Appendix L

Analysis of Potential
Stationary Source RACM Measures

Potential Stationary RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
P1	NOx Limit For Power Plants	Cap the emission rate from each utility boiler and turbine below NOx SIP Call limits	No	Would not deliver benefits by May 2004
P2	Specific Control Technology For Power Plants	Require all power generators to install specific types of control equipment (i.e. SCR, SNCR, low-NOx burners)	No	Would not deliver benefits by May 2004
P3	Controls on Power Plants Outside Nonattainment Area	Require power plants operating in counties adjacent to Washington nonattainment area to install nonattainment area controls	No	Would not deliver benefits by May 2004
P4	Purchase of Alternative Energy	Commit to purchasing a certain amount of the region's power from sources of alternative energy, such as wind farms, solar farms or landfill gas generators.	No	Unenforceable
P5	OTC Phase II NOx MOU	Require reductions in emissions from regional power plants through the OTC Phase II NOx MOU	No	Would not reduce emissions
W1	Reduced Emissions from Wastewater Systems	Adopt SCAQMD Rule 1176: Sumps and Wastewater Separators	No	No creditable emission reductions
X1	NOx Controls on Commercial Power Generating Equipment	Adopt OTC Additional NOx Controls Rule throughout nonattainment area (applies to industrial boilers, stationary combustion turbines and reciprocating engines, emergency generators, load shavers and cement kilns)	No	Would not deliver benefits by May 2004
X2	Enhanced Rule Compliance at Existing Stationary Sources	Step up enforcement of and compliance with existing rules for emissions control by stationary sources	No	No creditable emission reductions

Explanation of "Identifier" Field	
Abbreviation	**Explanation**
P	Power Generation
W	Waste Treatment
X	Other/Multiple Categories

Measure P1: NOx Limit For Power Plants

Measure Number: P1
Measure Name: NOx Limit For Power Plants

Description:
Cap the emission rate from each utility boiler and turbine below NOx SIP Call limits

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2006+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require either state-level regulation by Maryland, Virginia and the District or an MOU with power generators

· Given the current political initiatives to amend New Source Review provisions and pass the Clear Skies Initiative, power generators are unlikely to voluntarily enter into a MOU in advance of more regulatory certainty.

· Any regulation creating more stringent emission limits would be extremely controversial and would probably be litigated.

· All three states require well over 12 months to develop, pass and require compliance with a regulation.

· Even if power generators were to agree to an MOU in mid-2003, installation of emission-reducing technology or fuel switching could not take place by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure P2: Specific Control Technology For Power Plants

Measure Number: P2
Measure Name: Specific Control Technology For Power Plants

Description:
Require all power generators to install specific types of control equipment (i.e. SCR, SNCR, low-NOx burners)

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2006+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require either state-level regulation by Maryland, Virginia and the District or an MOU with power generators

· Given the current political initiatives to amend New Source Review provisions and pass the Clear Skies Initiative, power generators are unlikely to voluntarily enter into a MOU in advance of more regulatory certainty.

· Any regulation prescribing a specific control technology would be extremely controversial and would probably be litigated.

· All three states require well over 12 months to develop, pass and require compliance with a regulation.

· There is no certainty that prescribing a specific technology would reduce emissions below the already-mandated SIP Call limits.

· Even if power generators were to agree to an MOU in mid-2003, installation of emission-reducing technology or fuel switching could not take place by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure P3: Controls on Power Plants Outside Nonattainment Area

Measure Number: P3

Measure Name: Controls on Power Plants Outside Nonattainment Area

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Require power plants operating in counties adjacent to Washington nonattainment area to install nonattainment area controls

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Most plants outside the nonattainment area are already subject to SIP Call limits.

· This measure would require either state-level regulation by Maryland, Virginia and the District or an MOU with power generators

· Given the current political initiatives to amend New Source Review provisions and pass the Clear Skies Initiative, power generators are unlikely to voluntarily enter into a MOU in advance of more regulatory certainty.

· Any regulation creating more stringent emission limits would be extremely controversial and would probably be litigated.

· All three states require well over 12 months to develop, pass and require compliance with a regulation.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure P4: Purchase of Alternative Energy

Measure Number: P4
Measure Name: Purchase of Alternative Energy

RACM Determination: No
Reason: Unenforceable

Description:
Commit to purchasing a certain amount of the region's power from sources of alternative energy, such as wind farms, solar farms or landfill gas generators.

Criterion Summary

Year of First Benefits	2004
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· In comments submitted on the draft of this SIP revision, EPA stated that benefits from purchases of alternative energy cannot currently be quantified. See Appendix K, Comment ID TechCorr-2.

· As a result, reductions from this measure are not enforceable.

· If implemented, this measure would need to be part of a voluntary measures policy.

Summary Analysis

Reductions from this measure are not enforceable. Therefore the measure is not a RACM.

Measure P5: OTC Phase II NOx MOU

Measure Number: P5
Measure Name: OTC Phase II NOx MOU

Description:
Require reductions in emissions from regional power plants through the OTC Phase II NOx MOU

RACM Determination: No
Reason: Would not reduce emissions

Criterion Summary

Year of First Benefits	2004
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Maryland and the District are signatories to this MOU. Its provision have been implemented and are already credited in the SIP under Section 7.2.9.

· Virginia is not a signatory to this MOU. However, it has issued state operating permits for the two sources in the Northern Virginia area that would have been affected under the MOU. The permit limits NOx emissions to 0.15 lb/mmBtu, which is more stringent than the limits of the Phase II MOU.

· As a result, this measure would not reduce emissions.

Summary Analysis

This measure would not reduce emissions. Therefore the measure is not a RACM.

Measure W1: Reduced Emissions from Wastewater Systems

Measure Number: W1

Measure Name: Reduced Emissions from Wastewater Systems

Description:
Adopt SCAQMD Rule 1176: Sumps and Wastewater Separators

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure applies mostly to petroleum refineries, which are not present in the Washington nonattainment area

· Other affected sources include chemical plants and facilities engaged in production or distribution of natural gas or crude petroleum. These facilities are located almost exclusively in the Virginia portion of the nonattainment area.

· From the 2005 uncontrolled inventory, emissions from Industrial Wastewater Treatment facilities are zero. Therefore this measure would not reduce emissions.

Summary Analysis

The 2005 uncontrolled area source inventory includes no emissions from the sources affected by this measure. Therefore this measure would not reduce emissions and is not a RACM.

Measure X1: NOx Controls on Commercial Power Generating Equipment

Measure Number: X1

Measure Name: NOx Controls on Commercial Power Generating Equipment

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Adopt OTC Additional NOx Controls Rule throughout nonattainment area (applies to industrial boilers, stationary combustion turbines and reciprocating engines, emergency generators, load shavers and cement kilns)

Criterion Summary

Year of First Benefits	2006+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Maryland and the District are laying groundwork for adoption of this rule. Virginia is not currently pursuing the regulation.

· Maryland and the District are early in the regulatory process and do not expect to be able to require compliance with the measure before early 2006.

· All three states require well over 12 months to develop, pass and require compliance with a regulation.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure X2: Enhanced Rule Compliance at Existing Stationary Sources

Measure Number: X2

Measure Name: Enhanced Rule Compliance at Existing Stationary Sources

Description:
Step up enforcement of and compliance with existing rules for emissions control by stationary sources

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	N/A
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· Stationary sources in the nonattainment area are generally in compliance with all emissions regulations

· The only regulation for which compliance is in question is the New Source Review (NSR) program.

· Due to uncertainty surrounding rule changes proposed by the Bush administration, increased enforcement is NSR is not possible at this time

· Therefore it is anticipated that no emissions reductions would result from implementation of this measure

Summary Analysis

Because no additional emissions reductions are anticipated to result from adoption of this measure, the measure would not advance attainment and is not a RACM.

Appendix M

Analysis of Potential
Area Source RACM Measures

DRAFT Potential Area RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
A1	Reduce Aircraft Non-Gate Idling	Sign MOUs with airlines to limit idling of aircraft while taxiing	No	Would not deliver benefits by May 2004
A2	Airport Congestion Pricing	Charge higher aircraft landing fees during busy times of day to reduce airport delays and congestion	No	Would not deliver benefits by May 2004
B1	Bakeries	Adopt SCAQMD Rule 1153: Commercial Bakery Ovens	No	Would not deliver benefits by May 2004
C1	Episodic limits on asphalt paving and traffic marking activities	Prohibit road paving and traffic marking on ozone action days	Possible	
C2	Low-Emission Asphalt	Adopt SCAQMD Rules 1108: Cutback Asphalt (less than 0.5% VOC evaporating at 260F) and 1108.1: Emulsified Asphalt (less than 3% VOC evaporating at 260F)	No	De minimis
F1	Low-Emission Water Heaters	Adopt SCAQMD Rule 1121: Control of NOx from Residential Type Natural Gas Fired Water Heaters	No	Would not deliver benefits by May 2004
F2	Low-Emission Furnaces	Adopt SCAQMD Rule 1111: NOx Emissions from Natural Gas Fired, Fan-Type Central Furnaces (no more than 40 nanograms of NOx per joule of useful heat)	No	Would not deliver benefits by May 2004
L1	Control Locomotive Idling	Seek voluntary agreement or implement regulations to reduce idling of locomotives at switchyards through installation of APUs or other methods	Possible	
L2	Retrofit/Repower Locomotives	Provide financial incentives to retrofit or repower locomotives operating in the nonattainment area for cleaner burning diesel or alternative fuels	No	Would not deliver benefits by May 2004
O1	Open Burning	Eliminate open burning in counties adjacent to nonattainment area	No	Would not deliver benefits by May 2004
P1	Reduced Emissions from Petroleum Storage Tanks	Adopt SCAQMD Rule 1178: Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities	No	Would not deliver benefits by May 2004
X1	Implement OTC Beyond Nonattainment Area	Take credit for reductions due to implementation of OTC measures beyond nonattainment area	No	No creditable emission reductions
X2	Episodic controls on pesticide application	Prohibit application of pesticides on forecasted ozone exceedance days	No	Substantial adverse impacts
X3	Enhanced enforcement	Enhance enforcement of existing area source regulations	No	Would not deliver benefits by May 2004
X4	Implement VOC RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of VOC RACT rules beyond nonattainment area	No	No creditable emission reductions
X5	Implement NOx RACT Beyond Nonattainment Area	Take credit for reductions due to implementation of NOx RACT rules beyond nonattainment area	No	No creditable emission reductions

Explanation of "Identifier" Field	
Abbreviation	**Explanation**
A	Airports
B	Commercial Businesses
C	Coatings and Solvents
F	Fuel Consumption
L	Locomotives
O	Open Burning/Fires
P	Petroleum Storage or Transport
X	Other/Multiple Categories

Measure A1: Reduce Aircraft Non-Gate Idling

Measure Number: A1

Measure Name: Reduce Aircraft Non-Gate Idling

Description:

Sign MOUs with airlines to limit idling of aircraft while taxiing

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because the states cannot legally regulate aircraft or air travel, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines operating at DCA and IAD.

· A joint EPA/FAA task force is working on methods for reducing emissions from US airports. MWAA and the Air Transport Association object to states pursuing their own agreements outside of this national framework. As a result, it is the judgement of VDEQ that it would not be possible to secure an MOU with the airports authority and the affected airlines by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure A2: Airport Congestion Pricing

Measure Number: A2
Measure Name: Airport Congestion Pricing

Description:
Charge higher aircraft landing fees during busy times of day to reduce airport delays and congestion

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because the states cannot legally regulate aircraft or air travel, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines.

· Aircraft landing fees are set by the Metropolitan Washington Airports Authority (MWAA). Massport, the operator of Logan Airport, has begun a two-phase process to implement a congestion-reducing fee-for-landing approach. This approach has been the subject of federal litigation, has been objected to by Congress and is under review by the US Department of Transportation. Given the controversy surrounding this approach, it is unlikely such a program could be developed, promulgated and implemented by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure B1: Bakeries

Measure Number: B1
Measure Name: Bakeries

Description:
Adopt SCAQMD Rule 1153: Commercial Bakery Ovens

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would affect not only large bakeries categorized as stationary sources, but also many smaller bakeries classified as area sources. As such, this measure has to potential to financially impact small businesses.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure C1: Episodic limits on asphalt paving and traffic marking activities

Measure Number: C1
Measure Name: Episodic limits on asphalt paving and traffic marking activities

Description:
Prohibit road paving and traffic marking on ozone action days

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	$ 3,163
Estimated Reductions (VOC)	2.91

Issues

· Because private parties generally do not pave or mark roads, this could be enforced through state and county commitments

· Activities limited by this measure already do not occur on certain days for weather-related reasons, e.g. rain

· This measure would have a limited impact on the private sector, as most of these actions are maintenance activities performed by state or county employees.

· This measure is already implemented by MDOT and Montgomery County

Assumptions

· The 2005 area source controlled inventory in the severe area SIP predicts the following VOC emissions:
  · 3.687 tpd traffic markings
  · 0.025 tpd asphalt paving
· Asphalt paving emissions are de minimis.
· Consistent with source inventory, use population as a proxy for growth in traffic markings
· From cooperative forecasts, regional population in 2005 will be 101.2% of 2004 population
· Assume 80% rule compliance
· The region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002

· Assume 50% of traffic marking requires payment to a contractor for days lost to weather

· From Transportation Research Board's National Cooperative Highway Research Program (NCHRP) Synthesis 306, "Long Term Pavement Marking Practices", Appendix C, in the year 2000:
  · Virginia DOT spent an average of $622 per centerline mile in annual pavement marking expenditures
  · Virginia DOT marked 38,410 centerline miles
  · Maryland DOT spent an average of $3,890 per centerline mile in annual pavement marking expenditures
  · Maryland DOT marked 5,142 centerline miles
  · No data was available for the District of Columbia, so calculate costs for MD and VA only
· Assume the proportional of traffic marking activities on urban vs rural roads is the same as proportion of overall centerline miles

· From FHWA Highway Statistics 2001, Table HM-10, total public road length in urban areas is as follows:
  · Virginia: 27% urban
  · Maryland: 47% urban
  · District: 100% urban
· Allocate road length to the MSA by % of urban population

· All counties in MWAQC region are zoned "metro" (urban) by US Dept of Agriculture Economic Research Service
  · In Virginia, MWAQC counties make up 31% of the statewide metropolitan population
  · In Maryland, MWAQC counties make up 42% of the statewide metropolitan population

· BLS Producer Price Index for Construction of Highways and Streets was:
  · 1997 year end: 124.6
  · 2000 year end: 136.5
  · 2002 year end (preliminary): 133.7
· Use straight-line extrapolation from 1997-2002 to project a value for 2004: 137.3

Emission Reductions: Traffic Markings

Total Reductions = (3.687 tpd * 80% compliance) / 101.2%
Total Reductions = 2.91 tpd VOC

Cost Effectiveness

Annual VA Traffic Marking $ = $622 / mile * 38,410 miles * 27% of miles urban * 31% of urban population in Washington region * (137.3/136.5) inflation adustment
Annual VA Traffic Marking $ = $ 2,011,398

Annual MD Traffic Marking $ = $3,890 / mile * 5,142 miles * 47% of miles urban * 42% of urban population in Washington region * (137.3/136.5) inflation adustment
Annual MD Traffic Marking $ = $ 3,971,611

Daily Weather Payment = ($2,011,398 + $3,971,611) * 50% require payment / 365 days per year
Daily Weather Payment = $ 8,196

Annual Expenditure= $8,196 per day * 6.3 Code Red OAD
Annual Expenditure= $ 51,634

VOC Reductions Excluding DC= (3.687 - 0.403) tpd * 80% compliance / 101.4% growth
VOC Reductions Excluding DC= 2.59

Cost-effectiveness ($/ton) = $51,634 / (tons per day * 6.3 Code Red Ozone Action Days)

Cost-effectiveness (VOC) = $ 3,163

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure C2: Low-Emission Asphalt

Measure Number: C2
Measure Name: Low-Emission Asphalt

RACM Determination: No
Reason: *De minimis*

Description:
Adopt SCAQMD Rules 1108: Cutback Asphalt (less than 0.5% VOC evaporating at 260F) and 1108.1: Emulsified Asphalt (less than 3% VOC evaporating at 260F)

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Asphalt emissions in the region are only 0.025 tpd, which is below the *de minimis* threshold of 0.1 tpd

Summary Analysis

Emissions from asphalt paving do not exceed the *de minimis* threshold of 0.1 tpd. Therefore this measure is not a RACM.

Measure F1: Low-Emission Water Heaters

Measure Number: F1
Measure Name: Low-Emission Water Heaters

Description:
Adopt SCAQMD Rule 1121: Control of NOx from Residential Type Natural Gas Fired Water Heaters

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure would not require replacement of current water heaters; rather it would require newly purchased water heaters to meet a performance standard. Because the lifetime of a water heater often exceeds 20 years, turnover in the first few years of compliance will produce only negligible benefits.

· Even if states could require compliance with this measure in 2004, the benefits would be approximately zero.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure F2: Low-Emission Furnaces

Measure Number: F2
Measure Name: Low-Emission Furnaces

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Adopt SCAQMD Rule 1111: NOx Emissions from Natural Gas Fired, Fan-Type Central Furnaces (no more than 40 nanograms of NOx per joule of useful heat)

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure would not require replacement of current furnaces; rather it would require newly purchased furnaces to meet a performance standard. Because a furnace can last for over 40 years, turnover in the first few years of compliance will produce only negligible benefits.

· Even if states could require compliance with this measure in 2004, the benefits would be approximately zero.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure L1: Control Locomotive Idling

Measure Number: L1
Measure Name: Control Locomotive Idling

RACM Determination: Possible
Reason:

Description:
Seek voluntary agreement or implement regulations to reduce idling of locomotives at switchyards through installation of APUs or other methods

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 1,250
Estimated Reductions (NOx)	0.06

Issues

· CSX has approached the District of Columbia regarding installation of APUs on switchyard locomotives

· CSX hoped to have the credits certified for sale. This would only be acceptable if the region agreed to purchase generated credits at the market price and retire them.

· As locomotives idle most during the winter months, it is unclear to what extent APU installation would reduce ozone formation

· Negotiations on this measure have been ongoing for over a year with little progress. State air agencies do not believe an MOU could be effective by 2004.

· VRE has already implemented wayside power units for 14 trainsets.

· As FY 04 budgets are complete, additional units could not be funded until FY 05, after the beginning of the 2004 ozone season

Assumptions

· 14 VRE locomotives and trainsets operate on auxiliary power for 95 hours per week (M-F at night, all weekend)
· 7 VRE locomotives and trainsets operate on auxiliary power for 30 hours per week (M-F midday)
· Locomotives/transets would burn 2 gallons/hour at idle
· Without APUs, yard emissions would be:
  · 0.0506 lb VOC/gal
  · 0.5044 lb NOx/gal

Emission Reductions

Total VOC Reductions = ((14 trainsets * 95 hours/wk + 7 trainsets * 30 hours/wk) * 2 gal/hour * 0.0506 lb VOC/gal) / (14 days/wk * 2000 lb/ton)

Total VOC Reductions = 0.006 tons VOC

Total NOx Reductions = ((14 trainsets * 95 hours/wk + 7 trainsets * 30 hours/wk) * 2 gal/hour * 0.5044 lb NOx/gal / (14 days/wk * 2000 lb/ton)

Total NOx Reductions = 0.055 tons NOx

Cost Effectiveness

· EPA estimates cost effectiveness of operating APU for switcher unit at $750-1,250 per ton.

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure L2: Retrofit/Repower Locomotives

Measure Number: L2
Measure Name: Retrofit/Repower Locomotives

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Provide financial incentives to retrofit or repower locomotives operating in the nonattainment area for cleaner burning diesel or alternative fuels

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Recent federal regulations will require retrofits of all repowered locomotives beginning in 2005.

· Most locomotives operating in the District of Columbia are fairly new and will not require a rebuild/repower for 5-10 years

· Local jurisdictions' budgets for FY04-05 (July 1 2003 - June 30 2004) have been completed. Funds could not be allocated for this program until FY 05, beginning July 2004. Equipment could not be purchased before the fiscal year begins.

· A similar program, implemented in California as part of the Carl Moyer program, has met with little to no response.

Summary Analysis

This program could not be implemented in time to deliver benefits by May 2004. Additionally, similar programs in other areas of the country have been unsuccessful in recruiting participants.

Measure O1: Open Burning

Measure Number: O1
Measure Name: Open Burning

Description:
Eliminate open burning in counties adjacent to nonattainment area

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.

· This accounting change would not decrease emissions within the Washington area.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure P1: Reduced Emissions from Petroleum Storage Tanks

Measure Number: P1
Measure Name: Reduced Emissions from Petroleum Storage Tanks

Description:
Adopt SCAQMD Rule 1178: Further Reductions of VOC Emissions from Storage Tanks at Petroleum Facilities

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure X1: Implement OTC Beyond Nonattainment Area

Measure Number: X1

Measure Name: Implement OTC Beyond Nonattainment Area

Description:
Take credit for reductions due to implementation of OTC measures beyond nonattainment area

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

· MDE plans to implement the OTC measures statewide.

· Virginia has taken statewide implementation of the measures to the Air Pollution Control Board but is unsure whether statewide rules will be approved.

· In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.

· This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.

Measure X2: Episodic controls on pesticide application

Measure Number: X2
Measure Name: Episodic controls on pesticide application

Description:
Prohibit application of pesticides on forecasted ozone exceedance days

RACM Determination: No
Reason: Substantial adverse impacts

Criterion Summary

Year of First Benefits	2004+
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· Maryland Department of the Environment says that approximately 80% of pesticide applications in the region are for agricultural purposes.

· The remaining 20% of spraying is for government or public use. Most government uses are for public health reasons, such as prevention of West Nile virus or malaria. Delaying this type of spraying could have serious public health effects. Therefore, this measure would prohibit only pesticide spraying that is not necessary for public health.

· Farmers already try to limit the days on which they apply pesticides to reduce runoff affecting local water quality.

· Because current farming practices advocate minimal use of pesticide, when application is necessary the need is often critical. Crops can be decimated within days. Therefore this measure could have a substantial adverse impact on local farmers.

· Additionally, enforcement of this measure would be extremely difficult, as farmers are widely dispersed within the nonattainment area and enforcement would require in-person visits to farms.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure would have substantial adverse impacts on public health if applied to spraying by the public sector. A regulation affecting the private sector could not deliver benefits by May 2004. Therefore this measure is not a RACM.

Measure X3: Enhanced enforcement

Measure Number: X3
Measure Name: Enhanced enforcement

Description:
Enhance enforcement of existing area source regulations

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· For each affected group of sources, an initial study must be completed to document current rule effectiveness.

· From EPA's "Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans", enhanced rule effectiveness over the EPA default value of 80% must be demonstrated through preparation and implementation of an enforcement plan and the subsequent completion of a study documenting enhanced rule effectiveness.

· The region has not prepared a plan to increase enforcement. Because FY 04 budgets are complete, preparation and implementation of a plan and completion of a follow-up study could not be funded until FY 05. Until a plan is completed, there is no basis for the region to claim that it could increase compliance. Even if the study were funded immediately, it could not be completed, approved and implemented by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore the measure is not a RACM.

Measure X4: Implement VOC RACT Beyond Nonattainment Area

Measure Number: X4
Measure Name: Implement VOC RACT Beyond Nonattainment Area

Description:
Take credit for reductions due to implementation of VOC RACT rules beyond nonattainment area

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

· Maryland VOC RACT measures are statewide.

· Virginia is considering extending RACT rules statewide.

· In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.

· This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.

Summary Analysis

This measure results in no creditable emissions reductions for the Washington region. Therefore it is not a RACM.

Measure X5: Implement NOx RACT Beyond Nonattainment Area

Measure Number: X5
Measure Name: Implement NOx RACT Beyond Nonattainment Area

Description:
Take credit for reductions due to implementation of NOx RACT rules beyond nonattainment area

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

· Maryland NOx RACT measures are statewide.

· Virginia is considering extending RACT rules statewide.

· In order to take SIP credit for this measure, the Washington region would need to add to its baseline inventory applicable emissions from counties bordering the nonattainment area. The region could then deduct the reductions resulting from this measure.

· This accounting change would decrease neither the absolute emissions nor the relative change in 1990-2005 emissions within the Washington area, because new baseline emissions would greatly exceed the reductions.

Summary Analysis

This measure results in no creditable emissions reductions for the Washington region. Therefore it is not a RACM.

Appendix N

Analysis of Potential
Non-Road Source RACM Measures

DRAFT Potential Non-Road RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
A1	Agricultural equipment use restrictions	Mandatory restrictions on use of agricultural equipment during Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
A2	Agricultural equipment retrofits	Require agricultural equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
A3	Require low-NOx fuel for agricultural equipment	Require agricultural equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
A4	Low-emissions agricultural equipment	Require sale of low-emissions agricultural equipment in region	No	Would not deliver benefits by May 2004
C1	Construction equipment use restrictions	Restrict use of construction equipment during expected ozone exceedance days	No	Not economically feasible
C2	Construction retrofits	Require construction equipment operating on state and local contracts to be retrofitted with particulate fitlers and/or oxidation catalysts	No	Not economically feasible
C3	Require low-NOx fuel for construction equipment	Require construction equipment operating on state of local contracts to use low-NOx fuel during ozone season	No	No creditable emission reductions
C4	Idling restrictions for construction equipment	Limit idling by construction equipment	No	Would not deliver benefits by May 2004
C5	Low-emissions construction equipment	Require sale of low-emissions construction equipment in region	No	Would not deliver benefits by May 2004
C6	Preference for low-emissions construction equipment	In bids for government construction contracts, award extra points to bidders using low-emission construction equipment	No	Not economically feasible
G1	Episodic restrictions on lawn & garden equipment	Restrict use of lawn and garden equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
G2	Lawn & garden equipment retrofits	Require commercial gas-powered lawn & garden equipment to be retrofitted with emissions controls or low emission engines	No	Would not deliver benefits by May 2004
G3	Require low-NOx fuel for lawn & garden equipment	Require lawn & garden equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
G4	Idling restrictions for lawn & garden equipment	Limit idling by commercial lawn & garden equipment	No	No creditable emission reductions
G5	Low emissions lawn & garden equipment	Adopt EPA lawn & garden equipment rules before they become effective in 2007	No	Would not deliver benefits by May 2004
G6	Preference for low-emissions lawn & garden equipment	In bids for government contracts, award extra points to bidders using low-emission lawn & garden equipment	Possible	
G7	"Cash for Clunkers" lawn & garden program	Offer $75 for owners to turn in old, 2 and 4-stroke lawn & garden equipment and purchase electric or push mower	No	Not economically feasible
I1	Episodic restrictions on use of industrial equipment	Moratorium on use of industrial equipment during Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
I2	Industrial equipment retrofits	Require industrial equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
I3	Require low-NOx fuel for industrial equipment	Require industrial equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions

DRAFT Potential Non-Road RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
I4	Idling restrictions for industrial equipment	Limit idling by industrial equipment	No	No creditable emission reductions
I5	Low-emissions industrial equipment	Require sale of low-emissions industrial equipment in region	No	Would not deliver benefits by May 2004
I6	Industrial equipment replacement	Subsidize replacement of fossil-fuel fired industrial equipment with electric industrial equipment	No	Would not deliver benefits by May 2004
I7	Preference for low-emissions industrial equipment	In bids for government contracts, award extra points to bidders using low-emission industrial equipment	No	Not economically feasible
M1	"Cash for Clunkers" outboard motor program	Offer small cash reward for owners to turn in old, high-emission outboard motors	No	Not economically feasible
M2	Idling restrictions for recreational marine equipment	Limit idling by recreational marine equipment during ozone season	No	Would not deliver benefits by May 2004
M3	Recreational marine equipment use restrictions	Moratorium on use of recreational marine equipment on Code Red Ozone Action Days	No	Would not deliver benefits by May 2004
M4	Require low-NOx fuel for recreational marine equipment	Require diesel-fired recreational marine equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
M5	Graduated registration fees for recreational boats	Levee additional registration fee for registration of boats with old, high-emission engines	No	Would not deliver benefits by May 2004
R1	Episodic restrictions on recreational equipment use	Restrict use of recreational equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
R2	"Cash for Clunkers" recreational equipment program	Offer small cash reward for owners to turn in old, high-emission recreational equipment	No	Not economically feasible
R3	Require low-NOx fuel for recreational equipment	Require recreational equipment to use low-NOx fuel during ozone season	No	No creditable emission reductions
R4	Recreational equipment retrofits	Require recreational equipment to be retrofitted with particulate fitlers and/or oxidation catalysts	No	No creditable emission reductions
S1	Subsidize electric airport ground service equipment (GSE)	Subsidize, through direct contributions or tax breaks, installation of electric ground service equipment and/or charging stations at regional airports	No	Would not deliver benefits by May 2004
S2	Require low-NOx fuel for airport GSE	Require airport GSE to use low-NOx fuel during ozone season	No	No creditable emission reductions
S3	Airport GSE retrofits	Subsidize the retrofit of airport GSE with emissions control equipment	No	Would not deliver benefits by May 2004
S4	Reduce idling by airport GSE	Develop voluntary program to encourage operators to limit idling of airport GSE	Possible	
S5	Control aircraft auxiliary power units	Seek voluntary agreement to reduce use of aircraft APUs through use of gate-provided services or other strategies	No	Not economically feasible
T1	Light commercial equipment use restrictions	Restrict use of light commercial equipment during expected ozone exceedance days	No	Would not deliver benefits by May 2004
T2	Light commercial equipment retrofits	Require light commercial equipment to be retrofitted with emissions controls	No	Would not deliver benefits by May 2004
T3	Require low-NOx fuel for light commercial equipment	Require light commercial equipment to use low-NOx fuel during ozone season, if applicable	No	No creditable emission reductions

DRAFT Potential Non-Road RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
T4	Idling restrictions for light commercial equipment	Limit idling by light commercial equipment	No	No creditable emission reductions
T5	Low-emissions light commercial equipment	Require sale of low-emissions light commercial equipment in region	No	Would not deliver benefits by May 2004
T6	Preference for low-emission light commercial equipment	In bids for government contracts, award extra points to bidders using low-emission light commercial equipment	No	Not economically feasible
X1	EPA Tier II Emissions Standards for Large SI Engines	Adopt EPA Tier II standards before they become effective in 2007	No	Would not deliver benefits by May 2004
X2	Biodiesel for Off-Road Equipment	Require all off-road diesel equipment to burn biodiesel during ozone season	No	Not technologically feasible

Explanation of "Identifier" Field	
Abbreviation	**Explanation**
A	Agricultural Equipment
C	Construction Equipment
G	Lawn & Garden Equipment
I	Industrial Equipment
M	Recreational Marine Equipment
R	Personal Recreational Equipment
S	Airport Service Equipment
T	Light Commerical Equipment
X	Other/Multiple Categories

Measure A1: Agricultural equipment use restrictions

Measure Number: A1
Measure Name: Agricultural equipment use restrictions

Description:
Mandatory restrictions on use of agricultural equipment during Code Red Ozone Action Days

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· No registry of farmers or operators of agricultural equipment exists, such that they could be provided with Ozone Action Day notices in a timely manner. Affected operators may not use email and may be unwilling to check call in numbers daily.

· Enforcement of this measure would be difficult and costly due to the wide geographical area to be patrolled. A daily visit by an inspector would not ensure that equipment was not being operated before or after the visit.

· Because states do not have the personnel to enforce this rule, they would need to rely on local enforcement or hire additional staff. This could not be accomplished until at least FY 05.

· Compliance with this measure could reduce crop yields, especially in the case of multi-day exceedance episodes

Summary Analysis

This measure could not deliver benefits by May 2004. Enforcement of this measure would also be prohibitively difficult, as there is no registry of affected equipment operators nor is there an effective method for ensuring they comply with the rule. Therefore the measure is not a RACM.

Measure A2: Agricultural equipment retrofits

Measure Number: A2
Measure Name: Agricultural equipment retrofits

Description:
Require agricultural equipment to be retrofitted with emissions controls

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	N/A
Economically Feasible	Yes
Technologically Feasible	N/A
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· An extended compliance period might be required because of the need for farmer education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as agricultural equipment are not registered with the state

· Many farmers would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

· The District would be unaffected by this measure, as no agricultural equipment operates there.

Summary Analysis

This measure could not be implemented fast enough to deliver benefits by May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on some farmers.

Measure A3: Require low-NOx fuel for agricultural equipment

Measure Number: A3

Measure Name: Require low-NOx fuel for agricultural equipment

Description:
Require agricultural equipment to use low-NOx fuel during ozone season

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· There is no agricultural equipment operating in the District.

· This measure could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, farmers would likely not receive subsidies towards the higher cost of the low-NOx fuel

· Many farmers live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

· Any increase in VOC due to the effect of PuriNOx would have to be offset by additional VOC control measures in order for the region to continue to demonstrate Rate of Progress.

Assumptions

· Evaluate regional fleet of agricultural equipment to determine whether this measure would reduce emissions

· Measure will have 80% compliance rate

· From 2005 controlled non-road inventory in severe area SIP, emissions from MD diesel-fired agricultural equipment will be:
  - · 7.96 tons NOx
  - · 2.05 tons VOC

· As in SIP, assume no growth in agricutural emissions from 2004-2005

· Ozone season lasts 153 days

· From 2002 Transportation Energy Data Book[4], Table 2.4
  - · Agriculture industry used 479.2 trillion BTU of diesel in 2000 = 3,454,938,717 gallons
  - · Agricultural diesel usage decreases by ~3.3% annually

· From EPA NONROAD model[2], in 1997 MD and VA portions of Washington MSA had 0.113% of the nation's harvested cropland, as follows:
  · Frederick: 134,181 acres
  · Montgomery: 45,878 acres
  · Prince George's: 24,211 acres
  · Calvert: 15,721 acres
  · Charles: 22,184 acres
  · Loudoun: 69,572 acres
  · Fairfax: 1,675 acres
  · Prince William: 12,565 acres
  · Stafford: 6,939 acres
  · US Total: 295,406,519 acres
· Assume region uses 0.113% of nation's diesel agricultural fuel
· From EPA "Nonroad Engine and Vehicle Emission Study"[5], in the mid-Atlantic area:
  · 40% of agricultural activity occurs in the summer
  · 6% of agricultural activity occurs in the winter
  · Therefore 54% of activity occurs in shoulder months
· Therefore 67% of agricultural activity occurs during ozone season (3 summer months + 2 shoulder months)
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is 1.8 tpd NOx : 1 tpd VOC
· For diesel vehicles, VOC = HC * 1.053
· From regional NONROAD model data[2] (Total Pieces) and EPA Non-Road Engine Study[5] (all other data):

Description	SCC	HP Cat	HP	Hours	Load %	Loaded HP-Hrs	Total Pieces	NOx g/hp-hr	Exhaust VOC g/hp-hr	Tons/yr NOx	Tons/yr VOC
Agricultural Tractors	2270005015	0-100	98	448	70%	N/A	2,519	11.21	2.23	13.94	2.77
Combines	2270005020	100-175	132	129.5	70%	N/A	381	11.50	1.26	0.63	0.07
Balers	2270005025	0-100	74	97.5	58%	4,185	6	7.78	2.23	0.22	0.06
Sprayers	2270005035	0-100	92	87	50%	4,002	38	7.78	2.23	1.30	0.37
Tillers > 6HP	2270005040	0-100	7	238.5	78%	1,302	-	8.00	1.2	-	-
Swathers	2270005045	0-100	79	95.5	55%	4,149	77	11.50	0.9	4.05	0.32
Hydro Power Units	2270005050	0-100	35	715	48%	12,012	8	7.78	2.23	0.82	0.24
Other Agricultural Equipment	2270005055	0-100	57	344.5	51%	10,015	34	11.12	1.82	4.17	0.68

* Emission rates for agricultural tractors and combines are in g/hr

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	Tpy NOx	Tpy VOC
0-100	19.3%	99.4%	104.7%	98%	98%
100-175	17.0%	80.1%	84.3%	2%	2%
175-300	18.8%	72.8%	76.7%	0%	0%
300+	20.2%	30.0%	31.6%	0%	0%

Emission Reductions

Daily Reductions (NOx) = 7.96 tpd * (98% emissions * 19.3% reduction + 2% emissions * 17% reduction) * 80% compliance

Daily Reductions (NOx) = 1.23 tpd NOx

Annual Reductions (NOx) = 1.23 tpd * 153 days per ozone season

Annual Reductions (NOx) = 187 tpy NOx

Daily Increase (VOC) = 2.05 tpd * (98% emissions * 104.7% increase + 2% emissions * 84.3% increase) * 80% compliance

Daily Increase (VOC) = 1.71 tpd VOC

Annual Increase (VOC) = 1.71 tpd * 153 days per ozone season

Annual Increase (VOC) = 262 tpy VOC

Net Decrease (NOx-VOC) = 1.23 tpd NOx - (1.71 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -1.86 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure A4: Low-emissions agricultural equipment

Measure Number: A4
Measure Name: Low-emissions agricultural equipment

Description:
Require sale of low-emissions agricultural equipment in region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Because there are no regional standards for low-emissions agricultural equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure could not be implemented fast enough to deliver benefits by May 2004.

Measure C1: Construction equipment use restrictions

Measure Number: C1
Measure Name: Construction equipment use restrictions

Description:
Restrict use of construction equipment during expected ozone exceedance days

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$	177,496
Estimated Reductions (tpd NOx)		10.9

Issues

· This is an episodic measure

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Construction occasionally stops for other weather-related reasons, such as severe thunderstorms

· By 2004, this measure could only be implemented voluntarily on state contracts

Assumptions

· Measure will have 80% compliance rate

· From 2005 controlled non-road inventory in severe area SIP, emissions from construction equipment will be:
  · 65.5 tons NOx
  · 12.34 tons VOC

· As in non-road inventory, use employment as proxy for growth in construction

· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005

· The cost of this regulation would be the cost, if applicable, of paying contractors for each day they did not work. Assume 50% of contractors are paid for weather-related stoppages, while the other 50% assume weather risks

· Region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002

· From EPA NONROAD model[2], dollars spent on construction in Washington region in 1997:
  · Northern Virginia = $3,364,219,000
  · Southern Maryland = $2,383,910,000
  · District of Columbia = $672,873,000
  · Total = $6,421,002,000

· BLS Producer Price Index for New Construction[3] was:
  · 1997 year end: 134.6
  · 2002 year end (preliminary): 138.8

· Use straight line extrapolation to project a value for 2004: 140.5

· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)

· Assume this translates to 21% of regional construction emissions and fuel usage

Emission Reductions

Daily Reductions (NOx) = 65.5 tpd * 80% compliance * 21% state and local / 1.013 adjustment to 2004
Daily Reductions (NOx) = 10.9 tpd NOx

Daily Reductions (VOC) = 12.34 tpd * 80% compliance * 21% state and local / 1.018 adjustment to 2004
Daily Reductions (VOC) = 2.0 tpd VOC

Cost Effectiveness

2005 Regional Construction $= $6,421,002,000 * (140.5/134.6) inflation
2005 Regional Construction $= $ 6,702,457,511

Daily State& Local Constr $ = $6,702,457,511* 21% state & local / 365 days per year
Daily State& Local Constr $ = $ 3,856,208

Daily Weather Payment = $3,856,208 * 50% of contracts pay for weather-related stoppages
Daily Weather Payment = $ 1,928,104

Annual Expenditure= $1,928,104 per day * 6.3 Code Red Ozone Action Days
Annual Expenditure= $ 12,147,057

Cost-effectiveness ($/ton) = $12,147,057 / (tons per day * 6.3 Code Red Ozone Action Days)

Cost-effectiveness (NOx) = $ 177,496
Cost-effectiveness (VOC) = $ 946,790

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure C2: Construction retrofits

Measure Number: C2
Measure Name: Construction retrofits

RACM Determination: No
Reason: Not economically feasible

Description:
Require construction equipment operating on state and local contracts to be retrofitted with particulate fitlers and/or oxidation catalysts

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	$ 66,426
Estimated Reductions (VOC)	0.90

Issues

· Contractors would include cost of retrofits in contract bid price

· Almost every retrofit requires use of ultra-low sulfur diesel fuel (ULSD)

· ARTBA representatives have expressed concern about lubrication problems that can result from using ULSD in older equipment engines

Assumptions

· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel construction equipment will be:
  · 10.34 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)
· Assume this translates to 21% of regional construction emissions and fuel usage
· Measure will have 80% compliance rate
· From EPA Voluntary Diesel Retrofit Program verification list, installation of oxidation catalysts will reduce HC emissions by 50%.
· For diesel vehicles, VOC = HC * 1.053
· Therefore catalysts will reduce VOC emissions by 52.7%
· From EPA NONROAD model (v 2.2.0):
  · Population of construction equipment grows at approximately 2.2% per annum
  · In 1998, District of Columbia had 3,854 pieces of diesel construction equipment
  · In 1998, the Maryland portion of the Washington nonattainment area had 13,683 pieces of diesel construction equipment
  · In 1998, the Virginia portion of the Washington nonattainment area had 19,311 pieces of diesel construction equipment
· Oxidation catalyst costs $2500 per piece of equipment
· ULSD costs $0.15 per gallon more than regular low-sulfur diesel
· Retrofits average 6 year lifespan
· From 2002 Transportation Energy Data Book[4], Table 2.8
  · Construction industry used 2,589,383,000 gallons of diesel in 2000
  · Construction diesel usage increases by ~3.6% annually
· From EPA NONROAD model[2], Washington MSA has approximately 4.7% of nation's diesel-fired construction equipment.
· Assume region uses 4.7% of nation's diesel construction fuel

Emission Reductions

Total VOC Reduced = 10.34 tons * 21% state & local * 52.7% reduction * 80% compliance / 1.013 adjust to 2004
Total VOC Reduced = 0.90 tpd VOC

Cost Effectiveness

Total Equipment in 2004 = (3,854 District + 13,683 MD + 19,311 VA) * (1.022)^6
Total Equipment in 2004 = 41,987 pieces of equipment

Total Cost to Retrofit = 41,987 pieces equipment * $2,500 per piece
Total Cost to Retrofit = $ 104,968,576

Increased Fuel Costs = $0.15 per gallon * 2,589,383,000 gallons nationally in 2000 * (1.036^4) increase by 2004* 4.7% used locally * 21% state & local contracts
Increased Fuel Costs = $ 4,416,149

Annual Expenditure= ($104,968,576 / 6 year lifespan) + $4,416,149
Annual Expenditure= $ 21,910,912

Cost-effectiveness ($/ton) = $21,910,912 / (0.90 tpd * 365 days per year)
Cost-effectiveness (VOC) = $ 66,426

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure C3: Require low-NOx fuel for construction equipment

Measure Number: C3
Measure Name: Require low-NOx fuel for construction equipment

RACM Determination: No
Reason: No creditable emission reductions

Description:
Require construction equipment operating on state of local contracts to use low-NOx fuel during ozone season

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· Currently, PuriNOx is the only low-NOx additive verified by EPA to produce reductions

· PuriNOx is not currently blended in the area. Lubrizol will install a blender if demand exceeds 25 million gallons per year. Otherwise, the fuel would be trucked from NYC at an additional $0.10 per gallon

· If existing contracts cannot be altered to mandate use of PuriNOx, benefits in 2005 would drop sharply over this estimate. However, higher benefits would occur in future years as the percentage of participating contracts increases

· State-wide use of low-NOx fuel would require regulation and could not be implemented by May 2004. However, state and local governments could require use.

Assumptions

· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel construction equipment will be:
  · 65.20 tons NOx
  · 10.34 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau[1], state and local construction comprised 21% of total construction spending in 2001
· Ozone season lasts 153 days
· From 2002 Transportation Energy Data Book[4], Table 2.8
  · Construction industry used 2,589,383,000 gallons of diesel in 2000
  · Construction diesel usage increases by ~3.6% annually
· From Lubrizol, cost premium for PuriNOx is approximately $0.10 per gallon, assuming 25 million gallons of annual usage
· From EPA NONROAD model[2], Washington MSA has approximately 4.7% of nation's diesel-fired construction equipment.
· Assume region uses 4.7% of nation's diesel construction fuel
· From EPA "Nonroad Engine and Vehicle Emission Study"[5], in the mid-Atlantic area:

· 38% of construction activity occurs in the summer

· 15% of construction activity occurs in the winter

· Therefore 54% of construction activity occurs during ozone season (3 summer months + 2 shoulder months)

· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:

· 1.8 tpd NOx : 1 tpd VOC

· For diesel vehicles, VOC = HC * 1.053

· From regional NONROAD model data[2] (Total Pieces) and EPA Non-Road Engine Study[5] (all other data):

Description	SCC	HP Cat	HP	Hours	Load %	Loaded HP-Hrs	Total Pieces	Exhaust NOx g/hp-hr	Exhaust VOC g/hp-hr	Tons NOx	Tons VOC
Pavers	2270002003	0-100	91	690	62%	38,930	562	10.3	0.6	248.40	14.47
Plate Compactors	2270002009	0-100	8	448	43%	1,541	186	9.3	0.8	2.94	0.25
Rollers	2270002015	0-100	99	614.5	56%	34,068	1,975	9.3	0.8	689.76	59.33
Scrapers*	2270002018	300+	311	845.5	72%	N/A	556	5.7	0.7	2.95	0.36
Paving Equipment	2270002021	0-100	99	535	53%	28,071	711	11.1	1.01	244.21	22.22
Signal Boards/Light Plants	2270002027	0-100	6	713	82%	3,508	1,199	8	1.2	37.09	5.56
Trenchers*	2270002030	0-100	60	530.5	75%	N/A	1,401	10.02	1.54	8.21	1.26
Bore.Drill Rigs*	2270002033	175-300	209	405.5	75%	N/A	410	11.01	1.41	2.02	0.26
Excavators*	2270002036	100-175	143	752	57%	N/A	2,416	10.73	0.7	21.49	1.40
Concrete/Industrial Saws*	2270002039	0-100	56	501.5	73%	N/A	52	11.01	1.41	0.32	0.04
Cement & Mortar Mixers	2270002042	0-100	11	231	56%	1,423	112	11.01	1.01	1.93	0.18
Cranes*	2270002045	175-300	194	721.5	43%	N/A	1,693	10.3	1.26	13.87	1.70
Graders*	2270002048	100-175	172	714	61%	N/A	1,500	9.6	1.54	11.33	1.82
Off-Highway Trucks*	2270002051	300+	489	1510	51%	N/A	322	9.6	0.84	5.15	0.45
Crushing/Proc. Equipment*	2270002054	100-175	127	878.5	78%	N/A	178	11.01	1.41	1.90	0.24
Rought Terrain Forklifts*	2270002057	0-100	93	592.5	60%	N/A	1,991	8	1.58	10.40	2.05
Rubber Tire Loaders*	2270002060	100-175	158	757	54%	N/A	3,724	10.3	0.84	32.01	2.61
Rubber Tire Dozers*	2270002063	300+	356	840.5	59%	N/A	85	9.6	0.84	0.76	0.07
Tractors/Loaders/Backhoes*	2270002066	0-100	77	987.5	55%	N/A	5,893	10.1	1.4	64.79	8.98
Crawler Tractors*	2270002069	100-175	157	861	50%	N/A	3,623	10.3	1.26	35.42	4.33
Skid Steer Loaders*	2270002072	0-100	42	691.5	55%	N/A	7,365	9.6	2.1	53.89	11.79
Off-Highway Tractors*	2270002075	175-300	214	885	65%	N/A	538	11.91	2.46	6.25	1.29
Dumpers/Tenders*	2270002078	0-100	23	435.5	38%	N/A	10	9.6	0.84	0.05	0.00
Other Construction Equipment*	2270002081	100-175	161	562	62%	N/A	236	11.01	1.41	1.61	0.21

* Emission rates are in g/hr

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	91%	90%
100-175	17.0%	80.1%	84.3%	7%	8%
175-300	18.8%	72.8%	76.7%	1%	2%
300+	20.2%	30.0%	31.6%	1%	1%

Emission Reductions

Daily Reductions (NOx) = (65.20 tpd * 21% state and local contracts * (91% emissions * 19.3% reduction + 7% emissions * 17% reduction + 1% emissions * 18.8% reduction + 1% emissions * 20.2% reduction) * 80% compliance) / 1.013 adjustment to 2004

Daily Reductions (NOx) = 2.07 tpd NOx

Annual Reductions (NOx) = 2.07 tpd * 153 days per ozone season

Annual Reductions (NOx) = 317 tpy NOx

Daily Increase (VOC) = (10.34 tpd * 21% state and local contracts * (90% emissions * 104.7% increase + 8% emissions * 84.3% increase + 2% emissions * 76.7% increase + 1% emissions * 31.6% increase) * 80% compliance) / 1.013 adjustment to 2004

Daily Increase (VOC) = 1.75 tpd VOC

Annual Increase (VOC) = 1.75 tpd * 153 days per ozone season

Annual Increase (VOC) = 268 tpy VOC

Net Decrease (NOx-VOC) = 2.07 tpd NOx - (1.75 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -1.08 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure C4: Idling restrictions for construction equipment

Measure Number: C4
Measure Name: Idling restrictions for construction equipment

Description:
Limit idling by construction equipment

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· According to EPA OTAQ, no studies have been completed on idling emissions from nonroad vehicles. Therefore estimates of benefits are very uncertain.

· Construction equipment idling is more prevalent in winter months
· Current idling restrictions for motor vehicles are poorly enforced because personnel are not available to observe vehicles. Realistically, this rule cannot be enforced by random observation alone.

· Idle timers can be installed to automatically shut equipment off after a specified period of idle time. Timers cost approx $100.

· With approximately 41,000 pieces of regional construction equipment, this measure would have a $4.1 million capital cost.

· FY 04 budgets in the region are already complete. This measure could not be budgeted until FY 05 (July 2004), after the beginning of the 2004 ozone season.

· A state regulation would be needed to require equipment operators to install the timers. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Therefore this measure could not be implemented in an enforceable manner in time to deliver benefits in 2004.

Summary Analysis

The benefits of this measure are unclear. The only method of implementation ensuring a reasonable level of compliance is through installation of idle timers. This would require a state regulation, which could not deliver benefits by May 2004. Therefore, this measure is not a RACM.

Measure C5: Low-emissions construction equipment

Measure Number: C5
Measure Name: Low-emissions construction equipment

Description:
Require sale of low-emissions construction equipment in region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Because there are no regional standards for low-emissions construction equipment, rule development would be time consuming. The standard compliance period might also have to be extended to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure could not deliver benefits by May 2004.

Measure C6: Preference for low-emissions construction equipment

Measure Number: C6
Measure Name: Preference for low-emissions construction equipment
RACM Determination: No
Reason: Not economically feasible

Description:
In bids for government construction contracts, award extra points to bidders using low-emission construction equipment

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 40,777
Estimated Reductions	0.01

Issues

· This measure would require an MOU with state and local governments in the nonattainment area

· ARTBA representatives expressed concern that contract preferences would advantage larger companies, who could more easily afford to install retrofits

· Benefits from this program will increase as old contracts expire. Benefits could eventually reach 2 tpd VOC

Assumptions

· From 2005 draft non-road inventory emissions from construction equipment are:
  · 65.5 tons NOx
  · 12.3 tons VOC
· As in non-road inventory, use employment as proxy for growth in construction
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From Census Bureau C30 Report "Construction Dollars Put in Place" state and local construction in 2001 comprised 21% of total construction in 2001 ($177,527,000 out of $842,539,000)
· Assume 10% of new contracts will be awarded to low-emission vendors (optimistic compared to experiences in other areas of the country)
· New contracts will comprise 10% of total construction
· From EPA Voluntary Diesel Retrofit Program verification list, installation of retrofits will reduce HC emissions by at least 50%.
· For diesel vehicles, VOC = HC * 1.053
· Assume "low-emission" vendors will reduce VOC emissions by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year

Emission Reductions

Total Reductions (VOC) = 12.3 tpd * 21% of construction eligible * 10% awarded to low-emission * 10% is new construction * 52.7% VOC reduction / 1.013 adjustment to 2004

Total Reductions (VOC) = 0.01 tpd NOx

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 365 days)
Cost-effectiveness (VOC) = $ 40,777

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure G1: Episodic restrictions on lawn & garden equipment

Measure Number: G1

Measure Name: Episodic restrictions on lawn & garden equipment

Description:

Restrict use of lawn and garden equipment during expected ozone exceedance days

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· This is an episodic measure

· The region has averaged 6.3 Code Red Ozone Action days per year in the past three years.

· Many lawn and garden workers are low-income, and many are self-employed. Preventing these workers from earning money for over one week during the summer months would have significant impacts on the workers and their families.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure would not deliver benefits by May 2004, and would have substantial adverse impacts on workers in the lawn and garden industries. Therefore it is not a RACM.

Measure G2: Lawn & garden equipment retrofits

Measure Number: G2
Measure Name: Lawn & garden equipment retrofits

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Require commercial gas-powered lawn & garden equipment to be retrofitted with emissions controls or low emission engines

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· An extended compliance period might be required because of the need for farmer education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as lawn & garden equipment are not registered with the state

· Many owners would be unable to afford the cost of retrofits.

· As FY 04 budgets are complete, states could not fund this measure until FY 05, beginning July 2004.

Summary Analysis

This measure could not be implemented in time to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on residents or owners of commercial lawn and garden services. Therefore it is not a RACM.

Measure G3: Require low-NOx fuel for lawn & garden equipment

Measure Number: G3

Measure Name: Require low-NOx fuel for lawn & garden equipment

Description:
Require lawn & garden equipment to use low-NOx fuel during ozone season

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	0.06

Net Benefit (NOx-VOC)	0
Net Estimated Cost ($/ton)	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure could be implemented by 2004 on a voluntary basis only by state and local governments.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of lawn and garden equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel lawn & garden equipment will be:
  · 0.37 tons NOx
  · 0.06 tons VOC
· As in non-road inventory, use employment as proxy for growth in lawn & garden equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· All lawn & garden equipment is 100 hp or less
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC increases 104.7%
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Daily Reductions (NOx) = 0.37 tpd * 19.3% reduction * 80% compliance / 1.013 adjustment to 2004
Daily Reductions (NOx) = 0.06 tpd NOx

Daily Increase (VOC) = 0.06 tpd * 104.7% increase * 80% compliance / 1.013 adjustment to 2004
Daily Increase (VOC) = 0.05 tpd VOC

Net Decrease (NOx-VOC) = 0.06 tpd NOx - (0.05 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.03 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure G4: Idling restrictions for lawn & garden equipment

Measure Number: G4
Measure Name: Idling restrictions for lawn & garden equipment

RACM Determination: No
Reason: No creditable emission reductions

Description:
Limit idling by commercial lawn & garden equipment

Criterion Summary

Year of First Benefits	N/A
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	0

Issues

· Lawn and garden equipment is not left in idle for safety reasons. Also, operators are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

Summary Analysis

This measure would not reduce emissions. Therefore it is not a RACM.

Measure G5: Low emissions lawn & garden equipment

Measure Number: G5
Measure Name: Low emissions lawn & garden equipment

Description:
Adopt EPA lawn & garden equipment rules before they become effective in 2007

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Because there are no regional standards for low-emissions agricultural equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure G6: Preference for low-emissions lawn & garden equipment

Measure Number: G6
Measure Name: Preference for low-emissions lawn & garden equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission lawn & garden equipment

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	$ 7,238
Estimated Reductions (VOC)	0.13

Issues

· This measure would requires an MOU with state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

Assumptions

· From 2005 draft non-road inventory emissions from commercial lawn & garden equipment are:
  · 26.29 tons VOC
  · 0.95 tons NOx
· As in non-road inventory, use employment as proxy for growth in lawn & garden
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· State & local government use or contracts accounts for 10% of all use of this equipment
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 100% through use of electric equipment or hand-powered equipment
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment operates April - October = 214 days per year
· Assume contracts turn over at rate of 50% per year

Emission Reductions

Total Reductions (VOC) = 26.29 tpd * 10% local govts * 50% contract turnover * 10% low-emission * 100% VOC reduction / 1.013 employment growth

Total Reductions (VOC) = 0.13 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (0.13 tpd * 214 days)

Cost-effectiveness (VOC) = $ 7,238

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure G7: "Cash for Clunkers" lawn & garden program

Measure Number: G7
Measure Name: "Cash for Clunkers" lawn & garden program

RACM Determination: No
Reason: Not economically feasible

Description:
Offer $75 for owners to turn in old, 2 and 4-stroke lawn & garden equipment and purchase electric or push mower

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	$ 45,806
Estimated Reductions (VOC)	0.02

Issues

· No program of this type has been demonstrated in the northeast on a large scale

· MDE sponsored a small demonstration program of this type in the 1990s

· Participation rates are extremely difficult to estimate

· Montgomery County sponsored a multi-day program in 2003.

· Counties or states might be able to fund this program in 2004 if startup costs were minimized and low participation was expected. As FY 04 budgets are complete, a large scale program could not be funded until FY 05 (July 2004).

Assumptions

· Only residential users will participate in the measure, because electric and push mowers do not fulfill the needs of most commercial lawn care services

· From EPA NONROAD model, there were approximately 782,000 residential mowers in the Washington region in 1997.

· Measure would have 0.5% participation rate, or approximately 3,900 mowers

· From 2005 controlled non-road inventory in severe area SIP, emissions from residential lawnmowers or lawn tractors will be:

  · 4.74 tons VOC

  · 0.08 tons NOx

· Program costs would be $75 per mower, plus an outreach/recruitment/monitoring program at $200,000 per year

· Assume 100% emission reduction for each mower turned in

· As in nonroad inventory, use employment as proxy for growth in lawn & garden

· From regional cooperative forecasts, employment willl grow 1.3% from 2004-2004

· Ozone season lasts 153 days

· Assume 0.5% participation results in 0.5% reduction in emissions

· New mowers have 10 year useful life

· Mowers operate April - October = 214 days per year

Emission Reductions

Daily Reductions (NOx) = 0.08 tpd * 0.5% reduction / 1.013 adjustment to 2004

Daily Reductions (NOx) = 0.001 tpd NOx

Daily Reductions (VOC) = 4.74 tpd * 0.5% reduction / 1.013 adjustment to 2004

Daily Reductions (VOC) = 0.02 tpd VOC

Cost Effectiveness

Annual Expenditure= (($75 per mower * 782,334 mowers * 0.5% participation)/10 year lifespan) + $200,000
Annual Expenditure= $ 229,338

Cost-effectiveness ($/ton) = $229,338 / (tons per day * 214 days per year)

Cost-effectiveness (NOx) = $ 1,550,861
Cost-effectiveness (VOC) = $ 45,806

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure I1: Episodic restrictions on use of industrial equipment

Measure Number: I1
Measure Name: Episodic restrictions on use of industrial equipment

Description:
Moratorium on use of industrial equipment during Code Red Ozone Action Days

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Use of industrial equipment is vital to the operation of thousands of area businesses. Shutting these businesses down for 6 days of the summer could have serious financial impacts on the businesses.

· This equipment is not registered with the state, and there is no way to enforce this measure except by random inspections of local businesses. This is an extremely ineffective and time-intensive mechanism.

· Many operators of this equipment are low income, and this measure would put them out of work on Ozone Action Days.

Summary Analysis

This measure would not deliver benefits by May 2004, is unenforceable from a practical viewpoint, and would adversely affect the operators of the affected equipment. Therefore it is not a RACM.

Measure I2: Industrial equipment retrofits

Measure Number: I2
Measure Name: Industrial equipment retrofits

Description:
Require industrial equipment to be retrofitted with emissions controls

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· An extended compliance period might be required because of the need for owner education, assistance with retrofit selection, and procurement and installation of the equipment.

· Enforcement of this measure would be difficult, as industrial equipment is not registered with the state

· Many owners would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

Summary Analysis

This measure could not be implemented in time to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on residents or owners of commercial lawn and garden services. Therefore it is not a RACM.

Measure I3: Require low-NOx fuel for industrial equipment

Measure Number: I3

Measure Name: Require low-NOx fuel for industrial equipment

Description:
Require industrial equipment to use low-NOx fuel during ozone season

RACM Determination: No

Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, states are unable to subsidize higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of industrial equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel industrial equipment will be:
  · 1.77 tons NOx
  · 0.26 tons VOC
· As in non-road inventory, use employment as proxy for growth in industrial equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC
· In 2001, non-construction off-highway diesel fuel consumed in region was:
  · District of Columbia: 0
  · Maryland: 2,709,000 gallons
  · Virginia: 12,762,000 gallons

· After construction, agricultural equipment is primary consumer of off-highway diesel fuel (60% of non-construction use)

· Allocate fuel usgae based on % of farmland located in Washington region of MD/VA

  · Maryland: 17% of farmland located in Washington nonattainment area

  · Virginia: 3.7% of farmland located in Washington nonattainment area

· Industrial diesel equipment comprises approximately 13% of non-construction offroad diesel emissions in Washington area

· Assume industrial diesel equipment comprises approximately 13% of non-construction offroad diesel consumption in Washington area

Emission Reductions

Description	SCC	HP Cat	HP	Hours	Total Pieces	Exhaust NOx g/hr	Exhaust VOC g/hr	Tons NOx	Tons VOC
Aerial Lifts	2270003010	0-100	43	536	145	14	1.57	1.20	0.13
Forklifts	2270003020	0-100	83	1633	444	14	1.57	11.19	1.25
Sweepers/Scrubbers	2270003030	0-100	97	1250.5	146	14	1.57	2.82	0.32
Other General Indust Equip	2270003040	100-175	107	830	291	14	1.57	3.73	0.42
Other Material Handling Equip	2270003050	100-175	111	414.5	22	14	1.57	0.14	0.02

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	80%	80%
100-175	17.0%	80.1%	84.3%	20%	20%

Emission Reductions

Daily Reductions (NOx) = (1.77 tpd * (80% emissions * 19.3% reduction + 20% emissions * 17% reduction) * 80% compliance) / 1.013 adjust to 2004

Daily Reductions (NOx) = 0.26 tpd NOx

Daily Increase (VOC) = (0.26 tpd * (80% emissions * 104.7% increase + 20% emissions * 84.3% increase) * 80% compliance) / 1.013 adjust to 2004

Daily Increase (VOC) = 0.21 tpd VOC

Net Decrease (NOx-VOC) = 0.26 tpd NOx - (0.21 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.11 tpd NOx equivalent

Therefore this measure increases emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure I4: Idling restrictions for industrial equipment

Measure Number: I4
Measure Name: Idling restrictions for industrial equipment

Description:
Limit idling by industrial equipment

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	N/A
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Industrial equipment is rarely left in idle for safety reasons. Also, owners are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

Summary Analysis

This measure would not reduce emissions. Therefore it is not a RACM.

Measure I5: Low-emissions industrial equipment

Measure Number: I5
Measure Name: Low-emissions industrial equipment

Description:
Require sale of low-emissions industrial equipment in region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Because there are no regional standards for low-emissions industrial equipment, rule development would be extensive and time consuming. The compliance period would also have to be extensive to permit manufacturers to develop new products or select retrofits. This could not be accomplished by 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure I6: Industrial equipment replacement

Measure Number: I6
Measure Name: Industrial equipment replacement

Description:
Subsidize replacement of fossil-fuel fired industrial equipment with electric industrial equipment

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Due to budget crises, state and local governments do not have funds to undertake a project of this scale at this time.

· Electric equipment may not meet the same specifications of perform the same tasks as fossil fuel fired equipment

· It would take a significant investment of time to identify feasible replacements for equipment used by individual businesses, and then convince those businesses to replace their familiar, reliable equipment

· Because of the need for charging equipment, electric equipment usually requires a much higher capital investment than conventionally fueled equipment

· As the budgets for FY04 (July 1 2003 - June 30 2004) are already complete, this measure could first be funded in FY 05, beginning in July 2004. Because of the time required to recruit participants, select low emissions equipment, secure funding and take delivery of the equipment, this program could not deliver benefits by the end of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by 2004. Therefore it is not a RACM.

Measure I7: Preference for low-emissions industrial equipment

Measure Number: I7
Measure Name: Preference for low-emissions industrial equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission industrial equipment

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 138,587
Estimated Reductions	0.004

Issues

· This measure requires commitments from state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

· Contractors could reduce emissions by using low-NOx, retrofitted or electric equipment

Assumptions

· From 2005 draft non-road inventory emissions from industrial equipment are:
  · 3.20 tpd NOx
  · 1.53 tpd VOC
· Local government use or contracts account for 5% of all use of this equipment
· As in non-road inventory, use employment as proxy for growth in industrial equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 50%
· For diesel vehicles, VOC = HC * 1.053
· Assume "low-emission" vendors will reduce VOC emissions by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment will operate 355 days per year
· This analysis overestimates benefits and underestimates cost by assuming that all contracts are awarded annually

Emission Reductions

Total VOC Reduced = 1.53 tpd * 5% eligible * 10% awarded * 52.7% reduction / 1.013 adjustment to 2004
Total VOC Reduced = 0.004 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 355 days)

Cost-effectiveness (VOC) = $ 138,587

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure M1: "Cash for Clunkers" outboard motor program

Measure Number: M1
Measure Name: "Cash for Clunkers" outboard motor program

Description:
Offer small cash reward for owners to turn in old, high-emission outboard motors

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton HC+NOx)	$ 77,853
Estimated Reductions (HC+NOx)	0.13

Issues

· From non-road inventory, vast majority of personal watercraft NOx and VOC emissions in the region come from 2-stroke spark ignition outboard motors

· Most recent rule controlling emissions from gasoline spark ignition marine engines is 61 FR 52088, published October 4, 1996.

· Counties or states might be able to fund this program in 2004 if startup costs were minimized and low participation was expected. As FY 04 budgets are complete, a large scale program could not be funded until FY 05 (July 2004).

Assumptions

· From 2005 non-road inventory, all outboard emissions come from 2-stroke motors.
· 2005 regional emission due to outboard motors will be:
  · 11.61 tons VOC
  · 0.12 tons NOx
· As in non-road inventory, use population as proxy for growth in industrial equipment
· From regional cooperative forecasts, population will grow 1.2% from 2004-2005

· From NONROAD model, population of outboard motors is:
  · 75% < 10 hp
  · 25% > 100 hp
  · 15,648 in Washington region

· Program would encourage trade-ins of MY 1997 and older engines
· Assume these engines meet MY 1998 standards for <6 hp motors: 278 g/kW-hr HC+NOx
· MY 2004 standards for motors < 6 hp will be 130 g/kW-hr HC+NOx
· 6 HP ~= 4.3 kW
· Motors have 10 year useful life
· Assume 25% of life is left at trade-in
· Motors operate 35 hours per year
· Motors operate 1 day per week during ozone season = 22 days per year
· Assume 1% response rate on trade-in offer
· From Wisconsin DNR study, program must offer at least $520 to incentivize trade-in
· Cost would be $520 per motor plus outreach/recruitment/monitoring program at $200,000 per year

Emission Reductions for One Motor

Net NOx+HC Reduced = (278 g/kW-hr - 130 g/kW-hr) * 4.3 kW * 35 hours per year / (907,185 grams per ton * 22 operating days per year)

Net NOx+HC Reduced = 0.0011 tons per engine-day

Cost Effectiveness for One Motor

Annual Expenditure= $520 * 1 motor / 2.5 years remaining life
Annual Expenditure= $ 208

Cost-effectiveness ($/ton) = $208 / (0.001 * 22 days)

Cost-effectiveness (VOC) = $ 9,455

Emission Reductions for Entire Program

Total Motors Traded In = 15,648 2-stroke outboard motors * 75% under 10 hp * 1% return rate
Total Motors Traded In = 117 motors

Net NOx+HC Reduced = 117 motors * 0.0011 tons per motor-day
Net NOx+HC Reduced = 0.13 tons per day

Cost Effectiveness for Entire Program

Annual Expenditure= ($520 * 117 motors / 2.5 years remaining life) + $200,000 monitoring program
Annual Expenditure= $ 224,336

Cost-effectiveness ($/ton) = $224,336 / (tons per day * 22 days)
Cost-effectiveness (NOX+HC) = $ 77,853

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold.

Measure M2: Idling restrictions for recreational marine equipment

Measure Number: M2
Measure Name: Idling restrictions for recreational marine equipment

Description:
Limit idling by recreational marine equipment during ozone season

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	N/A
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton VOC)	N/A
Estimated Reductions (VOC)	N/A

Issues

· All three states require well over 12 months to develop, pass, and require compliance with a regulation. This measure would require regulation, and therefore cannot deliver benefits by 2004.

· According to EPA OTAQ, no studies have been completed on idling emissions from nonroad vehicles. Therefore estimates of benefits are very uncertain.

· In-person enforcement would be time-consuming and costly. Neither the personnel nor a coordination mechanism are available.

Summary Analysis

This measure could not deliver benefits by May 2004 and is therefore not a RACM.

Measure M3: Recreational marine equipment use restrictions

Measure Number: M3
Measure Name: Recreational marine equipment use restrictions

Description:
Moratorium on use of recreational marine equipment on Code Red Ozone Action Days

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure was proposed in the early 1990s and was not implemented due to public outcry

· This is an episodic measure that would be effective only on Code Red Ozone Action Days.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M4: Require low-NOx fuel for recreational marine equipment

Measure Number: M4

Measure Name: Require low-NOx fuel for recreational marine equipment

RACM Determination: No

Reason: No creditable emission reductions

Description:

Require diesel-fired recreational marine equipment to use low-NOx fuel during ozone season

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure could be implemented by 2004 on a voluntary basis only.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to go to the next county to get cheaper fuel that is not low-NOx

Emission Reductions

· Evaluate regional fleet of recreational marine equipment to determine whether this measure would reduce emissions

· From 2005 controlled non-road inventory in severe area SIP, emissions from regional diesel-fired pleasure craft will be:
  - · 0.11 tons NOx
  - · 0.02 tons VOC

· As in non-road inventory, use population growth as proxy for growth in pleasure craft emissions

· From regional cooperative forecasts, population will grow 1.2% from 2004-2005

· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  - · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Description	SCC	HP Cat	HP	Gallons	Total Pieces	Exhaust NOx g/gal	Exhaust VOC g/gal	Tons NOx	Tons VOC
Inboard/Sterndrive	2282020005	175-300	250	651	335	172.49	24.39	41.47	5.86
Outboard	2282020010	N/A	N/A	651	-	172.49	24.39	-	-
Sailboat Auxiliary Outboard	2282020025	N/A	N/A	33.5	-	163.29	122.45	-	-

· From above table and EPA Draft Report on PuriNOx[6]:

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	0%	0%
100-175	17.0%	80.1%	84.3%	0%	0%
175-300	18.8%	72.8%	76.7%	100%	100%

Emission Reductions

Daily Reductions (NOx) = (0.11 tpd * 18.8% reduction * 80% compliance) / 1.012 adjust to 2004

Daily Reductions (NOx) = 0.02 tpd NOx

Daily Increase (VOC) = (0.02 tpd * 76.7% increase * 80% compliance) / 1.012 adjust to 2004

Daily Increase (VOC) = 0.01 tpd VOC

Net Decrease (NOx-VOC) = 0.02 tpd NOx - (0.01 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.005 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure M5: Graduated registration fees for recreational boats

Measure Number: M5
Measure Name: Graduated registration fees for recreational boats

Description:
Levee additional registration fee for registration of boats with old, high-emission engines

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· All three states require well over 12 months to develop, pass, and require compliance with a regulation. This measure would require regulation, and therefore cannot deliver benefits by 2004.

· Virginia has rolled back its car tax, and many other personal taxation proposals have been defeated in the last 12 months.

· This measure could adversely affect fisherman and tour-boat operators

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure R1: Episodic restrictions on recreational equipment use

Measure Number: R1

Measure Name: Episodic restrictions on recreational equipment use

Description:

Restrict use of recreational equipment during expected ozone exceedance days

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This is an episodic measure that would be effective only on Code Red Ozone Action Days.

· The region averaged 6.3 Code Red Ozone Action Days per year from 2000-2002

· Enforcement of this measure would be nearly impossible because of the wide geographic area to be patrolled.

Summary Analysis

This measure would not deliver benefits by May 2004 and is unenforceable from a practical standpoint. Therefore this measure is not a RACM.

Measure R2: "Cash for Clunkers" recreational equipment program

Measure Number: R2
Measure Name: "Cash for Clunkers" recreational equipment program

Description:
Offer small cash reward for owners to turn in old, high-emission recreational equipment

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 22,293
Estimated Reductions	N/A

Issues

· As there is no documentation of a program of this type ever being implemented, it would be extremely difficult to gauge public response rates.

· As new standards will be phased in during 2007-8, encouraging purchase of new vehicles now will delay benefits from standards

Assumptions

· From EPA NONROAD model (v. 2.2.0), 105,555 2-stroke off-road motorcycles or ATVs were operational in the Metropolitan Washington region in 1998

· Of the 2-stroke recreational vehicles in the US, approximately 45% are off-road motorcycles and 55% are ATVs

· Assume 45% = 47,500 of these vehicles are 2-stroke ATVs

· 2-stroke ATVs tend to be used for small children or beginners, while 4-stroke ATVs are purchased for adults or more experienced riders. Since the different engines types cater to different market segments, it is not practical to encourage consumers to purchase one type over the other

· For 2-stroke ATVs and off-road motorcycles, EPA estimates emissions over vehicle lifetime to deteriorate by:
  · 20% for VOC (53.9 g/mi to 64.7 g/mi)
  · 0% for NOx (0.15 g/mi)
· For 4-stroke ATVs and off-road motorcycles, EPA estimates emissions over vehicle lifetime to deteriorate by:
  · 15% for VOC (2.4 g/mi to 2.76 g/mi)
  · 0% for NOx (0.41 g/mi)
· From NONROAD model, EPA estimates annual ATV usage at 1,570 miles per year
· From NONROAD model, EPA estimates average ATV lifetime at 13 years
· In 2001, average retail cost of an ATV was $5,123
· Assume 10% ($500) payment would be required to incentivize owners to scrap 4-stroke ATV instead of reselling
· Because 2-stroke ATVs are outgrown rather than worn out, assume 50% ($2,500) payment would be required to incentivize owners to scrap instead of reselling
· Assume ATVs operate 9 months per year
· Many ATVs are used for agricultural purposes. These vehicles will operate 7 days/week.
· Non-agricultural ATVs operate 1-2 days per week
· Assume average ATV operates 5 days per week
· Off-road motorcycles have an average lifespan of 8 years
· Off-road motorcycles travel 6,210 miles during lifetime
· In 2001, average cost of an off-road motorcycle was $2,123
· Assume 10% ($210) payment will be required to incentivize owners to scrap 4-stroke off-road motorcycle instead of reselling

Emission Reductions for One Vehicle

For One 2-Stroke ATV

· Trading in one end-of-life ATV for one new ATV would yield the following annual emission benefits:

Tons Reduced (VOC) = ((64.7 g/mi old - 53.9 g/mi new) * 1,570 miles per year) / 907,185 grams per ton
Tons Reduced (VOC) = 0.019 tons per year

For One 4-Stroke ATV

· Trading in one end-of-life ATV for one new ATV would yield the following annual emission benefits:

Tons Reduced (VOC) = ((2.76 g/mi old - 2.4 g/mi new) * 1,570 miles per year) / 907,185 grams per ton
Tons Reduced (VOC) = 0.001 tons per year

For One 2-Stroke Off-Road Motorcycle

· Trading in one end-of-life motorcycle for one new motorcycle would yield the following annual emission benefits:

Tons Reduced (VOC) = ((64.7 g/mi old - 53.9 g/mi new) * 6,210 miles per life) /(907,185 grams per ton * 8 year life)
Tons Reduced (VOC) = 0.009 tons per year

For One 4-Stroke Off-Road Motorcycle

· Trading in one end-of-life off-road motorcycle for one new motorcycle would yield the following annual emission benefits:

Tons Reduced (VOC) = ((2.76 g/mi old - 2.4 g/mi new) * 6,210 miles per life) / (907,185 grams per ton * 8 year life)
Tons Reduced (VOC) = 0.0003 tons per year

Cost Effectiveness for One Vehicle

For One 2-Stroke ATV

Annual Expenditure= $ 2,500
Cost-effectiveness ($/ton) = $1,000 / (tons per year * 6 years lifespan left)
Cost-effectiveness (VOC) = $ 22,293

For One 4-Stroke ATV

Annual Expenditure= $ 500
Cost-effectiveness ($/ton) = $500 / (tons per year * 2 years lifespan left)
Cost-effectiveness (VOC) = $ 401,267

For One 2-Stroke Off-Road Motorcycle

Annual Expenditure= $ 210
Cost-effectiveness ($/ton) = $210 / (tons per year * 1 year lifespan left)
Cost-effectiveness (VOC) = $ 22,724

For One 4-Stroke Off-Road Motorcycle

Annual Expenditure= $ 210
Cost-effectiveness ($/ton) = $210 / (tons per year * 1 year lifespan left)
Cost-effectiveness (VOC) = $ 681,728

· On a vehicle-by-vehicle basis, a cash for clunkers program would not be cost effective for any of the four vehicle types. A full program would include administrative fees as well, decreasing the cost effectiveness.

Summary Analysis

This measure is not economically feasible because it does not meet the cost-effectiveness threshold.

Measure R3: Require low-NOx fuel for recreational equipment

Measure Number: R3
Measure Name: Require low-NOx fuel for recreational equipment

Description:
Require recreational equipment to use low-NOx fuel during ozone season

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Because Virginia is a Dillon rule state, this measure requires state-level regulation. Virginia requires at least 2 years to implement and require compliance with a new regulation, so this regulation could not deliver benefits in Virginia by 2004.

· It is unlikely that Maryland or the District would be able to require compliance with this regulation by 2004

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of recreational equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, regional emissions from diesel recreational equipment will be:
  · 0 tons NOx
  · 0 tons VOC

Summary Analysis

As this sector has no emissions, this control measure would produce no benefits. Therefore this measure is not a RACM.

Measure R4: Recreational equipment retrofits

Measure Number: R4
Measure Name: Recreational equipment retrofits

Description:
Require recreational equipment to be retrofitted with particulate fitlers and/or oxidation catalysts

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· From analysis of Measure R3, there will be no diesel-fired recreational equipment in the Washington region in 2005. Because retrofits are only applied to diesel equipment, this measure would have no benefit.

Summary Analysis

As this sector has no emissions, this control measure would produce no benefits. Therefore this measure is not a RACM.

Measure S1: Subsidize electric airport ground service equipment (GSE)

Measure Number: S1
Measure Name: Subsidize electric airport ground service equipment (GSE)
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Subsidize, through direct contributions or tax breaks, installation of electric ground service equipment and/or charging stations at regional airports

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Electric ground service equipment requires a large capital investment for charging equipment.

· A handful of US airports have installed electric GSE with substantial support from a grant program administered by FAA.

· Airlines and GSE operators have been loathe to use electric GSE equipment without significant direct financial support. Given the current bankruptcies in the airline industry, this reticence will likely continue.

· Charging stations cost approximately $40,000 each. At a minimum, 2 stations would be needed at Reagan National and 3 stations at Dulles. This would result in $160,000 expenditure.

· All GSE would also need to be replaced. There are approximately 420 GSE in the region, and they would cost $30,000 each. With chargin stations, this totals $12.8 million in expenditures.

· States would need to allocate funds for this in annual budgets. As budgets for FY 04 (July 1 2003 - June 30 2004) are complete, this measure could not be funded until FY 05 (July 2004).

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure S2: Require low-NOx fuel for airport GSE

Measure Number: S2
Measure Name: Require low-NOx fuel for airport GSE

Description:
Require airport GSE to use low-NOx fuel during ozone season

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because air travel is interstate commerce, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines or GSE operators.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, state and local governments cannot afford to subsidize the increased fuel cost. Given the current problems with airline cost structure, airlines will likely be extremely unwilling to pay $0.15 more per gallon for low-NOx diesel fuel.

· GSE manufacturers have not guaranteed that PuriNOx will not void equipment warranties. Until this guarantee is made, it is extremely unlikely that any owners or operators would agree to use the fuel.

Assumptions

· Evaluate regional fleet of GSE to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD = 2.21
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD = 0.52
· Dulles mobile lounges are diesel fired. They contribute 0.48 tpd NOx in 2005 and 0.32 tpd in 2002, or 0.43 tpd in 2004
· Mobile lounges contribute 0.02 tpd NOx in 2005 and 0.015 tpd in 2002, or 0.018 tpd in 2004
· Remaining GSE are both gasoline and diesel fired. Assume 80% diesel, 20% gasoline.
· As in non-road inventory, use employment as proxy for growth in airport GSE
· From regional cooperative forecasts, employment will grow 1.8% from 2004-2005
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Total Diesel GSE (NOx) = (2.21 tpd - 0.43 tpd mobile lounges) * 80% + 0.43 tpd mobile lounges
Total Diesel GSE (NOx) = 1.85

Total Diesel GSE (VOC) = (0.52 tpd - 0.018 tpd mobile lounges) * 80% + 0.018 tpd mobile lounges
Total Diesel GSE (VOC) = 0.42

Description	SCC	HP Cat	HP	Tpd NOx	Tpd VOC
Mobile Lounge	N/A	0-100	78	0.48	0.02
Aircraft Support Equipment	2270008005	100-175	157	1.31	0.20

Non-Road Engine HP	NOx Reduction	HC Increase	VOC Increase	% Annual NOx	% Annual VOC
0-100	19.3%	99.4%	104.7%	27%	9%
100-175	17.0%	80.1%	84.3%	73%	91%

Daily Reductions (NOx) = (1.85 tpd * (27% emissions * 19.3% reduction + 73% emissions * 17% reduction) * 80% compliance) / 1.018 adjustment to 2004
Daily Reductions (NOx) = 0.26 tpd NOx

Daily Increase (VOC) = (0.42 tpd * (9% emissions * 104.7% increase + 91% emissions * 84.3% increase) * 80% compliance) / 1.018 adjustment to 2004
Daily Increase (VOC) = 0.28 tpd VOC

Net Decrease (NOx-VOC) = 0.26 tpd NOx - (0.28 tpd VOC * 1.8 tpd NOx per VOC)
Net Decrease (NOx-VOC) = -0.256 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure S3: Airport GSE retrofits

Measure Number: S3
Measure Name: Airport GSE retrofits

Description:
Subsidize the retrofit of airport GSE with emissions control equipment

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· The only commercial airports in the Washington nonattainment area are Washington Reagan National and Dulles

· Because air travel is interstate commerce, this measure cannot be implemented by regulation. The states must sign an MOU with the airlines or GSE operators.

· Given current airline bankruptcies, airlines will not agree to voluntarily replace or retrofit GSE equipment unless the cost is subsidized.

· States would need to allocate funds for this in annual budgets. As budgets for FY 04 (July 1 2003 - June 30 2004) are complete, this measure could not be funded until FY 05 (July 2004).

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure S4: Reduce idling by airport GSE

Measure Number: S4
Measure Name: Reduce idling by airport GSE

Description:
Develop voluntary program to encourage operators to limit idling of airport GSE

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 3,155
Estimated Reductions (NOx)	0.17

Issues

· Neither states nor MWAA has the authority to regulate airport GSE emissions. This measure would be enforceable through a voluntary MOU signed with airlines or GSE operators.

· Virtually no data is available on the idling behavior of airport GSE, so estimates of benefits from this measure are very uncertain.

· Virginia DEQ thinks it is unlikely that an MOU could become effective by May 2004

Assumptions

· Measure will have 80% compliance rate
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD = 2.21
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD = 0.52
· As in non-road inventory, use employment as proxy for growth in airport GSE
· From regional cooperative forecasts, employment will grow 1.8% from 2004-2005
· From NESCAUM survey of airport GSE fleets, GSE load factors when adjusted for fuel consumption are much lower than load factors assumed in EPA modeling
· For example, load factors for baggage tugs were reduced from 55% to 2%, while load factors for belt loaders were reduced from 50% to 7%
· Assume this reduced average load factors is due to greater-than-assumed idling time
· Assume emissions can be reduced by 10% by voluntary idling agreements
· Assume cost is a monitoring/verification program at $200,000 per year
· Equipment operates 365 days per year

Emission Reductions

Daily Reductions (NOx) = 2.21 tpd * 10% reduction * 80% compliance / 1.018 adjustment to 2004
Daily Reductions (NOx) = 0.17 tpd NOx

Daily Increase (VOC) = 0.52 tpd * 10% reduction * 80% compliance / 1.018 adjustment to 2004
Daily Increase (VOC) = 0.04 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 365 days)

Cost-effectiveness (VOC) = $ 13,409
Cost-effectiveness (NOx) = $ 3,155

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure S5: Control aircraft auxiliary power units

Measure Number: S5
Measure Name: Control aircraft auxiliary power units

RACM Determination: No
Reason: Not economically feasible

Description:
Seek voluntary agreement to reduce use of aircraft APUs through use of gate-provided services or other strategies

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 27,796
Estimated Reductions (NOx)	0.250

Issues

· States do not have the authority to regulate aircraft emissions. This measure would be enforceable through a voluntary MOU.

· The Metropolitan Washington Airports Authority (MWAA) controls use of airport services. The Authority can require airplanes to use preconditioned gate air iand gate electricity instead of idling to generate power.

Assumptions

· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2005 will be:
  · NOx: 0.59 tpd DCA, 1.99 tpd IAD
  · VOC: 0.18 tpd DCA, 0.48 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2002 will be:
  · NOx: 0.44 tpd DCA, 1.02 tpd IAD
  · VOC: 0.04 tpd DCA, 0.20 tpd IAD
· From MWAA, daily emissions from aircraft GSE/AGE/APU/Mobile Lounges in 2004 will be:
  · NOx: 0.54 tpd DCA, 1.67 tpd IAD
  · VOC: 0.13 tpd DCA, 0.39 tpd IAD
· In 2005, APUs emitted 0.04 tpd VOC and 0.43 tpd NOx
· This is 6% of GSE/AGE/APU/Mobile Lounge VOC emissions and 17% of NOx emissions
· Assume these percentages hold for 2004
· Therefore APUs will emit 0.03 tpd VOC and 0.38 tpd NOx in 2040
· Assume all APU emissions occur at gate
· Overall compliance with measure will be 80% (EPA mandated estimate)
· From MWAA, approximately 70% of flights currently use gate services, but this is not accounted for in the airport inventories
· Cost of this measure is cost to MWAA of O&M for additional 30% of flights to use preconditioned air
· From EPA, "Technical Data to Support FAA's Advisory Circular on Reducing Emissions from Commercial Aviation" (Sept 1995), O&M cost for operating a 400-Hz preconditioned air system at DCA was $1.945 million at 44 gates.
· Washington Dulles has 120 gates
· Because Dulles has 2.7 as many gates as Reagan National, assume O&M costs are 2.7 times as high

Emission Reductions

Total VOC Reductions = 0.03 tons * 80% reduction
Total VOC Reductions = 0.02 tons VOC

Total NOx Reductions = 0.38 tons * 80% reduction

Total NOx Reductions = 0.30 tons NOx

Cost Effectiveness

Estimate cost if preconditioned air were used by every aircraft instead of the current 70%

Expenditure for All Aircraft= ($1,945,000 at National + 2.7* $1,945,000 at Dulles) * (100%/70%) increased usage

Expenditure for All Aircraft= $ 10,280,714

Expenditure for 30% of Aircraft= $10,280,714 * 30%

Expenditure for 30% of Aircraft= $ 3,084,214

Annual Expenditure= $ 3,084,214

Cost-effectiveness ($/ton) = $3,084,214 / (tpd * 365 days per year)

Cost-effectiveness (NOx) = $ 27,796

Cost-effectiveness (VOC) = $ 352,079

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T1: Light commercial equipment use restrictions

Measure Number: T1
Measure Name: Light commercial equipment use restrictions

Description:
Restrict use of light commercial equipment during expected ozone exceedance days

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This is an episodic measure

· The region has averaged 6.3 Code Red Ozone Action days per year in the past three years.

· Use of light commercial equipment is vital to the operation of thousands of area businesses. Shutting these businesses down for 6 days of the summer could have serious financial impacts on the businesses.

· This equipment is not registered with the state, and there is no way to enforce this measure except by random inspections of local businesses. This is an extremely ineffective and time-intensive mechanism.

· Many operators of this equipment are low income, and this measure would put them out of work on Ozone Action Days.

· This measure would require regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure is unenforceable from a practical viewpoint, could not become effective by May 2004 and could adversely affect the operators of the affected equipment. Therefore it is not a RACM.

Measure T2: Light commercial equipment retrofits

Measure Number: T2
Measure Name: Light commercial equipment retrofits

Description:
Require light commercial equipment to be retrofitted with emissions controls

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Enforcement of this measure would be difficult, as industrial equipment are not registered with the state

· Many owners would be unable to afford the cost of retrofits, and states do not have the funds to pay for the equipment

Summary Analysis

This measure could not be implemented fast enough to deliver benefits in May 2004. Additionally, enforcement is practically impossible and the measure could impose a severe economic hardship on equipment owners

Measure T3: Require low-NOx fuel for light commercial equipment

Measure Number:	T3	**Description:**
Measure Name:	Require low-NOx fuel for light commercial equipment	Require light commercial equipment to use low-NOx fuel during ozone season, if applicable
RACM Determination:	No	
Reason:	No creditable emission reductions	

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure could be implemented by 2004 on a voluntary basis only by state and local governments.

· Only one fuel additive, PuriNOx, is certified to produce NOx reductions at this time

· Because of budget situations, operators would not receive subsidies towards the higher cost of the low-NOx fuel

· People who live on the edge of the nonattainment area and would be incentivized to drive to the next county to get cheaper fuel that is not low-NOx

Assumptions

· Evaluate regional fleet of light commercial equipment to determine whether this measure would reduce emissions
· Measure will have 80% compliance rate
· From 2005 controlled non-road inventory in severe area SIP, emissions from diesel light commercial equipment will be:
  · 0.63 tons NOx
  · 0.09 tons VOC
· As in non-road inventory, use population as proxy for growth in light commercial equipment
· All light commercial equipment is less than 100 hp
· From regional cooperative forecasts, population will grow 1.2% from 2004-2005
· From EPA draft report on PuriNOx, for nonroad equipment 0-100 HP emissions levels:
  · NOx decreases 19.3%
  · VOC increases 99.4%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC increases 104.7%
· From a comparison of the 2002 adjusted inventories in the Rate of Progress calculations, the approximate tradeoff ratio for the region for rate of progress purposes is:
  · 1.8 tpd NOx : 1 tpd VOC

Emission Reductions

Daily Reductions (NOx) = (0.63 tpd * 19.3% reduction * 80% compliance) / 1.012 adjust to 2004
Daily Reductions (NOx) = 0.10 tpd NOx

Daily Increase (VOC) = (0.09 tpd * 104.7% increase * 80% compliance) / 1.012 adjust to 2004
Daily Increase (VOC) = 0.07 tpd VOC

Net Decrease (NOx-VOC) = 0.10 tpd NOx - (0.07 tpd VOC * 1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC) = -0.038 tpd NOx

Therefore this measure would increase emissions.

Summary Analysis

This measure does not reduce net emissions. Therefore it is not a control measure.

Measure T4: Idling restrictions for light commercial equipment

Measure Number: T4
Measure Name: Idling restrictions for light commercial equipment

Description:
Limit idling by light commercial equipment

RACM Determination: No
Reason: No creditable emission reductions

Criterion Summary

Year of First Benefits	2004+
Enforceable	No
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· Industrial equipment is not left in idle for safety reasons. Also, owners are cost-incentivized to minimize gasoline consumption. Therefore, estimated benefits from this measure are zero.

· Enforcement of this measure would be nearly impossible.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure would not reduce emissions. Therefore it is not a RACM.

Measure T5: Low-emissions light commercial equipment

Measure Number: T5
Measure Name: Low-emissions light commercial equipment

Description:
Require sale of low-emissions light commercial equipment in region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· Because there are no regional standards for low-emissions light commercial equipment, rule development would be time consuming. A long compliance period would be required to permit manufacturers to develop new products or select retrofits.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T6: Preference for low-emission light commercial equipment

Measure Number: T6
Measure Name: Preference for low-emission light commercial equipment

Description:
In bids for government contracts, award extra points to bidders using low-emission light commercial equipment

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure requires an MOU with state and local governments in the nonattainment area

· Contract preferences could advantage larger companies, which could more easily afford capital investments

· Benefits from this program will increase as old contracts expire. Benefits could eventually reach 2 tpd VOC

· Contractors could reduce emissions by using low-NOx, retrofitted or electric equipment

Assumptions

· From 2005 draft non-road inventory emissions from industrial equipment are:
  · 3.20 tpd NOx
  · 1.53 tpd VOC
· As in non-road inventory, use employment as proxy for growth in industrial equipment
· From regional cooperative forecasts, employment will grow 1.3% from 2004-2005
· Assume local government use or contracts account for 5% of all use of this equipment
· Of all contracts put out to bid, 10% will be awarded to low-emission vendors
· Low-emission vendors will reduce VOC emissions by 50%
· For diesel vehicles, VOC = HC * 1.053
· Therefore VOC emissions would be reduced by 52.7%
· Incremental cost of low-emission contracts will be zero
· Monitoring program will be required @ $200,000 per year
· Equipment will operate 312 days per year
· This analysis overestimates benefits and underestimates cost by assuming that all contracts are awarded annually

Emission Reductions

Total VOC Reduced = 1.53 tpd * 5% eligible * 10% awarded * 52.7% reduction / 1.013 adjustment to 2004
Total VOC Reduced = 0.004 tpd VOC

Cost Effectiveness

Annual Expenditure= $ 200,000

Cost-effectiveness ($/ton) = $200,000 / (tpd * 312 days)

Cost-effectiveness (VOC) = $ 161,069

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure X1: EPA Tier II Emissions Standards for Large SI Engines

Measure Number: X1
Measure Name: EPA Tier II Emissions Standards for Large SI Engines

Description:
Adopt EPA Tier II standards before they become effective in 2007

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2007
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure X2: Biodiesel for Off-Road Equipment

Measure Number: X2
Measure Name: Biodiesel for Off-Road Equipment

Description:
Require all off-road diesel equipment to burn biodiesel during ozone season

RACM Determination: No
Reason: Not technologically feasible

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	No
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· EPA has not certified biodiesel to provide emission reductions for off-road vehicles. Therefore this measure is not technologically feasible.

Summary Analysis

This measure is not technologically feasible. Therefore it is not a RACM.

Appendix O

Analysis of Potential
Mobile Source RACM Measures

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
A1	Bose Anti-Air Pollutant and Energy Conservation System	Fund trial of Bose system in local vehicle fleets. The Bose system is a mechanical system that uses high-speed centrifugal separation to remove light combustible gases from the exhaust stream. The system can be used with all types of fuel.	No	Not technologically feasible
A2	W15-590 Diesel Fuel Additive	Fund trial of the fuel additive W15-590 to reduce NOX emissions. The additive can be mixed with the fuel before or after delivery from the distribution center.	No	Not technologically feasible
A3	CNG Buses Instead of New Diesel	Purchase additional CNG buses for local transit authorities instead of normally scheduled replacement diesel bus purchases. This would also require expanded CNG fueling and maintenance facilities.	No	Not economically feasible
A4	State & Local Fleet Replacement	Replace public sector gasoline-fueled automobile fleet with hybrid vehicles (i.e. Toyota Prius)	No	Not economically feasible
A5	CNG Fueling Stations for DC Metro Region	Build new modular CNG fueling stations	No	Not economically feasible
A6	Fleet ILEV for light-duty gasoline vehicles	Require fleets operating in nonattainment area to be comprised of a percentage of ILEV vehicles	No	Would not deliver benefits by May 2004
A7	International Green Diesel Retrofit	Fit 500 transit buses running on ultra low sulfur diesel with a quad-catalytic filter	No	Not economically feasible
A8	ZEV program	Adopt California ZEV program	No	Would not deliver benefits by May 2004
A9	Expand WMATA Fleet with Hybrid-Electric Buses	Purchase hybrid electric buses instead of clean diesel as part of WMATA fleet expansion	No	Would not deliver benefits by May 2004
A10	CNG Rental Cars	Purchase CNG rental cars for use in the region	No	Not economically feasible
A11	CNG Refuse Haulers	Purchase new CNG powered trash trucks instead of conventional diesel vehicles	No	Would not deliver benefits by May 2004
A12	CNG Taxicabs	Replace regional taxicabs 7 years or older with CNG or other alternative fuel vehicles	No	Not economically feasible
B1	Bike Lockers at Metro Stations, Park & Ride Lots, Other Locations	Expand existing bike lockers at Metrorail stations, install bicycle storage spaces in parking lots	No	Not economically feasible

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
B2	Bike Racks on Transit Buses	Provide external bike racks on WMATA and other local transit buses	No	Not economically feasible
B3	Improvements to Bicycle and Pedestrian Access	Provide incentives to developments that speed improvements to bicycle/pedestrian access. This includes improvements to sidewalks, curb ramps, crosswalks, lighting, etc.	No	Not economically feasible
B4	Employers Provide Free Bicycles for Midday Use	Require employers to provide one bicycle per 50 employees for mid-day business or personal use.	No	Would not deliver benefits by May 2004
B5	Bike/Pedestrian Paths	Fund construction of additional bicycle/pedestrian paths in the region	No	Not economically feasible
B6	Bicycle Racks in DC	Install bicycle racks at various locations throughout the region	Possible	
E1	4 Day Work Week/Flexible Work Schedules	Encourage employers to adopt a shorter work week, with employees working 4 10-hour days	No	Would not deliver benefits by May 2004
E2	Build Park & Ride Lots at Major Intersections of Commuter Highways	Construct new park & ride commuter lots along HOV facilities	No	Would not deliver benefits by May 2004
E3	Telecommuting Centers	Telecommuting centers, including marketing activity, consultant support, commuter and employer information and assistance	Possible	
E4	Commuter Operations Center	Provides commuter assistance services, including carpool and vanpool ridematching	No	Not economically feasible
E5	Vanpool Programs	Create programs and incentives designed to increase the number of vanpools in the region.	No	Not economically feasible
E6	Express Buses From Outyling Areas	Implement direct bus service from outlying Park & Ride lots and far suburbs to major work centers	No	Would not deliver benefits by May 2004
E7	New Surface Parking at Transit Centers	Add new parking spaces at transit centers (bus, Metrorail, MARC) parking lots	No	Not economically feasible
E8	Express Reverse Commuter Buses	Implement reverse commute express buses from the District to major outlying work centers	No	Would not deliver benefits by May 2004

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
E9	Free Reserved Carpool/Vanpool Spaces	Provide free reserved parking spaces for all carpools or vanpools	No	Would not deliver benefits by May 2004
E10	Government Actions (ozone action day similar to snow day)	Implement a liberal leave policy for local, state and federal employees on Code Red Ozone Action Days, permitting employees to work from home or take unscheduled leave	Possible	
E11	Guaranteed Ride Home	Provides free rides home in event of unexpected emergency or unscheduled overtime to commuters using public transport	No	Not economically feasible
E12	Integrated Rideshare	Provides transit, park & ride, and telecenter information to all commuters on a matchlist	Possible	
E13	Mandatory Employee Commute Reduction	Mandatory employer trip reduction to reduce trips by regional average of 20%	No	Would not deliver benefits by May 2004
E14	Student & staff based college & university rideshare programs	Create rideshare program focused on students and staff at regional universities	No	Would not deliver benefits by May 2004
E15	Vanpool Insurance	Establish a special risk pool to underwrite the cost of vanpool insurance	No	Would not deliver benefits by May 2004
E16	Ban Vehicles from Downtown Streets	Restrict private vehicle use in certain downtown areas during business hours , encouraging pedestrian and bicycle use instead.	No	Would not deliver benefits by May 2004
F1	Expand HOV Network on the Freeway System	Construct additional HOV lanes on regional freeways, for example I-95 and I-695	No	Would not deliver benefits by May 2004
F2	Extend Ramp Metering	Install signals to control flow of vehicles at selected freeway ramp entrances to maintain level of service	No	Would not deliver benefits by May 2004
F3	Permit Right Turn on Red	Reduce vehicle idling time by permitting right turn on red, where safety allows	Possible	
F4	Replace Traffic Signals with Lesser Controls	Install roundabouts in place of signalized intersections	No	Would not deliver benefits by May 2004

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
F5	Signals to Flashing Yellow 12am-5am	From midnight until 5am, set intersection signals to flashing yellow in predominant direction and flashing red in minor direction for all low volume intersections where safety permits	No	Would not deliver benefits by May 2004
F6	Speed Limit Adherance	Increase speed limit enforcement on portions of the freeway system where speeding is a problem so that more vehicles are traveling at or below the posted limit	No	Would not deliver benefits by May 2004
F7	Regional Traveler Information/Assistance Systems	Regional traveler information/assistance systems to facilitate efficient traffic management during incidents and accidents.	No	Not economically feasible
L1	Smart Growth and Infill Development Programs	Encourage development/redevelopment of land in designated growth areas, encouraging local governments to place greater emphasis on land development near transit stations	No	Would not deliver benefits by May 2004
L2	Convenience Commercial Centers in Residential Areas	Change zoning ordinances to allow neigborhood-serving retail establishments in residential areas	No	Would not deliver benefits by May 2004
L3	Proximity Commuting (Live Near Your Work)	Provides financial incentives to homebuyers moving to designated neighborhoods near their workplaces	No	Would not deliver benefits by May 2004
L4	Incentives for Mixed Use at Transit Centers	Include incentives for mixed-use development at transit centers to reduce sprawl and VMT	No	Would not deliver benefits by May 2004
M1	Parking Impact Fee	Levy a $250 annual fee on every commuter parking space in the Washington nonattainment area	No	Would not deliver benefits by May 2004
M2	Annual Gasoline Vehicle Pollution Fee	Levy an annual fee on petroleum-powered vehicles based on mileage driven and emission rates.	No	Would not deliver benefits by May 2004
M3	Cash for Clunkers	Purchase pre-1980 vehicles with minimal/no emissions controls	No	Would not deliver benefits by May 2004
M4	Commuter Choice Tax Credit	Employers subsidize employees' monthly transit or vanpool costs and receive a tax credit for incurred expenses.	No	Not economically feasible

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
M5	Congestion Pricing on Low Occupancy Vehicles	Impose a fee on vehicles containing two or fewer persons that use designated roadways during the peak AM period	No	Would not deliver benefits by May 2004
M6	Gas Tax Increase	Increase state and local gas taxes to add 10% to purchase price of gasoline. Use proceeds to fund regional transit operations.	No	Would not deliver benefits by May 2004
M7	Graduated Vehicle Registration Fee Based on Number of Vehicles	Assess graduated vehicle registration fee/car tax on every privately owned vehicle in the region. Households with multiple vehicles pay higher tax on each additional vehicle	No	Would not deliver benefits by May 2004
M8	Market Based Parking Charges at Federal Facilities	Require all federal work sites to charge the equivalent of commercial parking rates.	No	Would not deliver benefits by May 2004
M9	Commuter Choice - State & Local Government Employees	Provide the region's local, state and municipal employees with transit benefits	No	Not economically feasible
M10	Pay-as-you-drive auto insurance ($/gal)	Offer auto insurance rates linked to number of gallons of fuel consumed by vehicle	No	Would not deliver benefits by May 2004
M11	VMT Tax (2 cents/mile)	Charge VMT tax of $0.02 per mile for all vehicles registered or garaged in the region	No	Would not deliver benefits by May 2004
M12	Voluntary Employer Parking Cash-Out Subsidy	Employers who provide free parking would be encouraged to provide the cash equivalent of the parking subsidy to employees who do not drive to work.	No	Would not deliver benefits by May 2004
M13	Half Price Fares on Feeder Bus Service	All metro bus and local bus services to Metrorail and commuter rail stations reduce fares by half.	No	Would not deliver benefits by May 2004
M14	Free Parking for Carpools	All employers must provide free parking spaces for all carpools or vanpools.	No	Would not deliver benefits by May 2004
M15	Tax Parking Spaces Above Code Minimum	Discourage developers from providing parking in excess of code minimum by imposing a graduated tax on excess spaces.	No	Would not deliver benefits by May 2004

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
M16	Reduce Parking Fees at Facilities Outside the Beltway Adjacent to Metro	Reduce parking fees at Metro parking facilities or county/city managed facilities outside of the Beltway that are located near Metro stations.	No	Would not deliver benefits by May 2004
O1	Bike to Work Day	Conduct a one-day bike to work event. Provide outreach activities, education on the bike-to-work option, and assistance in trying bike-to-work	No	Will not reduce emissions
O2	Clean Air Partners Program	This program motivates individuals to take voluntary actions to reduce emissions on Ozone Action Days	No	Not economically feasible
O3	Clean Commute/Try Transit Week	Promotes use of alternative transportation, including transit, by daily commuters for one week per year	No	Will not reduce emissions
O4	Employer Outreach (Private Sector)	Provide regional outreach to encourage large private-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites	Possible	
O5	Employer Outreach (Public Sector)	Provide regional outreach to encourage public-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites	No	Not economically feasible
O6	Mass Marketing Campaign	6 year marketing effort involving business-to-business advertising campaign in print media and on world wide web. Aims to increase transit, ridesharing and other travel demand management programs	Possible	
P1	Control Parking at Schools	Restrict high school students from driving to and parking at high schools when bus service is available.	No	Would not deliver benefits by May 2004
P2	Restrict Construction of New Parking	Restrict construction of new parking at employment centers based on distance from transit and urban core	No	Would not deliver benefits by May 2004
T1	Transit Prioritization -- Queue Jumps	Provide queue jumps for buses at over-capacity signalized intersections throughout the region. Queue jumps allow buses to use a shoulder or other designated lane to bypass intersection queues and move forward towards the stop line.	Possible	
T2	Flat Fare For All Transit Trips	Single price all public transit services with a flat $1.10 fare and free transfers all day, 7 days per week	No	Would not deliver benefits by May 2004
T3	Access to Jobs Program	Identifies gaps in transit service between places of residence and places of work for low wage workers	No	Would not deliver benefits by May 2004
T4	Automatic Vehicle Locator System	System would provide bus location information to WMATA dispatchers. This would decrease wait time and improve on-time arrival/departure.	No	Would not deliver benefits by May 2004

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
T5	College 33 Pass System	Expand Baltimore college bus fare program to DC area. Program allows students to receive reduced fares near 19 participating schools in the region.	No	Would not deliver benefits by May 2004
T6	Expand Peak Period Metrorail Service	Extend peak-period service on Metrorail so trains run at 6 minute frequency from 6-11 am and 3-8 pm.	No	Would not deliver benefits by May 2004
T7	Free Bus Service Off-Peak	Institute free off-peak bus service from 10-2 on weekdays and all day on weekends.	No	Would not deliver benefits by May 2004
T8	Free bus-to-rail / rail-to-bus transfers	Institute free bus-to-rail transfer similar to free rail-to-bus transfer currently in place.	No	Would not deliver benefits by May 2004
T9	Free Rail Use 10-3	Free Metrorail trips for all riders from 10AM-3PM on weekdays	No	Would not deliver benefits by May 2004
T10	Free Transit Passes to Students	Free transit passes for high school and college students, subsidized by schools or through student registration fee	No	Would not deliver benefits by May 2004
T11	Increase Commuter Rail Frequency	Increase frequency of MARC service to every 15 minutes on Penn and Camden lines and every 10 min on the Brunswich line. Increase VRE frequency to every 15 minutes	No	Would not deliver benefits by May 2004
T12	Interactive Rideshare Kiosks	Transportation Information Kiosks in Maryland, Virginia and the District of Columbia	No	Not economically feasible
T13	New MARC Coaches	Purchase additional coaches for MARC to accommodate increased ridership	No	Would not deliver benefits by May 2004
T14	Employer Metro Shuttle Bus Services	Provide incentives for businesses to provide employee shuttle service to the nearest rail or transit stop	No	Not economically feasible
T15	Metrorail Feeder Bus Service & Fare Buydown	Improve Metrorail feeder bus service at underutilized park & ride lots, implement fare buydown program	No	Not economically feasible

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
T16	Mobile Commuter Stores	Fund mobile commuter stores in suburban commercial areas	No	Not economically feasible
T17	Real-Time Bus Schedule Information	Expand trials of real-time bus schedule information to local transit providers	No	Would not deliver benefits by May 2004
T18	Discount Multi-Trip Bus Fares	Introduce discount programs reducing cost of multiple bus rides through purchase of pass books (e.g. 10-trip tickets)	No	Not economically feasible
T19	Shorter Distance from Buildings to Bus Stops	For existing buildings, re-route traffic to allow buses to come closer to the building. For new buildings, alter setback requirements to allow closer bus access	No	Would not deliver benefits by May 2004
T20	Additional Transit Stores	Establish additional stationary transit stores in the region	No	Would not deliver benefits by May 2004
T21	Universal Transportation Access (MD + WMATA)	SmarTrip card will allow users to pay fares on all rail and bus systems in the region (including parking in Metrorail lots) using one electronic card	No	Not economically feasible
T22	Expand VRE Train Service	Expand VRE train service to include additional departures	No	Would not deliver benefits by May 2004
T23	WMATA Bus Information Displays with Maps	Install additional information boxes with maps and schedule information. Would include schedules in languages other than English in neighborhoods where most residents speak another language	No	Would not deliver benefits by May 2004
T24	Regional bus service expansion	Expansion of Metrobus and other regional bus services.	No	Not economically feasible
T25	Rush Hour Shift	Shift Metrorail AM and PM rush hours to start 30 min earlier and end 30 min earlier	No	Would not deliver benefits by May 2004
U1	Trip reduction ordinances	Prohibit drivers from traveling during certain periods, based on vehicle tags or other easily identifiable criteria. Can be a permanent or episodic control.	No	Widespread and adverse impacts
V1	Control Extended Idling of Buses and Trucks	Step-up enforcement of existing regulations to prevent extended vehicle idling	No	Would not deliver benefits by May 2004

Potential Mobile RACM Measures for the Metropolitan Washington Region				
Identifier	**Measure Name**	**Definition**	**RACM**	**Reason**
V2	High cetane diesel fuel for onroad vehicles	Require onroad diesel vehicles to use high cetane fuel	No	Would not deliver benefits by May 2004
V3	Light-duty diesel I/M	Develop I/M program for light-duty diesel vehicles	No	Would not deliver benefits by May 2004
V4	Remove Trash Trucks From Area Streets	Reduce use of trash trucks through transport of trash by barge	No	Would not deliver benefits by May 2004
V5	Early Bus Engine Replacement	Replaces high-polluting diesel engines in WMATA buses with new diesel engines	No	Not economically feasible
V6	Taxicab Replacement - Conventional Vehicles	Replace taxicabs with new "conventional" LDGVs	No	Would not deliver benefits by May 2004
V7	Zero I/M waivers and exemptions	Eliminate all waivers and exemptions in the I/M program	No	Would not deliver benefits by May 2004
V8	Car Sharing Program	Fund incentives for new car sharing customers (I.e. Flexcar or Zipcar services)	No	Not economically feasible
W1	CARB Diesel Fuel (On-Road)	Implement CARB diesel fuel standards	No	Would not deliver benefits by May 2004
W2	Biodiesel (On-Road)	Require regional use of biodiesel fuel for on-road vehicles	No	Not economically feasible
W3	Low-NOx Diesel Fuel (On-Road)	Require regional use of low-NOx fuel for on-road diesel vehicles	No	Not economically feasible
X1	Telecourses at Local Colleges and Universities	Encourage local colleges and universities to offer telecourses. This would reduce vehicle trips.	No	Would not deliver benefits by May 2004
X2	ATM Machines Installed at Metro Stations	Install ATMs near metro stations for rider convenience	No	Unenforceable

Explanation of "Identifier" Field	
Abbreviation	**Explanation**
A	Alternative Fuels/Advanced Vehicles
B	Bicycle/Pedestrian Improvements
L	Land Use/Development
E	Employer-Based Transportation Plans
F	Traffic System/Flow Improvements
M	Market Based/Economic Incentives
O	Outreach/Education
P	Parking Restrictions
U	Equipment Use Restrictions
T	Transit System Improvements
V	Other Vehicle-Based Programs
W	State or Local Regulatory Measures
X	Other

Measure A1: Bose Anti-Air Pollutant and Energy Conservation System

Measure Number: A1

Measure Name: Bose Anti-Air Pollutant and Energy Conservation System

RACM Determination: No

Reason: Not technologically feasible

Description:

Fund trial of Bose system in local vehicle fleets. The Bose system is a mechanical system that uses high-speed centrifugal separation to remove light combustible gases from the exhaust stream. The system can be used with all types of fuel.

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	No
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· The reductions resulting from use of this technology are not verified by EPA. As a result, no SIP credit can be granted for use of the additive.

Summary Analysis

Because EPA has not verified this technology, this measure is not technologically feasible and is therfore not a RACM.

Measure A2: W15-590 Diesel Fuel Additive

Measure Number: A2
Measure Name: W15-590 Diesel Fuel Additive

RACM Determination: No
Reason: Not technologically feasible

Description:
Fund trial of the fuel additive W15-590 to reduce NOX emissions. The additive can be mixed with the fuel before or after delivery from the distribution center.

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	No
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· The reductions resulting from use of this additive are not verified by EPA. As a result, no SIP credit can be granted for use of the additive.

Summary Analysis

Because EPA has not verified this technology, this measure is not technologically feasible and is therfore not a RACM.

Measure A3: CNG Buses Instead of New Diesel

Measure Number: A3
Measure Name: CNG Buses Instead of New Diesel

RACM Determination: No
Reason: Not economically feasible

Description:
Purchase additional CNG buses for local transit authorities instead of normally scheduled replacement diesel bus purchases. This would also require expanded CNG fueling and maintenance facilities.

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 36,270
Estimated Reductions	N/A

Issues

· WMATA is currently operating CNG buses
· Additional CNG buses are on order for delivery
· Fueling facilities must be retrofitted to accommodate CNG buses

Assumptions

· Perform analysis for 200 buses (point at which fueling facility will be most cost effective)
· Each WMATA bus travels 312 days and 40,000 miles per year (128 mi/day)
· All WMATA diesel buses run on ultra-low sulfur diesel (ULSD)
· New CNG bus costs approximately $370,000, or $30,000 more than new clean diesel bus
· Incremental annual operating cost for new CNG instead of new diesel bus = $12,000
· One fueling facility modification necessary for every 200 CNG buses
· Fuel facility modification costs $400,000, 30 year lifespan

Emission Reductions Per Bus

Diesel bus NOx Emissions = (3.90 g/bhp-hr * 4.679 bhp-hr/mi * 40,000 mi/yr * 200 buses) / (907,185 g/ton * 312 days/yr)
Diesel bus NOx Emissions = 0.516 tpd

CNG bus NOx Emissions = (1.84 g/bhp-hr * 4.679 bhp-hr/mi * 40,000 mi/yr * 200 buses) / (907,185 g/ton * days/yr)
CNG bus NOx Emissions = 0.243 tpd

Diesel bus VOC Emissions = (0.08 g/bhp-hr * 4.679 bhp-hr/mi * 40,000 mi/yr * 200 buses) / (907,185 g/ton * 312 days/yr)
Diesel bus VOC Emissions = 0.011 tpd

CNG bus VOC Emissions = (0.03 g/bhp-hr * 4.679 bhp-hr/mi * 40,000 mi/yr * 200 buses) / (907,185 g/ton * 312 days/yr)
CNG bus VOC Emissions = 0.004 tpd

Total NOx Reduced = 0.272 tons/bus-day
Total VOC Reduced = 0.007 tons/bus-day

Cost Effectiveness

Annualized Capital Cost=	($30,000 per bus * 200 buses /15 year life) + ($400,000 per facility / 30 year life)
Annual Operating Cost=	$12,000 per bus * 200 buses
Annual Expenditure=	$ 2,813,333

Cost-effectiveness ($/ton) = $2,813,333/ (tons/day * 312 days)

Cost-effectiveness (NOx) =	*$*	*33,098*	*per ton NOx*
Cost-effectiveness (VOC) =	*$*	*1,363,653*	*per ton VOC*

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure A4: State & Local Fleet Replacement

Measure Number: A4
Measure Name: State & Local Fleet Replacement

Description:
Replace public sector gasoline-fueled automobile fleet with hybrid vehicles (i.e. Toyota Prius)

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$	218,770
Estimated Reductions (NOx)	N/A	

Issues

· LDGV fleet replacement would be funded through state and local budgets.

· FY 04 budgets (July 1 2003 - June 30 2004) are largely complete. It is unlikely that funds for this program could be made available in FY 04 budgets.

· Expanded programs could not be funded for FY 04 because FY 04 budgets are complete. New programs could not be funded until FY 05, beginning July 04.

Assumptions

· Purchase 250 2003 hybrid vehicles instead of 2003 LEVs
· Emissions from replacement vehicles will be equivalent to emissions from 2003 Toyota Prius
· Current vehicles are similar to Dodge Neon/Chevy Cavalier and have emission rates equivalent to LEV standards
· MSRP for 2003 Vehicles:
  · Dodge Neon $13,480
  · Chevy Cavalier $14,595
  · Toyota Prius $20,480
· Incremental cost of purchasing hybrid vehicle instead of equivalent gasoline vehicle = $6,000
· Average state fleet vehicle travels 57 mi/day for 250 days/year
· Assume emission rates at end of useful life (100,000 miles)
· Assume 6 year vehicle life

Emission Rates	HC	NOx
EPA LEV Standard (g/mi)	0.0090	0.30
2003 Toyota Prius (g/mi)	0.0024	0.01

Emission Reductions

Total NOx Reduced= (0.30 g/mi - 0.01 g/mi) * 57 mi/day * 250 vehicles / 907,185 g/ton
Total NOx Reduced= 0.0046 tons/day

Total VOC Reduced= (0.009 g/mi - 0.0024 g/mi) * 57 mi/day * 250 vehicles / 907,185 g/ton
Total VOC Reduced= 0.0001 tons/day

Cost Effectiveness

Annual Cost = $6,000 per vehicle * 250 vehicles / 6 year vehicle life
Annual Cost = $ 250,000

Cost-effectiveness ($/ton) = $250,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 218,770 per ton NOx

Cost-effectiveness (VOC) = $ 9,645,774 per ton VOC

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. Therefore it is not a RACM.

Measure A5: CNG Fueling Stations for DC Metro Region

Measure Number: A5
Measure Name: CNG Fueling Stations for DC Metro Region

Description:
Build new modular CNG fueling stations

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 21,827
Estimated Reductions (NOx)	N/A

Issues

· Washington Gas has recently shut down a number of CNG fueling stations for lack of demand

· Many dual-fuel vehicles operating in the region are never fueled with CNG

· CNG taxis are unpopular with drivers because tank takes up most of trunk room, reducing airport fares

Assumptions

· Total vehicles replaced by 2005 will be:
  · 100 state & county LDGVs
  · 50 state & county HDGVs
  · 100 LDGV taxis
  · 75 LDGVs owned by general public
  · 200 commercial MDGTs
· Stations will be capable of dispensing 600 gasoline gallon equaivalents (GGE) of CNG per day
· From Washington Gas says that CNG storage tanks for stations cost $240,000
· Assume installation of entire CNG station, including card readers for public use, will be $500,000
· From California Energy Commission, maintenance costs are for stations are fixed at $0.125 - 0.375 per gallon.
· Assume $0.25 per gallon O&M cost
· Vehicles operate an average of 250 days per year
· State and local vehicles operate an average of 57 mi/day, 250 days/yr
· Public vehicles operate an average of 10,000 mi/year = 27 mi/day, 365 days/yr
· Taxis operate 50,000 mi/yr = 137 mi/day, 312 days/yr
· From DOE Alternative Fuels Data Center, Chevy Cavalier (LDGV) averages 23 mi/GGE
· Assume CNG fueled MDGT averages 10 mpg
· Assume HDGVs average 5 mpg
· Lifespan of CNG stations is not certain since technology is changing. A major developer is offering station leases with an opportunity to purchase the station for $1 after 10 years of operation. Therefore, assume station has 15 year life.

Emission Reductions

· From Michael Baker Jr., Inc. analysis, estimated emissions benefits from this measure are as follows:

Total NOx Reduced= 0.127 tons/day
Total VOC Reduced= 0.117 tons/day

Cost Effectiveness

Gallons used per day = (100 LDGV * 57 mi/day / 23 mpg) + (100 LDGV * 137 mi/day / 23 mpg) + (75 LDGV * 27 mi/day / 23

mpg) + (200 MDGT * 137 mi/day / 10 mpg) + (50 HDGV * 27 mi/day / 5 mpg)

Gallons used per day = 3,942

Fixed O&M Expenditure = $0.25 per gallon * 6,000 gallon/day capacity * 365 days/year

Fixed O&M Expenditure = $ 547,500 per year

Unreimbursed O&M Expenditure = $547,500 * 3,942 / 6,000 gallons

Unreimbursed O&M Expenditure = $ 359,664 per year

Total expenditure= $500,000 per station * 10 stations / 15 year life + $359,664

Total expenditure= $ 692,997

Cost-effectiveness ($/ton) = $692,997 / (tpd * 365 days)

Cost-effectiveness (NOx) = $ 21,827 per ton NOx

Cost-effectiveness (VOC) = $ 23,692 per ton VOC

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure A6: Fleet ILEV for light-duty gasoline vehicles

Measure Number: A6
Measure Name: Fleet ILEV for light-duty gasoline vehicles

Description:
Require fleets operating in nonattainment area to be comprised of a percentage of ILEV vehicles

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure would be very costl for small fleet operators that do not plan to purchase new vehicles. An extended compliance period might be necessary to enable sources to adjust their vehicle mixes at a rate approximating normal fleet turnover.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore, it is not a RACM.

Measure A7: International Green Diesel Retrofit

Measure Number: A7
Measure Name: International Green Diesel Retrofit

Description:
Fit 500 transit buses running on ultra low sulfur diesel with a quad-catalytic filter

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$16,933
Estimated Reductions (NOx)	N/A

Issues

· ULSD is required for proper operation of the filters

· WMATA has retrofitted a number of its buses with CRT filters. WMATA has never used the Green Diesel retrofit.

· Funds for this program would need to be allocated by the states or in transit providers' budgets.

· Though funds for a trial program might be indentified, funds for a large scale program could not be allocated for FY 04, beginning in July 2003, because budgets are already complete. Funds could not be allocated until FY05 (July 2004), after the start of the 2004 ozone season.

Assumptions

· $8,000 per filter capital cost
· $1,000 per bus additional annual maintenance costs
· Average bus operates 312 days and 40,000 miles annually
· Vehicle life of 15 years (This almost certainly overestimates the life of the filter.)
· Use of retrofit will result in NOx reduction of 0.1 tons/bus-yr (EPA OTAQ estimate)
· WMATA estimates adminstrative costs at $80,000 per year, or $320 per bus-year
· Buses consume 20,000 gal fuel per year
· ULSD costs an extra $0.15 per gallon

Emission Reductions Per Bus

Total NOx Reduced= 0.1 tons per year / 312 days per year
Total NOx Reduced= 0.0003 tons/bus-day

Cost Effectiveness

Annual expenditure= $8,000 filter / 15 year life per vehicle + $320 admin + $1,000 maintenance + 20,000 gallons fuel * $0.15 premium per gallon
Annual expenditure= $ 4,853 per bus

Cost-effectiveness ($/ton) = $4,853 / (tons/day * 312 days)

Cost-effectiveness (NOx) = $ 48,533 per ton NOx

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure A8: ZEV program

Measure Number: A8
Measure Name: ZEV program

Description:
Adopt California ZEV program

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Therefore this measure could not deliver benefits by May 2004.

· This regulation would require an extended compliance period to enable introduction of appropriate vehicles into the regional market.

· California has delayed its ZEV program because of implementation problems and protests from auto manufacturers.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore, it is not a RACM.

Measure A9: Expand WMATA Fleet with Hybrid-Electric Buses

Measure Number: A9

Measure Name: Expand WMATA Fleet with Hybrid-Electric Buses

Description:
Purchase hybrid electric buses instead of clean diesel as part of WMATA fleet expansion

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	N/A
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· WMATA is already well into the procurement process for all buses to be delivered in 2004.

· WMATA has made a commitment to operate a significant portion of its future fleet on CNG, and has invested millions of dollars in the necessary infrastructure.

· Requiring WMATA to finance large capital investments in an alternate clean fuel technology would have a substantial adverse impact on WMATA's budget and ability to provide cost-effective public transportation in the Metropolitan Washington region. Such funding is badly needed to finance service expansion and other capital improvements.

Summary Analysis

This measure could not not deliver benefits in May 2004 and would have substantial adverse impacts on WMATA. Therefore, this measure is not a RACM.

Measure A10: CNG Rental Cars

Measure Number: A10
Measure Name: CNG Rental Cars

Description:
Purchase CNG rental cars for use in the region

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program would need to be funded be state and local agencies, implemented via an MOU with local rental car agencies, or implemented through regulation.

· Because FY04 budgets are already complete, funds for this program could not be allocated until FY05, beginning July 04. This is after the beginning of the 2004 ozone season.

· Discussions urging rental car companies to voluntarily offer CNG vehicles have not begun. These talks would probably not be productive, as motorists would have very limited refueling options.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Therefore a regulation could not deliver benefits by May 2004.

Assumptions

· Purchase model year 2003 light-duty CNG vehicles instead of 2003 Tier I LEVs
· Comparison is based on base and bi-fuel models of 2003 Chevy Cavalier
· From GM.com, cost of CNG-fueled option for 2003 Cavalier is $6,420 per vehicle
· Because rental companies purchase new vehicles annually, the only cost would be the incremental cost of the CNG option
· From EV Rental Quarterly Report March 2002, average CNG rental car travels 15,000 mi/yr
· Vehicles operate 300 days per year
· Because Maryland, Virginia and the District participate in NLEV, use 2003 EPA emissions cert levels for NLEV vehicles
· Assume emission rates at end of useful life (100,000 miles)
· Assume 6 year vehicle life

Emission Rates	HC	NOx
CNG Cavalier (g/mi)	0.009	0.30
LEV Cavalier (g/mi)	0.156	0.30

Emission Reductions

Total NOx Reduced= ((0.30 g/mi - 0.30 g/mi) * 15,000 mi/yr) / (907,185 g/ton * 365 days/yr)
Total NOx Reduced= 0 tons/day

Total VOC Reduced= ((0.156 g/mi - 0.009 g/mi) * 15,000 mi/yr) / (907,185 g/ton * 300 days/yr)
Total VOC Reduced= 0.000008 tons/day

Cost Effectiveness

Annual Cost = $6,420 per vehicle / 6 year vehicle life
Annual Cost = $ 1,070

Cost-effectiveness ($/ton) = $1,070 / (tons/day * 300 days)

Cost-effectiveness (NOx) = N/A per ton NOx
Cost-effectiveness (VOC) = $ 440,221 per ton VOC

Summary Analysis

This measure is not economically feasible because it exceeds the cost-effectiveness threshold. It is also unlikely this measure could deliver benefits by May 2004. Therefore it is not a RACM.

Measure A11: CNG Refuse Haulers

Measure Number: A11
Measure Name: CNG Refuse Haulers

Description:
Purchase new CNG powered trash trucks instead of conventional diesel vehicles

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Funds for this program would need to be allocated by state or local agencies

· FY 04 budgets are already complete. This program could first be funded un FY 05, beginning July 04. Thisi s after the beginning of the 2004 ozone season.

Summary Analysis

This measure could not not deliver benefits by May 2004. Therefore, this measure is not a RACM.

Measure A12: CNG Taxicabs

Measure Number: A12
Measure Name: CNG Taxicabs

Description:
Replace regional taxicabs 7 years or older with CNG or other alternative fuel vehicles

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions	N/A

Issues

· The Council of Governments helps administer an alternative fueled vehicles program that provides funds and assistance for purchase of CNG taxis operating in the Washington region. The program is small and funding is year-to-year.

· Governments would need to recruit program participants. Many drivers object to CNG vehicles because the reduced trunk space does not enable them to accept airport fares.

Assumptions

· Replace 7+ year old vehicle with 2003 CNG vehicle
· Assume new vehicle is equivalent to 2003 CNG-fueled Chevy Cavalier, meets LEV standards
· From GM.com, cost of CNG-fueled option for 2003 Cavalier is $6,420 per vehicle
· From GM.com, base price for 2003 Cavalier is $14,795-17,595
· Assume cost of new CNG cab will be approximately $25,000
· Annual mileage is >50,000 miles per year, or 162 mi/day
· Vehicles operate 312 days per year
· Assume emission rates at end of useful life (100,000 miles)
· Assume 6 year vehicle life
· Assume existing taxicab emits at I/M failure rates (0.8 g/mi HC and 2.0 g/mi NOx)

Emission Rates	HC	NOx
CNG Cavalier (g/mi)	0.009	0.3
Existing Cab (g/mi)	0.800	2.0

Emission Reductions

Total NOx Reduced= (2.0 g/mi - 0.30 g/mi) * 162 mi/day * 50 vehicles / 907,185 g/ton
Total NOx Reduced= 0.0152 tons/day

Total VOC Reduced= (0.8 g/mi - 0.009 g/mi) * 162 mi/day * 50 vehicles / 907,185 g/ton
Total VOC Reduced= 0.0071 tons/day

Cost Effectiveness

Annual Cost = $25,000 per vehicle * 50 vehicles / 6 year vehicle life + $50,000 administrative cost
Annual Cost = $ 258,333

Cost-effectiveness ($/ton) = $258,333 / (tons/day * 312 days)

Cost-effectiveness (NOx) = $ 54,549 per ton NOx
Cost-effectiveness (VOC) = $ 117,236 per ton VOC

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure B1: Bike Lockers at Metro Stations, Park & Ride Lots, Other Locations

Measure Number: B1
Measure Name: Bike Lockers at Metro Stations, Park & Ride Lots, Other Locations

Description:
Expand existing bike lockers at Metrorail stations, install bicycle storage spaces in parking lots

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 30,701
Estimated Reductions (NOx)	N/A

Issues

· Bike lockers are currently being installed as part of an emission reductions measure in the 2002 CLRP/FY 03 TIP.

· Next allocation for funds to expand exsiting program would be FY 05, beginning July 2004. This is after the beginning of the 2004 ozone season.

Assumptions

· Assume bike rack/locker utilization of 50%

· Racks/lockers used 250 days/year

· Purchase and installation of one two-bike locker: $2,500 (WMATA, VDOT, MDOT)

· Racks lockers can be placed at park & ride lots (average avoided work trip distance = 25 miles/trip, Michael Baker Jr., Inc.) or at Metro stations (average avoided work trip distance = 15.5 miles, standard assumption)

· Assume 40 mph average travel speed on avoided trips

· Lockers have 15 year lifetime

Emission Reductions (One Locker)

VT Reduced= 1 new locker * 2 bikes/locker * 50% utilization * 72.5% SOV trips * 2 trips/day
VT Reduced= 1.45 trips

VMT Reduced= 1.45 trips * 15.5 miles/trip
VMT Reduced= 22 miles/day

Total NOx Reduced= (22 mi/day * 0.8073 g/mi + 1.45 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.000022 tons/locker-day

Total VOC Reduced= (22 mi/day * 0.3405 g/mi + 1.45 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.000013 tons/locker-day

Cost Effectiveness

Annual Expenditure= $2,500 per locker / 15 year life per locker
Annual Expenditure= $ 167

Cost-effectiveness ($/ton) = $167 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 30,701
Cost-effectiveness (VOC) = $ 51,808

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure B2: Bike Racks on Transit Buses

Measure Number: B2
Measure Name: Bike Racks on Transit Buses

Description:
Provide external bike racks on WMATA and other local transit buses

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 28,656
Estimated Reductions (NOx)	N/A

Issues

· Bike racks are currently being installed on WMATA and Ride-On buses as part of an emission reductions measure in the 2002 CLRP/FY 03 TIP.

· Next allocation for funds to expand exsiting program would be FY 05, beginning July 2004. This is after the beginning of the 2004 ozone season.

Assumptions

· WMATA buses have highest ridership, so installation of racks on those buses is most likely to be cost effective.
· Bike racks will be placed on all 1,458 WMATA buses
· Total WMATA bus ridership = 500,000 trips per day
· Increase in bus ridership due to bike rack installation will be 0.25% (Denver, CO study)
· Cost of racks + installation = $1,000 per bus
· Average avoided commute distance 15.5 miles each way
· 250 commute days per year

Emission Reductions

VT Reduced= 500,000 trips * 0.25% bus trip increase * 72.5% SOV trips
VT Reduced= 906 trips

VMT Reduced= 906 trips * 15.5 mi/trip
VMT Reduced= 14,043 miles

Total NOx Reduced= (14,043 mi/day * 0.8073 g/mi + 906 trips *1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.014 tpd

Total VOC Reduced= (14,043 mi/day * 0.3405 g/mi + 906 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.008 tpd

Cost Effectiveness

Annual Expenditure= $1,000 per rack * 1,458 racks / 15 year life per rack
Annual Expenditure= $ 97,200

Cost-effectiveness ($/ton) = $97,200 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 28,656
Cost-effectiveness (VOC) = $ 48,356

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure B3: Improvements to Bicycle and Pedestrian Access

Measure Number: B3
Measure Name: Improvements to Bicycle and Pedestrian Access
RACM Determination: No
Reason: Not economically feasible

Description:
Provide incentives to developments that speed improvements to bicycle/pedestrian access. This includes improvements to sidewalks, curb ramps, crosswalks, lighting, etc.

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 84,208
Estimated Reductions (NOx)	N/A

Issues

· Some projects of this type are already programmed as part of the 2002 CLRP/FY03 TIP. If programmed projects are not cost effective, additional projects will not be cost effective either.

· Funds for additional projects could not be allocated for FY 04 because budgets are nearly complete. Funds could not be allocated until FY 05, after the beginning of the 2004 ozone season.

Assumptions

· Several projects are planned in Maryland locations. Use estimates for these projects as a baseline for costs/benefits.
· Improvements will have 11 year lifetime (average 10 years for sidewalks, 12 years for signalization)
· From Michael Baker Jr. analysis:
  · Improvements will result in 5% transit ridership increase in areas of improvement
  · Transit ridership grows at 3% per year
  · In 2005, improvements will result in 750 additional commute riders daily
  · Average commute distance in area of improvements is 12 miles/trip
· Total cost of planned measures will be $4 million ($2.5 million for sidewalk construction, $1 million pedestrian bridges, $500,000 right-of-way)

Emission Reductions

VT Reduced= 750 commuters in 2005 * 2 trips/day / 1.03 change from 2004 to 2005
VT Reduced= 1,456 trips

VMT Reduced= 1,456 trips * 12 mi/trip
VMT Reduced= 17,476 miles

Total NOx Reduced= (17,476 mi/day * 0.8073 g/mi + 1,456 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.017 tpd

Total VOC Reduced= (17,476 mi/day * 0.3405 g/mi + 1,456 trips * 12 mi/trip trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.011 tpd

Cost Effectiveness

Annual Expenditure= $4,000,000 / 11 year life
Annual Expenditure= $ 363,636

Cost-effectiveness ($/ton) = $363,636 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 84,208
Cost-effectiveness (VOC) = $ 132,100

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure B4: Employers Provide Free Bicycles for Midday Use

Measure Number: B4

Measure Name: Employers Provide Free Bicycles for Midday Use

Description:
Require employers to provide one bicycle per 50 employees for mid-day business or personal use.

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Therefore a regulation could not deliver benefits by May 2004.

· This measure will encounter opposition from employers on ground of cost and availability of storage facilities

· Bicycle use by employees is anticipated to be low due to concerns about safety, inability to carry packages, travel time and lack of proper clothing.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure B5: Bike/Pedestrian Paths

Measure Number: B5
Measure Name: Bike/Pedestrian Paths

Description:
Fund construction of additional bicycle/pedestrian paths in the region

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 555,910
Estimated Reductions (NOx)	N/A

Issues

· One project of this type are already programmed as part of the 2002 CLRP/FY03 TIP. If programmed projects are not cost effective, additional projects will not be cost effective either.

· Funds for additional projects could not be allocated for FY 04 because budgets are nearly complete. Funds could not be allocated until FY 05, after the beginning of the 2004 ozone season.

Assumptions

· Analysis is for bike trail along Anacostia River
· Trail will have 10 year life
· Trail will reduce 262 vehicle trips and 685 VMT per day (Michael Baker Jr., Inc. estimate)
· Adjust estimate by correction factors for new Travel Demand Model (1.071176 VT, 1.01338943 VMT)
· New estimates 281 VT and 694 VMT
· Total cost of trail will be $1.32 million

Emission Reductions

Total NOx Reduced= (694 mi/day * 0.8073 g/mi + 281 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.001 tpd

Total VOC Reduced= (694 mi/day * 0.3405 g/mi + 281 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.001 tpd

Cost Effectiveness

Annual Expenditure= $1,320,000 / 10 year life
Annual Expenditure= $ 132,000

Cost-effectiveness ($/ton) = $132,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 555,910
Cost-effectiveness (VOC) = $ 471,660

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure B6: Bicycle Racks in DC

Measure Number: B6
Measure Name: Bicycle Racks in DC

Description:
Install bicycle racks at various locations throughout the region

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 9,017
Estimated Reductions (NOx)	0.003

Issues

· The 2003 TIP funds installation of 500 bicycle racks in the District

· As FY 04 budgets are complete, next allocation for funds to expand program would be FY 05 (July 2004). This is after the beginning of the 2004 ozone season.

Assumptions

· Purchase and installation of 50 racks will cost $125,000
· Racks will have 15 year lifespan
· Each rack will reduce 2 trips per day
· Avoided VMT will be 2 miles/trip
· Racks will be used 312 days per year

Emission Reductions

Daily VT Reduced= 2 trips/rack * 500 racks
Daily VT Reduced= 1,000 trips

Daily VMT Reduced= 1,000 trips * 2 miles/trip
Daily VMT Reduced= 2,000 miles/day

Total NOx Reduced= (2,000 mi/day * 0.8073 g/mi + 1,000 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.003 tpd

Total VOC Reduced= (2,000 mi/day * 0.3405 g/mi + 1,000 trips * 2.7731 g/mi) / (907,185 g/ton)
Total VOC Reduced= 0.004 tpd

Cost Effectiveness

Annual Expenditure= $125,000 / 15 year life
Annual Expenditure= $ 8,333

Cost-effectiveness ($/ton) = $8,333 / (tons/day * 312 days)

Cost-effectiveness (NOx) = $ 9,017
Cost-effectiveness (VOC) = $ 7,015

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure E1: 4 Day Work Week/Flexible Work Schedules

Measure Number: E1

Measure Name: 4 Day Work Week/Flexible Work Schedules

Description:
Encourage employers to adopt a shorter work week, with employees working 4 10-hour days

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Many employers already permit telecommuting or flexible work schedules during the summer (i.e. ozone season) so employees can care for school-age children

· Employers who do not permit telecommuting or flexible work schedules generally do so for business reasons rather than lack of awareness

· This type of program would be best administered as part of COG's regionwide Commuter Connections program.

· A regionwide push for increased flexible scheduling would require funding for advertising and outreach. As the program budget for FY 04 is already complete, this program could not be funded until FY 05, which is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E2: Build Park & Ride Lots at Major Intersections of Commuter Highways

Measure Number: E2

Measure Name: Build Park & Ride Lots at Major Intersections of Commuter Highways

Description:
Construct new park & ride commuter lots along HOV facilities

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Construction of new parking lots or structures would require location studies, local approval, possible rezoning, land acquisition, design and possible traffic flow adjustments

· As FY 04 budgets are nearly complete, funds for project study and design could not be allocated until FY 05 (July 2004.) This is after the beginning of the 2004 ozone season.

· Even if funds could be found immediately, site identification, land acqusition, project design and construction could not be completed by May 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E3: Telecommuting Centers

Measure Number: E3
Measure Name: Telecommuting Centers

RACM Determination: Possible
Reason:

Description:
Telecommuting centers, including marketing activity, consultant support, commuter and employer information and assistance

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 7,279
Estimated Reductions (NOx)	0.264

Issues

· Telework programs are included in the current TIP

· Estimated benefits from this program were significantly reduced from 1999 to 2002 (0.956 tpd NOx to 0.389 tpd NOx, and 0.504 tpd VOC to 0.195 tpd VOC)

· This measure is voluntary and includes a monitoring program that triennially assesses measure effectiveness

Assumptions

· LDA Consulting analysis estimates benefits from the Telework Resource Center during the period from July '99 - June '02 as:
  · average 12,590 VT reduced per day
  · average 279,692 VMT reduced per day
· 250 commute days per year
· Annual budget for measure is $480,000, including evaluation/monitoring program

Emission Reductions

Daily VT Reduced= 12,590
Daily VMT Reduced= 279,692

Total NOx Reduced= (279,692 mi/day * 0.8073 g/mi + 12,590 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.264 tpd

Total VOC Reduced= (279,692 mi/day * 0.3405 g/mi + 12,590 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.143 tpd

Cost Effectiveness

Annual Expenditure= $ 480,000

Cost-effectiveness ($/ton) = $480,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 7,279
Cost-effectiveness (VOC) = $ 13,383

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

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Measure E4: Commuter Operations Center

Measure Number: E4
Measure Name: Commuter Operations Center

Description:
Provides commuter assistance services, including carpool and vanpool ridematching

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 30,436
Estimated Reductions (NOx)	0.061

Issues

· This measure is voluntary and includes a monitoring program that triennially assesses measure effectiveness

· Estimated benefits from this program decreased by 0.017 tons VOC and 0.032 tons NOx from 1999 to 2002

Assumptions

· MWCOG Commuter Connections Program TERM Analysis Report (prepared by LDA Consulting, revised March 2003) estimates benefits from the Commuter Operations Center during the period from July 1999 through June 2002 as:

  · average 1,970 VT reduced per day

  · average 66,056 VMT reduced per day

· Average budget for evaluation period was approximately $465,000 including evaluation program

Emission Reductions

Daily VT Reduced= 1,970
Daily VMT Reduced= 66,056

Total NOx Reduced= (66,056 mi/day * 0.8073 g/mi + 1,970 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.061 tpd

Total VOC Reduced= (66,056 mi/day * 0.3405 g/mi + 1,970 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.031 tpd

Cost Effectiveness

Annual Expenditure= $ 465,000

Cost-effectiveness ($/ton) = $465,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 30,436
Cost-effectiveness (VOC) = $ 60,360

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure E5: Vanpool Programs

Measure Number: E5
Measure Name: Vanpool Programs

Description:
Create programs and incentives designed to increase the number of vanpools in the region.

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 185,169
Estimated Reductions (NOx)	N/A

Issues

· A few projects of this type are already programmed as part of the 2002 CLRP/FY03 TIP. If programmed projects are not cost effective, additional projects will not be cost effective either.

· FY 04 budgets are complete, so funds for additional projects could not be allocated until FY 05, after the beginning of the 2004 ozone season.

· Current programs are funded through 2007 only

Assumptions

· If currently funded program is not cost-effective, expansion would not be cost-effective either
· Current program creates 11 new vanpools with average of 9 riders (excluding driver)
· 72.5% of riders were using SOVs to commute
· 72.5% of riders drive to park & ride lot to access vanpool
· Each vanpool passenger avoids 25 VMT in each commute direction
· Average speed of travel of vanpool members would have been 40 mph, had they driven
· $900,000 in currently planned funding is sufficient for 6 years (2002-2007)

Emission Reductions

VT Reduced= 11 vanpools * 9 riders/vanpool * 72.5% SOV trips * 27.5% don't drive to P&R * 2 trips/day
VT Reduced= 39 trips

VMT Reduced= 11 vanpools * 9 riders/vanpool * 72.5% SOVs * 25 miles/trip * 2 trips/day
VMT Reduced= 3,589 miles/day

Total NOx Reduced= (3,589 mi/day * 0.8073 g/mi + 39 trips * 1.0725 g/trip) / 907,185 g/ton
Total NOx Reduced= 0.003 tpd

Total VOC Reduced= (3,589 mi/day * 0.3405 g/mi + 39 trips * 2.7731 g/trip) / 907,185 g/ton
Total VOC Reduced= 0.001 tpd

Cost Effectiveness

Annual Expenditure= $900,000 total funding / 6 years
Annual Expenditure= $ 150,000

Cost-effectiveness ($/ton) = $150,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 185,169
Cost-effectiveness (VOC) = $ 408,813

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure E6: Express Buses From Outyling Areas

Measure Number: E6
Measure Name: Express Buses From Outyling Areas

Description:
Implement direct bus service from outlying Park & Ride lots and far suburbs to major work centers

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· This measure would require WMATA to develop, fund, implement and publicize two new bus routes

· This measure would require rush-hour bus service on long routes. WMATA does not currently have extra buses that could be used for this service. All buses currently on order are slated for expansions of current service. Procurement of new buses and design and implementation of routes could not be funded until FY 05 (July 04). This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E7: New Surface Parking at Transit Centers

Measure Number: E7
Measure Name: New Surface Parking at Transit Centers

Description:
Add new parking spaces at transit centers (bus, Metrorail, MARC) parking lots

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 27,131
Estimated Reductions (NOx)	N/A

Issues

· A number of additional parking spaces are under construction and expected to be in use before 2005.

· Construction of parking lots or structures other than those already planned would require location studies, land acquisition, design, construction and possible traffic flow adjustments.

· FY 04 budgets are already complete. Therefore any new projects could not be funded until FY 05, after the beginning of the 2004 ozone season.

Assumptions

· New lots will be 100% utilized
· 70% of parkers will be new transit riders, 30% will be existing non-SOV riders
· Average occupancy of vehicles arriving at lot is 1.1 persons
· 90% of people using new parking spaces use transit. 10% carpool.
· Total average commute distance = 15.5 miles; average distance driven to parking lots = 6 miles (Michael Baker, Jr. analysis)
· Cost of lots = $5,000 per space
· All costs are for parking space construction -- no cost for land acquisition (cost of the measure is underestimated)
· 250 commute days per year

Emission Reductions

· From Michael Baker, Jr. Analysis:

Daily VT Increase= 11 trips/day
Daily VMT Reduced= 13,821 miles/day

Total NOx Reduced= (13,821 mi/day * 0.8073 g/mi - 11 trips * 1.0725 g/trip) / 907,185 g/ton
Total NOx Reduced= 0.012 tpd

Total VOC Reduced= (13,821 mi/day * 0.3405 g/mi - 11 trips * 2.7731 g/trip) / 907,185 g/ton
Total VOC Reduced= 0.005 tpd

Cost Effectiveness

Annual Expenditure= $5,000 per space * 500 spaces / 30 year life
Annual Expenditure= $ 83,333

Cost-effectiveness ($/ton) = $83,333 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 27,131
Cost-effectiveness (VOC) = $ 64,524

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure E8: Express Reverse Commuter Buses

Measure Number: E8
Measure Name: Express Reverse Commuter Buses

Description:
Implement reverse commute express buses from the District to major outlying work centers

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require WMATA to develop, fund, implement and publicize two new bus routes

· This measure would require rush-hour bus service on long routes. WMATA does not currently have extra buses that could be used for this service. All buses currently on order are slated for expansions of current service. Procurement of new buses and design and implementation of routes could not be funded until FY 05 (July 04). Threfore this measure could not deliver benefits by the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E9: Free Reserved Carpool/Vanpool Spaces

Measure Number: E9

Measure Name: Free Reserved Carpool/Vanpool Spaces

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Provide free reserved parking spaces for all carpools or vanpools

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Therefore a regulation could not deliver benefits by May 2004.

· The measure would be controversial, as it would impose a cost on employers. If every employee chose to carpool, the cost could be equivalent to providing free parking for half of all employees.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E10: Government Actions (ozone action day similar to snow day)

Measure Number: E10
Measure Name: Government Actions (ozone action day similar to snow day)
RACM Determination: Possible
Reason:

Description:
Implement a liberal leave policy for local, state and federal employees on Code Red Ozone Action Days, permitting employees to work from home or take unscheduled leave

Criterion Summary

Year of First Benefits	2004+
Enforceable	No
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 5,030
Estimated Reductions	1.578

Issues

· This measure would require an MOU signed by local, state and/or federal agencies

· This would be an episodic measure, and would only reduce emissions on predicted Code Red days

Assumptions

· Estimate reductions in commute trips only
· The region has averaged 6.3 Code Red Ozone Action Days per year during the period 2000-2002
· Based on regional surveys and a 1995/1996 survey performed in the Sacramento area, 3% of drivers change behavior on Ozone Action Days
· 72.5% of work trips are single-occupancy vehicle trips
· Average work trip length is 15.5 miles
· From Travel Demand Model Version 1, in 2005, 3,278,831 single-occupant vehicle work trips daily
· Scaling factor to convert TDM Version 1 trips to TDM Version 2.1 trips is 1.071176
· Therefore with new Travel Demand Model, there will be 3,512,205 single-occupant vehicle work trips daily
· This program would require $50,000 per year in monitoring costs

Emission Reductions

VT Reduced= 3,512,205 trips * 3% stay home
VT Reduced= 105,366 trips

VMT Reduced= 105,366 trips * 15.5 miles/trip
VMT Reduced= 1,633,175 miles/day

Total NOx Reduced= (1,633,175 mi/day * 0.8073 g/mi + 105,366 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 1.578 tpd

Total VOC Reduced= (1,633,175 mi/day * 0.3405 g/mi + 105,366 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.935 tpd

Cost Effectiveness

Annual Expenditure= $ 50,000

Cost-effectiveness ($/ton) = $50,000 / (tons/day * 6.3 days)

Cost-effectiveness (NOx) = $ 5,030
Cost-effectiveness (VOC) = $ 8,488

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure E11: Guaranteed Ride Home

Measure Number: E11
Measure Name: Guaranteed Ride Home

RACM Determination: No
Reason: Not economically feasible

Description:
Provides free rides home in event of unexpected emergency or unscheduled overtime to commuters using public transport

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 35,741
Estimated Reductions (NOx)	N/A

Issues

· This measure is voluntary and includes a monitoring program that triennially assesses measure effectiveness

Assumptions and Emission Reductions

· MWCOG Commuter Connections Program TERM Analysis Report (prepared by LDA Consulting, revised March 2003) estimates benefits from Guaranteed Ride Home during the period from July 1999 through June 2002 as:

  · average 6,803 VT reduced per day

  · average 202,058 VMT reduced per day

· Average budget for evaluation period was approximately $1,678,500, including monitoring program

Emission Reductions

Daily VT Reduced= 6,803
Daily VMT Reduced= 202,058

Total NOx Reduced= (202,058 mi/day * 0.8073 g/mi + 6,803 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.188 tpd

Total VOC Reduced= (202,058 mi/day * 0.3405 g/mi + 6,803 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.097 tpd

Cost Effectiveness

Annual Expenditure= $ 1,678,500

Cost-effectiveness ($/ton) = $1,678,500 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 35,741
Cost-effectiveness (VOC) = $ 69,478

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure E12: Integrated Rideshare

Measure Number: E12
Measure Name: Integrated Rideshare

Description:
Provides transit, park & ride, and telecenter information to all commuters on a matchlist

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 5,578
Estimated Reductions	0.159

Issues

· This measure is voluntary and includes a monitoring program that triennially assesses measure effectiveness

Emissions Reductions

· MWCOG Commuter Connections Program TERM Analysis Report (prepared by LDA Consulting, revised March 2003) estimates benefits from Integrated Rideshare during the period from July 1999 through June 2002 as:

· average 3,418 VT reduced per day

· average 117,940 VMT reduced per day

· Average budget for evaluation period was approximately $152,000, including monitoring program

Emission Reductions

Daily VT Reduced= 3,418
Daily VMT Reduced= 117,940

Total NOx Reduced= (117,940 mi/day * 0.8073 g/mi + 3,418 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.109 tpd

Total VOC Reduced= (117,940 mi/day * 0.3405 g/mi + 3,418 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.055 tpd

Cost Effectiveness

Annual Expenditure= $ 152,000

Cost-effectiveness ($/ton) = $152,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 5,578
Cost-effectiveness (VOC) = $ 8,216

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

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Measure E13: Mandatory Employee Commute Reduction

Measure Number: E13
Measure Name: Mandatory Employee Commute Reduction

Description:
Mandatory employer trip reduction to reduce trips by regional average of 20%

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	N/A
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Therefore a regulation could not deliver benefits by May 2004.

· This measure would encounter significant opposition from the business community. It could hamper development in areas with little or no transit access.

· This program is goal-based, and legal action could be take against the states if this program were implemented and goals were not met.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E14: Student & staff based college & university rideshare programs

Measure Number:	E14	**Description:**
Measure Name:	Student & staff based college & university rideshare programs	Create rideshare program focused on students and staff at regional universities
RACM Determination:	No	
Reason:	Would not deliver benefits by May 2004	

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Student enrollment at colleges and universities is much lower during the summer term, which coincides with ozone season.

· Many college students carpool already, either because they do not own cars or do not wish to pay for on-campus parking. Many other students take the bus or walk to class. As a result, a rideshare program may have little effect on vehicle trips.

· Part-time students, who are most likely to drive, also often need vehicles to travel to and from work. As a result, they are poor candidates for rideshare.

· Because FY 04 budgets are complete, development and administration of this program could not be funded until FY 2005, after the commencement of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E15: Vanpool Insurance

Measure Number: E15
Measure Name: Vanpool Insurance

Description:
Establish a special risk pool to underwrite the cost of vanpool insurance

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program would need to be implemented through a self-insurance program or through a contract with a major area insurer.

· Self-insurance would require a significant and costly development and implementation process, including employment of a contractor or creation of a new division of a regional agency

· A contract with a major insurer would require a full bid development and award process

· An extensive publicity and marketing program would be necessary to attract participants.

· Either implementation of this program would require significant planning and development time and significant funding. As FY 04 budgets are complete, this program could not be funded until FY 05, beginning July 2004. This is after the commencement of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure E16: Ban Vehicles from Downtown Streets

Measure Number: E16
Measure Name: Ban Vehicles from Downtown Streets

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Restrict private vehicle use in certain downtown areas during business hours, encouraging pedestrian and bicycle use instead.

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure will encounter opposition from taxi drivers, delivery workers and any other employee whose livelihood depends upon driving a car through the downtown business district during normal working hours.

· This measure would substantially increase gridlock on other roads in the region as traffic normally traveling through the District is diverted to other roads, e.g. the Beltway

· This measure would require legislative action on the part of the D.C. Council and Boards of Supervisors of any toher participating counties. Because legislatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· This measure would be highly controversial and could not pass and be implemented before March 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure F1: Expand HOV Network on the Freeway System

Measure Number: F1
Measure Name: Expand HOV Network on the Freeway System

Description:
Construct additional HOV lanes on regional freeways, for example I-95 and I-695

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require preparation and approval of one or more EA/EIS analyses, requiring 12-24 months

· Projects would need to be allocated funding, put out to bid, and constructed, requiring an additional 12-36 months

· FY 04 budgets are complete, so this program could not be funded until FY 05, beginning July 2004.

· Even if funding were identified immediately, additional lanes could not be designed, planned and constructed by May 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure F2: Extend Ramp Metering

Measure Number: F2
Measure Name: Extend Ramp Metering

Description:
Install signals to control flow of vehicles at selected freeway ramp entrances to maintain level of service

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· MDOT, VDOT and DC-DOT would need to undertake evaluations of all regional ramps to determine which are eligible

· Once a study is completed, procurement, installation and timing of signals would require 6-12 months

· As ramp metering is not common in this region, motorist education may be necessary to explain usefulness of signals

· As FY 04 budgets are complete, this project could not be funded until FY 05, after the beginning of the 2005 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure F3: Permit Right Turn on Red

Measure Number: F3
Measure Name: Permit Right Turn on Red

Description:
Reduce vehicle idling time by permitting right turn on red, where safety allows

RACM Determination: Possible
Reason:

Criterion Summary

Year of First Benefits	2002
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program is being implemented in the District.

· Before the program could be implemented in other regions, state transportation agencies would need to conduct a study of all intersections to determine which are candidates for permitting right turn on red.

· As FY 04 budgets are complete, these studies could not be funded until FY 05 (beginning July 04).

· Therefore the only candidate intersections are ones already identified.

Assumptions

· Assume that right turn on red is permitted for an additional:
  · 24 hours/day at 330 intersections
  · 12 hours/day at 448 intersections
· At intersections permitting right turn on red an additional 12 hours a day, assume 2 hours are peak and 8 hours are off-peak
· At intersections permitting right turn on red an additional 24 hours a day, assume 2 hours are peak, 18 hours are off-peak (4 hours deliver no benefit)
· As a result of new policy, each vehicle moving through affected intersection saves:
  · 10 seconds/intersection peak period
  · 5 seconds/intersection off-peak period
· Average intersection volume is :
  · 340 vehicles per hour peak
  · 295 vehicles per hour off-peak
· Average idle emissions per hour = emissions at 2.5 mph * 2.5 miles
· Average regional fleet emissions = average of emissions at 2 mph and 3 mph
  · Average regional fleet emissions 2 mph: 6.0875 g/mi VOC; 2.9527 g/mi NOx
  · Average regional fleet emissions 3 mph: 4.7701 g/mi VOC; 2.8284 g/mi NOx
· Measure delivers benefits on commute days only: 250 days/yr
· Measure costs $23,000 for sign removal

Emission Reductions

Averted Vehicle Hours of Travel = ((2 hours * 330 intersections * 340 vehicles * 5 seconds) + (18 hours * 330 intersections * 295 vehicles * 10 seconds) + (2 hours * 448 intersections * 340 vehicles * 5 seconds) + (10 hours * 448 intersections * 295 vehicles * 10 seconds)) / 3600 seconds/hour

Averted Vehicle Hours of Travel = 9,273 hours

Total NOx Reduced= (9,273 hours * (2.9527 g/mi + 2.8284 g/mi) / 2 * 2.5 miles) / (907,185 g/ton)

Total NOx Reduced= 0.074 tpd

Total VOC Reduced= (9,273 hours * (4.7701 g/mi + 6.0875 g/mi) / 2 * 2.5 miles) / (907,185 g/ton)

Total VOC Reduced= 0.139 tpd

Cost Effectiveness

Annual Expenditure= $ 23,000

Cost-effectiveness ($/ton) = $23,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 1,245

Cost-effectiveness (VOC) = $ 663

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure F4: Replace Traffic Signals with Lesser Controls

Measure Number: F4

Measure Name: Replace Traffic Signals with Lesser Controls

Description:
Install roundabouts in place of signalized intersections

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· VDOT, MDOT and DC-DOT would need to undertake evaluations of all intersections to determine which intersections are eligible

· Environmental Assessments may be required

· A bid and contracting process would be required for roundabout design and construction

· As FY 04 budgets are complete, this study could not be funded until FY 05, beginning July 2004.Thisis after commencement of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure F5: Signals to Flashing Yellow 12am-5am

Measure Number: F5
Measure Name: Signals to Flashing Yellow 12am-5am
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
From midnight until 5am, set intersection signals to flashing yellow in predominant direction and flashing red in minor direction for all low volume intersections where safety permits

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· VDOT, MDOT and DC-DOT would need to undertake evaluations of all intersections to determine which intersections are eligible

· Lights for all eligible intersections would need to be retimed

· Citizens might object to reduced signal timing for safety reasons

· As FY 04 budgets are complete, this study could not be funded until FY 05, beginning July 2004. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure F6: Speed Limit Adherance

Measure Number: F6
Measure Name: Speed Limit Adherance

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Increase speed limit enforcement on portions of the freeway system where speeding is a problem so that more vehicles are traveling at or below the posted limit

Criterion Summary

Year of First Benefits	2005+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Emission factors developed for the region using MOBILE6 indicate that this measure would increase VOC emissions rather than reducing them. VOC emission rates decrease as speed increases, even at 65 mph. NOx emissions would decrease.

· When this measure was proposed for inclusion in the TIP, TPB received many community comments opposing the measure

· This measure could be implemented by hiring additonal police officers or by using photo radar technology. Because FY 04 budgets are already complete, funds for neither the officers nor the technology could not be allocated in FY 04. This measure could first be funded in FY 05, beginning July 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Additinally, the increase in VOC emissions resulting from this measure would hinder the Washington region's ability to demonstrate Rate of Progress. Therefore, this measure is not a RACM.

Measure F7: Regional Traveler Information/Assistance Systems

Measure Number: F7
Measure Name: Regional Traveler Information/Assistance Systems
RACM Determination: No
Reason: Not economically feasible

Description:
Regional traveler information/assistance systems to facilitate efficient traffic management during incidents and accidents.

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 28,783
Estimated Reductions (NOx)	N/A

Issues

· All three states plan to implement this measure
· Implementation should be complete by 2005

Assumptions

· From 2005 controlled mobile inventory, projected regional network emissions are:
  · 213.9 tpd NOx
  · 74.54 tpd VOC
· From 2002 controlled mobile inventory, projected regional network emissions are:
  · 263.56 tpd NOx
  · 97.45 tpd VOC
· Use straight-line interpolation to estimate the 2004 controlled inventory
  · 230.45 tpd NOx
  · 82.18 tpd VOC
· Freeway emissions are approximately 40% of network emissions
· 4.9% of freeway emissions are due to non-recurring congestion (FHWA 1)
· 15% of non-recurring congestion can be eliminated by a robust freeway surveillance system (FHWA 1)
· Regional freeway surveillance system was 70% operational in 2000, and will be 100% operational in 2005. (FHWA 2)
· Using straight-line interpolation, assume surveilliance system will be 94% operational in 2004.
· A motorist assistance program can eliminate 25% of non-recurring congestion emissions (FHWA estimate)
· Regional motorist assistance covered 75% of freeway miles in 2000 and will cover 100% of freeway miles in 2005.
· Using straight-line interpolation, assume motorist assistance will cover 95% of freeway miels in 2004.
· Because only minor incidents are included in background data, assume 50% of maximum benefits from motorist assistance program are creditable.
· Systems deliver benefits 365 days/year
· VDOT travel information system costs $300,000 annually in O&M. Capital costs unknown, so system cost will be underestimated.
· DC Incident & Response system costs $20,800,000 over 6 years
· MD ITS system will cost approximately $4,232,000 in capital expenditures in 2004 (already amortized) and $4,327,000 in O&M

Emission Reductions

Non-recurring congestion (NOx)= 230.45 tons/day network * 40% of network is freeway * 4.9% non-recurring congestion
Non-recurring congestion (NOx)= 4.52 tpd

Freeway surveillance (NOx)= 4.52 tpd non-recurring congestion * 15% reduction * 94% implementation
Freeway surveillance (NOx)= 0.64 tpd

Motorist assistance (NOx)= 4.52 tons non-recurring congestion * 95% implementation * 25% reduction * 50% credit
Motorist assistance (NOx)= 0.54 tpd

Total NOx Reduced= 1.173 tpd

Non-recurring congestion (VOC)= 82.18 tons/day network * 40% of network is freeway * 4.9% non-recurring congestion
Non-recurring congestion (VOC)= 1.61 tpd

Freeway surveillance (VOC)= 1.61 tpd non-recurring congestion * 15% reduction * 94% implementation
Freeway surveillance (VOC)= 0.23 tpd

Motorist assistance (VOC)= 1.61 tons non-recurring congestion * 95% implementation * 25% reduction * 50% credit
Motorist assistance (VOC)= 0.19 tpd

Total VOC Reduced= 0.418 tpd

Cost Effectiveness

Annual Expenditure= ($4,232,000 + $4,327,000) MD + $300,000 VA + $20,800,000 / 6 years District
Annual Expenditure= $ 12,325,994

Cost-effectiveness ($/ton) = $12,325,994 / (tons/day * 365 days)

Cost-effectiveness (NOx) = $ 28,783
Cost-effectiveness (VOC) = $ 80,714

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure L1: Smart Growth and Infill Development Programs

Measure Number: L1
Measure Name: Smart Growth and Infill Development Programs
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Encourage development/redevelopment of land in designated growth areas, encouraging local governments to place greater emphasis on land development near transit stations

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Smart Growth planning is currently in place in parts of Maryland and Northern Virginia.

· The benefits from these existing Smart Growth programs are already taken in the SIP through the updated land use assumptions incorporated in the newest Travel Demand Model, which is used to predict mobile emissions.

· Any additional Smart Growth programs would result from local zoning and land use decisions or state regulations.

· Even if municipalities agreed to rezone for Smart Growth and completed a very expedited rezoning process in the summer of 2003, developers would have to design, finance, construct and sell or lease housing, retail or commercial space in the rezoned area. This process could not be completed before May 2004.

Summary Analysis

Benefits from current Smart Growth programs are already incorporated in the SIP. New programs could not deliver benefits by the conclusion of the 2004 ozone season. Therefore, this measure is not a RACM.

Measure L2: Convenience Commercial Centers in Residential Areas

Measure Number: L2

Measure Name: Convenience Commercial Centers in Residential Areas

Description:
Change zoning ordinances to allow neigborhood-serving retail establishments in residential areas

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· If zoning variances were requested in mid-2003, variances could be approved by early 2004. However, design, financing, construction, hiring etc for a business could not be completed before May 2004.

· Large-scale zoning changes could require full planning process and legislative approval (2-3 years, no benefits by 2004)

· Citizens in residential areas may object to large-scale zoning changes permitting commercial establishments

· This measure is dependent upon interest of potential merchants and residents. Given the current economy, it is unlikely that a large number of merchants would be interested in new locations.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure L3: Proximity Commuting (Live Near Your Work)

Measure Number: L3

Measure Name: Proximity Commuting (Live Near Your Work)

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Provides financial incentives to homebuyers moving to designated neighborhoods near their workplaces

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program is funded in Maryland, but most designated neighborhoods are outside the Washington nonattainment area. Furthermore, the program was designed to promote urban redevelopment rather than to provide air quality benefits. There is no guarantee that this program will decrease the average commute distance of participants.

· This program could be redefined and expanded to encourage shorter commute distances in the Washington region. However since FY 04 budgets are nearly complete, this program could not be funded until FY 05, beginning July 2004. Therefore the progra could not deliver benefits by the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by 2004. Therefore it is not a RACM.

Measure L4: Incentives for Mixed Use at Transit Centers

Measure Number: L4
Measure Name: Incentives for Mixed Use at Transit Centers

Description:
Include incentives for mixed-use development at transit centers to reduce sprawl and VMT

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Financial incentives would need to be budgeted by each state or local government. As FY 04 budgets are nearly complete, this program could not be budgeted until FY 05, beginning July 2004.

· Even if funding were approriated immediately, zoning, construction and leasing could not take place in time to deliver benefits in May 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M1: Parking Impact Fee

Measure Number: M1
Measure Name: Parking Impact Fee

Description:
Levy a $250 annual fee on every commuter parking space in the Washington nonattainment area

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	Revenue
Estimated Reductions (NOx)	N/A

Issues

· This measure would require legislative action. Because legislatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

· This program would be extremely controversial, especially among commuters who have no option but to drive to work.

· This program could discourage employers from locating in areas with poor transit access, such as outlying counties.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M2: Annual Gasoline Vehicle Pollution Fee

Measure Number: M2
Measure Name: Annual Gasoline Vehicle Pollution Fee

Description:
Levy an annual fee on petroleum-powered vehicles based on mileage driven and emission rates.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	Revenue
Estimated Reductions (NOx)	N/A

Issues

· Annual fee would be levied on petroleum vehicles at time of registration or inspection.

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

· Currently many rental car companies register vehicles in the Washington area, even if the vehicles operate in the Baltimore or Tidewater Virginia areas. This measure would discourage such practices and decrease state revenues.

· The benefits of this measure are difficult to quantify because of a lack of research on the effects of similar measures

· This measure would be extremely controversial and would be unlikely to pass the legislature.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M3: Cash for Clunkers

Measure Number: M3
Measure Name: Cash for Clunkers

Description:
Purchase pre-1980 vehicles with minimal/no emissions controls

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Emissions benefits are transient, because these vehicles would eventually be replaced or scrapped by owners.

· This program would compete with numerous area charities offering tax deductions for old unused cars.

· Most old cars are driven very seldom.

· This program is not funded. Because of the large subsidy given for each car and the need for a media campaign to recruit participants who would otherwise donate or resell their vehicles, this program would need to be specifically budgeted.

· As FY 04 budgets are already complete, this program could not be funded until FY 05 (July 2004).

· Air agencies would need to contract for scrappage of participating vehicles

Summary Analysis

This measure would not rdeliver benefits by May 2004. Therefore it is not a RACM.

Measure M4: Commuter Choice Tax Credit

Measure Number: M4
Measure Name: Commuter Choice Tax Credit

RACM Determination: No
Reason: Not economically feasible

Description:
Employers subsidize employees' monthly transit or vanpool costs and receive a tax credit for incurred expenses.

Criterion Summary

Year of First Benefits	2003+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 39,978
Estimated Reductions (NOx)	N/A

Issues

· This program is implemented in Maryland.

· Expanding this program throughout the region would require legislation in Virginia and the District

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

Assumptions

· Currently funded Maryland program will provide good cost-effectiveness benchmark for region-wide implementation
· From Michael Baker, Jr. Inc analysis using EPA's COMMUTER model, increased marketing initiatives will result in reduction of:
  · 17,300 daily vehicle trips by 2005
  · 258,100 daily VMT by 2005
· From Michael Baker Jr., Inc., cost of measure is estimated at $2.5 million annually
· As this analysis was based on participation estimates for 2005, benefits for 2004 will be overstated
· According to MDOT, participation rates for 2002 are far lower than estimated, so benefits for 2004 will be overstated

Emission Reductions

Total NOx Reduced= (258,100 mi/day * 0.8073 g/mi + 17,300 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.250 tpd

Total VOC Reduced= (258,100 mi/day * 0.3405 g/mi + 17,300 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.150 tpd

Cost Effectiveness

Annual Expenditure= $ 2,500,000

Cost-effectiveness ($/ton) = $2,500,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 39,978
Cost-effectiveness (VOC) = $ 66,775

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure M5: Congestion Pricing on Low Occupancy Vehicles

Measure Number: M5
Measure Name: Congestion Pricing on Low Occupancy Vehicles
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Impose a fee on vehicles containing two or fewer persons that use designated roadways during the peak AM period

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	N/A
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Because it collects fees, this program would require legislation in Maryland, Virginia and the District.

· Any non-technology-based implementation of this measure, such as the addition of tollbooths, would have a high cost and might actually generate emissions through increased idling.

· A technology-based solution, such as the installation of an EZ-Pass-like system in every car registered in the nonattainment area, would be time-consuming and costly. Additionally, this method could not determine vehicle occupancy.

· MDOT, VDOT and DC DOT would need to complete studies to identify candidate roadways and determine the effect of this measure on local traffic patterns.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M6: Gas Tax Increase

Measure Number: M6
Measure Name: Gas Tax Increase

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Increase state and local gas taxes to add 10% to purchase price of gasoline. Use proceeds to fund regional transit operations.

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	Revenue
Estimated Reductions (NOx)	N/A

Issues

· Many commuters could avoid the tax by purchasing gas outside the nonattainment region.

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

· This measure would hurt small delivery and trucking businesses

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M7: Graduated Vehicle Registration Fee Based on Number of Vehicles

Measure Number: M7

Measure Name: Graduated Vehicle Registration Fee Based on Number of Vehicles

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Assess graduated vehicle registration fee/car tax on every privately owned vehicle in the region. Households with multiple vehicles pay higher tax on each additional vehicle

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	Revenue
Estimated Reductions (NOx)	N/A

Issues

· Virginia has reduced its car tax in recent years and plans eventually to eliminate the tax altogether.

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M8: Market Based Parking Charges at Federal Facilities

Measure Number: M8

Measure Name: Market Based Parking Charges at Federal Facilities

Description:
Require all federal work sites to charge the equivalent of commercial parking rates.

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program could be implemented through an MOU with the GSA, branches or the military, and other government branches that operate parking spaces

· This measure could not be implemented through regulation or legislation specifically targeting the federal government. Any legislation would need to affect all parking spaces in the region (e.g. a parking impact fee)

· Parking is an important fringe benefit for many federal employees. This measure would be opposed by federal workers.

· States do not believe that if federal agencies were approached in 2003, an MOU could be signed and delivering benefits by May 2004.

· Any changes in federal parking rates would need to be included in the federal budget. The budget for FY 04, beginning October 2003, is already complete. Therefore rate changes could next be included in the F 05 budget, beginning October 2004.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M9: Commuter Choice - State & Local Government Employees

Measure Number: M9
Measure Name: Commuter Choice - State & Local Government Employees

Description:
Provide the region's local, state and municipal employees with transit benefits

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost (NOx)	$ 121,910
Estimated Reductions (NOx)	N/A

Issues

· This program is already in place for federal employees and government employees working in the State of Virginia

· Many employees who will benefit from this measure already use transit. This analysis tabulates benefits only from riders who switch to transit or carpools because of the measure.

· As FY 04 budgets are largely complete, this program could not be expanded to cover additional jurisdictions until FY 2005 (July 2004).

Assumptions

· Currently funded Virginia program will provide a cost-effectiveness benchmark. If current program is not cost effective, expanded programs will not be cost effective.
· Divide analysis region into two zones.
  · Zone 1 = Arlington, Alexandria, Fairfax, Falls Church
  · Zone 2 = Fredericksburg, Manassas, Loudoun, Prince William
· Zone 1 will see a 3.4% increase in transit or vanpool use (from COG Mode Choice Sensitivity Analysis program)
· Zone 2 will see a 1.58% increase in transit or vanpool use
· 6,199 eligible employees in Zone 1
· 1,935 eligible employees in Zone 2
· Average transit benefit is $55/month for 12 months
· 250 commute days per year
· This analysis uses 2005 program participation estimates, so it will overstate benefits

Emission Reductions

VT Reduced= (6,199 Zone 1 * 3.4% increase + 1,935 Zone 2 * 1.58% increase) * 72.5% SOV * 2 trips/day
VT Reduced= 350 trips

VMT Reduced= 350 trips * 15.5 miles/trip
VMT Reduced= 5,424 miles/day

Total NOx Reduced= (5,424 mi/day * 0.8073 g/mi + 350 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.005 tpd

Total VOC Reduced= (5,424 mi/day * 0.3405 g/mi + 350 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.003 tpd

Cost Effectiveness

Annual Expenditure= $55/month * 12 months * 242 employees
Annual Expenditure= $ 159,720

Cost-effectiveness ($/ton) = $159,720 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 121,910
Cost-effectiveness (VOC) = $ 205,711

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure M10: Pay-as-you-drive auto insurance ($/gal)

Measure Number: M10
Measure Name: Pay-as-you-drive auto insurance ($/gal)

Description:
Offer auto insurance rates linked to number of gallons of fuel consumed by vehicle

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This program would need to be implemented through a self-insurance program or through a contract with a major area insurer.

· Self-insurance would require a significant and costly development and implementation process, including employment of a contractor or creation of a new division of a regional agency

· A contract with a major insurer would require a full bid development and award process

· An extensive publicity and marketing program would be necessary to attract participants.

· As FY 04 budgets are complete, program development for this measure could not be funded until FY 05, beginning July 2004. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M11: VMT Tax (2 cents/mile)

Measure Number: M11
Measure Name: VMT Tax (2 cents/mile)

Description:
Charge VMT tax of $0.02 per mile for all vehicles registered or garaged in the region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	Revenue
Estimated Reductions	N/A

Issues

· The amount of tax would be determined by recording odometer mileage during vehicle inspection.

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

· Any new taxes are unlikely to pass the legislature

· This measure would have adverse effects on delivery drivers and small business owners

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M12: Voluntary Employer Parking Cash-Out Subsidy

Measure Number: M12

Measure Name: Voluntary Employer Parking Cash-Out Subsidy

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Employers who provide free parking would be encouraged to provide the cash equivalent of the parking subsidy to employees who do not drive to work.

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· This voluntary measure would affect work-related trips only.

· This measure could be implemented as part of the existing Commuter Connections program. However, as the Commuter Connections work program for FY 04 is already complete, this program could not be budgeted until FY 05 (beginning July 2004). Participants would then need to be recruited.

· As employers would need to budget for this measure, it would probably not to deliver benefits until the beginning of FY 2005 (usually January 2005 for private sector)

· In the current economic climate, businesses may be hesitant to spend additional funds on employee benefits.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M13: Half Price Fares on Feeder Bus Service

Measure Number: M13
Measure Name: Half Price Fares on Feeder Bus Service

Description:
All metro bus and local bus services to Metrorail and commuter rail stations reduce fares by half.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would be implemented as a WMATA fare adjustment

· WMATA is facing budgetary problems and will raise fares and/or parking fees beginning FY 04 (July 03). Fare cuts could next be implemented in the FY 05 budget.

· FY 05 begins in July 2004, after the beginning of the 2004 ozone season.

· This measure could adversely impact WMATA's ability to provide comprehensive transit service.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure M14: Free Parking for Carpools

Measure Number: M14
Measure Name: Free Parking for Carpools

Description:
All employers must provide free parking spaces for all carpools or vanpools.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would have significantly more impact on employers who do not own parking lots or receive free access to parking garages. Depending upon this number of employees who take advantage of this offer, this measure could become very costly, especially for small businesses.

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before the Fall 2003 session.

· If the measure were passed during the 03-04 session, legislators would need to provide time for employers to determine the number of employees planning to participate in the program and find and lease sufficient parking spaces. Participation probably could not be required until the beginning of the employer's next fiscal year, usually January 1, 2005.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M15: Tax Parking Spaces Above Code Minimum

Measure Number: M15

Measure Name: Tax Parking Spaces Above Code Minimum

RACM Determination: No

Reason: Would not deliver benefits by May 2004

Description:

Discourage developers from providing parking in excess of code minimum by imposing a graduated tax on excess spaces.

Criterion Summary

Year of First Benefits	2005
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure could hinder development in areas with no access to transit

· This measure would require legislative action. Because the legslatures have recessed for the summer, this measure could not be taken up before Fall 2003.

· If passed during the 03-04 session, this measure would not go into effect until the following fiscal year, beginning July 2004. This is after the start of the 2004 ozone season.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure M16: Reduce Parking Fees at Facilities Outside the Beltway Adjacent to Metro

Measure Number: M16
Measure Name: Reduce Parking Fees at Facilities Outside the Beltway Adjacent to Metro
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Reduce parking fees at Metro parking facilities or county/city managed facilities outside of the Beltway that are located near Metro stations.

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would be implemented as a WMATA parking fee adjustment or a reduction in state/county revenues

· WMATA is facing budgetary problems and will raise fares and/or parking fees beginning FY 04 (July 03). State and local jurisdictions have any completed FY 04 budgets.

· FY 05 begins in July 2004, after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure O1: Bike to Work Day

Measure Number: O1
Measure Name: Bike to Work Day

RACM Determination: No
Reason: Will not reduce emissions

Description:
Conduct a one-day bike to work event. Provide outreach activities, education on the bike-to-work option, and assistance in trying bike-to-work

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This one-day promotional event. It is an important educational tool, but does not attempt to reduce VMT on a consistent or episodic basis.

· As a result, this measure is not expected to result in a regular behavioral change, and estimated reductions from this program are zero.

Summary Analysis

This measure will not reduce emissions on a consistent or episodic basis. Therefore it is not a RACM.

Measure O2: Clean Air Partners Program

Measure Number: O2
Measure Name: Clean Air Partners Program

Description:
This program motivates individuals to take voluntary actions to reduce emissions on Ozone Action Days

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 56,443
Estimated Reductions (NOx)	N/A

Issues

· This program has been operating for a number of years.

· As this is a voluntary measure, an evaluation program would be required to confirm reductions.

Assumptions

· Estimate reductions in commute trips only

· Washington region portion of Clean Air Partners costs will be approximately $432,100 in 2003

· The region has averaged 9.33 Ozone Action Days per year during the period 2000-2002

· Based on regional surveys and a 1995/1996 survey performed in the Sacramento area, assume that 3% of drivers change behavior on Ozone Action Days

· Average participating driver reduces 1.04 trips on Ozone Action Days (Sacramento survey)

· Assuming average driver makes 2 trips (to and returning from work) commute trips are reduced by 52%

· 72.5% of work trips are single-occupancy vehicle trips

· Average work trip length is 15.5 miles

· From Travel Demand Model Version 1, in 2005, 3,278,831 single-occupant vehicle work trips daily

· Scaling factor to convert TDM Version 1 trips to TDM Version 2.1 trips is 1.071176

· Therefore with new Travel Demand Model, there will be 3,512,205 single-occupant vehicle work trips daily

· This analysis overestimates the benefits of this measure, as free transit service is only provided on Code Red Ozone Action Days. Over the past 3 years, only 2/3 of the ozone actions days declared in the Washington region have been Code Red days.

Emission Reductions

VT Reduced= 3,512,205 trips * 3% drive less * 52% trip reduction
VT Reduced= 54,790 trips

VMT Reduced= 54,790 trips * 15.5 miles/trip
VMT Reduced= 849,251 miles/day

Total NOx Reduced= (849,251 mi/day * 0.8073 g/mi + 54,790 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.821 tpd

Total VOC Reduced= (849,251 mi/day * 0.3405 g/mi + 54,790 trips * 2.7731 g/trip) / (907,185 g/ton)

Total VOC Reduced= *0.486 tpd*

Cost Effectiveness

Annual Expenditure= $ 432,100

Cost-effectiveness ($/ton) = $432,100 / (tons/day * 9.33 days)

Cost-effectiveness (NOx) = $ 56,443
Cost-effectiveness (VOC) = $ 95,247

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectivness threshold. Therefore it is not a RACM.

Measure O3: Clean Commute/Try Transit Week

Measure Number: O3
Measure Name: Clean Commute/Try Transit Week

RACM Determination: No
Reason: Will not reduce emissions

Description:
Promotes use of alternative transportation, including transit, by daily commuters for one week per year

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	0

Issues

· This one-week promotional event. It is an important educational tool, but does not provide incentives to reduce VMT on a consistent or episodic basis.

· As a result, this measure is not expected to result in a regular behavioral change, and estimated reductions from this program are zero.

Summary Analysis

This measure will not reduce emissions on a consistent or episodic basis. Therefore it is not a RACM.

Measure O4: Employer Outreach (Private Sector)

Measure Number: O4
Measure Name: Employer Outreach (Private Sector)

RACM Determination: Possible
Reason:

Description:
Provide regional outreach to encourage large private-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/NOx)	$ 3,542
Estimated Reductions (NOx)	1.070

Issues

· As this is a voluntary measure, an evaluation program would be required to confirm reductions

· The public sector portion of this measure has been funded for Northern Virginia. It could be expanded to other regions if it were budgeted for FY 2004, resulting in implementation in 2004.

· Private sector portion is coordinated by Commuter Connections

Assumptions

· MWCOG Commuter Connections Program TERM Analysis Report (prepared by LDA Consulting, revised March 2003) estimates benefits from Employer Outreach during the period from July 1999 through June 2002 as:
  · average 71,267 VT reduced per day
  · average 1,107,698 VMT reduced per day
· Annual cost of measure is $947,550

Emission Reductions

VT Reduced= 71,267 trips/day
VMT Reduced= 1,107,698 miles/day

NOx Reduced= (1,107,698 mi/day * 0.8073 g/mi + 71,267 trips * 1.0725 g/trip) / 907,185 g/ton
NOx Reduced= 1.070 tpd

VOC Reduced= (1,107,698 mi/day * 0.3405 g/mi + 71,267 trips * 2.7731 g/trip) / 907,185 g/ton
VOC Reduced= 0.634 tpd

Cost Effectiveness

Annual Expenditure= $ 947,550

Cost-effectiveness ($/ton) = $947,550 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 3,542
Cost-effectiveness (VOC) = $ 5,982

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

threshold necessary for RACM. Therefore this measure is not a RACM.

Measure O5: Employer Outreach (Public Sector)

Measure Number: O5
Measure Name: Employer Outreach (Public Sector)

RACM Determination: No
Reason: Not economically feasible

Description:
Provide regional outreach to encourage public-sector employers to voluntarily implement alternative commute strategies to reduce vehicle trips to work sites

Criterion Summary

Year of First Benefits	present
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/NOx)	$ 24,072
Estimated Reductions (NOx)	N/A

Issues

· As this is a voluntary measure, an evaluation program would be required to confirm reductions

· This measure has been funded for Northern Virginia. It could be expanded to other regions but probably could not be budgeted for FY 2004, because budgets are nearly complete. If program were budgeted starting FY 05 (July 2004) it would not begin after the start of the 2004 ozone season.

Assumptions & Emission Reductions

· 273,000 regional public-sector employees do not commute by alternative means (I.e. transit, vanpool, carpool)
· 25.2% of these employees are Northern Virginia employees
· Northern Virginia program will begin in the summer of 2003 and will result in 5% reduction in SOV commuters over 4 years.
· 1.25% reduction in SOV commuters will take place by the end of 2004.
· Program will cost $350,000 in first year, $450,000 in second year plus one-time $50,000 planning cost

VT Reduced= 273,000 SOV commuters * 25.2% Northern VA * 2 trips/day * 1.25% behavior change
VT Reduced= 1,720 trips/day

VMT Reduced= 1,720 trips/day * 15.5 miles/trip
VMT Reduced= 26,658 miles

NOx Reduced= (26,658 mi/day * 0.8073 g/mi + 1,720 trips * 1.0725 g/trip) / 907,185 g/ton
NOx Reduced= 0.026 tpd

VOC Reduced= (26,658 mi/day * 0.3405 g/mi + 1,720 trips * 2.7731 g/trip) / 907,185 g/ton
VOC Reduced= 0.015 tpd

Cost Effectiveness

Annual Expenditure= ($450,000 first year + $350,000 * 3 remaining years + $50,000 planning) * 25.2%/ 2 years
Annual Expenditure= $ 387,500

Cost-effectiveness ($/ton) = $387,500 / (avg tons/day over 4 yr program life * 250 days)

Cost-effectiveness (NOx) = $ 24,072
Cost-effectiveness (VOC) = $ 40,620

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure O6: Mass Marketing Campaign

Measure Number: O6
Measure Name: Mass Marketing Campaign

RACM Determination: Possible
Reason:

Description:
6 year marketing effort involving business-to-business advertising campaign in print media and on world wide web. Aims to increase transit, ridesharing and other travel demand management programs

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 2,939
Estimated Reductions (NOx)	0.147

Issues

· This measure is currently in place in the TIP, but has been delayed due to funding problems.

Assumptions

· From Travel Demand Model Version 1, in 2005, 3,278,831 single-occupant vehicle work trips daily
· Scaling factor to convert TDM Version 1 trips to TDM Version 2.1 trips is 1.071176
· Therefore with new Travel Demand Model, there will be 3,512,205 single-occupant vehicle work trips daily
· 20% of SOV commuters would consider switching modes
· 12% will switch after 4 years as a result of marketing campaign
· 3% will switch during each of 4 years
· Average trip 15.5 miles
· Campaign will begin in Fall 2003
· 1.5% of targeted drivers will have switched by May 2004
· Total budget for 4-year program is $3,710,000
· Program delivers benefits 250 days/year

Emission Reductions for Completed Program

Daily VT Reduced= 3,512,205 trips * 20% consider switch * 12% switch
Daily VT Reduced= 84,293 trips

Daily VMT Reduced= 84,293 trips * 15.5 miles/trip
Daily VMT Reduced= 1,306,540 miles

Total NOx Reduced= (1,306,540 mi/day * 0.8073 g/mi + 84,293 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 1.262 tpd

Total VOC Reduced= (1,306,540 mi/day * 0.3405 g/mi + 84,293 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.748 tpd

Emission Reductions by May 2004

Daily VT Reduced= 3,278,831 trips * 20% consider switch * 1.5% switch

Daily VT Reduced= 9,836 trips

Daily VMT Reduced= 9,836 trips * 15.5 miles/trip
Daily VMT Reduced= 152,466 miles

Total NOx Reduced= (152,466 mi/day * 0.8073 g/mi + 9,836 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.147 tpd

Total VOC Reduced= (152,466 mi/day * 0.3405 g/mi + 9,836 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.087 tpd

Cost Effectiveness

Annual Expenditure= $3,710,000 / 4 years
Annual Expenditure= $ 927,500

Cost-effectiveness ($/ton) = $927,500 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 2,939
Cost-effectiveness (VOC) = $ 4,959

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure P1: Control Parking at Schools

Measure Number: P1
Measure Name: Control Parking at Schools

Description:
Restrict high school students from driving to and parking at high schools when bus service is available.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· There is no guarantee this proposal would reduce VMT, as parents may drive their children to school if students cannot drive themselves.

· This proposal could adversely impact the ability ot students to reach after-school jobs or volunteer work.

· This proposal would require new county regulations or changes in school-district policy.

· Especially in large school districts, a significant number of students drive to school. Distirtcs would need to obtain additional buses and drivers to serve the students, and bus routes might need to be remapped.

· Because school district budgets are already set for the 2003-2004 school year, the additional funds necessary for new buses and drivers could not be allocated until FY 05, beginning July 04.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure P2: Restrict Construction of New Parking

Measure Number: P2
Measure Name: Restrict Construction of New Parking

Description:
Restrict construction of new parking at employment centers based on distance from transit and urban core

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This would require changes in local planning and/or zoning processes throughout the region

· Restricting construction of parking might limit growth in emissions, but is unlikely to reduce emissions

· Large scale changes in the local planning process must go through public hearing and usually require several years

· Even if the region were able to expedite the zoning process and approve this measure by the end of 2003, the measure could not apply retroactively to already approved projects. Projects appearing before the zoning boards in late 2003/early 2004 would not have been built by May 2004. Therefore this measure would not deliver benefits by May 2004.

Summary Analysis

This measure would not produce benefits by May 2004. Therefore it is not a RACM.

Measure T1: Transit Prioritization -- Queue Jumps

Measure Number: T1
Measure Name: Transit Prioritization -- Queue Jumps

RACM Determination: Possible
Reason:

Description:
Provide queue jumps for buses at over-capacity signalized intersections throughout the region. Queue jumps allow buses to use a shoulder or other designated lane to bypass intersection queues and move forward towards the stop line.

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 8,480
Estimated Reductions (NOx)	0.008

Issues

·This measure was funded for 10 Maryland intersections in the FY 2003 TIP

· State DOTs could perform a study of regional intersections to determine whether this measure could be implemented on a large scale. As FY 04 budgets are nearly complete, this type of study could not be funded until FY 05 (July 2004). Therefore an expansion of this measure would not deliver benefits by the beginning of the 2004 ozone season.

Assumptions

· From Michael Baker Jr., Inc. analysis using VAQONE model with Montgomery and Prince George's data, measure will eliminate:
  · 1,013 vehicle trips
  · 7,135 VMT
· 5 queue jumps can be created by re-striping, while 5 will require creation of an additional lane
· Re-striping costs $2,500 per jump
· New lane costs $61,500 per jump
· 20 year project life

Emission Reductions

Total NOx Reduced= (7,135 mi/day * 0.8073 g/mi + 1,013 trips * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.008 tpd

Total VOC Reduced= (7,135 mi/day * 0.3405 g/mi + 1,013 trips * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.006 tpd

Cost Effectiveness

Annual Expenditure= ($2,500 * 5 jumps + $61,500 * 5 jumps) / 20 years
Annual Expenditure= $ 16,000

Cost-effectiveness ($/ton) = $16,000 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 8,480
Cost-effectiveness (VOC) = $ 11,083

Summary Analysis

When the considered as a group, the benefits from the possible control measures do not meet the 8.8 tpd NOx or 34.0 tpd VOC threshold necessary for RACM. Therefore this measure is not a RACM.

Measure T2: Flat Fare For All Transit Trips

Measure Number: T2
Measure Name: Flat Fare For All Transit Trips

Description:
Single price all public transit services with a flat $1.10 fare and free transfers all day, 7 days per week

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· WMATA is facing budgetary problems and will raise fares and/or parking fees beginning FY 04 (July 03). Fare cuts cannot be accomodated in the FY 04 budget.

· FY 05 begins in July 2004, after the beginning of the 2004 ozone season.

· Many commuters already have the option to receive Metrochek, making them fairly insensitive to commute-trip Metro fare changes.

· A significant amount of the benefit from this measure would accrue to current, rather than new, passengers

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T3: Access to Jobs Program

Measure Number: T3
Measure Name: Access to Jobs Program

Description:
Identifies gaps in transit service between places of residence and places of work for low wage workers

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Many workers targeted by this program already carpool or take transit to their place of work because they do not own vehicles

· Program in Baltimore recently scaled back due to low ridership

· As FY 04 budgets are largely complete, funds for this measure could not be budgeted until FY 2005 (July 2004). WMATA would need to procure additional buses and design and publicize routes. This process would take 18 months or more, making program implementation impossible before the end of 2005.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T4: Automatic Vehicle Locator System

Measure Number: T4
Measure Name: Automatic Vehicle Locator System

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
System would provide bus location information to WMATA dispatchers. This would decrease wait time and improve on-time arrival/departure.

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· As FY 04 budgets are largely complete, funds for this measure could not be budgeted until FY 2005 (July 2004). WMATA would then need order, receive and install the locator systems. This process could not be completed before mid-2005.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T5: College 33 Pass System

Measure Number: T5
Measure Name: College 33 Pass System

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Expand Baltimore college bus fare program to DC area. Program allows students to receive reduced fares near 19 participating schools in the region.

Criterion Summary

Year of First Benefits	205+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Program depends upon voluntary participation by schools (currently 13 of 32 schools in Baltimore region do not participate)

· As many college students do not have cars and frequently carpool or use the bus, this program may not have a significant effect on vehicle trips

· As FY 04 budgets are largely complete, funds for this measure could not be budgeted until FY 2005 (July 2004). Program development and participant recruiting will take 6-12 months. Schools could begin participation at the beginning of the winter 2004-2005 semester (January 2005). Therefore, this measure would not deliver benefits by May 2004.

· Schools are out of session during ozone season, so avoided VMT will be very low

Summary Analysis

This measure would not deliver benefits May 2004. Therefore it is not a RACM.

Measure T6: Expand Peak Period Metrorail Service

Measure Number: T6
Measure Name: Expand Peak Period Metrorail Service

Description:
Extend peak-period service on Metrorail so trains run at 6 minute frequency from 6-11 am and 3-8 pm.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Extending the peak period would require additional drivers and would permit less time for car maintenance

· WMATA estimates this measure would cost $10 million annually.

· WMATA's FY 04 budget is already completed. This measure could not be put into place until the FY 05 budget beginning July 04. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T7: Free Bus Service Off-Peak

Measure Number: T7
Measure Name: Free Bus Service Off-Peak

Description:
Institute free off-peak bus service from 10-2 on weekdays and all day on weekends.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· WMATA estimates this measure would cost $21 million annually.

· WMATA's FY 04 budget is already completed. This measure could not be put into place until the FY 05 budget beginning July 04. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T8: Free bus-to-rail / rail-to-bus transfers

Measure Number: T8
Measure Name: Free bus-to-rail / rail-to-bus transfers

Description:
Institute free bus-to-rail transfer similar to free rail-to-bus transfer currently in place.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· This program would require complete installation of SmarTrip cards to enable the bus-to-rail transfers. Complete installation is currently scheduled for late 2003

· WMATA's FY 04 budget is already completed. This measure could not be put into place until the FY 05 budget beginning July 04. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T9: Free Rail Use 10-3

Measure Number: T9
Measure Name: Free Rail Use 10-3

Description:
Free Metrorail trips for all riders from 10AM-3PM on weekdays

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Farecard readers would need to be reprogrammed

· WMATA's FY 04 budget is already completed. This measure could not be put into place until the FY 05 budget beginning July 04. This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T10: Free Transit Passes to Students

Measure Number: T10
Measure Name: Free Transit Passes to Students

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Free transit passes for high school and college students, subsidized by schools or through student registration fee

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Most area high school students already receive either subsidized transit passes or school district bus service

· Many college students do not own cars, and so frequently carpool or use public transit anyway

· This program depends upon voluntary participation by schools. For College 33 pass, the school-subsidized discount transit pass offered to many students in the Baltimore region, 13 of 32 schools in Baltimore region do not participate. The severe budget problems at colleges in Virginia would probably preclude many Virginia schools from participating.

· As FY 04 budgets are largely complete, funds for this measure could not be budgeted until FY 2005 (July 2004). Program development and participant recruiting will take 6-12 months. Schools could begin participation at the beginning of the winter 2004-2005 semester (January 2005). Therefore, this measure would not deliver benefits by the end of the 2004 ozone season.

· Because schools are out of session during most of the ozone season, benefits will be greatly reduced for most of the season

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T11: Increase Commuter Rail Frequency

Measure Number: T11
Measure Name: Increase Commuter Rail Frequency

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Increase frequency of MARC service to every 15 minutes on Penn and Camden lines and every 10 min on the Brunswich line. Increase VRE frequency to every 15 minutes

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require significant capital expenditures for purchase of new equipment and costs for employment of additional staff.

· As much of the track used by the region's commuter rail trains is owned by CSX, commuter rail lines may not be able to secure right-of-way for trains to run on a more frequent basis.

· The purchase of additional cars and/or engines requires a long lead time. Because FY 04 budgets are complete, funds cannot authorized for purchase until FY 2005 (beginning July 2004). Therefore additiona equipment could not be obtained until mid- to late 2005.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T12: Interactive Rideshare Kiosks

Measure Number: T12
Measure Name: Interactive Rideshare Kiosks

Description:
Transportation Information Kiosks in Maryland, Virginia and the District of Columbia

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 886,379
Estimated Reductions (NOx)	N/A

Issues

· Some kiosks have been funded for installation around the region.

· Additional kiosks would require additional funding. Since FY 04 budgets are complete, additional kiosks could not be funded until FY 05, which begins in July 04. Therefore the program could not be expanded by May 04.

Assumptions

· From LDA Consulting analysis:
  · 9 kiosks would reduce 16 vehicle roundtrips per day
  · Therefore 30 kiosks will reduce 30*16/9 = 54 roundtrips = 108 trips per day
· All vehicle trips reduced are former SOV trips
· Cost of 30 kiosks is $1.792 million
· Kiosk life is five years

Emission Reductions

VMT Reduced= 108 trips * 15.5 miles/trip
VMT Reduced= 1,674 miles/day

Total NOx Reduced= (1,674 mi/day * 0.8073 g/mi + 108 trips * 1.0725 g/mi) / (907,185 g/ton)
Total NOx Reduced= 0.002 tpd

Total VOC Reduced= (1,674 mi/day * 0.3405 g/mi + 108 trips * 2.7731 g/mi) / (907,185 g/ton)
Total VOC Reduced= 0.001 tpd

Cost Effectiveness

Annual Expenditure= $1,792,000 / 5 years
Annual Expenditure= $ 358,400

Cost-effectiveness ($/ton) = $358,400 / (tons/day * 250 days)

Cost-effectiveness (NOx) = $ 886,379
Cost-effectiveness (VOC) = $ 1,495,748

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T13: New MARC Coaches

Measure Number: T13
Measure Name: New MARC Coaches

Description:
Purchase additional coaches for MARC to accommodate increased ridership

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions (NOx)	N/A

Issues

· New cars were recently purchased previously for MARC

· Because FY 04 budgets are largely complete, additional cars could not be budgeted for until FY 05, beginning July 04. Delivery could not be taken on the new cars before some time in 2005.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T14: Employer Metro Shuttle Bus Services

Measure Number: T14
Measure Name: Employer Metro Shuttle Bus Services

Description:
Provide incentives for businesses to provide employee shuttle service to the nearest rail or transit stop

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 31,912
Estimated Reductions (NOx)	N/A

Issues

· Program is funded in Virginia in 2003 TIP

· Because FY 04 budgets are complete, program could not be funded in other jurisdictions until FY 2005, beginning July 04. This is after the beginning of the 2004 ozone season.

Assumptions

· VA program will cost $963,000 for three years (capital cost of leasing vans). Employer costs (O&M) not included.
· 30 buses will make 2 trips/hour for 6 hours per day
· Average ridership will be 8 people/bus
· Average avoided one-way trip is 15.5 miles
· 85% of workers drive alone to transit stop (no cold start saved)
· All riders were SOV trips prior to taking shuttle bus

Emission Reductions

VT Reduced= 30 buses * 2 trips/hr * 6 hours/day * 8 riders/bus * 15% do not drive to transit stop
VT Reduced= 432 trips

VMT Reduced= 30 buses * 2 trips/hr * 6 hours/day * 8 riders/bus * 15.5 miles/trip
VMT Reduced= 44,640 miles/day

Total NOx Reduced= (44,640 mi/day * 0.8073 g/mi + 432 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.040 tpd

Total VOC Reduced= (44,640 mi/day * 0.3405 g/mi + 432 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.018 tpd

Cost Effectiveness

Annual Expenditure= $963,000 / 3 years
Annual Expenditure= $ 321,000

Cost-effectiveness ($/ton) = $321,000 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 31,912
Cost-effectiveness (VOC) = $ 71,035

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T15: Metrorail Feeder Bus Service & Fare Buydown

Measure Number: T15
Measure Name: Metrorail Feeder Bus Service & Fare Buydown

RACM Determination: No
Reason: Not economically feasible

Description:
Improve Metrorail feeder bus service at underutilized park & ride lots, implement fare buydown program

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 330,617
Estimated Reductions (NOx)	N/A

Issues

· Program is implemented in FY 2003 TIP for 2 lots in Maryland
· Few other park & ride lots have excess capacity
· Because FY 04 budgets are complete, program could not be funded until FY 05 for expansion to other lots in other jurisdictions

Assumptions

· Currently funded programs provide good cost-effectiveness benchmark for expansion programs
· Annual cost of approved measure will be $445,000
· Fare buydown will attract 175 new transit riders daily to New Carrollton (100) and Glenmont (75) stations
· As riders will still drive to the Park & Ride lots, there will be no reduction in vehicle trips
· Riders to New Carrolton avoid 19 VMT per trip, riders at Glenmont avoid 15 VMT/trip
· All riders were previously SOV drivers

Emission Reductions

VMT Reduced= (100 riders * 2 trips/day * 19 miles/trip) + (75 riders * 2 trips/day * 15 miles/trip)
VMT Reduced= 6,050 miles/day

Total NOx Reduced= (6,050 mi/day * 0.8073 g/mi) / (907,185 g/ton)
Total NOx Reduced= 0.005 tpd

Total VOC Reduced= (6,050 mi/day * 0.3405 g/mi) / (907,185 g/ton)
Total VOC Reduced= 0.002 tpd

Cost Effectiveness

Annual Expenditure= $ 445,000

Cost-effectiveness ($/ton) = $445,000 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 330,617
Cost-effectiveness (VOC) = $ 783,869

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T16: Mobile Commuter Stores

Measure Number: T16
Measure Name: Mobile Commuter Stores

Description:
Fund mobile commuter stores in suburban commercial areas

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 118,230
Estimated Reductions (NOx)	N/A

Issues

· Stores are expected to take 5 years to reach full benefits.

· 2 VA stores were launched in spring 2002. By ozone season 2004, they will have completed 2 years of operation

· Additional stores could not be funded until FY 04 (next available budget cycle, beginning July 2004) so program cannot be expanded before the beginning of the 2004 ozone season.

Assumptions

· Each store will result in 46 additional carpoolers and 61 additional transit users each year (2003 TERM Analysis)
· By summer 2004, each store will have placed 184 people (2 years of operation, minus attrition)
· All riders were previously SOV drivers
· Capital cost per transit store is $33,550
· Store life is 6 years
· Annual operating cost is $157,300 (includes monitoring program)

Emission Reductions

VT Reduced= 184 people/day * 2 trips/person
VT Reduced= 368 trips/day

VMT Reduced= 368 trips/day * 15.5 miles/trip
VMT Reduced= 5,704 miles/day

Total NOx Reduced= (5,704 mi/day * 0.8073 g/mi + 368 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.006 tpd

Total VOC Reduced= (5,704 mi/day * 0.34053 g/mi + 368 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.003 tpd

Cost Effectiveness

Annual Expenditure= $33,550 / 6 years + $157,300
Annual Expenditure= $ 162,892

Cost-effectiveness ($/ton) = $162,892 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 118,230
Cost-effectiveness (VOC) = $ 199,510

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T17: Real-Time Bus Schedule Information

Measure Number: T17
Measure Name: Real-Time Bus Schedule Information

Description:
Expand trials of real-time bus schedule information to local transit providers

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Currently in place for certain stops on Route 38B between the District and Arlington County

· Expand trial to other local bus services such as Dash, The Bus, Ride On, Fairfax Connector

· As FY04 budgets are complete, FY 2005 (beginning July 04) is the next budget cycle for allocating funds for this project. Procurement and installation would also be necessary. An expansion of this measure could not deliver benefits by May 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T18: Discount Multi-Trip Bus Fares

Measure Number: T18
Measure Name: Discount Multi-Trip Bus Fares

RACM Determination: No
Reason: Not economically feasible

Description:
Introduce discount programs reducing cost of multiple bus rides through purchase of pass books (e.g. 10-trip tickets)

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Ride-On Super Discount program reduces cost of 20-ride fare coupon from $18 to $10

· This program could not be extended to WMATA or other regional transportation providers during FY 2004 (beginning July 2003) because this measure would result in a revenue decrease and FY 04 budgets are already complete.

· This measure could first be funded in FY05, which begins July 2004. This is after the start of the 2004 ozone season.

· This measure would primarily benefit existing daily riders.

Assumptions

· Evaluate cost effectiveness of new Ride-On program.
· Montgomery County bus ridership is 20 million/year, 312 days per year = 64,100 per day
· Measure will result in 0.39% increase in Ride On ridership (William Allen Mode Choice Model Sensitivity Analysis, 1993)
· Cost of measure is $8 per 20 rides, or $0.40 per ride
· 72.5% of new riders were previously SOV drivers
· Average daily commute distance is 15.5 miles/trip
· Buses operate 312 days/year

· Assume only 1% of existing daily riders take advantage of the 10-trip pass. This probably underestimates the costs of this measure.

Emission Reductions

VT Reduced= 64,100 trips * 0.39% increase * 72.5% SOV
VT Reduced= 181 trips/day

VMT Reduced= 181 trips/day * 15.5 miles/trip
VMT Reduced= 2,806 miles/day

Total NOx Reduced= (2,806 mi/day * 1.414 g/mi + 181 trips/day * 0.947 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.005 tpd

Total VOC Reduced= (2,806 mi/day * 0.368 g/mi + 181 trips/day * 2.445 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.002 tpd

Cost Effectiveness

Annual Expenditure= $0.40 per rider * (181 new trips/day + 1% * 64,100 existing trips/day) * 312 days/yr
Annual Expenditure= $ 102,616

Cost-effectiveness ($/ton) = $102,616 / (tons/day * 312)

Cost-effectiveness (NOx) = $ 72,086
Cost-effectiveness (VOC) = $ 252,426

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T19: Shorter Distance from Buildings to Bus Stops

Measure Number: T19
Measure Name: Shorter Distance from Buildings to Bus Stops
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
For existing buildings, re-route traffic to allow buses to come closer to the building. For new buildings, alter setback requirements to allow closer bus access

Criterion Summary

Year of First Benefits	2005
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Requires large change in timing of bus routes. Routes will be longer because of need to drive into smaller off-street spaces.

· In high-traffic areas, turning on and off congested roads may lead to large system delays

· Will cause loss of parking spots near existing buildings

· May require zoning variances

· Because F 04 budget is complete, studies to determine which stops should be moved and appropriate methods could not be funded until FY 2005, beginning July 2004.

· Additional 6-12 months required to implement traffic flow changes, reroute buses, and move parking spaces

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T20: Additional Transit Stores

Measure Number: T20
Measure Name: Additional Transit Stores

Description:
Establish additional stationary transit stores in the region

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· It is estimated to take 5 years for a transit store to reach its full potential

· Implementation time for a transit store is one year.

· Generally assumed stores must be operational for one year before producing benefits

· Because FY 04 budgets are complete, new stores could not be funded until FY 05 (July 04). Stores therefore would not be operational until mid-2005 and would not produce benefits until mid-2006.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T21: Universal Transportation Access (MD + WMATA)

Measure Number: T21
Measure Name: Universal Transportation Access (MD + WMATA)
RACM Determination: No
Reason: Not economically feasible

Description:
SmarTrip card will allow users to pay fares on all rail and bus systems in the region (including parking in Metrorail lots) using one electronic card

Criterion Summary

Year of First Benefits	2003
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 266,895
Estimated Reductions (NOx)	0.048

Issues

· Program is funded and will be completely operational in 2003

Assumptions

· Current average daily network bus ridership = 506,973 WMATA and 87,650 MD local = 594,623
· Bus ridership will increase by 0.75% on these routes as a result of this measure
· Cost of this measure is $13,764,000

Emission Reductions

VT Reduced= 594,623 trips * 0.75% increase * 72.5% SOV
VT Reduced= 3,233 trips/day

VMT Reduced= 3,233 trips/day * 15.5 miles/trip
VMT Reduced= 50,116 miles/day

Total NOx Reduced= (50,116 mi/day * 0.8073 g/mi + 3,233 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.048 tpd

Total VOC Reduced= (50,116 mi/day * 0.3405 g/mi + 3,233 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.029 tpd

Cost Effectiveness

Annual Expenditure= $ 4,032,000

Cost-effectiveness ($/ton) = $4,032,000/ (tons/day * 312 days per year)

Cost-effectiveness (NOx) = $ 266,895
Cost-effectiveness (VOC) = $ 562,074

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure T22: Expand VRE Train Service

Measure Number: T22
Measure Name: Expand VRE Train Service

Description:
Expand VRE train service to include additional departures

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2002
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· An expansion of current service would require additional funding for personnel and possibly additional capital purchases

· VRE's FY 2004 budget is already complete, and VRE is contemplating a fare increase because of budget shortfalls. Therefore this program could not be funded until FY 2005, beginning July 2004.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T23: WMATA Bus Information Displays with Maps

Measure Number: T23
Measure Name: WMATA Bus Information Displays with Maps
RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Install additional information boxes with maps and schedule information. Would include schedules in languages other than English in neighborhoods where most residents speak another language

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	N/A
Estimated Reductions (NOx)	N/A

Issues

· Because FY 04 budgets are complete, funds for this measure could not be budgeted until FY 05 (July 2004). This is after the beginning of the 2004 ozone season.

Summary Analysis

This measure could not deliver benefits by May 2004. Therefore it is not a RACM.

Measure T24: Regional bus service expansion

Measure Number: T24
Measure Name: Regional bus service expansion

Description:
Expansion of Metrobus and other regional bus services.

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 180,233
Estimated Reductions	N/A

Issues

· FY 2003 TIP includes two new Metrobus routes during weekday rush hours, MTA Green Line Link, Neighborhood Circulator Metrobuses, MTA Bus Service from Southern MD to District, PRTC Express Bus, Prince George's County Bus Expansion

· According to MDOT, Green Line Link is still conceptual and will not deliver benefits by 2004

Assumptions

· Determine cost-effectiveness of different types of currently planned bus service expansions to estimate general cost-effectiveness of expanding regional bus service

Cost Effectiveness: PRTC Express Bus

· 2 bus routes will run from Dumfies-area P&R lots to Pentagon.
· $3.35 million will fund buses from 1999-2006
· Buses will attract 400 new riders daily
· 57% of these riders were formerly SOV riders
· 125 of these riders board buses at curb side. The remainder board at Park & Ride.
·Commuters taking these buses travel approximately 5 miles each way to P&R lots
·Commuters taking these buses travel approximately 20 miles each way from P&R lots to work
·Commuters taking these buses travel approximately 25 miles each way from home to work

VT Reduced= 400 riders * 2 trips per day * 57% former SOV riders * (125/400) board curbside
VT Reduced= 143 trips

VMT Reduced= (143 trips/day * 25 mi/trip) + (800 trips * 57% former SOV * (275/400) use P&R * 20 mi/trip)
VMT Reduced= 9,833 miles/day

Total NOx Reduced= (9,833 mi/day * 0.8073 g/mi + 143 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.009 tpd

Total VOC Reduced= (9,833 mi/day * 0.3405 g/mi + 143 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.004 tpd

Annual Expenditure= $3.5 million / 8 years
Annual Expenditure= $ 437,500

Cost-effectiveness ($/ton) = $437,500 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 196,224
Cost-effectiveness (VOC) = $ 424,130

Cost Effectiveness: Neighborhood Circulator Buses

· Program requires purchase of 5 buses at $200,000 each and annual operational costs of $150,000 per route
· Five circulator buses will each make 10 trips per day with an average of 15 riders per bus
· Avoided VMT will average 15, 16, 17, 19 and 20 miles each way for the 5 new routes
· 72.5% of riders were former SOV commuters
· Bus life is 15 years

VT Reduced= 5 buses * 10 trips per bus-day * 15 riders per bus * 2 trips per rider-day * 72.5% former SOV
VT Reduced= 1,088 trips

VMT Reduced= (1,088 trips/day * ((15 + 16 + 17 + 19 + 20)/5) miles per trip
VMT Reduced= 18,923 miles/day

Total NOx Reduced= (18,923 mi/day * 0.8073 g/mi + 1,088 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.018 tpd

Total VOC Reduced= (18,923 mi/day * 0.3445 g/mi + 1,088 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.011 tpd

Annual Expenditure= $200,000 per bus * 5 buses / 15 year life + $150,000 operating per route * 5 routes
Annual Expenditure= $ 816,667

Cost-effectiveness ($/ton) = $816,667 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 180,233
Cost-effectiveness (VOC) = $ 310,814

Cost Effectiveness: Southern Maryland Bus Service Expansion

· Cost of program is $2,794,004 for route with highest ridership increase (Route 901)
· 4 additional trips on route 901 result in 596 additional riders
· Average one-way commute was 20 miles
· 72.5% of riders were SOV riders

VT Reduced= 596 riders * 2 trips per day * 72.5% former SOV riders
VT Reduced= 864 trips

VMT Reduced= 864 trips/day * 15.5 mi/trip
VMT Reduced= 13,395 miles/day

Total NOx Reduced= (13,395 mi/day * 0.8073 g/mi + 864 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.013 tpd

Total VOC Reduced= (13,395 mi/day * 0.3445 g/mi + 864 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.008 tpd

Annual Expenditure= $ 2,794,004

Cost-effectiveness ($/ton) = $2,794,004 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 863,551
Cost-effectiveness (VOC) = $ 1,446,089

Cost Effectiveness: Prince George's County Bus Expansion

· Program will fund 28 new buses
· Average 15 riders per bus
· Total 428 riders per day
· 72.5% of commuters former SOV commuters
· Average one-way commute was 15.5 miles
· Cost of program is $5,328,000 in capital + $1,931,000 annual operating costs
· Buses last 15 years

VT Reduced= 428 riders * 2 trips per day * 72.5% former SOV riders
VT Reduced= 621 trips

VMT Reduced= 621 trips/day * 15.5 mi/trip
VMT Reduced= 9,619 miles/day

Total NOx Reduced= (9,619 mi/day * 0.8073 g/mi + 621 trips/day * 1.0725 g/trip) / (907,185 g/ton)
Total NOx Reduced= 0.009 tpd

Total VOC Reduced= (9,619 mi/day * 0.3445 g/mi + 621 trips/day * 2.7731 g/trip) / (907,185 g/ton)
Total VOC Reduced= 0.006 tpd

Annual Expenditure= $5,328,000 capital / 15 year lifespan + $1,931,000 annual operating cost
Annual Expenditure= $ 2,286,200

Cost-effectiveness ($/ton) = $2,286,200 / (tons/day * 250)

Cost-effectiveness (NOx) = $ 983,961
Cost-effectiveness (VOC) = $ 1,647,725

Summary Analysis

All of the representative bus routes exceed the cost-effectiveness threshold. Therefore this measures is not economically feasible and is not RACM.

Measure T25: Rush Hour Shift

Measure Number: T25
Measure Name: Rush Hour Shift

Description:
Shift Metrorail AM and PM rush hours to start 30 min earlier and end 30 min earlier

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· In order to accommodate this measure, WMATA would incur additional costs to open stations 1/2 hour earlier. As the Fy 04 budget is complete, these increased costs could not be accomodated until FY 05, beginning July 2004.

· Many regional employees receive subsidized transit, so a small fare change will not affect their transit decisions

· The lower fare incentive provided for customers traveling at the end of the current rush hour will be partially offset by the higher fare disincentive for customers traveling before the current afternoon rush hour.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure U1: Trip reduction ordinances

Measure Number: U1
Measure Name: Trip reduction ordinances

RACM Determination: No
Reason: Widespread and adverse impacts

Description:
Prohibit drivers from traveling during certain periods, based on vehicle tags or other easily identifiable criteria. Can be a permanent or episodic control.

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure could impose substantial and widespread adverse impacts on many sectors of the population. People who work in locations not accessible to public transportation, delivery services, taxis and other transportation services, and many types of contractors would be unable to work with the ban in effect. It would be difficult and time-consuming to exempt specific citizens from the ban according to profession or place of employment. Such exemptions would also make enforcement costly and difficult.

· This measure would require legislative action. It would be extremely unlikely to pass.

Summary Analysis

Based on the potential for substantial and widespread adverse impacts, this measure is not a RACM.

Measure V1: Control Extended Idling of Buses and Trucks

Measure Number: V1
Measure Name: Control Extended Idling of Buses and Trucks

Description:
Step-up enforcement of existing regulations to prevent extended vehicle idling

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Virtually all counties in the nonattainment area have passed some form of vehicle idling restrictions. However, many ordinances provide exemption for sources such as delivery trucks and buses. These are some of the largest sources of idling emissions.

· Many counties do not regularly enforce idling restrictions.

· Increased enforcement would require hiring additional personnel. As FY 04 budgets are complete, personnel could not be hired until FY 05, beginning July 04.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure V2: High cetane diesel fuel for onroad vehicles

Measure Number: V2
Measure Name: High cetane diesel fuel for onroad vehicles

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Description:
Require onroad diesel vehicles to use high cetane fuel

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Requiring use of high-cetane fuel or a cetane additive by all vehicles in the region would require state regulations. As states require well over 12 months to develop, promulgate and require compliance with a regulation, this measure could not be implemented by May 2004.

· Additionally, states would be required to obtain a fuel waiver from EPA to implement this measure.

· Through vehicles could avoid this regulation by driving through the Metropolitan Washington area without refueling.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure V3: Light-duty diesel I/M

Measure Number: V3
Measure Name: Light-duty diesel I/M

Description:
Develop I/M program for light-duty diesel vehicles

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	N/A
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. As states require well over 12 months to develop, promulgate and require compliance with a regulation, this measure could not be implemented by May 2004.

· This measure would require program development, standard development, driver notification, and a full bidding process for the I/M administration contract.

· Many current diesel testing programs test for particulate matter only.

Summary Analysis

This measure would not deliver benefits May 2004. Therefore it is not a RACM.

Measure V4: Remove Trash Trucks From Area Streets

Measure Number: V4
Measure Name: Remove Trash Trucks From Area Streets

Description:
Reduce use of trash trucks through transport of trash by barge

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	N/A
Enforceable	No
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	Yes
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Virginia has recently passed a law allowing trash to be barged on Virginia rivers in exchange for a fee.

· Fee has not been set; will be determined by VA DEQ.

· This measure would require an MOU with interstate trash haulers

· Once VA DEQ sets fee, trash haulers would have to obtain permits, agree to MOU, obtain barges and switch hauling method. This is not expected to be possible by May 2004.

· Unknown how many, if any, trash trucks would disappear from area streets. Muncipal trash service would continue; only through trucks would stop driving.

Summary Analysis

This measure would not deliver benefits May 2004. Therefore it is not a RACM.

Measure V5: Early Bus Engine Replacement

Measure Number: V5
Measure Name: Early Bus Engine Replacement

Description:
Replaces high-polluting diesel engines in WMATA buses with new diesel engines

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	$ 34,872
Estimated Reductions	N/A

Issues

· WMATA regularly retrofits or repowers buses as part of a mid-life overhaul. This program would have to go beyond normal WMATA operations.

· WMATA's FY 04 budget is complete. This program could not be funded until FY 05 (July 2004).

· WMATA is already planning to replace most of its bus fleet with CNG buses.

Assumptions

· Buses that will be repowered operate an average of 300 days per year
· 1992 diesel buses (oldest buses in operation) emit 4.55 g NOx/bhp-hr
· New diesel buses (4-stroke with EGR) emit 3.47 g NOx/bhp-hr
· Buses travel 110 miles/day 312 days/year
· New engine costs approximately $40,000 per bus
· New engine will have 6 year life

Emission Reductions Per Bus

NOx Reduced= (110 mi/day * (4.55-3.47) g/bhp-hr * 4.679 bhp-hr/mi) / (907,185 g/ton)
NOx Reduced= 0.0006 tpd

Cost Effectiveness Per Bus

Annual Expenditure= $40,000 / 6 year life
Annual Expenditure= $ 6,667

Cost-effectiveness ($/ton) = $6,667/ (tons/day * 312)

Cost-effectiveness (NOx) = $ 34,872

Summary Analysis

This measure is not economically feasible because it exceeds the cost effectiveness threshold. Therefore it is not a RACM.

Measure V6: Taxicab Replacement - Conventional Vehicles

Measure Number: V6
Measure Name: Taxicab Replacement - Conventional Vehicles

Description:
Replace taxicabs with new "conventional" LDGVs

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Because FY 04 budgets are complete, this measure could not be funded until FY 05 (July 2004). Participants would need to be recruited and cars would need to be ordered and delivered. This could not occur before 2005.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure V7: Zero I/M waivers and exemptions

Measure Number: V7
Measure Name: Zero I/M waivers and exemptions

Description:
Eliminate all waivers and exemptions in the I/M program

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation.

· This measure would be controversial, because it would eliminate waivers for antique cars and other types of vehicles not equipped to meet modern emission standards

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure V8: Car Sharing Program

Measure Number: V8
Measure Name: Car Sharing Program

Description:
Fund incentives for new car sharing customers (I.e. Flexcar or Zipcar services)

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	Current
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost ($/ton NOx)	$ 93,635
Estimated Reductions (NOx)	N/A

Issues

· Metro encourages car sharing by making shared cars available at many stations

· The FY 03 TIP funds incentives for 1,000 new car sharing customers for three years.

· Additional incentives could be funded in FY 05 and deliver benefits by mid-2004.

Assumptions

· 35 members can share one car
· Each car results in 5 daily roundtrips taken on transit instead of in SOVs
· Average avoided trip length is 15.5 miles
· Annual subsidy is $125 per member
· Cost estimates do not include administrative costs

Emission Reductions Per Car

VT Reduced= 10 trips/day

VMT Reduced= 10 trips/day * 15.5 miles/trip
VMT Reduced= 155 miles/day

Total NOx Reduced= (155 mi/day * 0.8073 g/mi +10 trips/day * 1.0725 g/mi) / (907,185 g/ton)
Total NOx Reduced= 0.00015 tpd

Total VOC Reduced= (155 mi/day * 0.3405 g/mi +10 trips/day * 2.7731 g/mi) / (907,185 g/ton)
Total VOC Reduced= 0.00009 tpd

Cost Effectiveness

Annual Expenditure= $125 per member * 35 members
Annual Expenditure= $ 4,375

Cost-effectiveness ($/ton) = $4,375 / (tons/day * 312)

Cost-effectiveness (NOx) = $ 93,635
Cost-effectiveness (VOC) = $ 158,007

Summary Analysis

This measure exceeds the cost effectiveness threshold. Therefore it is not economically feasible and is not a RACM.

Measure W1: CARB Diesel Fuel (On-Road)

Measure Number: W1
Measure Name: CARB Diesel Fuel (On-Road)

Description:
Implement CARB diesel fuel standards

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2005
Enforceable	Yes
Economically Feasible	Yes
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· CARB fuel is not refined in the Washington area. It would need to be transported in at high cost.

· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Furthermore, an EPA fuel waiver would be required for this measure.

· This has the potential to create widespread adverse impacts in the form of high fuel costs and fuel shortages.

· People living or working on the edge of the nonattainment area would be incentivized to drive to an adjacent county to purchase cheaper fuel.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure W2: Biodiesel (On-Road)

Measure Number: W2
Measure Name: Biodiesel (On-Road)

Description:
Require regional use of biodiesel fuel for on-road vehicles

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This has the potential to create widespread adverse impacts in the form of high fuel costs and fuel shortages.
· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Furthermore, an EPA fuel waiver would be required for this measure.

People living or working on the edge of the nonattainment area would be incentivized to drive to an adjacent county to purchase cheaper fuel.

· This measure could be implemented only as a voluntary measure or demonstration project.

Assumptions

· Measure would have 80% compliance rate
· PuriNOx is currently the only low-NOx fuel certified by EPA
· From 2005 controlled mobile inventory, projected regional emissions are:
  · 238.12 tpd NOx
  · 98.34 tpd VOC
· From 2002 controlled mobile inventory, projected regional network emissions are:
  · 291.28 tpd NOx
  · 125.87 tpd VOC
· Use straight-line interpolation to estimate the 2004 controlled inventory
  · 255.84 tpd NOx
  · 109.85 tpd VOC
· Ozone season lasts 153 days
· Cost premium for PuriNOx approximately $0.30 per gallon, assuming 20% soybean-derviced biodiesel at $1.80 per gallon and 80% clean

diesel at $0.90 per gallon

- From Version 2.1 Travel Demand Model, daily network VMT, including transit and school buses, will be
  - 2002: 121,811,100
  - 2005: 127,283,200
- Using straight-line interpolation, 2004 VMT will be 125,459,200
- From rate of progress calculations, 1.8 tpd NOx = 1 tpd VOC
- From analysis of 2005 Montgomery County emissions, diesel vehicles have following travel and emission characteristics:

CLASS	DUTY	% Mobile NOx	% Mobile VOC	MPG	% of VMT
LDDV	Light	0.001	0.001	28.3	0.001
LDDT12	Light	0.001	0.001	22.1	0.001
LDDT34	Light	0.001	0.001	15.5	0.002
HDDV2b	Light-Heavy	0.014	0.003	12.8	0.006
HDDV3	Light-Heavy	0.005	0.001	11.6	0.002
HDDV4	Light-Heavy	0.006	0.001	10.2	0.002
HDDV5	Light-Heavy	0.003	0.001	9.8	0.001
HDDV6	Med-Heavy	0.021	0.004	8.7	0.005
HDDV7	Med-Heavy	0.039	0.007	7.5	0.007
HDDV8a	Heavy-Heavy	0.065	0.007	6.5	0.008
HDDV8b	Heavy-Heavy	0.271	0.031	6.2	0.028
HDDBT	Heavy-Heavy	0.021	0.002	3.7	0.002
HDDBS	Heavy-Heavy	0.029	0.005	6.2	0.004

- From above table and EPA OTAQ's Diesel Retrofit website:

Duty-Class Totals	% Mobile NOx	% Mobile VOC	Avg MPG	% of VMT	% NOx Inc	% VOC Inc
Light	N/A	N/A	20.4	0.004	2.0%	21%
Light-Heavy	2.8%	0.6%	11.8	0.011	2.0%	21%
Med-Heavy	6.0%	1.1%	8.0	0.012	2.0%	21%
Heavy-Heavy	38.6%	4.5%	6.1	0.042	2.0%	21%

Emission Reductions

NOx Increase= 255.84 tpd on-road * 47.7% of total emissions * 2% increase * 80% compliance

NOx Increase= 1.95 tpd

VOC Reduced = 109.85 tpd on-road * 6.5% of emissions * 21% reduction * 80% compliance

VOC Reduced = 1.20 tpd

Net Decrease (NOx-VOC)= (1.20 tpd VOC * 1.8 tpd NOx per VOC) - 1.95 tpd NOx

Net Decrease (NOx-VOC)= 0.21 tpd NOx equivalent

Cost Effectiveness

Daily Gallons Consumed =

(125,459,200 miles * 0.4% light-duty)/20.4 mpg + (125,459,200 miles * 1.1% light-heavy)/11.8 mpg + (125,459,200 miles * 1.2% med-heavy)/8.0 mpg + (125,459,200 miles * 4.2% heavy-heavy)/6.2 mpg

Daily Gallons Consumed = 1,179,627

Annual Expenditure= 1,179,627 gallons per day * $0.30 per gallon * 153 days per year

Annual Expenditure= $ 54,144,881

Cost-effectiveness ($/ton) = $54,144,881/ (tons/day * 153 days)

Cost-effectiveness (NOx-VOC) = $ 839,821

Summary Analysis

This measure is not economically feasible because it does not meet the cost effectiveness threshold. Therefore is is not a RACM.

Measure W3: Low-NOx Diesel Fuel (On-Road)

Measure Number: W3
Measure Name: Low-NOx Diesel Fuel (On-Road)

Description:
Require regional use of low-NOx fuel for on-road diesel vehicles

RACM Determination: No
Reason: Not economically feasible

Criterion Summary

Year of First Benefits	2005+
Enforceable	Yes
Economically Feasible	No
Technologically Feasible	Yes
Adverse Impacts	N/A
Intensive or Costly Effort	No

Estimated Cost (NOx-VOC)	$ 23,169
Estimated Reductions	N/A

Issues

· This has the potential to create widespread adverse impacts in the form of high fuel costs and fuel shortages.
· This measure would require state regulation. All three states require well over 12 months to develop, pass, and require compliance with a regulation. Furthermore, an EPA fuel waiver would be required for this measure.

· People living or working on the edge of the nonattainment area would be incentivized to drive to an adjacent county to purchase cheaper fuel.

· This measure could be implemented only as a voluntary measure or demonstration project.

Assumptions

· Measure would have 80% compliance rate
· PuriNOx is currently the only low-NOx fuel certified by EPA
· From 2005 controlled mobile inventory, projected regional emissions are:
  · 238.12 tpd NOx
  · 98.34 tpd VOC
· From 2002 controlled mobile inventory, projected regional network emissions are:
  · 291.28 tpd NOx
  · 125.87 tpd VOC
· Use straight-line interpolation to estimate the 2004 controlled inventory
  · 255.84 tpd NOx
  · 109.85 tpd VOC
· Assume transit and school buses are all heavy-heavy duty vehicles (Class 8a or above)
· Because EPA did not test PuriNOx in light duty vehicles, assume no benefit for use of PuriNOx in light-duty diesels

- Include cost of supplying PuriNOx to all on-road diesel, as it is impossible to segregate heavy-duty vehicles at the pump.
- Use MOBILE6-modeled Montgeomery County emissions data as a proxy for regional average
- Ozone season lasts 153 days
- From Lubrizol, cost premium for PuriNOx approximately $0.10 per gallon, assuming at least 25 million gallons annual usage
- Cost analysis does not include cost to region of offsetting increase in VOC, which would be needed to demonstrate rate of progress.
- From Version 2.1 Travel Demand Model, daily network VMT, including transit and school buses, will be
  - 2002: 121,811,100
  - 2005: 127,283,200
- Using straight-line interpolation, 2004 VMT will be 125,459,200
- From rate of progress calculations, 1.8 tpd NOx = 1 tpd VOC
- From analysis of 2005 Montgomery County emissions, diesel vehicles have following travel and emission characteristics:

CLASS	DUTY	% Mobile NOx	% Mobile VOC	MPG	% of VMT
LDDV	Light	N/A	N/A	28.3	0.001
LDDT11	Light	N/A	N/A	22.1	0.001
LDDV34	Light	N/A	N/A	15.5	0.002
HDDV2b	Light-Heavy	0.014	0.003	12.8	0.006
HDDV3	Light-Heavy	0.005	0.001	11.6	0.002
HDDV4	Light-Heavy	0.006	0.001	10.2	0.002
HDDV5	Light-Heavy	0.003	0.001	9.8	0.001
HDDV6	Med-Heavy	0.021	0.004	8.7	0.005
HDDV7	Med-Heavy	0.039	0.007	7.5	0.007
HDDV8a	Heavy-Heavy	0.065	0.007	6.5	0.008
HDDV8b	Heavy-Heavy	0.271	0.031	6.2	0.028
HDDBT	Heavy-Heavy	0.021	0.002	3.7	0.002
HDDBS	Heavy-Heavy	0.029	0.005	6.2	0.004

- From above table and EPA OTAQ's Diesel Retrofit website:

Duty-Class Totals	% Mobile NOx	% Mobile VOC	Avg MPG	% of VMT	% NOx Red	% VOC Inc
Light	N/A	N/A	20.4	0.004	N/A	N/A
Light-Heavy	2.8%	0.6%	11.8	0.011	9.0%	120.2%
Med-Heavy	6.0%	1.1%	8.0	0.012	10.2%	119.1%
Heavy-Heavy	38.6%	4.5%	6.1	0.042	12.9%	87.8%

Emission Reductions

NOx Reduced= 255.84 tpd on-road * (2.8% Light-Heavy * 9% reduction + 6% Med-Heavy * 10.2% reductions + 38.6% *

Heavy-Heavy * 12.9% reduction) * 80% compliance

NOx Reduced= *11.96 tpd*

VOC Increase = 109.85 tpd on-road * (0.6% Light-Heavy * 120.2% increase + 1.1% Med-Heavy * 119.1% increase + 4.5%% * Heavy-Heavy * 87.8% increase) * 80% compliance

VOC Increase = *5.26 tpd*

Net Decrease (NOx-VOC)= 11.96 tpd NOx - (5.26 tpd VOC *1.8 tpd NOx per VOC)

Net Decrease (NOx-VOC)= *2.50 tpd NOx equivalent*

Cost Effectiveness

Daily Gallons Consumed = (125,459,200 miles * 0.4% light-duty)/20.4 mpg + (125,459,200 miles * 1.1% light-heavy)/11.8 mpg + (125,459,200 miles * 1.2% med-heavy)/8.0 mpg + (125,459,200 miles * 4.2% heavy-heavy)/6.2 mpg

Daily Gallons Consumed = 1,179,627

Annual Expenditure= 1,179,627 gallons per day * $0.10 per gallon * 153 days per year

Annual Expenditure= $ 18,048,294

Cost-effectiveness ($/ton) = $18,048,294/ (tons/day * 153 days)

Cost-effectiveness (NOx-VOC) = $ 23,169

Summary Analysis

This measure is not economically feasible because it does not meet the cost effectiveness threshold. Therefore is is not a RACM.

Measure X1: Telecourses at Local Colleges and Universities

Measure Number: X1
Measure Name: Telecourses at Local Colleges and Universities

Description:
Encourage local colleges and universities to offer telecourses. This would reduce vehicle trips.

RACM Determination: No
Reason: Would not deliver benefits by May 2004

Criterion Summary

Year of First Benefits	2004+
Enforceable	Yes
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· This measure depends solely on participation by local educational institutions.

· Because FY 04 budgets are nearly complete, this measure could not be funded until FY 05 (July 2004). The first semester during which colleges could be recruited to participate would be the Fall 2004 semester, after the start of the 2004 ozone season.

· Many colleges already offer telecourses for student convenience and to reduce costs. Those colleges that do not offer the courses are unlikely to change behavior.

Summary Analysis

This measure would not deliver benefits by May 2004. Therefore it is not a RACM.

Measure X2: ATM Machines Installed at Metro Stations

Measure Number: X2
Measure Name: ATM Machines Installed at Metro Stations

Description:
Install ATMs near metro stations for rider convenience

RACM Determination: No
Reason: Unenforceable

Criterion Summary

Year of First Benefits	2004+
Enforceable	No
Economically Feasible	N/A
Technologically Feasible	Yes
Adverse Impacts	No
Intensive or Costly Effort	No

Estimated Cost	N/A
Estimated Reductions	N/A

Issues

· Metro will not install ATMs inside stations or parking facilities for security reasons

· Most urban and near-suburban metro stations have at least one ATM within walking distance.

· Neither Metro nor local jurisdictions have the authority to require landowners near metro stations to install ATMs. Therefore this measure is not enforceable.

Summary Analysis

This measure is not enforceable and is therefore not a RACM.