes) and expand with Regional Measure 2 revenues
- Assist transit operators with further planning work on enhanced bus and Bus Rapid Transit concepts
- Continue to seek new funding for MTC's Lifeline Transportation Network, to serve low income communities and assist persons transitioning from Welfare to Work (to date, MTC has funded 32 projects through the Low Income Flexible Transportation (LIFT) program using federal, state, and local funds).
- Complete retrofitting of 1,700 public transit buses with particulate traps and NOx catalysts. Continue Air District programs to fund the replacement of diesel buses with clean fuel buses and retrofitting of existing diesel buses with emission control technology.
- Sustain current bus services to the three Bay Area commercial airports for air passengers and employees.

Phase 2 (Beyond 2006)

- Restoration of some local routes that were eliminated or where service was curtailed

- Additional lifeline service as new funds become available
- Implementation of new Enhanced Bus and Bus Rapid Transit (BRT) services consistent with the financial assumptions in MTC's long range Regional Transportation Plan
- Expansion of Regional Express Bus Programs in North and South Bay as defined in Regional Measure 2

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.

Effectiveness

Emission reductions are based on the new Enhanced Bus, BRT, and Regional Express bus services expected to be operational in 2006 and 2015. The calculations reflect the number of new transit riders expected to use the services, mode of access, and proportion of riders who are transit dependent and do not own cars. Additionally, the 2006 calculations include the reductions from MTC's efforts to retrofit the regional bus fleet with devices to lower NOx and particulates:

	<u>ROG</u>	<u>NOx</u>
2006	0.42 tpd	1.13 tpd
2015	0.15 tpd	0.13 tpd

Cost

The cost of restoring and expanding local bus service cannot be estimated at this time. Capital costs for the existing Regional Express Bus Program and various AC Transit, Muni and VTA enhanced bus and Bus Rapid Transit programs are shown below; operating costs cannot be estimated at this time:

- Regional Express Buses North and South Improvements: \$19.5 million (funded by Regional Measure 2)
- AC Transit BRT and Enhanced Bus, Phase 1: Telegraph Avenue/International Boulevard Corridor: \$167.0 million
- AC Transit BRT and Enhanced Bus, Phase 2: Telegraph Avenue/International Boulevard Corridor: \$164.4 million
- Muni BRT/Transit Preferential Streets (TPS) Program (includes Geary Street Corridor BRT project, also may include BRT along Van Ness Avenue and Potrero Avenue corridors): \$280 million
- VTA BRT Corridor: El Camino Real (Line 22) Phases 1 and 2: \$7.0 million
- VTA BRT Corridor: Along Stevens Creek Boulevard, El Camino Phase IIIB and Monterey Highway: \$46.0 million
- MTC Lifeline Transportation Program: \$216 million committed over the 25-year horizon of the Transportation 2030 Plan

Impediments

According to MTC's latest financial estimates from the Transportation 2030 Plan, Bay Area transit bus operators will have combined funding shortfalls of approximately \$1.3 billion in operating and \$1.4 billion in capital replacement over the next 25 years (some of these transit operators operate both bus and rail service). Thus 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.

Other Impacts

An improved bus system will offer more mobility choices for Bay Area travelers, provide a better transit network for those without a car, and reduce vehicle use. The Lifeline Transportation Network improves mobility options for low-income households. Reductions in vehicle travel will have corollary benefits in terms of saving energy, reducing greenhouse gases, and improving water quality through reduced runoff of oil laden water from roads.

TCM 4: UPGRADE AND EXPAND LOCAL AND REGIONAL RAIL SERVICE

Purpose

This TCM will reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by upgrading and expanding existing rail systems (BART, MUNI, VTA and Caltrain) and developing new rail service in the North Bay. This TCM will be most effective if implemented in conjunction with transit-oriented development near new and existing rail stations that provides for high density and mixed use development (see TCM 15) and with transit access improvements (see TCM 5).

Background

The Bay Area rail system has been continuously expanded over the past several decades. Rail systems provide about 72 million revenue vehicle miles of service and carry 32 percent of Bay Area transit riders in FY 2002-03. This TCM includes new service expansions and upgrades that have been studied and included in local and regional rail programs. MTC's Resolution 3434 Regional Transit Expansion Program includes nine new rail extensions and significant rail service expansions and enhancements. If fully implemented, the Resolution 3434 program would create 160 new route miles of rail and other bus and ferry improvements at a cost of around \$12 billion. (Note: Resolution 3434 was adopted as part of the 2001 Regional Transportation Plan, and then subsequently updated as part of the Transportation 2030 Plan.) Funding for Resolution 3434 is based on a combination of federal aid, state funding, local sales tax revenues, and other local sources. (For example, Regional Measure 2, approved by Bay Area voters in March 2004, provides funds from increased bridge tolls to several rail expansion projects.) The long-term capital replacement costs of sustaining the rail system are substantial and exceed those of the bus system due to the need to maintain the tracks and other fixed plant facilities. Addressing ongoing maintenance and operations costs presents significant challenges for Bay Area transit operators.

Description

Phase 1 (2004-2006)

- Muni Metro Third Street Light-Rail Project: light-rail extension to Bayview Hunters Point (Phase 1, initial operating segment)
- Caltrain Express/Rapid Rail Phase 1 ("Baby Bullet") to San Francisco
- Vasona Corridor light-rail extension from downtown San Jose to Winchester Boulevard in Campbell

Phase 2 (Beyond 2006)

- BART extension to Warm Springs
- BART-Oakland International Airport Connector
- Muni Metro Third Street Light-Rail Project: light-rail transit extension to Chinatown (Phase 2, Central Subway)
- Caltrain Express Tracks Phase 2
- Caltrain Downtown Extension/ Transbay Terminal Replacement
- Caltrain Rapid Rail Phase 2/ Electrification from San Francisco to Gilroy

- BART/East Contra Costa Rail Extension
- BART extension into Santa Clara County
- Downtown/East Valley: Santa Clara/Alum Rock corridor and Capitol Expressway light-rail extension to Nieman Boulevard
- Sonoma Marin Area Rail Transit District (SMART) commuter rail project
- Capitol Corridor Phase 1 Intercity Rail Service: track capacity/frequency improvements from Oakland to San Jose designed to allow 16 daily round trips between Oakland and Sacramento/San Jose
- Capitol Corridor Phase 2
- Dumbarton Rail Corridor Phase 1 (diesel locomotive service connecting BART and Caltrain over a rebuilt Dumbarton rail bridge)
- ACE service expansion to eight trains

MTC has adopted policies to encourage supportive local land use plans and policies for areas near rail transit extensions. As part of the Transportation 2030 Plan, MTC adopted transportation/land-use principles to encourage local development that makes these rail investments more cost effective.

Travel Market Affected

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

Effectiveness

Emission reductions are based on the new rail services expected to be operational in 2006 and 2015. The calculations reflect the number of new transit riders expected to use the services, mode of access to the rail stations, and proportion of riders who are transit dependent and do not own cars. The effectiveness of TCM 4 in reducing vehicle travel and emissions will be enhanced by implementing transit-oriented development near stations and station access improvements.

	<u>ROG</u>	<u>NOx</u>
2006	0.23 tpd	0.21 tpd
2015	0.15 tpd	0.12 tpd

Cost

The Phase 1 improvements are under construction and will be operational before 2006. The Phase 2 improvements are in various stages of implementation, and are mostly contained in MTC’s Resolution 3434 program. Aggregate capital costs for the Phase 1 and Phase 2 programs are listed below as included in MTC’s Transportation 2030 Plan:

Phase 1: \$947.0 million

Phase 2: \$12.0 billion (approximately \$10.0 billion of this is committed funding)

Impediments

Upgrade and expansion of region's rail systems will require that operators first be able to continue to maintain and operate their existing systems. Therefore, given the transit capital and operating shortfalls projected in MTC's Transportation 2030 Plan, most of the new rail expansions will be contingent on new sources of capital and operating funds, such as Regional Measure 2 (approved by voters in March 2004); new local sales tax measures approved by voters in Contra Costa, Marin, Sonoma, and San Mateo counties in November 2004; and federal earmarks from the SAFETEA bill that was signed into law on August 10, 2005.

Other Impacts

Construction of various rail projects will have environmental impacts which are analyzed in the individual project level EIRs (including short term emissions from construction activities). Construction of new rail systems will create jobs and provide an economic stimulus to the Bay Area. Co-location of higher density development near rail systems will prove a benefit to overall regional mobility. Rail systems will generally improve the reliability of commute and other trips because they operate on their own dedicated right of way. Passengers accessing new rail stations by car could create localized congestion around the stations, but this can be mitigated by measures that promote the use of feeder buses, employer shuttles, walking, and bicycling to transit stations (e.g., TCM 5).

TCM 5: IMPROVE ACCESS TO RAIL AND FERRIES

Purpose

TCM 5 will reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by reducing auto trips used to make short access trips to rail stations and ferry terminals and by increasing transit ridership by improving access to transit. This measure will expand feeder buses and shuttles, and improve bicycle and pedestrian access. By improving rail and ferry access options, these systems will become more convenient and there is a greater likelihood people will choose transit for their overall trip instead of a car. This measure will complement TCMs 3, 4, 6 and 7.

Background

The Bay Area's extensive investment in rail will be maximized if there is convenient access to the stations and terminals. Often access is constrained because of limited parking and because transit service to stations may be infrequent or not serve nearby destinations. Walking and bike access may be unsafe or difficult due to local traffic conditions, inadequate bicycle parking, terrain or other obstacles. The same issues apply to existing and potential new ferry terminals that would be developed by the Water Transit Authority in the future.

From the standpoint of air quality, short station access trips by autos present particular problems and opportunities. Motor vehicle emissions are much higher when a cold engine has just been started ("cold start emissions"). Therefore, much of the air quality benefit of transit is negated if riders drive to the station. On the other hand, since most users of transit generally live within a few miles of the transit service, there is considerable potential for alternative access options other than by car. Feeder bus and shuttles, walking, and biking are the principal options. Extensive feeder bus service already exists to many rail stations, so the opportunities for further improvement may be limited, and new service can be expensive. In the last ten years employers, cities, universities, hospitals, transit agencies and others have developed more than 150 shuttles directly linking rail stations with key nearby destinations. Walking and biking improvements have been a recent focus of public attention, including the Safe Routes to Transit concept. Currently only about 2 percent of BART's riders ride bikes to BART.

Another new station access concept that is currently being explored is the use of "station cars" for short trips. Station cars could be reserved in advance by transit riders and used for the "last mile" of a passenger's trips from the station to their destination, where bus service, walking, or other means of transportation would take too long or be too inconvenient. Ideally, the station cars themselves would be low emission vehicles to reduce air emissions.

Improved rail/bus connectivity at key transit hubs is another aspect of improved access. MTC is currently evaluating improvements to regional transit connectivity in an ongoing study, and it is likely that there will be station specific recommendations for these hubs addressing signage, transit information, or specific physical modifications.

Many of these station access concepts were recently evaluated by MTC as part of 2001 Ozone Attainment Plan Further Study Measure 5 (FSM 5), and findings from the study are included in this TCM.

Description

Bike/Walk Access: Improvements would include bicycle routes and lanes near transit stations, with connections to local and regional bike route networks; increased secure bicycle storage at transit, with bike stations at certain hubs; sidewalks, crosswalks, and direct pedestrian connections to nearby neighborhoods and activity centers, and better signage of bike/pedestrian access routes. This range of improvements is sometimes referred to as “Safe Routes to Transit”.

Feeder Buses: Improvements would primarily focus on the transfer arrangements between rail and ferries and the buses to make the transfer more convenient. New ferry routes and terminals and new rail stations will need to be developed in collaboration with local transit operators who will provide the feeder bus service.

Station Cars: These are vehicles that could be located at rail stations for use by transit riders who need to travel to destinations near the stations, but which do not have good transit service or are too far or inconvenient for walking/biking. Station cars would be shared vehicles that could be checked out in advance. Transit riders would pay for the use of the vehicle depending on how far it is driven and how long it is checked out. Station cars would need to meet the most stringent vehicle emissions requirements for maximum air quality benefit.

Shuttles: Bay Area shuttles are operated by a diverse group of businesses, cities, schools and transit operators. In order to sustain successful shuttles over the long term, stable funding sources, particularly operating subsidies, will be pursued. There are additional opportunities to establish new shuttle services, where the required partnerships can be developed. MTC analyzed new shuttle service in the 2001 Ozone Attainment Plan (Further Study Measure 5) and will review “last mile” shuttle potential in the 2005 Regional Transit Connectivity Plan required by Regional Measure 2.

Phase 1 (2004-2006)

- Develop demonstration program for station car and bike station concepts at selected regional transit centers
- Determine long term funding needs for existing shuttles, encourage better coordination between shuttles and transit operators, and examine funding options for new and existing shuttles
- Begin implementation of Safe Routes to Transit to improve bicycle and pedestrian access (RM 2 to provide about \$20 million)
- Complete Regional Transit Connectivity Plan (MTC is required to complete plan by May 2006 under RM2 (as revised pending legislative action)).

Phase 2 (Beyond 2006)

- Continue Safe Routes to Transit improvements
- Continue and expand other successful concepts from Phase 1

- Develop a master plan for implementation of bike stations or other innovative secure bicycle storage strategies at key transit hubs.
- Implement most cost effective new shuttles where funding is available.

The Air District's Transportation Fund for Clean Air (TFCA) funds public agency improvements to bicycle and pedestrian access, and local feeder bus or shuttle service to rail and ferry systems. The TFCA program funds several shuttle projects currently operating in the Bay Area. The amount of TFCA funds allocated to these routes generally decreases over time, and there is no guarantee these routes will continue to receive TFCA funding in the future. Efforts should be made to capture and retain the transit market created by the shuttle routes. The Air District will work with transit operators to develop TFCA applications for new shuttle and feeder bus service to rail and ferry stations that reduce emissions.

The Air District's TFCA program and MTC's Transportation for Livable Communities program fund bicycle and pedestrian improvements at transit facilities.

Cost

The cost of expanding fixed route feeder bus service is not known, and would depend on the operator and which routes would be expanded. Current operating costs vary between \$76 and \$114 per revenue service hour.

The cost of providing shuttles varies as well. Recent estimates for leasing a shuttle vehicle run between \$35 and \$75 per hour of service.

A very large station car program (1,000 cars) would cost approximately \$25 million for the cars (assume hybrid/SULEV type vehicles) and about \$5 million per year in administration costs.

The cost of adding bicycle storage at transit stations depends on whether the storage is provided as an enclosed locker or through a more substantial Bike Station arrangement. Lockers are fairly inexpensive, costing about \$1,500. Bike Station costs vary considerably depending on the services provided, ranging from under \$100,000 for the Berkeley BART bike station to over \$700,000 for the downtown S.F. Caltrain bike station. Assuring long term operating costs for bike stations also must be considered. A comprehensive program of Safe Routes to Transit to BART stations could cost over \$45 million, as estimated by one bicycle advocacy group.

Effectiveness

Emission reductions associated with TCM 5 are based on the following programs and assumptions.

- 1) An increase in feeder bus trips by riders who formally drove to rail/ferry
- 2) Additional bicycle access trips based on provision of new storage and safe routes to transit.
- 3) 24 new shuttle services to rail and ferries
- 4) 1000 car station car program

	<u>ROG</u>	<u>NOx</u>
2006	0.17 tpd	0.15 tpd
2015	0.06 tpd	0.05 tpd

Impediments

The ability of local transit operators to increase fixed route feeder bus service depends on availability of new operating funds, which are scarce. While employers could underwrite the cost of shuttles, most of the time the costs are prohibitively expensive unless the employee pays a large portion. Comprehensive efforts to improve bike and walk access to a number of rail stations, will require new funding sources. An initial demonstration program for station cars at 4-6 stations may be able to access existing fund sources (CMAQ, RM2)

Travel Market Affected

TCM 5 will affect all types of trips, including commute travel, shopping, personal business, social and recreational travel, and school trips.

Other Impacts

This measure will improve traveler safety for pedestrians and bicyclists. Additional feeder and shuttle services would produce emissions that could be mitigated by retrofitting vehicles with catalysts (if diesel powered), or by purchasing CNG or electric vehicles. The measure could reduce local auto traffic and congestion around stations and alleviate potential auto parking shortages.

TCM 6: IMPROVE INTERREGIONAL RAIL SERVICE

Purpose

TCM 6 will reduce motor vehicle travel and emissions for longer distance interregional trips by upgrading and expanding rail service in the Capitol Corridor (Sacramento-Oakland-San Jose) and the Altamont Corridor (Altamont Commuter Express between Stockton/Tracy and San Jose). It also includes initiation of new services as funding becomes available (e.g., potential High Speed Rail service between Los Angeles and the Bay Area).

Background

Capitol Corridor service between Sacramento and the Bay Area was initiated by the State in 1991 and management of the service was turned over to the Capitol Corridor Joint Powers Board in 1996. Currently there are 12 roundtrips a day between Sacramento and Oakland, with four continuing to San Jose. In recent years ridership growth on the Capitol Corridor has been among the highest in California for similar services.

The Altamont Commuter Express (ACE) from Stockton/Tracy, through Livermore/Pleasanton, to San Jose started operating in 1998. ACE provides three daily roundtrips a day, with the largest volume of passengers getting on and off at the Great America station serving Silicon Valley.

Another intercity service, Amtrak's San Joaquin trains, provides four daily roundtrips between Oakland and Bakersfield with two connecting feeder buses serving Stockton.

Description

MTC's Resolution 3434 Regional Transit Expansion Program includes funding for expanding existing intercity rail services as shown below. In addition, studies continue on a California High Speed Rail system between Los Angeles and the Bay Area, with potential funding pending a future statewide ballot measure. No significant changes in service are anticipated between now and 2006.

Phase 2 (Beyond 2006)

- Increase Capitol Corridor service to 16 daily roundtrips
- Increase Altamont Corridor Express service to 8 daily roundtrips.
- Track enhancements for both Capitol Corridor and ACE for more reliable service.
- Potential High Speed Rail Service between Los Angeles and the Bay Area

Additional services that may be studied and considered in the future include service from San Benito County and Monterey to the San Jose area.

Travel Market Affected

TCM 6 will affect mostly interregional trips, but will also serve intraregional travel over portions of the various corridors.

Effectiveness

Emission reductions are based on ridership estimates for the Phase 2 Capitol and ACE service improvements that would be implemented by 2015.. NOx estimates take into account the offsetting emissions from the diesel locomotives that power the additional trains.

	<u>ROG</u>	<u>NOx</u>
2015	0.03 tpd	(0.30) tpd <i>increase</i>

Cost

The capital costs of the Capitol Corridor improvements in MTC's Resolution 3434 Transit Expansion Program are estimated to be \$245 million (2004 dollars). The capital costs for ACE improvements are estimated to be \$128 million (2004 dollars). Higher levels of service will be contingent on finding additional sources of operating revenues. The total cost of the statewide high-speed rail system is about \$37 billion. The California High Speed Rail authority plans to seek voter approval of \$9.9 billion in general obligation bonds to develop the initial Los Angeles, San Francisco, and Sacramento segment.

Impediments

As with other proposed transit improvements, there are funding shortfalls on the capital and operating side for intercity rail enhancements that are addressed in MTC's Transportation 2030 Plan. Because the intercity services use privately owned railroad tracks, increasing service can lead to lengthy negotiations with the railroad owner over the costs making it necessary to track improvements to provide more capacity and allow for more scheduling flexibility.

Other Impacts

TCM 6 will improve travel options between the Bay Area and neighboring counties, and reduce auto trips in two of the region's most heavily congested corridors, I-80 and I-580. Diesel locomotive emissions can be reduced by conversion of the locomotives to clean diesel or alternative fuels, or possibly through the use of catalytic devices. (Electrification of intercity lines would not be cost effective at current ridership levels.) Reduced auto use will lower fuel consumption and decrease greenhouse gas emissions.

TCM 7: IMPROVE FERRY SERVICE

Purpose

TCM 7 will reduce emissions from Transbay auto trips, which tend to be longer in length, and will also reduce auto traffic in highly congested bridge corridors. New high-speed ferry service will offer a transportation alternative for crossing the Bay that is reliable, comfortable and provides a pleasant and relaxing travel experience. New ferry technology will result in overall emissions that are lower than those attributable to current passenger ferry service.

Background

Freeways and bridges that serve Transbay travel are already heavily congested in the peak periods, and during portions of the weekend. The number of trips crossing the Bay is projected to grow at a higher rate than the regional average over the next 25 years. Existing ferry services have all been expanded with newer, high-speed vessels on the Larkspur, Vallejo and Alameda/Oakland routes to San Francisco. In 1999 state legislation created the new Bay Area Water Transit Authority (WTA) to plan and operate new ferry routes beyond those currently in service. Their work produced an Implementation and Operations Plan in 2003, which recommended an expansion of existing ferry service and an initial set of routes shown below:

- Pittsburg/Antioch-Martinez-San Francisco
- Hercules/Rodeo-San Francisco
- Richmond-San Francisco
- Berkeley-San Francisco-Mission Bay
- Oyster Point (South San Francisco)-San Francisco
- Redwood City-San Francisco
- Treasure Island – San Francisco

Description

TCM 7 contains several elements. Phase 1 (2004-2006) primarily involves initial planning for new ferry service. A new low emission ferry will start Vallejo service in 2004. Phase 2 includes the start up of these services as well as further study into other possible new ferry service.

Phase 2 (Beyond 2006)

- Expansion of existing ferry service between Oakland/Alameda and San Francisco (two new vessels)
- New intermodal transit hub at Vallejo Ferry Terminal
- Expansion of service between Larkspur and San Francisco
- New Berkeley/Albany service to San Francisco (two vessels)
- New South San Francisco service to San Francisco (two vessels)
- Expand berthing capacity at the Ferry Building in San Francisco
- Feeder bus service to provide access to ferries (see also TCM 5)
- Expand carrying capacity for bicycles on ferries (see also TCM 9)

- Hydrogen fuel-cell ferry demonstration project from Treasure Island to San Francisco
- Assist operators in converting vessels to lower emissions

Phase 2 will also include the continuing study of other new services, including:

- Potential new service between, Richmond, Hercules/Rodeo, Martinez, and Redwood City to San Francisco;
- Further study of using the Port of Sonoma
- Potential new service for passengers and cargo between Oakland and San Francisco airports

MTC has worked with ferry and other transit operators to develop transfer arrangements, including low cost transfers and joint passes (see TCM 13).

Travel Market Affected

Transbay trips across the Bay bridges are projected to increase by 40 percent over the next 25 years, higher than the Bay Area average. This measure will focus primarily on peak period commute travel, when congestion on bridges is greatest. It will also provide an additional transportation option for shopping, personal business, and social and recreational trips. Tourism is also expected to generate a number of new riders for many of the ferry services.

Effectiveness

TCM 7's emission reductions are based on MTC's analysis of the seven new services above. Emissions from the ferry vessels would be lower than those attributable to current passenger ferry service, given the WTA's commitment to the operate ferries that are 85 percent cleaner than the EPA's 2007 Tier 2 standards for marine vessels. Phase 2 improvements are expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2015	0.06 tpd	0.06 tpd

Cost

New ferry service requires funding for vessels, terminals and parking, and feeder bus service. Funds for several new services (vessels and operating funds) were provided through voter approval of Regional Measure 2 in March 2004. In addition, the WTA received a \$10.0 million federal earmark for capital investments from the SAFETEA bill that was signed into law on August 10, 2005. Local jurisdictions together with County Congestion Management Agencies will need to prioritize funding for terminals in their local funding process. Future expansion of existing ferry services is uncertain given current transit funding problems.

The capital cost of the seven new ferry routes (as estimated by WTA) is \$175 million (plus the cost for fuel cell project to Treasure Island), and the net annual operating cost is estimated to be \$90 million.

Impediments

Passage of Regional Measure 2 provides partial funding for the Oakland/Alameda/Harbor Bay, Berkeley/Albany, and South San Francisco routes. Planning for new ferry terminals, including environmental review and obtaining the necessary permits, could be lengthy depending on the site. Funding for feeder bus service to the new terminals will also need to be identified (see TCM 5).

Other Impacts

System level environmental impacts of an expanded ferry system were recently analyzed by the WTA in a comprehensive EIR; impacts of individual terminals would be assessed in separate project level EIRs. New ferry service could impact existing transit operators by shifting some existing passengers to water transit, resulting in some revenue diversion. New ferry terminals may result in traffic impacts on neighborhoods near the terminals. There could also be an increase in cold start emissions from the increase in passenger vehicles parked at ferry terminals during the workday. An extensive system of ferries could add to the attraction of the Bay Area as a tourist destination and provide an economic stimulus.

Another major advantage of an expanded ferry system would be the role ferries would play in the event of a future earthquake that damaged one or more Bay bridges or BART. If an earthquake were to strike the Bay Area (highly probable over the next 30 years), ferries could play a vital role in post quake evacuation and in the immediate to longer term recovery period.

TCM 8: CONSTRUCT CARPOOL / EXPRESS BUS LANES ON FREEWAYS

Purpose

The California Air Resources Board considers an HOV lane network to be a "reasonably available" transportation control measure. This TCM could help reduce mobile source emissions by continuing the development of an integrated Bay Area HOV lane system that will encourage use of carpools, vanpools and other high occupancy vehicles (HOVs), such as express buses. Well-managed HOV lanes will encourage commuters and other trip makers to use high occupancy modes by providing faster more reliable travel compared to travel in the adjacent mixed flow freeway lanes. HOV lanes act in combination with other factors that influence carpooling and transit, such as free passage on the Bay bridges and limited or high cost parking in some areas.

Background

The Bay Area currently has 300 lane miles of HOV lanes (in 2000), including freeways and expressways (in Santa Clara County). Another 100 lane miles are programmed in MTC's current Transportation Improvement Program (2005 TIP). Monitoring of existing HOV lanes by Caltrans indicates that most all of these lanes carry considerably more people than the adjacent mixed flow lanes. Under state law, alternatively fueled vehicles identified with a sticker may also use the HOV lanes.

MTC periodically reviews HOV lane performance and updates the Bay Area HOV Lane Master Plan. Recommended HOV lane improvements are then included in the Regional Transportation Plan and programmed in the TIP. The latest HOV Master Plan would expand the system to 534 lane-miles. The HOV Master Plan also addressed other related issues, such as HOV lane occupancy requirements, hours of operation, and enforcement. The latest update (February 2003) also included a comprehensive analysis of regional emissions from different HOV lane configurations, including conversion of existing lanes to HOV lanes, raising occupancy requirements to 3+ on all HOV lanes, and providing exclusive lanes for express buses.

Description

The measure primarily addresses the physical configuration of the HOV lane system and operational requirements. Express bus service is addressed under TCM 3. The Phase 1 HOV lanes are those included in MTC's current TIP, whereas the Phase 2 lanes are those in the long range Regional Transportation Plan.

Phase 1 (2004-2006)

- 100 new miles of HOV lanes programmed in 2005 TIP
- New HOV to HOV lane connector at Rt 101/85 interchange in Mountain View
- New park and ride lots at various locations

Phase 2 (Beyond 2006)

The financially constrained element of the Transportation 2030 Plan includes funding for an additional 200 lane miles beyond those in the TIP, plus other park and ride lot projects. Another 200 lane miles is proposed in the vision element of the Transportation

2030 Plan as part of a proposed region-wide high-occupancy toll network. Special attention should be paid to express bus operations to maximize benefits for transit. Monitor and adjust occupancy requirements and hours of operation to maximize air quality and mobility benefits.

Phase 2 will also include the further development of HOV lane support infrastructure and programs, including strategically located park and ride lots, HOV bypass lanes at freeway on ramps, direct access HOV ramps (“slip ramps”) for carpools and buses to major employment centers, HOV-to-HOV lane freeway connectors to better integrate the entire network, possible use of freeway shoulders by express buses to bypass bottlenecks, and active enforcement of occupancy and use restrictions.

Increases in certain express bus services will be considered to maximize person carrying capacity of HOV lanes. TCM 3 discusses regional express bus service, which would be operated on HOV lanes in the Bay Area.

Average vehicle occupancy of all HOV lanes should be carefully monitored. MTC’s HOV Lane Master Plan predicts that by 2010, seven corridors will have HOV lane volumes in excess of the practical capacity of 1,600 vehicles per hour, and by 2025 15 out of 18 HOV corridors will exceed this volume. An increase in vehicle occupancy from 2+ to 3+ would normally be considered after other feasible corridor management strategies (Express Bus, expanded CHP enforcement, ramp metering, etc.) have been deployed.

As congestion continues to increase in the Bay Area and the length of the peak period expands, the Bay Area should consider moving toward a consistent regionwide set of hours (this would correspond to the current maximum spread of 5:00 a.m. to 10:00 a.m. and 3:00 p.m. to 7:00 p.m.). Additionally, there may be selected corridors and travel directions where hours of operation could be extended to mid-day hours (10:00 a.m. to 3:00 p.m.) based on travel conditions in the mixed flow lanes and the number of transit, carpools and vanpool users who could take advantage of these lanes.

Travel Market Affected

TCM 8 is aimed primarily at commute trips, which account for the majority of trips during the morning and evening peak periods. In the future, HOV lanes should help to increase average vehicle occupancy for other types of trips as hours of operation are expanded (e.g., shopping, personal business, school, recreational).

Effectiveness

The emission estimates below are based on the new HOV lane miles programmed in the TIP.

	<u>ROG</u>	<u>NOx</u>
2015	0.37 tpd	0.39 tpd

Cost

The cost of the HOV lanes programmed in the 2005 TIP is \$2.1 billion (\$256.0 million is programmed in FY 2005-2007). The cost of additional lanes in the Transportation 2030 Plan is about \$1.6 billion for HOV projects in the financially constrained element and over \$600 million for HOV projects in the vision element. (Note: Many HOV projects are part of larger widening projects; total project costs are cited.) New county sales tax measures, as passed by voters in November 2004, will provide funding for new HOV lanes in some counties (e.g., Sonoma Route 101). Furthermore, federal earmarks from the SAFETEA bill that was signed into law on August 10, 2005 will also help fund I-80 HOV lanes in Solano County.

Impediments

A review of the history of HOV lane violation rates indicates that there has been a dramatic improvement in HOV lane compliance, with only one lane exceeding the national average. However, continuing monitoring is important to preserve public support, particularly in light of new legislation allowing hybrid vehicles to use HOV lanes. Evaluation of future HOV lane performance in the HOV Lane Master Plan indicates that some lanes could become overcrowded in the future, and it may be necessary to consider changing occupancy requirements to preserve travel time savings; however, public resistance to such changes may be difficult to overcome.

Other Impacts

Increasing the use of carpools, vanpool, and express buses will have significant payoffs in conserving fuel, reducing dependence on foreign oil, and lowering greenhouse gas emissions. TCM 8 may have a short term negative impact on air quality due to emissions generated during construction and increased localized congestion.

HOV lanes outside the urban core may have some marginal impact on land use by making longer distance commuting more attractive. However, development decisions involve many other factors as well, and ABAG's adoption of a Smart Growth land use scenario (see TCM 15) is intended to focus more population growth in the Central part of the Bay Area, where HOV lanes will provide an important augmentation to mobility.

A well-developed HOV lane network could serve as the foundation for conversion of these lanes to a High Occupancy Toll Network as discussed in TCM 18.

TCM 9: IMPROVE BICYCLE ACCESS AND FACILITIES

Purpose

Bicycles are a low cost, widely available (60 percent of Bay Area households have at least one bicycle) and pollution free mode of transportation. TCM 9 will reduce mobile source emissions by expanding bicycle facilities serving employment sites, educational and cultural facilities, residential areas, shopping districts, and other activity centers. Typical improvements would include bike lanes, routes, paths, and bicycle parking facilities. Accessibility of transit to bike riders is also part of this TCM.

Background

According to the 1995 Nationwide Personal Transportation Study, 40 percent of all trips are two miles or less, and two-thirds are five miles or less. One-third of Bay Area employees live within five miles of their worksite. These short and medium length trips are well suited to bicycle travel, especially in the Bay Area's mild climate.

While a number of factors influence people's decisions about whether to use bicycles for their trip, key obstacles are the lack of safe and convenient bicycle routes and storage. Currently bicycles are widely used for recreational riding, but are less used as a commute mode, with only 1 percent of total daily trips being made by bike (compared to 9 percent by walking), or for other trips such as shopping or school trips. Greater use could be expected with a variety of local and system-wide improvements. MTC's 2001 Regional Transportation Plan defined a regional bike network for the first time, and MTC has decided to set aside funding in the Transportation 2030 Plan to complete critical gaps in this network.

Experience in cities such as Palo Alto, Davis, Seattle, and Portland, Oregon shows that bicycles can play an important role in local transportation. To obtain TDA funding from MTC local jurisdictions must have a Bicycle Advisory Committee to plan and prioritize funding for bike projects. These plans can also address related bicycle mobility and safety features such as signage, bike detectors at signals, safe lane widths, etc. Also, a number of Bay Area cities routinely incorporate bicycle improvements when maintaining or upgrading local streets.

Bicyclists also use transit extensively for their longer trips, and most Bay Area transit systems currently accommodate bikes (though some have restrictions during peak commute times). Buses accommodate bikes either through front mounted racks or on board if they can be folded. BART and Caltrain accommodate bikes on their trains, but with some restrictions. The Regional Express buses accommodate bikes with front racks as well.

A special issue for the bicycle community has been the provision of bike lanes on the Bay bridges. Bay bridges with bicycle lanes currently include the Golden Gate, new Carquinez Bridge, Antioch, and Dumbarton bridges. New bridges under construction that will include bicycle lanes are the new eastern span of the Bay Bridge (Oakland to Treasure Island) and new Benicia Bridge. A feasibility study has been completed of installing bike lanes on the western portion of the Bay Bridge (costs range from \$160

million to over \$300 million), and a study is being conducted of bicycle access across the Richmond-San Rafael Bridge.

Description

TCM 9 would focus on improvements to the Regional Bike Network defined in MTC's 2001 Regional Transportation Plan. TCM 9 also supports local efforts to provide bicycle access and amenities and to better integrate bicycles into roadway improvement and Caltrans' efforts to consider non motorized travel in all of their plans, programs, and projects.

The TCM includes the following types of programs and activities:

- MTC's Regional Bike Plan consists of over 600 miles of bike routes. MTC's Transportation 2030 Plan commits \$200 million in funding to complete critical links and to leverage local funds to construct even more facilities. This funding is allocated to both bicycle and pedestrian needs. As part of MTC's monitoring of the regional transportation system, MTC collects bike counts at a number of heavily traveled bike facilities.
- MTC and Air District grant programs fund bicycle improvements.
- Caltrans Deputy Director Order 64 requires Caltrans to incorporate non-motorized transportation options in design and construction of state highway facilities.
- Many local jurisdictions have developed bike plans and incorporate bike facilities when they repair or improve local arterials (for example, in Santa Clara County).

Improvements to bicycle access and facilities are also discussed in TCM 15, Local Land Use Planning and Development Strategies and TCM 20, Traffic Calming.

Phase 1 (2004-2006)

- Fund Regional Bike Plan improvements (specific projects TBD)
- Develop on-line bicycle mapping tool as part of the regional 511 traveler information number (MTC)
- Bike to work day promotion (MTC)
- Funding for bike improvements included in MTC's Transportation for Livable Communities (TLC) projects
- The Air District's TFCA program funds bicycle routes, storage and other facilities.
- Funding for other local bicycle improvements through local sales tax measures and state TDA Article 3 funds
- Fund Safe Routes to Transit improvements (see TCM 5).
- Encourage local jurisdictions to continue to develop safe and convenient networks of bicycle lanes and routes.
- Encourage local jurisdictions to provide bike racks or other secure storage in downtowns, shopping areas, and other activity centers.
- Encourage local jurisdictions to require bicycle access and amenities (e.g., bike storage, showers and lockers, etc.) as conditions of approval of development proposals (see TCM 15).
- Explore innovative bicycle programs, such as "station bike" programs or similar bicycle sharing programs at transit stations, town centers, other activity centers.

Phase 2 (Beyond 2006)

- Generally a continuation of the above activities, but with the potential for additional funding from passage of local sales tax measures for transportation in various counties.
- Additional emphasis on bicycle training and safety related projects, including public education for both bicyclists and motorists

Travel Market Affected

TCM 9 will promote bicycle use (or bicycles combined with transit) for the entire range of local trips, including commuting, shopping, personal business, and social and recreational travel. The potential market for TCM 9 is significant, given that short distance trips of less than five miles account for the majority of all trips in the region.

Effectiveness

The emission reductions below represent are based on increasing the regional bike mode share by 3% in 2006 (i.e., from 1.0% to 1.03% of regional trips) and 10% in 2015, and assume a higher bicycle mode share for regional trips, assuming an aggressive bicycle education and development program.

	<u>ROG</u>	<u>NOx</u>
2006	0.04 tpd	0.03 tpd
2015	0.06 tpd	0.04 tpd

Cost

The cost of completing MTC's Regional Bike Plan is estimated to be \$1.0 billion, and as mentioned above, the Transportation 2030 Plan will provide a \$200 million dedicated source of funding to help complete this network (includes pedestrian facilities). In addition, Alameda, Contra Costa, and San Francisco counties have committed close to \$240 million in transportation sales tax funds for bicycle and pedestrian needs. With the passage of their sales tax measures in November 2004, Marin, Sonoma, Contra Costa and San Mateo counties pledge another \$160 million. An estimated amount of \$245 million in traditional funding sources is potentially available for nonmotorized needs over the next 25 years. These sources include the Transportation Development Act, the Air District's Transportation Fund for Clean Air, and Caltrans' Bicycle Transportation Account, and federal Transportation Enhancement funds. In addition, several bicycle and multi-use trail projects received federal earmarks from the SAFETEA bill that was signed into law on August 10, 2005, including \$25.0 million for non-motorized transportation pilot program in Marin County.

Impediments

Widespread use of bicycles is limited by a number of factors, including the user's physical ability, terrain, weather, need to carry cargo or packages, etc. Personal safety is another concern for riders who may not have extensive experience in riding in different traffic conditions, but can be addressed through training and by providing bike lanes and other safety improvements. Public education for motorists and cyclists to obey traffic laws and "share the road" would also improve safety. While most transit operators have formulated workable arrangements for accommodation of bikes, increased accommodation of bikes during peak passenger loads will still present operational issues for some operators. Dedicated bike lanes across some bridges may be extremely expensive or operationally infeasible. Bicycle accommodation at work sites may create additional costs for employers.

Other Impacts

Bicycles have low impact on the environment across all resource categories. Some major bike facilities may have localized environmental impacts that would be addressed in project specific EIRs. Since bicycles are an excellent means of physical exercise, TCM 9 will also promote public health. Increased bicycle use may reduce the need for auto parking at some employment or residential sites and transit stations.

TCM 10: YOUTH TRANSPORTATION

Purpose

TCM 10 is designed to reduce motor vehicle travel and mobile source emissions related to the transportation of youths and students for school and other activities.

Background

Youth and students have special transportation needs. Because they have limited access to motor vehicles, they depend upon public transit, bicycles, walking, and being driven by adults.

Due to funding constraints, a number of school districts in the Bay Area are no longer able to operate school bus services. MTC conducted a recent study of re-instituting school district bus service in Alameda County, and determined that costs would be high in relation to air quality benefits. In addition, no funding sources for re-instituting service could be identified, unless new local revenues were somehow generated in the future.

MTC and AC Transit are participating in a program to reduce the cost of school bus passes for low income students within AC Transit's service area. The goals of the program are to increase school attendance and access to after school activities. The initial year's evaluation has been completed, but it does not appear that the air quality benefits are significant. (Future evaluations of a more mature program may yield different results.)

Recent State legislation (Safe Routes to Schools) provides for about \$20 million per year statewide for certain projects to provide safer pedestrian access for school children. This legislation is currently pending renewal to extend the program for another five years.

The Air District's Low Emission School Bus Program provides funding to school districts for purchasing alternative fuel school buses, replacing old diesel engines with cleaner engines, or installing particulate matter retrofits.

Description

TCM 10 will improve youth and student mobility through a variety of means:

Phase 1 (2004-2006) - Primarily includes continuation of existing programs to:

- Encourage walking and bicycling to school (Safe Routes to Schools program).
- Encourage carpooling among high school students with cars (e.g., the Rides to School Program) (see TCM 14).
- Establish special carpool formation services for parents, students and staff at Bay Area elementary and secondary schools (see TCM 14).
- Encourage shuttle programs to provide service to schools.
- Target Bay Area schools for greater participation in Spare the Air program.
- Purchase older school buses with alternatively fueled vehicles, replace old diesel school buses with cleaner engines or retrofit older school bus engines.

Phase 2 (Beyond 2006)

- Continue Phase 1 programs
- Support transit ride discounts to youth and students (contingent on transit operators ability to financially participate in the program)

Travel Market Affected

According to MTC travel data, school trips account for two to three percent of total vehicle miles traveled in the Bay Area. TCM 10 would address this market, as well as youth travel outside of school hours.

In addition to its direct impact on school trips, TCM 10 may also have an impact on commute trips. If additional school bus service is provided, parents who must now drop off their children at school while in route to work might be able to commute via ridesharing or transit.

Effectiveness

Emission reductions are largely based on reducing the number of regional auto trips made to schools by 2% in 2006 and 10% in 2015 due to the combined effects of the various programs above.

	<u>ROG</u>	<u>NOx</u>
2006	0.11 tpd	0.09 tpd
2015	0.22 tpd	0.16 tpd

Cost

MTC has provided \$2 million in funds to AC Transit to test a student bus pass program for low income students. One year of the program has been completed. In 2003, the Air District had approximately \$3.4 million available to assist school districts in reducing emissions from school buses. The emission reductions shown above for clean fuel school buses assume maintenance of this level of funding.

Impediments

Full implementation of this measure depends upon additional funding to re-institute school district provided bus service. The Safe Routes to Schools program will need to be reauthorized by the Legislature for funding to continue.

Other Impacts

In addition to reducing emissions, TCM 10 will mitigate local traffic congestion near schools and provide additional safety for children walking and cycling to and from school. Other benefits include reduced fuel consumption and the ability of some family members to carpool or take transit if they do not have to take children to school.

TCM 11: INSTALL FREEWAY TRAFFIC MANAGEMENT SYSTEMS

Purpose

TCM 11 will reduce emissions produced by stop and go congestion on Bay Area freeways by employing the latest traffic management technologies to improve flow of vehicles throughout the day. TCM 11 is consistent with the State's statutory definition of a transportation control measure as a strategy to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling or traffic congestion for purposes of reduction motor vehicle emissions (H&S sec 40233 (4)(d)).

Background

Over 60 percent of daily vehicle miles of travel (VMT) in the Bay Area occurs on freeways. Vehicles that are stuck in stop and go traffic conditions produce higher emissions than vehicles traveling at higher constant speeds. Stop and go conditions can result from either recurrent congestion (excess vehicle demand compared to roadway capacity) or accidents and other incidents (such as a disabled vehicle) that back up traffic for extended periods. Incidents during the peak period can be highly disruptive to traffic because of the greater traffic volumes at these times. Traffic flow conditions can be managed through measures to control the amount of traffic entering freeways as well as advanced incident detection and response systems. These traffic management strategies are critical since the projected growth in vehicle miles of travel will significantly exceed the expected growth in regional road capacity.

Description

Caltrans manages freeway operations through a comprehensive system of traffic advisory signs, traffic surveillance by closed circuit TV and metering of freeway on ramps. This traffic management system is gradually being expanded as funds are available. Full implementation of the Traffic Operations System (TOS) will cover approximately 450 miles of the Bay Area's freeways. The chief component of the system that will help with regular peak period congestion is ramp metering. With ramp metering, the flow of traffic onto the freeway can be controlled to predetermined rates to ensure that the vehicles entering the freeway do not overload the capacity of the freeway and create congested flow conditions downstream. Caltrans maintains a centralized Traffic Management Center (TMC), where the information is collected and processed.

Incident detection and response is also coordinated through Caltrans TMC. Detection is performed by freeway cameras, loop detectors in the freeway pavement, motorist calls, and other sources. MTC, Caltrans, and the CHP partner to provide roving tow truck services, called the Freeway Service Patrol (FSP) system to remove incidents as quickly as possible and prevent long periods of stop and go or blocked traffic. This system currently covers 450 miles of freeway and is mostly deployed to address commute conditions. FSP services include towing, gas, and accident removal. The system is popular with freeway users. Future expansion would include the addition of off peak routes and weekend service for heavily traveled recreational routes.

In addition, MTC has developed and maintains a traveler information phone number (511) to allow motorists to access current traffic information over their intended travel

route. This information system has secondary benefits in that it can allow travelers to change routes, travel times, or mode to avoid poor traffic conditions and thus reduce congestion-related emissions. (511 also provides extensive information on Bay Area transit routes and schedules.)

Phase 1 (2004-2006)

- Integrate traffic management features into new freeway construction projects
- Maintain current level of FSP service
- Maintain and improve 511 information and customer convenience

Phase 2 (Beyond 2006)

- Extend ramp metering in other major freeway corridors
- Obtain adequate funding for full deployment of Caltrans' TOS/TMC project
- Expand FSP to other routes and times of the day
- Continue to require traffic management elements in Caltrans freeway projects

Travel Market Affected

TCM 11 addresses all categories of vehicle trips, including inter-regional and commercial travel, as well as commute trips, shopping, recreation, personal business, etc.

Effectiveness

TCM 11 emission effects are based on a modest improvement in average freeway speeds of 13.5% to 27.0% due to the combined effects of all the programs above. Effectiveness was estimated using the following assumptions:

- FSP Service emission reductions updated from TCM D (from 2001 Ozone Attainment Plan) with adjustments from EMFAC2002, v2.2.
- Partial implementation of the TOS covering approximately 690 miles of 1,400 total centerline miles of Bay Area freeways (2.6% implemented in 2006 and 21.9% implemented in 2015).
- Assumed Bay Area peak period freeway speed is 37 MPH.

	<u>ROG</u>	<u>NOx</u>
2006	0.04 tpd	0.11-0.12 tpd
2015	0.04-0.05 tpd	(0.04) <i>increase</i> - 0.01 tpd

To maintain the effectiveness of ramp meters, the timing plans should be periodically updated.

Cost

The cost of Caltrans' high priority system management improvements is over \$300 million. The cost of operating the current Freeway Service Patrol/callbox system is approximately \$5 million per year). The cost of the 511 Traveler Information number is approximately \$6 million per year.

Impediments

The cost of deploying the full Caltrans Traffic Operation System in the Bay Area is constrained by lack of funding at the state level to install the hardware and operate the system. Initiation of local ramp metering is often controversial, as local jurisdictions fear that ramp traffic 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). The main impediment to the expansion of the FSP program is the availability of funding.

Other Impacts

Emission reductions calculated for this TCM may be less than calculated due to the generation of offsetting emissions from vehicle idling at freeway on ramps and acceleration onto the freeway (although there is no specific methodology to perform these calculations). Ramp metering may benefit some communities by reducing the amount of cut through traffic that gets off the freeway to avoid congestion. Overall freeway safety will be improved with the FSP program.

TCM 12: ARTERIAL MANAGEMENT MEASURES

Purpose

Arterial traffic controls include signals, stop signs, and yield signs. Coordination of signals on major arterial routes can reduce vehicle idling and acceleration by dedicating extra “green” time to the major traffic direction and thereby reducing vehicle emissions. Bus operations will also benefit from these strategies through faster and more reliable travel times.

Background

Over 40 percent of daily regional vehicle miles of travel (VMT) occurs on arterials. By coordinating the operation of multiple signals, vehicles can travel at fairly constant speed over a long route, reducing stop and go emissions. Close to 60 percent of 7000 signals in the Bay Area are currently subject to some kind of coordination. Advanced technologies allow signal timing plans to be reset based on actual traffic conditions at an intersection or group of intersections. Signals may also be adjusted from a central traffic management facility that manages large signal systems. For all signal systems it is important from an efficiency standpoint to ensure that their signal timing plans are periodically updated to reflect changes in local and areawide traffic conditions over time.

Additionally, most local bus routes use arterials, and their operations can be impeded due to local traffic congestion which slows buses and reduces schedule reliability. Improving the performance and reliability of buses on arterials can stimulate increased ridership. Slower bus travel times also results in more buses being required to provide the desired headways. Signals can be equipped with software to extend the green time or switch the signal to green earlier to move buses faster and help maintain the schedule.

Description

This measure includes both the coordination of signals that have not yet been coordinated as well as the periodic retiming of signals that are coordinated to update their timing plans based on current traffic conditions. Of the approximately 2,500 signals in the Bay Area that have not been coordinated, it is estimated that roughly 50 percent are near enough to another coordinated signal to merit coordination. Also, for the 4,400 signals that have already been coordinated, the basic feature of this TCM is the updating of their timing plans to ensure they are optimized for current traffic conditions.

Arterial management projects should pay careful attention to the needs of transit. Cities and counties should assure that retiming plans include discussions with transit operators to determine whether it is feasible and desirable to implement bus priority treatment on an arterial. Arterial management strategies that can enhance transit operations include dedicated transit-only lanes, queue jumper lanes at intersections, signal priority, bus bulbs, increased enforcement of bus loading zones, and relocation of bus stops. Reports on the effectiveness of transit signal priority systems indicate that they could provide up to 15 percent improvement in travel time along a given route.

The main impediment to maintaining a well-coordinated signal system is the interest and level of effort required from local governments who have had to reduce staff resources due to financial pressures. Where signal coordination on an arterial requires cooperation of multiple jurisdictions, the negotiations can take time to resolve both technical and policy issues.

Other Impacts

Optimized signal timing plans have been shown to be potent strategies for reducing automobile fuel consumption, and the attendant greenhouse gas emissions (early interest in signal timing sprang up during the fuel crisis of the early 70's and 80's). To the extent that bus priority treatments improve travel times and schedule reliability, ridership and transit revenues could increase. Also consistent travel time savings could allow operators to serve a high volume route with fewer buses, saving capital and operating costs.

It is also critical that arterial management projects carefully consider pedestrian and bicyclist safety. Reducing idling and stop and go traffic can reduce emissions, but arterial improvements – particularly those that speed the flow of traffic – should also assure that pedestrian and bicycle safety is preserved and enhanced. Measures to enhance pedestrian and bicyclist safety include: prominent crosswalks and pedestrian signals; signage and striping; provision of or improvements to mid-block crossings; bicycle loop detectors for signals; and consideration of bicycle access in planning new arterial construction or modifications. Bike/ped safety on arterials is also discussed in TCM 20, Traffic Calming.

TCM 13: TRANSIT USE INCENTIVES

Purpose

TCM 13 will focus on programs that could potentially increase transit use and lower vehicle emissions, such as monetary incentives, better transit information, deployment of a universal fare card for transferring between operators, and better signage at transit stops and transfer locations.

Background

With 26 different transit operators in the Bay Area, transit users need convenient ways to plan trips, transfer between operators, and pay fares. Through cooperative efforts between MTC and the Bay Area transit operators, new technologies and strategies are being developed to make transit trips more convenient and to take less time.

Transit fare policies are determined by the policy boards of the individual operators, but MTC is developing a new universal fare card (Translink) to make fare collection easier and to make it easier for riders to transfer between systems. Under state law, MTC requires each transit agency in the region to maintain a fare/transfer revenue sharing agreement with every connecting agency. The ability of transit operators to stimulate ridership growth by providing discounted fares for different age groups or various trip purposes depends on the individual operator's revenue base and the ability of the operator to pay for ongoing operating costs as well as longer term capital replacement needs. Increasing fares can decrease ridership, and has a particularly adverse impact on low income transit users. (MTC is currently conducting a study of overall transportation affordability.)

Various operators have also designated key transit hubs or centers for improvement (e.g., AC Transit's Comprehensive Service Plan which is developing 11 transit centers, 6 at BART stations), and these improvements are being made as funding becomes available.

Description

TCM 13 includes the following:

Phase 1 (2004-2006)

- TransLink®. TransLink is a program that utilizes "smart card" technology for the collection of fares on all the region's transit systems. It will significantly improve the convenience of fare payment and collection. The universal fare card is being deployed on transit systems throughout the region, making it easier for riders to use multiple transit systems and providing an improved revenue tracking mechanism for transit operators. The initial phase will include deployment of Translink with the major transit operators.
- Improvements to the 511 transit information service. Information for trip planning can be obtained by calling 511, which connects people to the individual transit operator, or through web based information on the internet at

<http://transit.511.org/>. Web based transit information is also available for planning trips.

- Commuter Check/Ecopass. The Commuter Check program, which sells transit vouchers to employers who then give them to employees to purchase tickets and passes, continues to expand with over \$12 million in annual sales. A similar type of program in Santa Clara County, called EcoPass, provides discounted tickets to employees through their employer. Residential EcoPass programs have also been implemented. MTC and the Air District will encourage employers, transit operators, local governments and others to promote and expand such programs. Encourage colleges and universities to include transit passes with student registration fees to encourage transit use by students. The Class Pass program at UC Berkeley provides an AC transit pass as a part of student registration fees.
- Improved signage at transit transfer hubs, including the provision of transit schedules and route maps. MTC's Transit Connectivity Report addresses the need for better signage and other information at transfer hubs, which would be a low cost improvement. The Report was completed in January 2005, and an expanded effort to address transit connectivity, utilizing Regional Measure 2 funds, will continue through 2005.

Phase 2 (Beyond 2006)

In addition to the continuation of the efforts above, additional activities would include:

- Deploy real time transit arrival information. Bay Area transit operators are in different stages of studying and deploying equipment to provide real time bus/train arrival information. (BART has electronic arrival information signs, Muni is planning on a systemwide application, and AC Transit has installed bus arrival information signs along the San Pablo Ave. enhanced bus route.) Real time information improves the transit experience by removing uncertainty in knowing the arrival time for the next vehicle, minimizing waiting time, and increasing a passenger's sense of security for late night trips.
- Increased amenities at transit hubs and stops. The purpose for providing new amenities at transit hubs would be to improve comfort and convenience for riders and create a sense of "place" by having food, retail activities, restrooms, improved shelters, lighting improvements, etc. These improvements enhance the transit experience for riders, particularly regarding the quality of service and ease in making transfers.
- Complete transit centers as identified in AC Transit's *Comprehensive Service Plan* in Alameda and Contra Costa Counties.

Travel Market Affected

TCM 13 will make transit a more attractive and convenient option for a wide range of trips. Measures to promote the sale and subsidy of transit passes through employers focus primarily on commute travel, whereas TCM 13 measures would improve convenience for all types of transit trips.

Effectiveness

Emission estimates are based on a 1% to 5% increase in transit ridership due to the combined effects of all of these programs.

	<u>ROG</u>	<u>NOx</u>
2006	0.02-0.12 tpd	0.02-0.10 tpd
2015	0.01-0.05 tpd	0.01-0.04 tpd

Cost

Annual costs for various types of programs are provided below:

TransLink® costs about \$80 million over the next 5 years as program ramps up.

511 costs about \$6 million per year.

The RTC Clearinghouse and Commuter Check program cost approximately \$400,000 per year.

Real Time Transit Arrival Information - With the passage of Regional Measure 2 in March 2004, about \$20 million in competitive grant funding is available to implement real time transit information systems (the cost of large scale deployment is unknown because of the different types of systems and applications which are being considered in the Bay Area by different transit operators). Priority will be given to projects identified in MTC's Transit Connectivity Plan mentioned above.

Impediments

Most of the key elements of this measure are already in a mature stage of deployment. Development of more ubiquitous transit arrival information will depend on resolution of technological issues among by different transit operators and new funding. Provision of enhanced transit amenities at hubs will require new funding.

Other Impacts

TCM 13 is likely to enhance the overall perception of the quality of transit service in the Bay Area, and would have indirect benefits for reduced auto fuel consumption and greenhouse gas emissions to the extent the combination of strategies above produce new transit riders. Deployment of real time transit information systems results in an unknown additional demand on transit operating funds.

TCM 14: CARPOOL AND VANPOOL SERVICES AND INCENTIVES

Purpose

The purpose of TCM 14 is to reduce motor vehicle emissions by promoting carpooling and vanpooling as an alternative to the single occupant vehicle.

Background

Organized efforts to promote ridesharing in the Bay Area began in response to the oil crises of the 1970's. These programs have grown steadily over the years due mainly to efforts by regional agencies, local governments and employers to reduce commute related congestion. The share of Bay Area commuters who carpool to work (about 13 percent) remained about the same between 1990 and 2000; this share is in the upper range compared to other major metropolitan areas. MTC administers the regional ridesharing program through its contract with Parsons Brinkerhoff, Quade & Douglas, Inc. MTC also provides funding to the Solano Napa Commuter Information (Solano and Napa counties), Peninsula Traffic Congestion Relief Alliance (San Mateo County), and 511 Contra Costa (Contra Costa County) to perform portions of the Regional Rideshare Program's work in their respective counties.

The Rideshare Program's primary focus is on carpool and vanpool matching services, but the program also promotes transit, biking, and walking. The program also coordinates with various county ridesharing agencies to help support their services and with employers who maintain commute alternatives programs. (Employer based trip reduction programs are discussed in TCM 1.)

MTC created a technical advisory committee (TAC) to provide strategic direction for the program. This TAC is made up of representatives of the nine county congestion management agencies (CMAs) and the Air District, since several CMAs also support local programs to promote carpooling and vanpooling. For example, Alameda County operates a guaranteed ride home program for employees who take transit or carpool to work and need to make emergency trips home during the day. Contra Costa, San Mateo, Solano and Napa counties also operate local TDM programs, including local incentive programs, local transit information and shuttle operations and community outreach. The Air District's TFCA program also provides financial support for the regional rideshare program and for some of the county trip reduction programs.

Description

MTC administers the regional rideshare program which provides the following core services to the Bay Area public: ridematching information; vanpool formation and support; information on other commute alternatives (transit, bicycling and telecommuting); outreach and promotion to generate new ridematching applications (e.g. Rideshare Week, transportation fairs, other special events, etc.). In 2003 the program initiated on-line ridematching to provide added convenience for those wishing to explore carpool options.

The rideshare program contractor is responsible for answering all telephone inquiries related to rideshare and bicycling, through the regional 511 Traveler Information system. The rideshare program also maintains the rideshare and bicycle pages of the 511.org website, where carpoolers can find maps showing carpool lanes and park and ride lot locations. Vanpool drivers can also post advertisements of available seats.

Phase 1 (2004-2006)

- Maintain current regional rideshare programs and services. Increase efficiency in delivering regional core by improving coordination with local programs.
- Examine other innovative concepts to promote carpooling, such as real time ridematching (using the internet).
- Explore possibility of providing a regional incentive to increase ridesharing by implementing a demonstration program offering a cash incentive for new vanpools.
- Explore options for expanding medium distance vanpools (i.e., 15-30 miles one-way), particularly since vanpools are able to take advantage of the extensive carpool lane system. Real-time vanpool matching could also be used to facilitate shared-ride van services. Such service could be based on the airport shuttle concept, but designed to serve multiple origins and destinations, rather than a single destination such as an airport.

Phase 2 (Beyond 2006)

- Maintain Phase 1 programs and enhance where feasible.

Travel Market Affected

This TCM focuses on commute travel; however, the ridematching system has potential applications for other types of trips, such as trips to and from transit stations, home-to-school trips, as well as trips to airports and other major activity centers.

Effectiveness

Due to recent changes to the approach to the regional ridesharing program, the program is expected to become more effective in the future. Emission reductions are based on a 2% increase in ridesharing by 2006 and a 10% increase by 2015. Since this measure does not substantially increase the current level of effort by local and regional agencies or the private sector, or involve new concepts that are untested, very minimal emissions reductions are assumed. However, without maintaining current efforts, commute carpool and vanpool trips would likely decrease.

	<u>ROG</u>	<u>NOx</u>
2006	0.01 tpd	0.01 tpd
2015	0.01 tpd	0.01 tpd

Cost

The cost to implement the regional rideshare program is approximately \$4 million per year. Air District TFCA funding for regional and county trip reduction programs in FY 03/04 was approximately \$4.4 million.

Impediments

Surveys and focus groups have found that many people want flexibility in their daily trips due to the need to have flexibility in their work hours, conduct errands, or pickup and drop off children at daycare. This lifestyle directly impacts the markets for carpooling and vanpooling which are dependent on fixed schedules among participants. Strategies such as guaranteed ride home programs and real-time ridematching can help address these concerns. A secondary impediment is the decline in employer/private sector interest due to other financial priorities. This has led to a decline in promotional activities such as on-site commute fairs and dissemination of on site trip reduction information. The potential market for the real time ridematching concept and/or shared-ride van concept is large, but difficult to quantify until the specific approach is better defined. MTC rideshare program staff will participate on a task force for an instant ridematching demonstration project, sponsored by the Alameda County CMA.

Other Impacts

Increased use of carpools and vanpools for commuting is a highly effective strategy for reducing fuel consumption and CO₂ emissions, and lowering dependence on foreign oil. Commuters who carpool and vanpool save money by reducing their expenditures for maintaining and operating their vehicles. In heavily traveled corridors, carpools using HOV lanes significantly improve the person carrying capacity of a freeway. Ridesharing programs can provide critical services in emergencies. After the Loma Prieta earthquake, the rideshare program served as a source of information for large numbers of employees seeking help in finding commute options to get to work.

TCM 15: LOCAL LAND USE PLANNING AND DEVELOPMENT STRATEGIES

Purpose

Land use patterns directly affect how we travel between homes, jobs, schools, shops and services, and other destinations. Motor vehicles are a major source of ground-level ozone precursors, fine particulates, toxic air contaminants, carbon monoxide, and other air pollutants. TCM 15 seeks to reduce motor vehicle use and emissions by promoting land use patterns and development projects that facilitate walking, bicycling and transit use for a higher percentage of personal trips.

Background

The Air District has encouraged local governments to address the air quality impacts of all local activities by incorporating air quality elements or sections into their general plans since 1986. The District, ABAG, MTC and the Bay Area Alliance for Sustainable Communities undertook the Smart Growth Strategy/Regional Livability Footprint Project in 1999. The goal of the Smart Growth Project is to develop and implement a preferred land use vision for the region to promote environmental quality, economic vitality and social equity. During an extensive public workshop process, workshop participants identified a vision for the region that favors compact, mixed use development near transit stations, transit corridors and town centers. The Smart Growth vision is reflected in ABAG's Projections 2003, and informs the Regional Transportation Plan (Transportation 2030), air quality strategies, and implementation programs of the regional agencies.

The California Clean Air Act (CCAA) requires regional clean air plans to include indirect source control programs to encourage developments, as well as local and regional plans, that:

- Minimize dependence on motor vehicles and, thereby, reduce air contaminant emissions;
- Require mitigation of adverse air quality impacts of facilities that do attract a significant volume of motor vehicle traffic.

TCM 15 responds to the indirect source requirements of the CCAA and the increasing understanding of the connection between land use, transportation and environmental quality as reflected in the Smart Growth Project and related programs.

Description

The location, mix, intensity and design of development influence travel choices. Communities can promote transit, walking and cycling by encouraging compact, infill development providing a mix of uses at moderate or high densities.

Local governments can address the land use/transportation/air quality connection through planning and development policies and programs. Cities and counties can integrate air quality-beneficial policies and programs into general plans and related implementation programs such as subdivision regulations, zoning ordinances, capital improvement programs, parking benefit districts, parking requirements, and development design guidelines. Localities can produce separate air quality elements, or

can incorporate air-quality beneficial policies into the land use, circulation/transportation, and other required elements of the general plan.

Local governments and transit districts can prepare specific plans for downtowns, transit stations, and other activity centers. Development patterns can support transit, walking and cycling in various ways, including:

- Focusing higher density development near transit stations and corridors
- Encouraging compact development with a mix of uses that locates housing near jobs, shops and services, schools, and other community facilities
- Encouraging infill development
- Locating shops and services near employment centers
- Designing streets, sidewalks and bike routes to ensure safe and convenient access for pedestrians and bicyclists
- Designing development projects to provide safe, convenient pedestrian access to transit stops and nearby services
- Reducing parking requirements and the land area occupied by parking

Phase 1 (2004-2006)

MTC will implement its 5-point transportation land use platform that was adopted as part of the Transportation 2030 plan process. Included in the platform are a transportation/land use policy and a new planning grant program to fund specific plans around transit stations and corridors, which was approved by MTC in July 2005.

MTC's Transportation for Livable Communities (TLC) planning grants fund local planning programs to promote community revitalization.

MTC's TLC capital grants fund local projects that promote transit, walking and cycling.

MTC's Housing Incentive Program (HIP) provides financial incentives to cities to provide high-density housing near transit stations and corridors.

MTC's "T-Plus" program will provide funding to each county congestion management agency to promote community revitalization projects.

The Air District's Transportation Fund for Clean Air (TFCA) funds bicycle projects, traffic calming, shuttles, low emission vehicles, trip reduction programs, and other clean air projects. Funding levels average approximately \$20 million/year.

ABAG will periodically update and monitor its Smart Growth demographic projections.

MTC will develop incentives and conditions to promote supportive local land use policies around major new transit investments that generate ridership sufficient and make new transit investments economically viable.

MTC, ABAG and the Air District could develop financial and other incentives to encourage innovative parking strategies to promote reduced amounts of parking, parking fees, and other parking programs. Cities and counties have authority over parking

policies. Local governments could take various actions to promote innovative parking strategies, including:

- Reduce or eliminate parking requirements. Reduce parking requirements, particularly at transit oriented and infill development, mixed use projects, senior and affordable housing, and other appropriate locations. Utilize market-based measures to determine the appropriate amount of off-street parking.
- Parking maximums / caps. Limit the number of off-street spaces in areas with good transit service. Encourage using cost savings to enhance transit services.
- Unbundled parking. Consider allowing developers and property owners to unbundle the price of parking spaces from the rent for tenants.
- Shared parking. Promote shared parking at mixed use projects and other appropriate locations.
- On-street parking. Price on-street parking in commercial districts according to market demand and with consideration to adjacent off-street parking facilities. Consider implementing parking benefit districts that use revenue generated from on-street parking fees to fund pedestrian-supporting infrastructure and programs in the area.
- Parking fees. Charge market-value for off-street parking, and consider residential permit programs to alleviate spillover concerns.
- Parking cash out. Promote parking cash out through outreach, financial assistance, and requirements through CEQA processes or conditions of approval.
- Parking design. Adopt design guidelines and local ordinances that minimize land area dedicated to off-street parking. Locate parking underground or behind developments to reduce land area used for parking and/or increase pedestrian accessibility. Encourage parking structures with ground-floor uses to enhance pedestrian access.
- Technical assistance. Maintain examples of best practices and innovative parking strategies. Highlight and publicize through workshops, guidance documents, awards, and other methods.

MTC, in cooperation with transit operators and local governments, will examine promising opportunities for transit oriented development.

ABAG will promote multi-jurisdictional planning along selected transit corridors to encourage transit oriented development.

MTC, ABAG and the Air District will pursue legislative changes to remove barriers and provide incentives for smart growth.

MTC, ABAG and the Air District will engage in outreach and public involvement processes to build support for smart growth programs.

The Air District, MTC and ABAG will explore ways to promote carsharing as a way to reduce parking requirements. The regional agencies and cities and counties could support carsharing through financial incentives, helping secure additional parking, assistance with marketing, and pilot programs. Emphasis should be placed on hybrid and SULEV vehicles to maximize air quality benefits.

The Air District will monitor implementation of indirect source mitigation programs in other regions for potential feasibility in the Bay Area.

The Air District, MTC and ABAG will consult with and provide technical assistance to local jurisdictions interested in pursuing smart growth strategies.

The Air District, MTC, and ABAG will highlight and publicize noteworthy examples of local clean air plans, policies and programs, as well as noteworthy development projects.

Cities and counties are encouraged to require the provision of bicycle access and facilities (e.g., bike lanes/routes, secure parking and showers/lockers, where appropriate) at developments such as employment centers, shopping centers, and residential complexes (see TCM 9).

Cities and counties should assure that local plans, policies and programs encourage walking and promote a safe and convenient pedestrian environment (see TCM 19).

Cities and counties, in cooperation with transit providers, should prepare transit station area plans for appropriate transit stations and transit centers, with the goal of promoting higher density, mixed use development, multimodal connections and convenient pedestrian access in order to increase transit use, walking and other alternative modes.

Cities and counties are encouraged to require developer-based trip reduction programs.

The Air District will continue to provide technical support to local jurisdictions and others on air quality analyses in environmental review processes.

The Air District encourages cities and counties to develop strategies to reduce emissions from sources other than motor vehicles, such as lawn and garden equipment, woodstoves and fireplaces, and residential and commercial energy consumption.

The Air District, ABAG and MTC will study opportunities to promote location efficient mortgages (LEMs) to encourage home purchases near transit.

Phase 2 (Beyond 2006)

Implementation of smart growth strategies will occur over many years. MTC, ABAG and the Air District will continue the programs listed above, and refine and augment them as appropriate, in future years. Budgetary and legislative constraints may influence long-term programs.

Travel Market Affected

Local planning and development to improve air quality and reduce motor vehicle travel will address all types of trips—commute, shopping, school, recreation, social, and personal business.

Effectiveness

TCM 15 emission reductions in 2006 are based upon expected growth in funding smart growth projects through the Air District's TFCA program and MTC's TLC/HIP programs. This TCM would reduce emissions over the long term by promoting better integration of land use and transportation at the local level and by supporting the implementation of the other TCMs in the Ozone Strategy.

	<u>ROG</u>	<u>NOx</u>
2006	0.09 tpd	0.14 tpd
2015	N/A*	N/A*

* Note that for 2015, emission reductions associated with TCM 15 are not yet determined. The Ozone Strategy mobile source inventory is based upon ABAG's Projections 2003, which is a smart growth policy-based regional population forecast. Therefore, the emissions benefits associated with many of the programs and policies in TCM 15 have already been accounted for in the emissions inventory baseline.

Cost

It is impossible to quantify costs associated with this measure. Costs would include preparation of general and specific plans, development review and environmental clearance, public capital investments, private investment in development projects, and other costs. Costs would be offset by rents and tax revenue from new development.

Impediments

Because Smart Growth land use patterns result in accommodating more people in the urban core with more infill development, there sometimes may be jurisdictional and neighborhood concerns with increased density, traffic, parking, localized air pollution and other impacts. Providing appropriate levels of transit service for this new development will require additional funding. A full range of incentives will need to be developed, which will take time and possible legislative action. Local governments may have limits to the staff resources available to making major changes in their plans and zoning to reflect Smart Growth principles.

Other Impacts

Local plans, policies and programs that effectively integrate land use, transportation and air quality considerations can help cities and counties achieve the following benefits:

- Preserve open space, agriculture and other land resources
- Improve housing supply and affordability
- Reduce long distance commuting
- Increase accessibility
- Increase mobility
- Conserve energy
- Improve water quality

- Use infrastructure and land more efficiently
- Increase transit ridership
- Improve economic competitiveness
- Enhance community attractiveness and quality of life

The Smart Growth Strategy/Regional Livability Footprint Project preferred land use vision will provide emission benefits in neighboring counties as more housing is provided in the Bay Area, cutting down on long distance commute trips. MTC analyzed effects in neighboring counties and estimated roughly a 2.8% decrease in VMT and ozone precursor emissions.

TCM 16: PUBLIC EDUCATION/INTERMITTENT CONTROL MEASURES

Purpose

The purpose of this measure is to educate 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. Special emphasis is placed on the need to curtail polluting activities on the relatively infrequent days when meteorological conditions could lead to poor air quality and possible exceedances of federal and state air quality standards. This latter element of the region's air quality program is called *Spare the Air (STA)*.

Background

Educating the public about the health effects of air pollution, the sources of air pollution, and ways to reduce air pollutant emissions is a critical component of efforts to improve air quality in the Bay Area. Increased awareness can lead to changes in personal behavior. The Air District administers a wide variety of public education campaigns. The Air District encourages voluntary actions that reduce air pollution throughout the year, but particular emphasis is focused on days when pollution levels are expected to be highest.

Since motor vehicles are the leading source of ozone forming emissions in the Bay Area, efforts to reduce vehicle travel, particularly on Spare the Air Days, can help in avoiding exceedances of federal and state standards. The Air District also encourages the public to reduce other types of polluting activities including use of paints, solvents and consumer products, use of gasoline-powered lawn and garden equipment, and woodburning. The Air District attempts to inform the public of actions they can take through public announcements in the media, through employers and local governments, and through various promotional activities. Surveys indicate that the public is willing to alter behavior in response to air quality goals. Because the Spare the Air program is voluntary in nature, its effectiveness depends on the cooperation of the general public.

Description

Spare the Air is an intermittent, voluntary control program in which Bay Area residents, businesses and public agencies are asked to reduce or postpone polluting activity on days when weather conditions are conducive to high ozone levels. It focuses on the 5 to 15 days per year when air quality is expected to be poor. *Spare the Air* days are declared when any part of the Bay Area is predicted to have 92 or greater (parts per million) on the Pollutant Standards Index (PSI) scale - approaching the new federal 8-hour standard for ozone. Predictions are made the previous afternoon by Air District meteorologists. STA advisories are then sent to participating individuals, employers and agencies, as well as press and media outlets.

On these days, the Air District issues *Spare the Air* advisories and asks Bay Area residents to curtail or postpone activities that pollute. This includes eliminating discretionary driving and substituting driving trips with biking, walking, telecommuting, taking public transit or carpooling instead. The strategy also includes linking motor vehicle trips together ("trip-linking") to avoid excessive engine cold start emissions. To

inform the public of these days, the Air District sends e-mail notices, contacts television news bureaus, publishes announcements in newspapers and makes public service announcements on the radio. Caltrans posts messages on their variable message signs on Bay Area freeways letting motorists know of *Spare the Air* days. Residents are also asked to avoid activities that generate pollution such as use of hair sprays, pesticides, gasoline-powered lawn and maintenance equipment, use of oil-based paints and solvents, and the use of recreational boats. Together these activities generate over 200 tons per day of organic gases in the Bay Area.

The Air District also works very closely with Bay Area employers to implement the *Spare the Air* program. Employers who participate in the program pledge to educate their employees on air quality and *Spare the Air*, and to notify employees of *Spare the Air* days. The Air District provides numerous educational materials to the employers including brochures, a video, posters, signs, sample newsletter articles, and training sessions. Approximately 2,250 employers representing over a million employees now participate.

Topics addressed in the public outreach effort of this TCM include:

- Health effects of air pollution,
- Connection between air pollution and motor vehicle usage,
- Benefits of reducing single-occupant motor vehicle use, particularly on poor air quality days,
- Benefits to the environment of carpooling, vanpooling, taking public transit, biking, walking, or telecommuting,
- Air pollution effects of motor vehicles that are not properly tuned,
- Benefits of trip-linking,
- Air quality advantages of avoiding consumer products that pollute on high ozone days and using electric or hand-powered lawn mowers and leaf blowers instead of gasoline powered models.

In addition to expanding outreach efforts and enrolling increasing numbers of participants, the STA program has added other elements over the years, including:

- Bay Area Clean Air Partnership (BayCAP) – Partnering with business groups and employers to promote voluntary action to reduce air pollution.
- Clean Air Cities and Counties – Engaging local governments to educate residents about the STA program and ways to reduce air pollution.
- Clean Air Consortium – Partnering with cities, counties and other public agencies to minimize polluting activities on STA days, i.e., postponing activities such as lawn maintenance, building painting, vehicle refueling, etc.
- A youth outreach campaign and educational materials.
- Coordination with San Joaquin Valley Unified APCD and Sacramento Metropolitan AQMD *Spare the Air* programs.
- *Spare the Air Tonight* – Expansion of the STA program to wintertime, to discourage woodburning when high levels of fine particulate are predicted.

Several recent efforts to examine new *Spare the Air* strategies have included free fares on the Livermore Amador Valley Transit system during the 2003 and 2004 ozone seasons, free morning BART rides on the first two weekday STA days during the 2004

ozone season, providing “Observe the Speed Limit” messages on Caltrans’ freeway signs to reduce emissions from vehicles traveling at high speeds, conducting surveys of older vehicle owners to determine the interest and ability of owners of these cars to not use them on Spare the Air Days, and conducting meetings with employers to examine telecommuting opportunities on these days. During the 2005 ozone season, morning commutes will be free on participating Bay Area transit during the first five non-holiday weekday Spare the Air Days.

Phase 1 (2004-2006)

- Continue *Spare the Air* notices to media, employers, public agencies and individuals.
- During the 2005 ozone season starting June 14, 2005 and ending October 14, 2005, free morning commutes are offered on participating Bay Area transit during the first five non-holiday weekday Spare the Air Days.
- Place greater emphasis on discouraging use of pre-1985 cars in Spare the Air advisories, outreach to employers and public agencies, STA website, and other outreach efforts.
- Expand Clean Air Consortium to include additional cities and counties, as well as other public agencies such as park districts, school districts, colleges and universities, etc.
- Place greater emphasis on ROG reductions (e.g., consumer products, paints and solvents, vehicle refueling, barbecue lighter fluid) in Spare the Air advisories, outreach to employers and public agencies, STA website, and other outreach efforts.
- Target major commercial airports and airport tenants for greater participation in the Spare the Air program.
- Place greater emphasis on obeying freeway speed limits in electronic freeway signs, STA advisories, outreach to employers and public agencies, STA website, and other outreach efforts. Explore opportunities to increase enforcement of freeway speed limits on Spare the Air days.
- Increase efforts to coordinate Bay Area Spare the Air program with Sacramento and San Joaquin Valley STA programs and provide additional outreach to Sacramento and Central Valley commuters to the Bay Area.
- Discourage use of recreational watercraft on STA days.
- Continue gasoline-powered lawnmower buyback incentive programs.
- Continue to expand the STA employer network.
- Target Bay Area schools for greater participation in Spare the Air program.
- Educate the public about ways to maintain and operate motor vehicles to reduce air pollution, such as keeping vehicles properly tuned, using synthetic motor oil, observing speed limits, and avoiding aggressive acceleration and deceleration.
- Continue the Bay Area Clean Air Partnership (BayCAP) shuttle project to inventory existing shuttle programs, provide coordination and assistance, and promote “best practices” among shuttle operators.

Phase 2 (Beyond 2006)

- Continue Phase 1 programs, and expand depending on effectiveness and resources available.
- Study effectiveness and costs of free transit service on all Spare the Air days.
- Possible legislative approaches to formalize and strengthen certain episodic approaches, as required.

Travel Market Affected

The Spare the Air program is aimed at the general public with special emphasis on employers and morning commuters, since reductions in early morning emissions are important to avoid exceedances that occur later in the day as ozone precursors “cook” in hot sunlight. However, all motorists should attempt to reduce discretionary vehicle trips or better link trips to avoid excess emissions throughout the day, particularly when an ozone episode may extend for several days at a time.

Effectiveness

Efforts have been made to quantify emission reductions on Spare the Air days through follow up surveys. The Air District’s current estimate is that the *Spare the Air* program reduces ROG by about 1.9 tons per day and NOx by about 2.0 tons per day.¹ The estimated emissions reductions for the 2005 ozone season free morning commute for the first five non-holiday weekday STA days is estimated to be 0.21 tpd of ROG and 0.20 tpd of NOx. Likely emission reductions from all the proposed Spare the Air enhancements are unknown, but collectively they could contribute additional reductions on STA days.

Cost

The annual cost of the *Spare the Air* program is approximately \$2 million, which includes staff and consultant time for the public and employer program, the printing and distribution of materials, media advertising, and other costs. MTC and the Air District has committed \$4.0 million towards a Spare the Air/Free Morning Transit Commute Program for the 2005 ozone season.

Impediments

The Air District has worked with employers and the general public through a voluntary framework, which relies on cooperation of all parties. Some enhancements to the Spare the Air program would require additional resources to initiate and maintain the programs. Free transit service on all Spare the Air days would require additional funding in the future.

Other Impacts

¹ Because the STA program is an episodic program, these emission reductions are assumed to occur only on STA days.

This measure raises the awareness of the public about the causes of and solutions to the air pollution problem. Although this TCM mainly addresses intermittent controls, it may have a broader impact. People who choose to change their travel or other behaviors in response to a voluntary request may continue to reduce vehicle use or change other polluting activity on a regular basis.

TCM 17: CONDUCT DEMONSTRATION PROJECTS

Purpose

This measure will promote demonstration projects to develop innovative approaches to reduce mobile source emissions.

Background

Additional work is needed to test new approaches and monitor their effectiveness, quantify emission reductions and travel benefits, and evaluate the synergistic effects of complementary measures. It is important to encourage demonstration projects that can serve as models for trip reduction and travel demand efforts and clean fueled vehicles and infrastructure throughout the region.

Description

This measure would undertake various demonstration projects and studies to further develop strategies that will ultimately be needed to help achieve State air quality standards. While these demonstration projects are not all strictly TCMs, they do impact mobile source emissions. The Air District, MTC, ARB and Caltrans will cooperate in developing demonstration projects. Examples are as follows:

- Additional demonstration projects will be developed to promote the use of low and zero emission vehicles by public and private sector fleets, as well as by individuals. (Current Air District programs to encourage low emission vehicles are discussed under MS-3, Low Emission Vehicle Incentives.) Forthcoming demonstration projects may include both on-road vehicles (e.g. battery electric and hybrid school buses) and off-road vehicles (e.g. retrofit devices for diesel marine engines and construction equipment) with a variety of uses and fuels (e.g. compressed natural gas, hybrid engines, biodiesel).
- Hydrogen technology. Continue working with automobile manufacturers and other interested parties on the testing of hydrogen fuel cell vehicles for use in local public fleets. Work with local and statewide hydrogen fuel cell partnerships on ways to improve fuel cell technology and to develop demonstration projects that improve the state's hydrogen fueling infrastructure, especially exploring possible renewable sources for hydrogen.
- Gas cap replacement program for older cars. Preliminary District analysis suggests that replacing gas caps in vehicles exempt from Smog Check may be a cost-effective emission reduction strategy. Currently, the enhanced Smog Check program in the Bay Area includes a test of a vehicle's evaporative control system through which missing or malfunctioning gas caps must be repaired. A gas cap replacement program could target pre-1976 model year vehicles that are not required to submit to Smog Check. The Air District is considering a pilot program to swap older leaking gas caps for new gas caps in pre-1976 vehicles. Further analysis from a short-term pilot program in one Bay Area County would help to determine emission reductions, implementation mechanisms, costs, and funding sources for a possible more comprehensive program.

- Heavy duty diesel vehicle idling. Extended vehicle idling of diesel vehicles can be a source of significant NOx and fine particulate emissions. This measure would explore the use of electric hookups at locations with high numbers of heavy-duty trucks to reduce the use of the vehicle's diesel engine to produce on board power, and other techniques for reducing diesel vehicle idling. This demonstration project could complement efforts to reduce diesel idling under MS-1, Diesel Equipment Idling Model Ordinance.
- Refuse truck incentive program. A new ARB regulation, which took effect in July 2004, requires all refuse vehicle fleets to equip their trucks with the best available control technology to reduce emissions of particulate matter. The Air District and MTC plan to make incentive funds available to encourage fleets subject to the ARB regulation to install control technology to reduce NOx emissions, in addition to particulate matter.
- Carsharing. Membership in carsharing organizations is increasing. Preliminary data from surveys to date show reduced auto ownership and reduced emissions from participants. There may be greater potential over the long term as carsharing allows households to reduce auto ownership. The data is very limited, however, and further experience with carsharing will allow better analysis of the program's air quality impact and suggest ways to increase its effectiveness. This demonstration project would explore carsharing projects that have greatest potential to be air quality beneficial and then promote these opportunities, particularly at BART stations. MTC and the Air District plan to partner with UC Berkeley's Institute of Transportation Studies to fund a hybrid and hydrogen fuel cell carshare vehicle demonstration project at the Pleasant Hill BART station. Notably, the City and County of San Francisco received a \$1.6 million federal earmark from the SAFETEA bill that was signed into law on August 10, 2005 to expand its carsharing pilot program to serve low- and moderate-income neighborhoods.

Travel Market Affected

Demonstration projects generally would directly affect a small percentage of travel in the region. However, the experience gained through these projects will be of great benefit in developing longer term policies and programs that affect all types of travel in the region, including commuting, shopping, recreation and personal business, and commercial travel.

Effectiveness

Demonstration projects are intended to test, sometimes at a limited scale, concepts that appear promising but whose cost effectiveness is uncertain. Because the success of future demonstration projects is unknown, no direct emission reductions have been identified. However, results from demonstration projects should contribute to reduced emissions by providing tested models to use in crafting effective future programs with possible broader implementation.

Cost

Specific elements of demonstration projects have not yet been fully developed, and thus estimating costs is not feasible at this time.

Impediments

Demonstration projects are generally supported by the public and funding agencies as a reasonable way to gain valuable information about the feasibility and cost of new approaches to problems without making large scale investments up front. Depending upon the demonstration project, new funding may be required from the Air District and MTC (federal CMAQ funds).

Other Impacts

If found to be effective, the demonstration projects in TCM 17 could have beneficial impacts in terms of reducing certain other air pollutants (such as particulates from diesel engines) and could have positive economic impacts if the projects are developed and implemented by companies in the Bay Area.

TCM 18: IMPLEMENT TRANSPORTATION PRICING REFORM

Purpose

Strategies to price the use of the region's transportation system could have long-term implications for improving air quality and addressing persistent congestion issues. Pricing of transportation facilities would not only affect travel behavior, but would generate new revenues for future transportation improvements and for TCMs in this plan. Sound economic principles require a link between the cost of providing transportation facilities and services and the cost of using them; however, recent transportation funding decisions have decreased the proportion of funding from user based charges (such as gas taxes and tolls) and increased reliance on non user charges (such as local county sales). A variety of pricing strategies have been suggested to restore and better link the price of transportation with user demand and with the indirect costs of transportation consumption related to air and water quality impacts.

Background

Gas taxes have been the historic means for paying for transportation improvements, and as prices increase motorists generally will curtail some of their travel. Federal and state taxes currently amount to about 36 cents per gallon, and have not increased in over a decade. Increases in fuel efficiency and increased use of alternative fuels also reduce revenues from gas taxes. The arguments for new transportation fees are based on the need to provide enhanced transportation choices as much as they are on providing near term emission reductions. In order to affect the number of trips and amount of travel made by autos, pricing strategies would need to significantly increase the cost of gas, tolls, parking, etc., to levels that probably are not currently acceptable to the public (particularly given the already high cost of living in the Bay Area). Public surveys of interest in increasing the gas tax, even at modest levels, show significant public opposition. Efforts to secure legislative interest in strategies such as congestion pricing on the Bay Bridge also have failed to garner enough support to advance this concept, even as a demonstration project. Thus, the theory and implementation of new strategies must be coupled together in a pragmatic approach, and include outreach to business and environmental organizations and the public at large to build support for these measures.

Specific traffic management fees include congestion pricing (fees change by time of day), High Occupancy Toll (HOT) lanes (solo drivers pay to access freeway carpool lanes where they would otherwise be prohibited), and cordon pricing (such as the fee paid to drive in central London).

Vehicle based fees that could encourage motorists to purchase low or zero emission cars included registration fees and fees based on the emission characteristics of the car and amount of mileage driven.

Parking availability and the pricing of parking are also key determinants in how often people use their vehicles and are discussed under TCM 15.

With all of the above pricing concepts, the new revenue could be applied to transit, carpooling, bicycle facilities, pedestrian improvements, and other programs to enhance alternatives to driving alone. Or they could be used for some system management programs that lead to more efficient vehicle operations, or approaches to reduce emissions from more polluting vehicles, such as diesel vehicles.

Although pricing measures offer potential for reducing air pollution and congestion, certain aspects of these fees could have disproportionately large effects on low income households, and would have to be designed with remedies in mind.

Description

Pricing measures under this TCM would require close cooperation between the Air District, MTC, the business community and other stakeholders to develop legislative support. This TCM would consist of the following pricing options:

Phase 1 (2004-2006)

- **Higher Bridge Tolls** - Regional Measure 2 increased bridge tolls by \$1 as of July 1, 2004. Higher bridge tolls will have a modest impact on shifting Transbay trips to various modes of transit. Bridge tolls are still relatively inexpensive compared to similar tolls on other bridges around the country.
- **Congestion Pricing** - MTC and the Air District will continue to test legislative support for congestion pricing on the Bay bridges. If authorized by the legislature, MTC and Caltrans will begin a demonstration of congestion pricing. If this demonstration is successful, congestion pricing may be expanded to other bridges in the region.
- **Gas Tax Increase** - MTC has authority for placing a regional gas tax measure on the ballot for up to a \$0.10 increase over 20 years. Through periodic polling, MTC will continue to investigate the viability of proposing a regional gas tax to Bay Area voters (which would currently require a 2/3 margin of approval). This measure would include building legislative and public support for higher federal and state gas taxes, either through a tax increase or indexing current taxes to keep up with inflation.
- **Parking Pricing** - MTC and the Air District will continue to work with cities and counties and transit agencies to encourage local parking pricing strategies such as the implementation of market-based on-street and off-street parking fees, and parking cash-out programs. More detailed descriptions of parking strategies are included in TCM 15.

Phase 2 (Beyond 2006)

- **Continuation of Phase 1 elements**
- **High Occupancy Toll (HOT lanes)** - The most likely lane to be developed for testing this concept would be in the I-680 corridor (Sunol Grade), and would allow single occupant vehicles to pay for using the carpool lane to avoid congestion in

the adjacent mixed flow lanes. Notably, a \$2.0 million federal earmark from the SAFETEA bill that was signed into law on August 10, 2005 was directed towards the construction of the I-680 HOT project. Additionally MTC will be investigating the concept of a much more extensive system of HOT lanes, using the existing HOV system as a foundation for this network. Surplus revenues (those available after paying for the direct operating costs) generated by a HOT lane could be used to pay for expanding the HOT network or for commute options in congested corridors. Real time pricing would also be considered, which would factor in the value of the travel time savings compared to slower travel in the more congested mixed flow lanes. A preliminary evaluation by MTC of the air quality benefits shows decreases in VOC and increases in NOx. Any HOT lanes pursued under this TCM should be those showing the greatest emission reduction benefit.

- **Gas Tax Increase/VMT Fees** - This measure would consist of a significant increase in the cost per mile of driving, either imposed as higher gas taxes or direct taxes on the amount of driving (Vehicle Miles of Travel). This TCM assumes gas prices (in real terms) would approach current levels in Europe and Japan. People who own more fuel efficient cars would pay less annually than others. Alternatively, VMT fees would directly relate to wear and tear on the roads and the amount of running emissions generated by on road travel (but not cold start emissions). VMT would be less susceptible to revenue loss due future increases in fuel efficiency of cars and would have some impact on moderating the amount of vehicle travel conducted. A portion of the fee could be based on the air pollution characteristics of the vehicle (i.e., cleaner vehicles would pay less). With either fee, revenues could be used for a broad array of transportation and air quality programs. (Also see Vehicle Registration Fees below.)
- **Taxes on Diesel Fuel** - A higher diesel fuel tax would be used to reduce NOx and particulate matter emissions from older heavy duty diesel trucks, which can 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 catalytic converters that significantly reduce NOx and particulate matter.
- **Emissions-based Vehicle Registration Fees** - Vehicle registration fees would 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 vehicle buy back, 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.
- **Parking Fees** – This measure would establish \$3 daily parking fees for all work-related parking sites, including public and privately provided spaces. The fees would be used in turn to pay for various employer-sponsored programs to expand transit, carpooling, bicycling, walking and telecommuting and to administer residential parking permit programs to reduce spillover effects.

Travel Market Affected

Market-based measures would affect all types of travel, including commuting, commercial trips, shopping, personal business, and social and recreational travel.

Effectiveness

Different pricing strategies will produce different emission reductions, which are shown separately for each strategy. Emission reductions for most pricing measures are based on demand elasticity factors from the MTC travel demand forecast model which indicate how changes in automobile travel costs would affect regional vehicle trips and miles of travel. Emission estimates for HOT lanes are based on changes in freeway speeds resulting from allowing single occupant vehicles in the mixed flow lanes to use the HOT lanes for a fee. The emission estimates do not include the effects of investing the new revenues in other programs that would lower automobile emissions.

- **Congestion Pricing on Bay Bridges**

	<u>ROG</u>	<u>NOx</u>
2015	0.01 tpd	0.01 tpd

* Emission reductions would vary, depending on whether program is revenue neutral.

- **Regional and State Gas Tax / VMT Fees**

	<u>ROG</u>	<u>NOx</u>
2015	0.45 tpd	0.34 tpd

- **High Occupancy Toll (HOT lanes)**

	<u>ROG</u>	<u>NOx</u>
2015	0.03 tpd	(0.04) tpd <i>increase</i>

- **Parking Fees**

	<u>ROG</u>	<u>NOx</u>
2015	0.03 tpd	0.02 tpd

Cost

Different fees would generate different amounts of revenue. Pricing measures would obviously entail out-of-pocket expenses for many drivers, in some cases substantial expenses, especially those who are either unable or unwilling to shift to alternatives to the single occupant vehicle. However, most of these expenses represent transfers within the region's economy that could be directed to enhanced transportation alternatives and vehicle emission reduction programs. Increased costs to households and businesses would be offset to a certain degree by reduced costs of vehicle ownership, operations and maintenance.

Impediments

Bay Area business associations, government agencies and environmental organizations have historically expressed support for consideration of new pricing measures. Their support will be needed to secure legislation authorizing pricing measures. New fees would, however, have significant impact on business related costs and household expenditures, and therefore would continue to be unpopular with the public and Legislature. To obtain approval of new pricing strategies directed at improving air quality, there will need to be compelling reasons for their implementation based on tangible and near term improvements in traffic and air quality. Programs involving substantial pricing increases will need to mitigate the impacts on low income households.

Other Impacts

Pricing strategies that reduce the number of vehicle trips by modest amounts in congested corridors could produce relatively large improvements in delay. Revenues from pricing strategies could also provide new transportation options that provide faster or more convenient travel and save users considerable amounts of time. Reduced travel demand could lead to considerable savings in fuel consumption, dependence on foreign oil, and greenhouse gas emissions. Reduced vehicle use could extend the useful life of vehicles, and may stimulate consumers into purchasing more fuel-efficient and lower polluting vehicles.

TCM 19: IMPROVE PEDESTRIAN ACCESS AND FACILITIES

Purpose

Implementing measures to make pedestrian travel safer, more convenient and more attractive will promote walking, reduce the need to use autos, and therefore reduce mobile source emissions.

Background

Virtually all travel, regardless of mode, entails some walking at some point in the trip. Many trips are very short in length. Approximately 14 percent of all trips are one-half mile or less in length, and 28 percent of all trips are one mile or less. These trip lengths are a reasonable walking distance for most people and represent an enormous opportunity to reduce motor vehicle use and emissions. Eliminating short vehicle trips is especially beneficial to air quality because vehicle emissions are highest at the beginning of a trip. In many parts of the Bay Area the share of trips made by walking is very small, as many people rely on the car. Much of this low level of pedestrian travel can be attributed to low density, single-use land use patterns and development of streets and roads and development projects that lack adequate attention to the pedestrian environment. MTC has recently focused more attention on pedestrian safety issues by creating a Regional Pedestrian Committee in 2002 to address the gamut of pedestrian planning and education issues of interest to local communities. Pedestrian improvements proposed in this TCM complement measures in other TCMs, particularly TCM 15 and TCM 20.

Description

Numerous actions can be pursued in order to increase pedestrian travel, including the following:

- Local general plans, specific plans and zoning ordinances should promote land use patterns that facilitate walking, such as increased densities, mixed land uses, focusing development around transit stops, strengthening downtowns and community centers, infill development and reuse/redevelopment of underutilized land.
- The design and placement of buildings in new development should encourage walking, for example by providing sidewalks/paths, minimizing setbacks, locating entrances near sidewalks and transit stops, etc.
- Locate and design parking so that pedestrians have direct, attractive access.
- 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, should be provided.
- Pedestrian amenities such as sidewalks, benches, landscaping, etc. should be provided at new development.
- Existing development and streets should be retrofitted to incorporate pedestrian-friendly improvements.
- Street design standards should 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, street trees, etc. Traffic calming strategies are discussed in greater detail in TCM 20.

Cities and counties can undertake a variety of actions to promote pedestrian travel, including the following:

- Review and revise general and specific plans to assure that land use policies promote development patterns that encourage walking and circulation policies that emphasize pedestrian travel.
- Review and revise zoning ordinances, subdivision ordinances, parking requirements and other local programs to include pedestrian-friendly design standards/guidelines.
- Review and revise street design standards to promote pedestrian access, safety and comfort.
- Include pedestrian improvements (e.g. sidewalks, lighted crosswalks, traffic medians and better signage) in local capital improvement programs.
- Designate a staff person to be pedestrian or non-motorized (pedestrian/bicycle) program manager.
- Require developers to provide pedestrian amenities in new projects.
- Identify and implement pedestrian-friendly improvements to existing streets and developments.
- Emphasize pedestrian safety in enforcement of local traffic codes and public education campaigns.

Phase 1 (2004-2006)

- The Air District and MTC will comment on pedestrian improvements in related elements of city and county on general plans, policies and programs, and in CEQA documents.
- MTC will continue to fund the Transportation for Livable Communities (TLC) program, which includes funding for projects in local communities that improve pedestrian mobility.
- MTC will continue to support the Regional Pedestrian Committee, develop pedestrian safety programs, collect data on pedestrian safety issues, and report on safety trends in the annual State of the System Report.
- The Air District's TFCA program funds certain pedestrian improvements (those that support development projects that reduce motor vehicle emissions).
- MTC will continue to support Safe Routes to Schools (see TCM 10).

Phase 2 (Beyond 2006)

- MTC and the Air District will continue to identify and fund planning projects to identify ways to enhance pedestrian movement in neighborhoods, downtown centers, and near transit stops.
- Continue funding specific improvements through a variety of programs, including TLC, TDA Article 3, local sales tax measures, etc.
- Continue to support Safe Routes to Schools (also see TCM 10)

Travel Market Affected

Pedestrian improvements will tend to have a greater impact on trips for shopping, school, recreation and personal business since these trip types generally are shorter in length than work trips.

Effectiveness

Emission reductions estimates for TCM 19 assume a 1% increase in regional walk trips by 2006 (i.e., an increase from 11% to 11.3% of all regional trips) and a 5% increase by 2015 due to the various programs described above:

	<u>ROG</u>	<u>NOx</u>
2006	0.04 tpd	0.02 tpd
2015	0.08 tpd	0.04 tpd

Cost

MTC's current TIP provides \$69 million for bike and pedestrian projects. Owing to the very localized nature of a large number of small projects, it is difficult to develop a comprehensive estimate of pedestrian funding needs.

Impediments

Pedestrian improvements tend to have a lower priority in communities than improvements for autos and bicycles; therefore there is a need to raise the general awareness of the importance of pedestrian issues in communities and the need to integrate pedestrian improvements into street upgrade and maintenance projects.

Safety concerns related to crime as well as conflicts with motor vehicles sometimes dissuade people from walking. Pedestrian improvements and related programs, e.g., enforcement of traffic laws, should enhance pedestrians' actual and perceived safety.

Other Impacts

In addition to reducing motor vehicle emissions, pedestrian improvements will decrease the chance of personal injury, benefit health and fitness, and generally foster a greater sense of community vitality.

TCM 20: PROMOTE TRAFFIC CALMING MEASURES

Purpose

“Traffic calming” is the combination of mainly physical measures that slow vehicle traffic and improve conditions for pedestrians and bicyclists in residential and retail areas. These measures are often desired by communities that experience excessive cut through traffic or that want to slow vehicle speeds to protect pedestrians and cyclists. Children and older adults are often considered particularly vulnerable. Motor vehicle emissions are reduced to the extent that walking and cycling increase and overall vehicle travel in an area is reduced.

Background

Traffic calming modifies the streetscape to reduce the number and speed of motor vehicles, smooth speeds and increase the attractiveness of transit, bicycling and walking. Traffic calming has been most extensively implemented in Western Europe. Traffic calming has grown fastest in Germany, with one province reporting over 8,000 traffic calming projects in 1989. Many of the traffic calming techniques used in Europe are implemented on an areawide basis, which is generally not the case in the US. Areawide traffic calming strategies are preferable because they improve pedestrian and cycling conditions throughout an entire neighborhood or district, rather than shifting traffic from one street to another.

Many communities in the Bay Area are developing traffic calming plans and installing traffic calming devices. Berkeley is developing a residential traffic calming program, and has installed numerous traffic diverters, speed humps, and other devices. Palo Alto has a Neighborhood Traffic Calming Program and has implemented traffic calming improvements in many parts of the city. Cotati completed a traffic calming plan for the downtown area. Oakland constructed a traffic median on International Blvd. in the Fruitvale district. San Francisco’s traffic calming program is implementing a variety of site specific and areawide projects.

Description

There are many traffic calming strategies that cities and counties may consider. The most effective programs generally involve thorough consultations with residents and merchants, as well as public safety officials.

MTC’s Transportation for Livable Communities program and the Air District’s Transportation Fund for Clean Air fund traffic calming projects.

The following actions can be taken to implement traffic calming in the Bay Area:

- **Pedestrian Streets** - Pedestrian streets exclusively reserve streets for use by pedestrians. Consider converting streets to pedestrian streets where:
 - Streets have significant pedestrian activity, and
 - Pedestrians are able to access the area via transit, bicycle or walking and the area is difficult to access by motor vehicle.

- **Residential and Neighborhood Traffic Calming** - Implement traffic calming on residential and neighborhood streets through:
 - Road humps and speed tables which raise the surface of the road,
 - Traffic circles/mini-roundabouts that replace traffic signals and stop signs at intersections,
 - Narrowing of motor vehicle lanes, introduction of dedicated bike lanes and wider sidewalks,
 - Chicanes, which place physical obstacles or parking bays, staggered on alternate sides of the street so that motor vehicles must slow down to maneuver through the street,
 - Traffic throttles/pinch points that restrict a two-way road over a short distance to a single lane,
 - “No Entry” signage restricting through motor vehicle access,
 - Surface treatments including textured surfaces such as brickwork, paving and rumble strips designed to warn drivers of excessive speed or of an approaching hazard where speeds should be lowered, and
 - Merging the street/sidewalk to the same height and use of the same paving materials so that there is no distinction between the road and sidewalk.

- **Arterial and Major Route Traffic Calming** - Arterial traffic calming generally limits motor vehicle speeds to 33 mph on arterials and major routes, with the recognition that bicycle and pedestrian activity can still be enhanced. Implement traffic calming on arterials and major routes by:
 - Installing sidewalk bulbouts and traffic medians.
 - Replacing traffic signals and stop signs with modern roundabouts,
 - Improving pedestrian amenities and safety through making wider and attractive sidewalks, adequately marking crosswalks and installing count-down pedestrian signals. Strategies to facilitate pedestrian travel are discussed in greater detail in TCM 19.
 - Reduced speed limits and/or increased enforcement of speed limits and other traffic laws.

Travel Market Affected

TCM 20 will affect the entire range of motor vehicle, transit, bicycle and pedestrian trips, including commute travel, school travel, shopping, personal business, recreation, and commercial travel.

Effectiveness

Traffic calming techniques are most effective when implemented on an area-wide basis. By improving safety for pedestrians and bicyclists, traffic calming encourages walking and cycling. Some of these reductions may be captured in TCMs 9 and 19. It is uncertain how much additional emission reductions can be attributed specifically to traffic calming. To be conservative, no additional reductions are claimed, but traffic calming is considered an important support program for other bike/ped programs.

Cost

The cost of traffic calming ranges from \$9 per square yard to \$18 per square yard of street/sidewalk. These costs are outweighed by the benefits of reduced traffic accidents and congestion. In 1990, traffic accidents alone cost the nation up to \$137 billion a year in direct costs, lost time and productivity. Surveys of local jurisdiction by the Institute of Traffic Engineers indicate that traffic calming projects reduce injury accidents by 20 - 50 percent, depending on the type of treatment.

Impediments

If traffic calming is not implemented area wide but only in select and isolated streets, there is the potential for an increase in traffic in the surrounding areas due to trip diversion.

Police and fire protection agencies may have concerns with barriers and other devices that slow their response times. However, experience in many communities has shown that close coordination between transportation planners and public safety officials can resolve most of these potential conflicts. Also, some studies have shown that when traffic calming leads to fewer traffic accidents, there are fewer emergencies needing a response.

Cities and counties can include area-wide traffic calming policies in general or specific plans, or develop traffic calming plans, to ensure effective traffic calming measures in the overall area and minimize potential adverse affects.

Other Impacts

Traffic calming results in fewer vehicle and pedestrian accidents and injuries in areas where it is implemented. Lower traffic volumes on residential streets results in lower community noise levels. Traffic reductions on some streets may lead to more traffic on other streets without any traffic calming measures as diverted vehicles use alternative routes. Traffic calming can contribute to more livable neighborhoods and vibrant shopping areas.

BAY AREA
2005 OZONE STRATEGY

**APPENDIX E - FURTHER STUDY MEASURE
DESCRIPTIONS**

DRAFT

SEPTEMBER 2005



**BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT**

939 Ellis Street
San Francisco, CA 94109
(415) 771.6000
www.baaqmd.gov

APPENDIX E - FURTHER STUDY MEASURE DESCRIPTIONS

TABLE OF CONTENTS

Further Study Measure FS 1: ADHESIVES AND SEALANTS	E - 3
Further Study Measure FS 2: ARCHITECTURAL COATINGS	E - 5
Further Study Measure FS 3: COMMERCIAL CHARBROILERS	E - 6
Further Study Measure FS 4: COMPOSTING OPERATIONS.....	E - 7
Further Study Measure FS 5: FOOD PRODUCT MANUFACTURING AND PROCESSING	E - 8
Further Study Measure FS 6: LIVESTOCK WASTE.....	E - 9
Further Study Measure FS 7: LIMITATIONS ON SOLVENTS BASED ON RELATIVE REACTIVITY	E-11
Further Study Measure FS 8: SOLVENT CLEANING AND DEGREASING	E-12
Further Study Measure FS 9: EMISSIONS FROM COOLING TOWERS.....	E-14
Further Study Measure FS 10: REFINERY WASTEWATER TREATMENT SYSTEMS.....	E-15
Further Study Measure FS 11: VACUUM TRUCKS	E-17
Further Study Measure FS 12: VALVES AND FLANGES	E-18
Further Study Measure FS 13: WASTEWATER FROM COKE CUTTING OPERATIONS.....	E-19
Further Study Measure FS 14: NOx REDUCTIONS FROM REFINERY BOILERS ..	E-20
Further Study Measure FS 15: STATIONARY INTERNAL COMBUSTION ENGINES	E-21
Further Study Measure FS 16: ENCOURAGE ALTERNATIVE DIESEL FUELS.....	E-23
Further Study Measure FS 17: MITIGATION FEE PROGRAM FOR FEDERAL SOURCES	E-24
Further Study Measure FS 18: INDIRECT SOURCE MITIGATION PROGRAM.....	E-25
Further Study Measure FS 19: FREE TRANSIT ON SPARE THE AIR DAYS	E-26
Further Study Measure FS 20: EPISODIC MEASURES	E-27

FURTHER STUDY MEASURE FS 1: ADHESIVES AND SEALANTS

Further Study Measure Description

In 2003 and early 2004, the ARB, San Joaquin, Sacramento and Bay Area districts jointly undertook a rule comparison project for a number of source categories, including adhesives and sealants. The South Coast AQMD rule for adhesives appears to be the most stringent, particularly for architectural adhesives. Architectural adhesives encompasses a wide variety of adhesives used in residential and commercial construction: carpet adhesives, flooring adhesives, subfloor adhesives, tile adhesives, drywall adhesives, and multipurpose construction adhesives. The South Coast VOC limits range from 50 to 150 grams per liter (g/l) for various categories of architectural adhesives.

In 1998, the ARB and California districts developed Reasonably Available Control Technology/Best Available Retrofit Control Technology (RACT/BARCT) VOC limits for adhesives and sealants. RACT/BARCT VOC limits range from 100 to 250 g/l for various categories of architectural adhesives. The Bay Area rule, Regulation 8, Rule 51: Adhesive and Sealant Products, meets the BARCT limits in the ARB document.

Generally, most adhesive and sealant products that meet the RACT/BARCT limits will also meet the SCAQMD limits. VOC content for these products is dictated by formulation technology. Solvent-based products generally have a VOC content of 300-400 g/l, and water-based products generally have a VOC content of 0-50 g/l. Reducing the VOC limits in rules will have little effect because most currently available solvent-based products do not comply with either set of limits, and most water-based products comply with both sets of limits, so reducing the allowable VOC limits would not produce any emission reductions. A small subset of architectural adhesives are solvent-based products that have VOC contents in the 100-150 g/l liter range. These products generally use a mixture of water and hydrocarbon solvents and were typically formulated to meet the California RACT/BARCT limits.

The largest category of architectural adhesives is subfloor adhesives formulated with solvent to allow bonding to wet or frozen lumber. These products meet the BAAQMD and BARCT VOC limit of 200 g/l. However, they would not comply with the South Coast AQMD limit of 50 g/l. In California, most wood frame construction relies upon green (wet) lumber. The South Coast 2000 staff reports states that the lower limits are feasible because of the warm climate of the Los Angeles area. The report also notes that relatively low-VOC polyurethane adhesives can bond wet and frozen lumber but fails to discuss the role of isocyanates from polyurethanes in allergic sensitization and asthma. In areas outside the Los Angeles basin, lower temperatures and higher humidity will cause curing difficulties for products meeting the SCAQMD limits. Consequently, a 50 g/l VOC limit for the Bay Area is not feasible.

In the rule comparison discussions, significant differences in inventory between the districts emerged. Specifically, the San Joaquin District has almost no area source adhesive emissions, which includes the architectural adhesives, whereas the Bay Area inventory has over 9 tons organic emissions per day from area source adhesives. When Bay Area staff developed Regulation 8, Rule 51: Adhesives and Sealants, the area source inventory was derived from the Rauch Guide to the US Adhesives and Sealants Industry, by the Rauch Associates, Inc., originally the 1990 edition. The Rauch Guide

breaks down adhesives and sealants into nine categories, which allows some categories to be eliminated because they are either consumer uses and likely subject to the ARB's consumer products standards, or used in sources that require a permit and would be included in the point source inventory. From the US totals, the Bay Area population percentage and control factors based on the rule requirements are applied to produce an area source inventory. Because of the discrepancy between inventories, joint further study among districts is recommended to reconcile these differences.

References

California Air Resources Board. 1998. "Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Adhesives and Sealants."
Koressel, T., Charles McMurray Co. 2003. Personal communication.
South Coast AQMD. 2002. "Final Staff Report: Proposed Amended Rule 1168-Adhesives and Sealants"
South Coast AQMD. 2000. "Staff Report: Proposed Amended Rule 1168-Adhesives and Sealant Applications"
TIAX. 2003. Sacramento Regional Clean Air Plan Update: Control Measure D3.
Walnut, F., TACC International. 2003. Personal Communication.

FURTHER STUDY MEASURE FS 2: ARCHITECTURAL COATINGS

Further Study Measure Description

The District amended Regulation 8, Rule 3: Architectural Coatings in 2001 based on the CARB Suggested Control Measure (SCM) for Architectural Coatings (June, 2000). The SCM was the product of nationwide surveys of available coatings conducted by CARB and discussion among districts, architectural and industrial maintenance coatings manufacturers, infrastructure owners and painting contractors. The Sacramento district was the first district to adopt amendments in June 2001, and the Bay Area adopted amendments in November 2001.

The development of the SCM on which the amendments were based was directed by the California Air Pollution Control Officers Association (CAPCOA). CAPCOA further directed that CARB and the districts evaluate South Coast's future (later than 2004) VOC limits and/or other limits to achieve the maximum possible reductions from the architectural coatings category. CARB is currently evaluating new survey data, and investigating feasible VOC standards both on a mass basis and also on a reactivity basis following the same CARB/districts workgroup format. Districts are awaiting the results of the CARB surveys and data analysis and will work together to develop future reductions in VOC emissions from architectural coatings. The CARB/districts efforts are expected to be completed in 2005.

References

CAPCOA Statement of Principles and Positions on Architectural Coatings Regulations (10/28/99)
SCAQMD Rule 1113: Architectural Coatings

FURTHER STUDY MEASURE FS 3: COMMERCIAL CHARBROILERS

Further Study Measure Description

In 1997, the South Coast AQMD adopted Rule 1138: Control of Emissions from Restaurant Operations. Rule 1138 requires that chain driven charbroilers install catalytic oxidation equipment to control emissions. The catalytic oxidizers control particulate matter and volatile organic compounds that are emitted from the cooking process. The South Coast determined that chain driven charbroilers to be the only type of restaurant operation for which control is cost effective, although further research is being conducted on under-fire charbroilers. In 2002, the San Joaquin Valley adopted Rule 4692: Commercial Charbroiling. Both rules have the same exemption criteria: charbroilers that cook less than 875 lbs of meat per week or emit less than 1 lb of emissions per day are not subject to the rule.

The South Coast originally projected a cost effectiveness for this control measure of \$4650 per ton for a combination of VOC and particulate matter. More recently, the San Joaquin APCD estimated a cost effectiveness of \$3070 per ton combined VOC and PM reduced. However, for VOC alone, the cost effectiveness rises to \$13,070. The South Coast assumed a control effectiveness of 90% and the San Joaquin APCD used figures for control efficiency of 83% and 86% for PM and VOC, respectively. Some additional research indicates that the emission reductions may be closer to 62%, which would raise the cost of pollutants reduced per ton 38%.

The current inventory for VOC emissions from all cooking operations in the Bay Area is 1.29 tons/day. Of that, based on a population-weighted comparison between the Bay Area and the San Joaquin Districts, emissions estimates from chain driven charbroilers are 0.08 tons/day VOC and 0.26 tons/day PM. A comparable rule would reduce emissions by 0.066 tons/day VOC and 0.22 tons/day PM. This is a de minimis amount for VOC alone.

This control measure may not be justified for VOC alone, however, considering the potential to control particulate matter, it may be justified. Also, the South Coast's efforts regarding under-fire charbroilers, scheduled to be completed this year, may increase the potential emission reductions.

References

South Coast Rule 1138: Control of Emissions from Restaurant Operations and staff report, 11/7/1997, SCAQMD
San Joaquin Rule 4692: Commercial Charbroiling and staff report, 3/21/2002, SJVAPCD

FURTHER STUDY MEASURE FS 4: COMPOSTING OPERATIONS

Further Study Measure Description

In January, 2003 the South Coast AQMD adopted Rule 1133.2: Emission Reductions from Co-composting Operations, to limit emissions of both VOC and ammonia. Co-composting is the mixing of biosolids or manure with bulking agents to produce compost. Rule 1133.2 requires new co-composting operations to be enclosed and emissions controlled by 80%, and existing co-composting operations be enclosed and emissions controlled by 70%. Existing operations are given compliance dates between 2007 and 2009, depending on throughput capacity. The rule does not apply to agricultural composting, greenwaste (gardening, agriculture and landscaping) composting, woodwaste composting, co-composting operations of less than 1,000 tons throughput per year or 35,000 tons per year throughput if no more than 20% biosolids. The rule is expected to reduce the South Coast composting emissions by 17.6%.

The Bay Area does not have a specific category in the emission inventory for composting or greenwaste. Emissions are included within the category of "waste management, landfills, point or area sources" or "waste management, other." The Bay Area requires a permit of a composting facility that processes 500 tons/year, lower than the South Coast exemption level for Rule 1133.2. The source code assigned to these operations varies, making an emissions estimate based on permitted sources uncertain. Based on the South Coast control measure and rule development staff report, the Bay Area inventory for composting operations is about 3.4 tons/day VOC and 2.35 tons/day ammonia (South Coast inventory numbers * 0.5). Consequently, this measure applied to the Bay Area would be expected to reduce VOC emissions by 0.6 tons/day.

The South Coast Rule 1133.2 staff report indicates that the cost effectiveness for this rule ranges from \$8700 to \$10,000 per ton of ammonia and VOC reduced and from \$23,000 to \$26,500 per ton of VOC reduced. This is not very cost effective compared to most Bay Area rules for VOC, but within the range of acceptable costs for VOC and ammonia combined. However, as the South Coast AQMD gains experience in implementation of this rule, cost effectiveness may be found to be less. Also, additional benefits of particulate control from the reductions in ammonia (which reacts to form secondary particles) may make the cost effectiveness more attractive as a particulate control measure.

References

SCAQMD Rule 1133.2: Emission Reductions from Co-composting Operations and staff report, Jan. 10, 2003

FURTHER STUDY MEASURE FS 5: FOOD PRODUCT MANUFACTURING AND PROCESSING

Further Study Measure Description

The South Coast AQMD adopted Rule 1131: Food Product Manufacturing and Processing Operations, in September, 2000. The rule addresses any facility that emits more than 440 pounds of organic compound emissions per month that produces, formulates or configures food or food products, including spices, extracts, flavorings and colorings. Bakeries, wineries and breweries are not subject to the rule. VOC emitting processes found in food product manufacturing include distillation, extraction, reaction, blending, drying, crystallization, separation, granulation, filtration and extrusion. The South Coast rule limits solvents used in food processing to 120 grams VOC/liter or requires capture and control of emissions. Solvent used for sterilization of food products is limited to 400 grams VOC/liter and, after 2005, 200 grams VOC/liter.

The South Coast rule projects an emission reduction of about 2 tons from an inventory of 2.47 tons/day. In the Bay Area, the emissions from food preparation are contained in the emission inventory categories, "Other Food and Agricultural Processing," which includes coffee roasting, grain milling, sugar refining and pet food processing. The emission inventory lists organic emissions from this category at 0.3 tons/day. However, some operations subject to the South Coast rule, such as sterilization, reaction or distillation, may have source codes that put them into other categories in the Bay Area. The South Coast staff report notes that food processing operations were exempt from the South Coast permit system. In the Bay Area, some food processing operations are exempt, including non-restaurant cooking operations of less than 1000 tons per year throughput, dry food milling, grinding, handling and packaging equipment, and small coffee, cocoa and nut roasters. Because other food processing equipment is subject to permit requirements, it may already be controlled, reducing the potential emissions reductions.

Based on the difference between the South Coast emission inventory and the Bay Area emission inventory, the differences in permitting regulations and the possibility that some sources in the Bay Area are already controlled, this measure is recommended for further study.

References

South Coast AQMD Rule 1131: Food Product Manufacturing and Processing Operations, and staff report, September, 2000.

FURTHER STUDY MEASURE FS 6: LIVESTOCK WASTE

Further Study Measure Description

The South Coast AQMD has proposed Rule 1127: Emission Reductions from Livestock Waste, based on control measure WST-01 in their 2003 Air Quality Management Plan. The proposed rule would control emissions from livestock waste (primarily dairies) by requiring wastes to be transported out of the district, controlled in an approved composting operation, processed in a controlled anaerobic digester, or spread on agricultural land approved for the spreading of manure. In 1997, the SCAQMD adopted Rule 1186 that requires livestock operations to take certain measures to reduce particulate matter, but the rule does not address livestock waste. South Coast proposed Rule 1127 is designed to reduce emissions of particulate, ammonia (which forms aerosol particulate matter) and VOC. The measure estimates that a reduction in ammonia of 50% is possible at a cost effectiveness of from \$2000 to \$5000 per ton ammonia. The ammonia concentration is approximately three times the VOC concentration, so as a VOC only control measure, cost effectiveness would range from \$6000 to \$15,000 per ton.

The Bay Area emission inventory for livestock waste is 29.81 tons/day total organic compounds. Most of that is methane. Reactive organic emissions are 8% of that total, 2.38 tons/day. Of that inventory of emissions from total livestock waste, approximately 13% (0.31 tons/day) is from dairy cattle, the basis of the South Coast measure. The ARB has raised questions about the emissions estimates, so ROG (VOC) emissions may be lower. Accordingly, the capital costs associated with control of VOC emissions would make the measure less cost effective.

The focus of the South Coast measure is to control particulate and ammonia. The measure has more utility for control of particulate and ammonia, a fine particulate precursor, than for VOC, and particularly so in the South Coast where dairy farms are concentrated in an area that is upwind from monitoring stations that record high PM10 levels. The South Coast control measure notes that a decrease in ammonia and VOC emissions of 2 to 3% per year is likely due to the increased urbanization of the region (which will decrease the number of dairies) and water quality control regulations that require manure to be removed from dairies bi-annually, or incorporated into soil at agronomic rates as quickly as possible. In the Bay Area, many farms may already comply with the proposal by segregating waste and incorporating manure into soil at agronomic rates. In addition, incentives already exist to sell electricity generated by a methane digester into the power grid. Any study should investigate these incentives as a cost effective means of control. Due to uncertainty in the VOC inventory for this category, and the cost effectiveness of a command and control measure, this measure is not recommended as a control measure at this time. However, because of the potential particulate matter benefits, it is recommended for further study.

References

“PG&E vs Cow Power Dairy Farmers Say the Utility Opposes Energy from Methane Gas” Martin, Glen, SF Chronicle, June 27, 2004
SCAQMD Final 2003 Air Quality Management Plan, Control Measure #2003 WST-01, SCAQMD, August, 2003
Air Emissions Action Plan For California Dairies, ad hoc Dairy subcommittee of the SJVUAPCD, May, 2003

FURTHER STUDY MEASURE FS 7: LIMITATIONS ON SOLVENTS BASED ON RELATIVE REACTIVITY

Further Study Measure Description

Further Study Measure F8 in the 2000 Clean Air Plan suggested the potential to make regulations more effective by replacing VOC limits, measured in mass VOC per volume of product, with limits based on the relative contribution to ozone formation of each of the organic species that make up the VOC of a product, or the "relative reactivity." This further study measure would examine whether a relative reactivity approach would be either more cost effective than mass reductions in VOC content or allow reductions where further reductions in mass might not be technically feasible.

The differences in ozone produced by different species of organic compounds have been recognized for many years, however, the ability to quantify the relative contributions to ozone formation of the vast number of organic species has only recently been developed. The California Air Resources Board, working with scientists and representatives of industry and air agencies, have developed a scale of incremental reactivities that is used in their aerosol paint regulation (Regulation for Reducing the Ozone Formed from Aerosol Coating Product Emissions). Currently, CARB staff have requested speciation data for architectural and automotive refinish coatings to consider whether a relative reactivity approach might be advantageous for these two source categories. US EPA staff is involved in CARB's processes to consider relative reactivity based regulations, but they have yet to approve CARB's consumer product rules into the SIP, including the aerosol paint rule. District staff participate in discussions of reactivity as it relates to potential regulatory activity. At this time, however, because the potential for emission reductions (or ozone formation reductions) cannot be assessed for any source category, this control measure is recommended for further study.

References

17 California Code of Regulations, Section 94520, 94700, Regulation for Reducing the Ozone Formed from Aerosol Coating Product Emissions, and Table of Maximum Incremental Reactivity
Further Study Measure 8, 2000 Bay Area Clean Air Plan, BAAQMD, December, 2000

FURTHER STUDY MEASURE FS 8: SOLVENT CLEANING AND DEGREASING

Further Study Measure Description

In 2003 and early 2004, the ARB, San Joaquin, Sacramento and Bay Area districts jointly undertook a rule comparison project for a number of source categories, including solvent cleaning and degreasing. The discussion included vapor degreasing, cold cleaning and wipe cleaning. The joint conclusion was that vapor degreasing, done largely with negligibly photochemically reactive solvents, was not a source category that was likely to produce any significant emissions reductions. Cold cleaning and wipe cleaning are discussed below.

Cold Cleaning

Cold cleaning describes the use of cleaning solution in a tank or container into which a part to be cleaned is immersed, or a remote reservoir cleaner that pumps some cleaning solution over a part to be cleaned that then drains back into the reservoir. All districts except the South Coast have adopted a 50 gram/liter VOC standard for cleaning solutions, and the South Coast has adopted a 25 g/l VOC standard. The South Coast, in adoption of a 50 g/l VOC standard in 1997, used an EPA emission factor of 1.45 pounds VOC/day/cold cleaner. In 2002, the South Coast staff report assumed a 50% reduction in the remaining emissions because of the adoption of a 25 g/l VOC standard.

Bay Area staff believe that the EPA emission factor used by South Coast for rule adoption, and subsequently by other districts for control measures, is too high because it did not account for the low volatility of the mineral spirits blends used in most mineral spirits cold cleaners and remote reservoir cleaners at the time the rule was adopted. In 1998, the Bay Area adopted a 50 g/l VOC standard except for one cold cleaner in each facility. At that time, Bay Area staff estimated emissions from these cleaners based on information provided by the Safety Kleen Corporation, the dominant cold cleaner solvent provider. Emissions were estimated by a mass balance approach, considering 1) the percent market share that Safety Kleen had in 1998; 2) the number of mineral spirit cold cleaners Safety Kleen leased and serviced in the Bay Area; 3) the amount of solvent they supplied and recycled; and; 4) an estimation of the sludge and foreign substance in their return solvent. From that data, we developed an emission factor of 0.6 pounds VOC/day/cold cleaner, significantly less than the 1.45 lb/day factor used by the South Coast and other districts. In 2002, the Bay Area District amended the standards so that all cold cleaners, with some exceptions for specific substrates consistent with other districts, would have to meet the 50 g/l VOC limit.

Using the methodology in the 2002 Bay Area staff report to calculate emissions reductions for a 25 g/l VOC standard, the additional emissions reductions to be gained from a rule amendment would be 0.0743 tons per day, less than de minimis. In addition, the South Coast, in their staff report, estimated that 70% of cleaning solutions available to comply with their 50 g/l VOC standard would also meet their 25 g/l VOC standard. Consequently, the potential emissions reductions would be only 30% of the above total, or 0.022 tons/day. However, because of the discrepancy in how emissions are calculated between districts, joint further study is needed to examine emissions calculations for cold cleaners within California.

Wipe Cleaning

Wipe cleaning involves wetting a rag, cloth or paper with a cleaning solution and wiping grease or soils from a part by hand. The South Coast AQMD adopted a 25 g/l VOC standard for wipe cleaning concurrent with their adoption of a 25 g/l VOC standard for cold cleaning.

In 2002, the Bay Area District amended 5 rules to incorporate a 50 gram/liter VOC standard for wipe cleaning operations. These rules regulate the surface preparation and coating of metal parts, metal furniture and large appliances, plastic parts, marine vessels and general solvent and surface coating.

In calculation of the emissions attributable to wipe cleaning in Bay Area facilities, staff recalculated the emission inventory for area sources because it was developed from 1993 data and did not account for the subsequent impact of the Montreal Protocol on Ozone Depleting Substances and EPA's finding that acetone was a negligibly photochemically reactive. These two factors have led to a surge in the development of water-based cleaning applications, and a shift to the use of solvents such as MEK or alcohol to acetone, significantly reducing reactive organic emissions.

The adoption of a 25 g/l VOC standard for wipe cleaning has been calculated to reduce emissions by 0.0756 tons per day, not including any cleaning solutions that would already meet the 25 g/l standard. If, as South Coast staff estimated for cold cleaners, 70% of the solutions in use already meet a 25 g/l VOC standard, the emissions reductions could be only 0.023 tons per day. This is less than de minimis, however, further study is needed on a statewide basis to update the study on which the area source inventory was derived.

References

- BAAQMD Analysis of SMAQMD Suggested Changes to BAAQMD Rules, attachment to letter, B. Norton to N. Covell, Nov. 12, 2002
- South Coast AQMD Proposed Amended Rule 1122 Staff Report, South Coast AQMD, July, 2001
- Staff report, Proposed Amendments to Regulation 8, Rules 4, 14, 19, 31, 43, BAAQMD, Oct. 2002
- Staff Report, Proposed Amendments to Reg. 8, Rule 16: Solvent Cleaning Operations, BAAQMD, Sept. 2002
- Staff Report, Proposed Amendments to Reg. 8, Rule 16: Solvent Cleaning Operations, BAAMQD, Sept. 1998

FURTHER STUDY MEASURE FS 9: EMISSIONS FROM COOLING TOWERS

Further Study Measure Description

The emission inventory for refinery cooling towers shows 0.45 tons/day organic emissions, based on cooling water throughput from cooling towers with District permits. AP-42 emission factors of 6 lbs organic emissions per million gallons water throughput were used in this calculation. This assumes organic compound leaks into the cooling water system are not minimized. However, if leaks are minimized, the AP-42 emission factor is 0.7 lb organic emissions per million gallons water. Further study is needed to determine whether leaks from cooling towers are currently minimized and whether there is any potential for emission reductions from regulations.

References

Compilation of Air Pollution Emission Factors (AP-42), US EPA, 1995

FURTHER STUDY MEASURE FS 10: REFINERY WASTEWATER TREATMENT SYSTEMS

Further Study Measure Description

Emissions from refinery wastewater systems are being studied through further study measure FS-9 from the 2001 Ozone Attainment Plan. Refinery wastewater systems basically consist of collection systems to collect and transport hydrocarbon-containing process water, physical separation systems to separate oil and water by mechanical means, and finally, biological and chemical processes to treat effluent. District staff studied emissions from the wastewater collection systems. The physical separation systems, including oil-water separators and dissolved air floatation units, are already controlled by Regulation 8, Rule 8. An amendment to Regulation 8, Rule 8: Wastewater (Oil-Water) Separators was adopted in September 2004 resulting in an estimated reduction in ROG emissions by 2.2 tons/day from this portion of the wastewater system. This further study measure focuses on the effluent treatment systems, including wastewater ponds.

Water entering the treatment systems after physical separation tends to have low organic content, but most of these organic compounds must be removed by biological degradation. Some of these compounds are volatilized and emitted to the atmosphere. Reg 8-8 does not require control of biological or chemical treatment portions of wastewater systems. Water is treated until it meets the San Francisco Bay Regional Water Quality Control Board discharge requirements.

Emissions for one refinery's large treatment pond with a flow rate of 10 million gallons per day have been estimated, using EPA's WATER8 model, to be approximately 150 pounds per day. Total wastewater pond emissions for the Bay Area refineries are currently estimated to be 0.4 tons per day. The current emissions inventory estimates 0.24 tons per day organic emissions for this source category. However, staff believe that better emissions estimates could be made by a combination of sampling and refined models. A study of the emissions from the biological and chemical treatment portion of refinery wastewater systems has been initiated through a cooperative workgroup process that includes refinery personnel, ARB, District and SF Bay Regional Water Quality Control Board staff, environmental groups and consultants with expertise in developing emissions models for wastewater systems.

In addition to organic emissions, odors result when aeration ceases or is insufficient, such as when biological treatment processes are overwhelmed by accident or storm, or when the biota in the treatment process are otherwise disrupted. Considerable research is currently being conducted by universities and other institutions so that the action of treatment pond biota can be better understood and controlled. This research, some of which is being conducted by Lawrence Berkeley Laboratory, holds potential for reducing odors from wastewater ponds. In community meetings held to solicit control measure suggestions, several requests were made to control refinery wastewater treatment ponds. Consequently, the potential for control is recommended for further study.

References

Draft Technical Assessment Document: Potential Control Strategies to Reduce Emissions from Refinery Wastewater Collection and Treatment Systems, CARB and BAAQMD, Jan., 2003

FURTHER STUDY MEASURE FS 11: VACUUM TRUCKS

Further Study Measure Description

This measure was analyzed in the 1994 Clean Air Plan as Control Measure B6: Control of Emissions from Cleaning Up Organic Liquids. The analysis concluded that the measure would not be cost effective. However, in addition to cleaning up spills, vacuum trucks have been observed in frequent use as part of some refinery operations, such as removing water from tank surfaces, cleaning of oil-water separators, and transport of sludges, slop oils and tank bottoms. At one refinery, it was estimated that over 1,000,000 gallons of hydrocarbon containing liquids were put in vacuum trucks per month, which is the equivalent of approximately 145,000 gallons of hydrocarbons per month. On a volume basis, at least 1.5 gallons of air is emitted for every gallon of vacuum tank capacity.

In some cases, emissions from the tanks are controlled by the use of a carbon canister that adsorbs organic vapors as they are emitted from the truck tank, primarily to control odors. Further study can determine the emissions from these activities and whether control of emissions is more cost effective than the 1994 analysis found.

References

1994 Clean Air Plan Control Measure B6: Control of Emissions from Cleaning Up Organic Liquids

FURTHER STUDY MEASURE FS 12: VALVES AND FLANGES

Further Study Measure Description

In 2003 and early 2004, the ARB, San Joaquin, Sacramento and Bay Area districts jointly undertook a rule comparison project for a number of source categories, including valves and flanges. Valves and flanges are typically found at refineries and chemical plants, but also found in other petroleum and gas production facilities. The review found that the Bay Area's existing Regulation 8, Rule 18: Equipment Leaks, is the most stringent regulation in the state. Reg. 8, Rule 18 was amended on January 21, 2004 to fulfill the provisions of control measure SS-16 from the 2001 Ozone Attainment Plan. During the rule development, staff identified a number of different areas for potential future study to further reduce emissions from valves and flanges. These areas include: 1) setting a maximum leak limit for components; 2) targeting minimization and repair periods; 3) accelerating equipment replacement for equipment found leaking frequently; 4) requiring inaccessible equipment to be replaced by superior technologies; 5) quantifying mass emissions and imposing emissions caps; 6) increasing inspection frequencies; and 7) incorporating remote sensing technologies to identify the largest leaking components.

References

Staff Report, Proposed Amendments to Regulation 8, Rule 18: Equipment Leaks, January, 2004, BAAQMD

FURTHER STUDY MEASURE FS 13: WASTEWATER FROM COKE CUTTING OPERATIONS

Further Study Measure Description

Refineries operate high pressure water pumps to remove or “cut” coke from coking drums. During the investigation of Further Study Measure FS 9: Refinery Wastewater Systems in the 2001 Ozone Plan, it was noted that coke cutting operations at some facilities generated significant quantities of wastewater. This wastewater, at elevated temperatures, is often recycled. The wastewater from coke cutting is not part of the refinery wastewater collection and treatment system. One possible method of control would be to include coke cutting wastewater in the existing collection and treatment system. Additional research needs to be conducted to determine whether coke cutting wastewater contains significant quantities of VOC and whether there is any potential for emissions reductions from these operations. Because of these unknowns, it is recommended that coke cutting operations be studied.

References

Draft Technical Assessment Document: Potential Control Strategies to Reduce Emissions from Refinery Wastewater Collection and Treatment Systems, CARB and BAAQMD, Jan., 2003

FURTHER STUDY MEASURE FS 14: NOX REDUCTIONS FROM REFINERY BOILERS

Further Study Measure Description

The measure is based on the San Joaquin Valley Unified APCD's Rule 4306 – Boilers, Steam Generators, and Process Heaters – Phase 3: a five-ppm NO_x limit corrected to 3% O₂, or 0.0062 lb/MMBtu standard for large refinery boilers and process heaters (larger than 110 MMBtu). This limit is much lower than that allowed in Bay Area Regulation 9, Rule 10: Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries. The Bay Area limit of 0.033 lb/MM BTU (approximately 30 ppm) was adopted in 1994. The San Joaquin limit in Rule 4306 was adopted in 2003 and represents the most stringent rule in California.

The Bay Area Rule 9-10 applies only to refinery boiler units. When the rule was adopted, averaging among units was considered the only cost effective way to achieve the regulatory standards. Many of the units are old, low-NO_x burner technology did not exist for some, and some are in locations where there is not enough space to add selective catalytic reduction (SCR) units. Newer units, however, are subject to lower BACT limits for NO_x and are not part of the average. To properly determine the feasibility and appropriateness of implementing a lower NO_x limit on refinery boilers in the Bay Area, at a minimum, several factors need to be evaluated:

- A precise inventory of refinery boilers;
- A determination of the type, age, retrofit ability of; and the nature of the emissions from these boilers;
- The cost effectiveness of retrofits and replacement technologies;
- The contribution to emissions of the boilers that are currently exempt from Rule 9-10; and
- The inventory of non-refinery boilers of similar size in use in the District.

References

San Joaquin Valley Unified APCD Rule 4306 – Boilers, Steam Generators, and Process Heaters – Phase 3.

Staff Report, Regulation 9, Rule 10: Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries.

FURTHER STUDY MEASURE FS 15: STATIONARY INTERNAL COMBUSTION ENGINES

Further Study Measure Description

Gaseous Fuel Fired Engines

The District regulates NO_x emissions from internal combustion engines under Regulation 9, Rule 8, which imposes NO_x limits on engines fired with gaseous fuels. Reg 9-8 was adopted in 1993 pursuant to CARB pollution transport regulations (California Code of Regulations beginning at section 70600). Those regulations required the BAAQMD to adopt by 1994 BARCT for source categories that collectively amounted to 75% of the 1987 nitrogen oxides emission inventory. Because the majority of IC engine emissions came from approximately 60 large engines fired with gaseous fuels located at wastewater treatment facilities, landfills, and refineries, Reg 9-8 imposed controls only on gaseous-fueled engines. Collectively, these engines were estimated to emit 9 tons per day of NO_x, and the rule was estimated to reduce emissions by 8.1 tons per day.

Under Reg 9-8, engines fired with fossil-derived fuels must meet a NO_x limit of 56 ppm if rich burn and 140 ppm if lean burn. (Current BARCT limits would be, respectively, 25 ppm, or alternatively 96% reduction, and 65 ppm, or alternatively 90% reduction.) Engines fired with waste-derived fuel must meet a 140 ppm limit if lean burn and 210 ppm if rich burn. Current BARCT limits would be 65 ppm and 50 ppm respectively, or alternatively, 90% reduction for either. The inventory currently shows that NO_x emissions from stationary IC engines fired with gaseous fuels are 2.37 tons per day, including engines subject to Reg 9-8 as well as smaller engines not subject to the rule. District BACT for engines requires gaseous fuel except where impractical.

Emission reductions from engines fired with gaseous fuels cannot be easily estimated. The CARB BARCT limits include alternative percentage reduction limits that allow compliance through a demonstration that, though an engine may not meet a specified exhaust concentration limit, emissions have been reduced by a specified percentage. Many of the engines are likely to comply with the BARCT alternative percentage reduction requirements so that the BARCT limits would produce no emission reduction. For other engines, emission reductions cannot be easily estimated: engine-by-engine calculations would be required, and emission reductions may be minor.

Liquid Fuel Fired Engines

NO_x emissions from stationary liquid-fueled IC engines in the Bay Area are shown in the most recent BAAQMD inventory to be 4.6 tons per day. Virtually all stationary liquid-fueled engines in the BAAQMD are compression-ignited engines, almost all of which are fueled with diesel oil. The BAAQMD inventory for these engines is based on the inventory developed by CARB for the stationary diesel ATCM. The CARB/BAAQMD inventory shows approximately 4100 diesel engines rated 25 hp or higher in the BAAQMD, of which approximately 3800 are used to drive backup generators or backup pumps. These are emergency standby engines which are exempt from the requirements of Reg 9, Rule 8. These 3800 engines account for about one-fourth of all NO_x emissions from stationary sources under the District's jurisdiction. Many of the backup engines in the BAAQMD have been installed since 2000, when permits became mandatory for existing and new backup engines of at least 50 hp. New engines have been required to meet BACT NO_x limits set at CARB's Tier 1 limit of 6.9 g/bhp-hr.

Based on BAAQMD permit data, the CARB inventory appears to be fairly reliable in its population estimates for backup engines.

According to the CARB inventory, approximately 300 diesel engines are used to drive prime generators, prime pumps, or for other purposes. These engines account for approximately three-fourths of all NOx emissions (3.3 tons per day) from liquid-fueled engines and would be the primary target for controls. We believe this number greatly overstates the number of such engines in the Bay Area. This discrepancy arises because CARB, in determining how many engines should be classified as prime engines, relied on data from four air districts, including two (San Joaquin and South Coast) that have large numbers of these engines in operation in petroleum production, an activity of no significance in the Bay Area.

BAAQMD permit data shows that there are 495 engines flagged as non-standby engines. However, an examination of the data shows that some are, in fact, standby engines and a much larger number are used only intermittently. The permit data show that cities and counties have a large number of diesel generators that may run temporary lights for street repair, etc. Of the 495 non-standby engines, 70 of them have emissions of at least 1 pound of NOx per day, and only 47 of them have emissions of 10 pounds of NOx per day. These are the prime engines that are of concern. The collective emissions estimate for those engines of greater than one pound NOx per day is 1294 lbs per day, 0.65 tons/day, confirmation that the CARB inventory overstates the number of diesel-fired prime engines.

The California Air Resources Board adopted the stationary diesel ATCM on January 20, 2004. District imposed NOx controls on liquid-fueled engines may not produce emission reductions beyond those that are likely to be achieved through the implementation of the ATCM. The ATCM will result in the replacement of virtually all existing prime engines by 2011. All new engines will have to meet BACT both for particulate matter and for ozone precursors (VOC and NOx). If modifications to existing District Regulation 9, Rule 8 is recommended and will not cause regulatory conflict with the ATCM, it will be included for further study.

References

- California Air Resources Board. 2001. "Determination of Reasonably Available Control Technology and Best Available Retrofit Control Technology for Stationary Spark-Ignited Internal Combustion Engines."
- California Air Resources Board. 2003. "Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Adoption of the Proposed Airborne Toxic Control Measure for Stationary Compression-Ignition Engines."
- Marr, L.C., Harley, R.A. 2002. "Spectral analysis of weekday-weekend differences in ambient ozone, nitrogen oxide, and non-methane hydrocarbon time series in California." *Atmospheric Environment* 36, 2327-2335.
- Sacramento Metropolitan AQMD. Rule 412.
- San Joaquin Unified APCD. 2003. "Final Draft Staff Report: Proposed Amendments to Rule 4701 (Internal Combustion Engines - Phase 1) and Rule 4702 (Internal Combustion Engines - Phase 2)"
- San Joaquin Unified APCD. Rules 4701 and 4702.
- South Coast AQMD. Rule 1110.2.
- Ventura County APCD. Rule 74.9.

FURTHER STUDY MEASURE FS 16: ENCOURAGE ALTERNATIVE DIESEL FUELS

Further Study Measure Description

Biodiesel

The District is currently conducting a feasibility study and pilot project to explore the potential air quality benefits of using biodiesel fuel in place of conventional petroleum diesel. The study will quantify the recoverable biodiesel feedstock from Bay Area sources, assess the environmental benefits (including air emission benefits) from these sources, identify production technology and costs, prepare a marketing plan, and identify obstacles and corresponding solutions to increasing biodiesel use in the Bay Area. The pilot project would demonstrate conversion of local feedstocks to biodiesel, use of the biodiesel in local fleets, and compare air pollutant emissions resulting from the use of the pilot project biodiesel to emissions from use of petroleum diesel in local fleets. While biodiesel has been shown to reduce emissions of particulates, reactive organic gases and toxic air contaminants, it can increase emissions of oxides of nitrogen. One important element of the District's feasibility study and pilot project is to explore ways to achieve emission reductions for oxides of nitrogen. The District will evaluate results of the study and project before determining whether and how to promote biodiesel use in the Bay Area.

Water/Diesel Emulsion

The ARB verified the emission reductions of Lubrizol's PuriNOx water/diesel emulsion in January 2001. In March 2004, the ARB released a report assessing the emission characteristics of PuriNOx. On average, emissions of NOx and PM were reduced 14% and 58 %, respectively, while hydrocarbon emissions increased by 87%. A significant contribution to air quality from PuriNOx is in the reduction of diesel PM. ARB identified diesel PM as a toxic air contaminant that accounts for 70% of the toxic risk from all identified toxic air contaminants. While PuriNOx was shown to increase emissions of some toxic air contaminants, such as formaldehyde, acetaldehyde, BTEX, 1,3-butadiene, and some polycyclic hydrocarbons, the benefits from reducing diesel PM were significantly greater than the risks posed by the increase in other toxic air contaminants. The District will consider appropriate methods to promote the use of water/diesel emulsified fuels in the Bay Area.

FURTHER STUDY MEASURE FS 17: MITIGATION FEE PROGRAM FOR FEDERAL SOURCES

Further Study Measure Description

The regulation of emissions from ships, aircraft, trains, and off-road farm and construction equipment less than 175 hp is under exclusive federal jurisdiction and therefore pre-empted from State and local air district authority. Existing and projected Federal regulations for these pre-empted sources are not expected to achieve significant emission reductions in the near term. The Mitigation Fee Program, adopted into the South Coast AQMD's 2003 AQMP, but not yet implemented, would charge an air quality impact fee to sources pre-empted from State and local air district authority under the federal Clean Air Act. The proposed method of control would first require the EPA or other federal agencies to appropriate funds or enable collection of fees by the SCAQMD in lieu of controlling these sources through more stringent federal regulations. The SCAQMD has the authority to collect fees based on emissions under the Lewis Presley Air Quality Management Act. The SCAQMD would use the impact fees to fund and/or implement cost-effective emission reduction projects from both federal and non-federal sources. Implementation of this control measure by the SCAQMD may require additional legislation. The District will monitor SCAQMD's progress in implementing this program, and will evaluate the feasibility of implementing such a program in the Bay Area. The cost effectiveness of this measure in the Bay Area has not been determined. The ARB's emission inventory for ships, aircraft and trains in the Bay Area is estimated to be approximately 47.1 TPD of NO_x and 9.3 TPD of ROG in 2005.

FURTHER STUDY MEASURE FS 18: INDIRECT SOURCE MITIGATION PROGRAM

Further Study Measure Description

Indirect sources are development projects that generate vehicle trips and thus indirectly cause air pollutant emissions. Health & Safety Code Section 40716 states that air districts may "...adopt and implement regulations to...reduce or mitigate emissions from indirect and areawide sources of air pollution," but also states, "Nothing in this section constitutes an infringement on the existing authority of counties and cities to plan or control land use, and nothing in this section provides or transfers new authority over such land use to a district."

Some small, single-county California air districts have implemented limited indirect source control requirements. Most California air districts currently limit their indirect source control activities to review of CEQA documents and, occasionally, technical guidance. No multi-county, regional air districts currently have ISC programs beyond CEQA commenting and limited technical assistance.

San Joaquin Valley Unified APCD staff is evaluating the option of adopting indirect source rules to reduce emissions of PM10 and ozone precursors. Rule 9510 would establish provisions for review of development projects and require implementation of mitigation measures and/or payment of fees. Rule 3180 would establish the fee schedule. SJVUAPCD conducted workshops in March 2004 on draft rules, and is continuing with the rule development process as of summer 2004.

The Air District currently implements various programs to reduce emissions from indirect sources, including: review and comment on CEQA documents; promotion of air quality elements in local plans; Transportation Fund for Clean Air grants for bicycle facilities, traffic calming, shuttles and other projects; cooperation with other regional agencies and stakeholder groups in the Smart Growth Strategy/Regional Livability Footprint project.

The Air District will evaluate ways to enhance these programs and further reduce emissions from indirect sources. The primary goal of the program would be to encourage land use development projects located and designed in such a way as to reduce vehicle use. Examples include infill development, mixed uses, increased densities near transit facilities, street design to encourage walking and cycling, etc. A secondary goal could potentially include providing funds (e.g., from air quality mitigation fees) for air quality mitigation measures such as transit improvements, shuttles, bicycle and pedestrian facilities, retrofitting or repowering heavy-duty diesel vehicles, etc. Potential program options that could be evaluated include Air District rules, enhanced outreach to local government, expanded CEQA review, or other programs. The Air District will monitor San Joaquin Valley Unified APCD's progress with developing indirect source rules and fees in order to determine the viability of such a program in the Bay Area.

FURTHER STUDY MEASURE FS 19: FREE TRANSIT ON SPARE THE AIR DAYS

Further Study Measure Description

Various transit districts around the United States have implemented free or reduced transit fares on ozone alert days. In the Bay Area, the Air District and MTC have implemented several pilot programs involving free transit service on Spare the Air (STA) days: a 1996 program with Santa Clara VTA, a 2003 and 2004 program with LAVTA, a 2004 program with BART, and a 2005 program with many additional Bay Area transit providers.

The 1996 VTA program involved distribution of VTA transit vouchers at participating worksites on STA days. The program was moderately successful, and also identified a number of enhancements to improve effectiveness, particularly the need for better marketing and more simplified implementation. Under the 2003 LAVTA program, all rides on all of LAVTA's Wheels routes were free on STA days. Survey data showed increases in ridership on STA days. The program continued in 2004.

Under the BART program, BART agreed to provide free rides during the morning commute for up to the first five weekday Spare the Air days in 2004. \$2 million in CMAQ and TFCA funding were committed to the project in 2004, which provided roughly \$312,000 per day for BART's costs and approximately \$450,000 for marketing and program evaluation. During the 2005 ozone season, the Air District and MTC have committed \$4 million to provide free morning transit service on 19 transit operators in the region, including all major operators, on the first five, non-holiday, weekday Spare the Air Days.

In 2002, Air District staff calculated rough estimates of the costs and potential emission reductions of providing free rides on all Bay Area transit systems (excluding ferries) on STA days. Approximate costs were estimated to be \$1.1 million - \$1.3 million per day. Approximate emission reductions, assuming 5% and 15% increases in ridership, were as follows: ROG, 1.2 - 3.5 tpd; NOx, 1.5 - 4.6 tpd. MTC also evaluated such a program in 2002 and estimated costs to be \$1.5 million per day and emission reductions (15% ridership increase) to be: ROG, 0.7 tpd; NOx, 1 tpd. Thus, emission reductions from free transit on STA days could be significant (particularly for a TCM), but costs would be very high.

The Air District and MTC will study the feasibility of providing free transit service on STA days, focusing particularly on: 1) identifying the most cost-effective routes, and 2) identifying federal, State, regional, local and/or private funds that could potentially pay for the program. Since the cost of region-wide implementation is so high, pilot programs on selected transit systems may be warranted as alternatives to region-wide implementation. Further study would be needed to identify the most cost-effective transit systems for pilot programs. Other, more limited options that may be studied include reduced fares (rather than free fares) and free transfers between systems. Effective marketing programs for free transit on STA days will also need to be studied. The current limited-day STA free transit program will provide valuable information to evaluate this concept.

FURTHER STUDY MEASURE FS 20: EPISODIC MEASURES

Further Study Measure Description

Episodic measures are measures that are not implemented year-round, but instead are implemented only at times when pollution levels are expected to be highest. The Air District's Spare the Air program (STA), described in TCM 16, is a long-standing episodic measure aimed at discouraging polluting behavior by businesses, government agencies, and members of the public on days when weather conditions are conducive to high ozone levels.

The Air District and MTC have previously examined enhancements to episodic measures. The STA program has expanded significantly over the years. TCM 16 proposes further enhancements to the STA program. Further study measure 20 proposes to examine opportunities for and benefits of providing free transit service on STA days, possibly leading to expansion of several pilot programs the Air District and MTC have implemented in previous years.

The Air District and MTC will study additional potential episodic measures. Key considerations will include emission reduction potential, costs, technical and administrative viability, and public acceptability. Potential episodic measures that could be examined include, but are not limited to, the following:

Reduce high-speed travel on freeways. Cars and trucks produce higher emissions when traveling at high freeway speeds (e.g., above posted speed limits). TCM 16 proposes to emphasize (voluntary) compliance with freeway speed limits on STA days through STA advisories and outreach. MTC and the Air District could examine additional measures, such as expanded California Highway Patrol enforcement of freeway speed limits on STA days.

Limit use of pre-1981 vehicles. Older vehicles produce much more pollution than newer vehicles because they lack current emission control devices. The Air District's Vehicle Buy Back program offers owners of pre-1981 cars a cash incentive to voluntarily retire their vehicle, which is subsequently scrapped. TCM 16 proposes to place greater emphasis on discouraging use of pre-1981 vehicles in STA advisories and outreach. MTC and the Air District could examine additional measures to discourage use of pre-1981 vehicles on STA days, such as targeted outreach to owners of pre-1981 vehicles or providing incentives.

Reschedule processes at stationary sources. Some Air District rules limit polluting activity – such as repair and maintenance, cleaning, and other shutdowns of production equipment – at industrial facilities on STA days. Examples include prohibiting tank cleaning or process vessel depressurization at refineries on STA days. As Air District rules are adopted or amended, the District will continue to investigate such STA limitations to polluting activity that is infrequent and thus could be easily rescheduled.